

Volume 6, Issue 2 (XXIII)  
April - June 2019

ISSN 2394 - 7780



International Journal of  
**Advance and Innovative Research**

Indian Academicians and Researchers Association  
[www.iaraedu.com](http://www.iaraedu.com)

# International Journal of Advance and Innovative Research

Volume 6, Issue 2 ( XXIII ): April - June 2019

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**Journal - 63571**

## UGC Journal Details

**Name of the Journal :** International Journal of Advance & Innovative Research

**ISSN Number :**

**e-ISSN Number :** 23947780

**Source:** UNIV

**Subject:** Multidisciplinary

**Publisher:** Indian Academicians and Researchers Association

**Country of Publication:** India

**Broad Subject Category:** Multidisciplinary

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**AN EXPLORATION OF OUTFLOW OF AGRICULTURAL SURPLUS TO NON-AGRICULTURE SECTOR IN UTTAR PRADESH**

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**ABSTRACT**

*It has been observed by several scholars that due to the higher marginal propensity to consume at lower and middle income levels, farmers have gone to improve living and nutrition standards including better education and health care rather than ploughing back it in to agriculture sector. Even growth of income of large cultivators; spread of financial institutions in the rural areas and the deceleration of investment in physical assets have resulted in increased outflow of savings from the agriculture sector to non-agricultural sectors. This study has explored the reason of outflow of agricultural surplus to non-agriculture sector in the state of Uttar Pradesh by a multistage stratified random sampling design with the help of a detailed structured questionnaire.*

*Most of the farmers preferred investment in agriculture due to lack of capital to invest in other business, which needs huge investment at a time, profit from cash crops, risk and competition in other business and less risk in agriculture. Most of the farmers in state preferred investment in non-agriculture sector to earn extra income, due to lower return from smallholdings in agriculture, to fulfill the needs of family, hard work and less profit in agriculture, increasing cost of inputs and lower prices of the agricultural product.*

*The results supported the view about the outflow of agricultural savings to non-agricultural sector, mainly in eastern region of the state. All these trends indicate that there was substantial out flow of the savings in agriculture sector to non-agricultural sector but it is not due to the neglect of agriculture. Importance of agriculture sector is still pertinent and reflected by large investment in the agriculture by the sample households, particularly by medium and large farmers. In spite of increasing cost of cultivation, hard fieldwork and decreasing returns, preference to invest in agriculture is not decreasing in farmers.*

*Keywords: Agricultural Surplus, investment, non-agriculture sector, preference to invest, outflow*

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**INTRODUCTION**

The growth of Indian agriculture depends upon what the farmers do with the additional incomes generated. The income from cultivation partly depends upon the nature of crops grown and partly upon the intensity of cultivation. The technological break-through in agricultural production through HYV seeds-fertilizers revolution has accelerated the transformation of Indian farm economy from subsistence level to a profitable business since green revolution periods. Consequently, farmers were motivated to save and invest in order to expand their incomes and shrink in rural poverty.

Agriculture contributed more than 52 % of total output of India's economy in early 1950s. Recently, its share has steadily declined to about 13%. Transformation of Indian economy from agriculture to non-agriculture sector got a strong drive after 1980-81. Though, the lethargic incorporation of labor force in the non-agricultural sector raises concerns among policy makers and scholars. This disproportion share of agricultural and non-agricultural sectors in income and employment created a widening gap between the earnings of agricultural and non-agricultural labour. This has been converted into a growing rural-urban divide and inter-sectoral disparities.

In India, there has been an unbalanced surplus transfer progressively increasing inequality between villages and towns. The Government of India has succeeded in transferring agricultural families saving and skills for investment into non-agricultural fixed and human capital. The transfer of agricultural capital surplus in excess of investment in agriculture to non-agricultural uses has damaged the rate of growth of the total output.

A number of studies have been conducted in India covering various aspects of inter-sectoral resource transfers focused on understanding the mechanism through which resource transfers have influenced the relative growth of the sectors. Mellor (1967, 1971) and Mellor and Lele (1972) discuss the magnitude of the resource flows of agriculture and non-agriculture sector under various conditions of economic growth and highlight their relationship with changing technology and economic and institutional devices. In case of India the study finds that all the three mechanisms, i.e., government accounts, price relationships and private accounts have transferred resources to the agriculture sector, which is not a case of successful development. So a wide range of devices may be used to facilitate such resource transfers, including the increasing agricultural taxes, lowering the relative agricultural prices and direct investment outside agriculture by wealthy agriculturalists. A



contrasting argument is given by Michael Lipton (1978, 1980) that resources are transferred to the non-agricultural sector than to the agriculture sector presumably on the assumption that the rate of return to investment is higher in the non-agriculture sector.

There was an extensive discussion during the 1975 conference of the Indian Society of Agricultural Economics about the determinants of investment and the need for mobilization of rural surpluses. Some of the studies pointed out that a number of farm households were diverting a large part of increased income to non-farm investment or consumption. Singh and Gugnani (1975) observed that due to the higher marginal propensity to consume at lower and middle income levels, farmers have gone to improve living and nutrition standards including better education and health care rather than ploughing back it in to agriculture sector. Several researchers analyzed that the intra-sectoral flow of savings and investment becomes more important than the inter-sectoral transfer of savings because the distribution of land and thus of incomes is largely uneven among farmers, so on some farms a large proportion of additional income has been invested in farm activities, but a number of farm households where additional avenues of profitable investment on farm are drying up divert saving to non-farm investment (Bansal, 1969; Panikar, 1969; Panchamukhi, 1975; Joshi, 1992)

Several studies by Mundle (1975, 1977, 1981) regarding the estimation of resource flows between agriculture and non-agriculture, explained that the drain of resources from agriculture hampers capitalist development in agriculture and reduces the differentiation of peasantry limiting thereby the growth of market for industrial goods in the agriculture sector. Some studies have estimated the direction of flows and concluded that financial flows have favoured agriculture, which in turn have led to a saving potential in the agriculture sector. These studies have drawn attention to lower growth in rural debts and higher rate of repayment defaults, implying an increase in the non-capital formation uses of the credit advances, which is indicated by relative shift of investment pattern of rural household in favour of non-farm activities (Mody 1983, 1984; Griappa, 1984; Shetty, 1990)

Backward and stagnant technology in the rural sector was tended to reduce the effective uses of current investment. Many scholars have pointed out growth of income of large cultivators; spread of financial institutions in the rural areas and the deceleration of investment in physical assets have resulted in increased outflow of savings from the agriculture sector to non-agricultural sectors.

**Objective-** In this backdrop, the main theme of this paper is to explore the reason of outflow of agricultural surplus to non-agriculture sector in the state of Uttar Pradesh.

The paper is organized into four sections. Section one describes briefly the methodology and study design. In section two estimates of outflow of agricultural surplus to non-agriculture sector have been worked out. Income and investment, per farm saving and its use for different purposes and reasons for preference to invest the savings in agriculture sector and non-agriculture sector have been discussed in this section. Section three summarizes the main findings of the paper.

### **I- Study Design and Methodology**

A multistage stratified random sample design was adopted for the primary data collection from 256 selected rural households to study the investment behaviour of farmers. Data on various aspects of socio-economic conditions of the households, their income levels and saving and investment pattern were collected with the help of a detailed structured questionnaire for the period of 1 Aug 2014 to 30 Sep 2015. In the first stage two districts, one each from the eastern and western regions of U.P. was selected. Bijnor district was selected of west U.P. and Faizabad district of east U.P., as they represent the average situation prevailing in the two regions. In the second stage, two blocks were selected from each district, one with good irrigation facilities, and the other with poor irrigation facilities to take into account the variations in resource endowment.

In the third stage, two villages were selected from each of the selected blocks, one with better infrastructure facilities in terms of roads and banks and the other with relatively poorer infrastructure facilities. In the final stage, 32 cultivating households were selected from each of the selected villages. Eight households were randomly selected in each village and from each category (according to the size of holding representing marginal (<1 hectare), small (1 to 2 hectares), medium (2 to 4 hectares) and large cultivators (>4 hectares).

**II -Outflow of agricultural surplus to non-agriculture sector-** Outflow of agricultural surplus to non-agriculture sector is an important issue in India. Various scholars explained that a number of farm households were diverting a large part of their income to non-farm investment.

**A: Income and Investment by Sample House Holds-**

All categories of sample households earned more than 58% in Faizabad and more than 78% in Bijnor district of their income by agriculture sector. However, their investment in agriculture sector accounted for 53 % and 58% in both the districts respectively. Income from agriculture sector on large farms was 55% while their investment in sector was 50% of total investment. Income from agriculture sector on large farms was 73% while their investment in agriculture was about 64 % of total investment in Bijnor districts. Investment in non-agriculture sector by marginal farmers in both districts was higher than agriculture sector.

**Table-1: Per Farm Income and Investment by Sample House Holds**

Land Holding	Income Source			Pattern of Investment		
	Agriculture sector	Non-Agriculture sector	Total	Agriculture sector	Non-Agriculture sector	Total
<b>Faizabad</b>						
Marginal	41833	22242	64075	12278	17982	30260
	(65.3)	(34.7)	(100.0)	(40.6)	(59.4)	(100.0)
Small	49948	24500	74448	36837	29317	66154
	(67.1)	(32.9)	(100.0)	(55.7)	(44.3)	(100.0)
Medium	70947	60868	131815	105723	78682	184405
	(53.8)	(46.2)	(100.0)	(57.3)	(42.7)	(100.0)
Large	133686	106681	240367	146166	141663	287829
	(55.6)	(44.4)	(100.0)	(50.8)	(49.2)	(100.0)
All Farms	74107	53573	127680	75251	66910	142161
	(58.0)	(42.0)	(100.0)	(52.9)	(47.1)	(100.0)
<b>Bijnor</b>						
Marginal	58138	10499	68637	13864	24262	38126
	(84.7)	(15.3)	(100.0)	(36.4)	(63.6)	(100.0)
Small	73730	14679	88409	45459	37114	82573
	(83.4)	(16.6)	(100.0)	(55.1)	(44.9)	(100.0)
Medium	132997	30050	163047	112361	95171	207532
	(81.6)	(18.4)	(100.0)	(54.1)	(45.9)	(100.0)
Large	213592	78599	292191	210855	120100	330955
	(73.1)	(26.9)	(100.0)	(63.7)	(36.3)	(100.0)
All Farms	119616	33457	153073	95635	69161	164796
	(78.1)	(21.9)	(100.0)	(58.0)	(42.0)	(100.0)

Source: Primary survey data, note: Figure in parenthesis indicates percentage to total.

**B: Per Farm Saving and Its Use for Different Purposes**

The study had enquired from the sample households about number of children are reading in the city and an average per month expenditure on education of them and also their saving and its utilization for different purposes in last five years. More than 90 % of large farmers' children were reading in the city in both districts. About 80 % small and medium farmers' children were also reading in city in Bijnor district. This indicates the interest of all categories of farmers to increase the educational level in Bijnor district and higher investment in education in western UP. The results supported the view of the outflow of agricultural savings to non-agricultural sector as only 15 % and 20% of the total saving was invested in agriculture sector in both districts in last five years.

The average investment from the saving in five years was highest in agriculture among different purposes on all size of farms in Bijnor district. Marginal and small farmers in Bijnor district invested one-fourth and one-third of their saving in agriculture. This is rather an encouraging picture for agriculture, particularly in western Uttar Pradesh. Marginal and small farmers also invested significant amount of their savings into plots and buildings, vehicles and non-farm business in last five years in Bijnor.

**Table-2: Per Farm Saving and Its Use for Different Purposes by Sample Households in Last Five Years**

Sources	Faizabad					Bijnor				
	Marginal	Small	Medium	Large	All Farms	Marginal	Small	Medium	Large	All Farms
Agriculture	4921	6643	20979	52956	21375	2819	5783	41056	152447	50526
Sector	(14.16)	(14.48)	(12.28)	(17.06)	(15.21)	(23.69)	(33.09)	(16.81)	(21.59)	(20.63)

Increase current	1173	2584	4054	12604	5104	469	563	7562	10135	4682
Consumption	(3.38)	(5.63)	(2.37)	(4.06)	(3.63)	(3.94)	(3.22)	(3.10)	(1.44)	(1.91)
Buildings/Plots	5065	6838	25800	53991	22923	1968	2362	62395	64500	32806
	(14.58)	(14.90)	(15.11)	(17.39)	(16.31)	(16.54)	(13.51)	(25.55)	(9.14)	(13.39)
Durable	1030	991	9751	9979	5438	768	934	5988	14377	5517
Household goods	(2.96)	(2.16)	(5.71)	(3.21)	(3.87)	(6.45)	(5.34)	(2.45)	(2.04)	(2.25)
Jewellery/Gold	1921	2593	5216	29477	9802	412	494	17686	13041	7908
etc.	(5.53)	(5.65)	(3.05)	(9.49)	(6.97)	(3.46)	(2.83)	(7.24)	(1.85)	(3.23)
Education of	1225	2654	6618	20750	7812	490	588	42450	116545	40018
Children	(3.53)	(5.78)	(3.88)	(6.68)	(5.56)	(4.12)	(3.36)	(17.39)	(16.51)	(16.34)
Shares &	0	0	1807	2695	1189	0	0	0	0	0
Debentures	(0.0)	(0.0)	(1.06)	(0.87)	(0.85)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Banks &	1946	2027	9878	13058	6727	778	1922	7835	152889	40856
Post offices	(5.60)	(4.42)	(5.78)	(4.21)	(4.79)	(6.54)	(10.99)	(3.21)	(21.66)	(16.68)
Non Agriculture	4457	4017	22624	45524	19155	2026	2139	27314	106559	34510
Business	(12.83)	(8.75)	(13.25)	(14.66)	(13.63)	(17.03)	(12.24)	(11.19)	(15.09)	(14.09)
Vehicles	12048	16235	61156	68427	39466	1783	2431	31774	74695	27671
	(34.67)	(35.38)	(35.81)	(22.04)	(28.08)	(14.98)	(13.91)	(13.01)	(10.58)	(11.30)
Other	965	1304	2898	1029	1549	386	263	117	746	378
Purposes	(2.78)	(2.84)	(1.69)	(0.33)	(1.10)	(3.24)	(1.51)	(0.05)	(0.11)	(0.15)
Total Saving in	34751	45885	170781	310489	140540	11900	17479	244177	705935	244872
Five Years	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Source: Primary survey data, Note: Figure in parenthesis indicates percentage to total.

About 35% of the farmers in Faizabad reported the agriculture sector as area of preference to invest their savings. However, approximately same proportion of farmers preferred non- agriculture sector in the district. A good ratio of the farmers were also sought to invest in both sectors in Faizabad district. Nearly 43% of medium farmers were reported the preference to investment in agriculture sector and most of the large farmers preferred both sector to invest in Faizabad. But there was a different scenario in Bijnor district. More than 50% of the farmers interested to invest in agriculture sector (Table.3). Proportion of farmers, who preferred agriculture sector for investment, increased with increase in size of holdings in the district. Most of the marginal farmers were interested to invest in non-agriculture in both districts. All these trends indicates that there was substantial out flow of the savings in agriculture sector to non- agricultural sector, particularly in the eastern region of Uttar Pradesh but it is not the neglect of agriculture in the region. Importance of agriculture sector is still pertinent and reflected by huge investment in the agriculture by the sample households in both districts, particularly by medium and large farmers.

**Table-3: Households Reporting Area of Preferences to Invest the Savings**

Area of Preference to Invest the Savings	Marginal	Small	Medium	Large	All Farms
			Faizabad		
Agriculture sector	10 (31.25)	11 (34.38)	14 (43.75)	10 (31.25)	45 (35.15)
Non Agriculture sector	17 (53.13)	12 (37.5)	9 (28.13)	9 (28.13)	47 (36.72)
Both Sectors	5 (15.62)	9 (28.13)	9(28.13)	13(40.62)	36(28.12)
Total	32	32	32	32	128
<b>Bijnor</b>					
Agriculture sector	15 (46.87)	15 (46.87)	19 (59.37)	20 (62.5)	69 (53.91)
Non Agriculture sector	16 (50.0)	12 (37.5)	8 (25.0)	5 (15.62)	41 (32.03)
Both Sectors	1 (3.12)	5 (15.62)	5 (15.62)	7 (21.87)	18 (14.06)
Total	32	32	32	32	128

Source: Primary survey data

### C: Reasons for preference to invest the savings in agriculture sector and non-agriculture Sector

The sample households were asked to give one reason for preference to invest in agriculture and one reason for preference to invest in non-agriculture sector. Most of the farmers, particularly marginal and small farmers in both districts preferred investment in agriculture due to lack of capital to invest in other business, which needs

huge investment at a time (Table 4). Profit from cash crops attracts most of the medium and large farmers to invest in agriculture in both districts. Due to parental occupation, a good proportion of farmers in both districts preferred investment in agriculture. Risk and competition in other business and less risk in agriculture was also a reason to invest in agriculture.

Most of the farmers of all categories in both districts preferred investment in non-agriculture sector to earn extra more income. Most of the marginal and small farmers preferred non-agriculture sector to invest due to lower return from their small size holdings.

**Table 4: Reasons for Preference to Invest the Savings in Agriculture Sector**  
(No. of persons reporting in %)

Reasons for Preference to Invest the Savings in Agriculture Sector	Marginal	Small	Medium	Large	All Farms
	Faizabad				
No money to invest in other business	46.88	31.25	12.50	0.00	22.66
To nourish big family by agriculture	6.25	9.38	6.25	3.13	6.25
There is less risk in agriculture	12.50	3.13	0.00	6.25	5.47
No Knowledge of other business	15.63	9.38	3.13	12.50	10.16
Hard work & good investment make agriculture much profitable	3.13	12.50	6.25	6.25	7.03
To increase productivity of land	3.13	0.00	6.25	6.25	3.91
No time for other business with service	6.25	3.13	9.38	15.63	8.59
To get pure food grains	0.00	3.13	0.00	15.63	4.69
Investment in Orchards gives more profit	0.00	0.00	9.38	6.25	3.91
Investment in cash crops makes good profit	0.00	3.13	25.00	15.63	10.94
We have to invest in agricultural land , it is parental occupation	6.25	21.88	6.25	6.25	10.16
Much competition in other business	0.00	3.13	15.63	6.25	6.25
Total	100.00	100.00	100.00	100.00	100.00
Bijnor					
No money to invest in other business	50.00	31.25	9.38	6.25	24.22
To nourish big family by agriculture	12.50	12.50	9.38	18.75	13.28
There is less risk in agriculture	12.50	0.00	6.25	6.25	6.25
No Knowledge of other business	9.38	15.63	12.50	9.38	11.72
Hard work & good investment make agriculture much profitable	0.00	6.25	6.25	12.50	6.25
To increase productivity of land	0.00	12.50	9.38	3.13	6.25
No time for other business with service	6.25	3.13	9.38	9.38	7.03
To get pure food grains	3.13	6.25	12.50	9.38	7.81
Investment in Orchards gives more profit	0.00	0.00	3.13	0.00	0.78
Investment in cash crops makes good profit	0.00	0.00	18.75	12.50	7.81
We have to invest in agricultural land , it is parental occupation	6.25	12.50	3.13	9.38	7.81
Much competition in other business	0.00	0.00	0.00	3.13	0.78
Total	100.0	100.0	100.0	100.0	100.0

**Table-5: Reason for Preference to Invest the Savings in Non-Agriculture Sector**  
(No. of persons reporting in %)

Reason for Preference to Invest the Savings in Non-Agricultural Sector	Marginal	Small	Medium	Large	All Farms
	Faizabad				
For extra & more income	21.88	37.50	3.13	9.38	17.97
No profit to invest in marginal & small holdings	34.38	15.63	0.00	0.00	12.50
Only farming can't give sufficient money in increasing Inflation	15.63	6.25	31.25	18.75	17.97
Non farm business gives more profit	9.38	9.38	12.50	6.25	9.38
To involve family members rather than farming	6.25	0.00	3.13	9.38	4.69
Lower prices of the product in agriculture	6.25	15.63	21.88	12.50	14.06
To fulfil the needs of big family	3.13	3.13	6.25	9.38	5.47

Already invested a large amount in agriculture in past years	0.00	0.00	9.38	12.50	5.47
Price of inputs in agriculture are increasing	0.00	3.13	9.38	6.25	4.69
There is more hard work & less profit in agriculture	3.13	9.38	3.13	15.63	7.81
Total	100.00	100.00	100.00	100.00	100.00
<b>Bijnor</b>					
For extra & more income	21.88	31.25	9.38	9.38	17.97
No profit to invest in marginal & small holdings	25.00	18.75	0.00	0.00	10.94
Only farming can't give sufficient money in increasing Inflation	15.63	6.25	6.25	9.38	9.38
Non farm business gives more profit	6.25	9.38	12.50	12.50	10.16
To involve family members rather than farming	12.50	3.13	6.25	9.38	7.81
Lower prices of the product in agriculture	6.25	12.50	18.75	12.50	12.50
To fulfil the needs of big family	0.00	6.25	3.13	12.50	5.47
Already invested a large amount in agriculture in past years	0.00	0.00	21.88	18.75	10.16
Price of inputs in agriculture are increasing	12.50	6.25	6.25	3.13	7.03
There is more hard work & less profit in agriculture	0.00	6.25	15.63	12.50	8.59
Total	100.00	100.00	100.00	100.00	100.00

Source: Primary survey data

To fulfill their needs in increasing inflation forced a number of farmers to invest in non- agriculture sector to earn extra income in both districts. Due to hard work and less profit accordingly in agriculture was an important reason for the investment in non-agriculture. Increasing cost of inputs and lower prices of the agricultural product makes agriculture less profitable, so most of the farmers in both districts preferred non-agriculture sector for investment.

### III. CONCLUSION

The study has estimated current saving in the form of financial and physical assets. Financial saving was not large on marginal and small farms but was substantial on the medium and large farms in both districts. Investment from own savings in the last five years was highest in agriculture among different purposes on all size of farms in Bijnor district. Marginal and small farmers in Bijnor district invested a good proportion of their saving in agriculture. On the other hand, medium and large farmers in the district also diverted their savings in other uses because they already invested sufficient amount in the agriculture. This is rather an encouraging picture for agriculture, particularly in western Uttar Pradesh. However, in Faizabad, purchase vehicles, plots and buildings ornaments, and non-farm business was mostly preferred by the farmers for investment.

Proportion of farmers, who preferred agriculture sector for investment, increased with increase in size of holdings in the district. Most of the farmers preferred investment in agriculture due to lack of capital to invest in other business, which needs huge investment at a time, profit from cash crops, risk and competition in other business and less risk in agriculture. Most of the farmers in both the districts preferred investment in non-agriculture sector to earn extra income, due to lower return from smallholdings in agriculture, to fulfill the needs of family in increasing inflation, hard work and less profit in agriculture, increasing cost of inputs and lower prices of the agricultural product.

The results supported the view about the outflow of agricultural savings to non- agricultural sector, mainly in eastern region of the state. All these trends indicate that there was substantial out flow of the savings in agriculture sector to non-agricultural sector but it is not due to the neglect of agriculture. Importance of agriculture sector is still pertinent and reflected by large investment in the agriculture by the sample households in both districts, particularly by medium and large farmers. In spite of increasing cost of cultivation, hard fieldwork and decreasing returns, preference to invest in agriculture is not decreasing in farmers of both the districts.

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**ANTIFUNGAL AND ANTIBACTERIAL PROPERTIES OF 4-HYDROXY-3-[(1E)-PROP-1-EN-1-YL]PHENYL 4-(1H-INDOL-3-YL)BUTANOATE' COMPOUND****Deven Mamania<sup>1</sup>, Raj Badekar<sup>2</sup>, Sharad Sankhe<sup>3</sup> and Rama Lokhande<sup>4</sup>**<sup>1,4</sup>School of Basic Sciences, Jaipur National University, Jaipur<sup>2</sup>Riva Industries, Ambernath MIDC, Ambernath, Thane<sup>3</sup>Chemistry Department, Patkar-Varde College, Goregano, Mumbai**ABSTRACT**

In the present study, title compound by synthesized reported method. 4-Hydroxy-3-[(1E)-prop-1-en-1-yl]phenyl 4-(1H-indol-3-yl)butanoate compound was screened for their invitro growth inhibiting activity against different strains of bacteria viz. *E. coli*(G-), *S. aureus*(G+), *S. typhi*(G+), *B. subtilis*(G+), *K. pneumonice*(G+), *P. aeruginosa*(G+). For the detection of antibacterial activities, the agar cup method. Nutrient agar (NA) was used as basal medium for test bacteria and Antifungal activities of synthesized compound towards five plant pathogenic and mould fungi were studied, viz. *Colletotrichum Gloeosporiodes penz*, *Canilida Albicans*, *Aspergillus Niger*, *Aspergillus Flaves* and *penicillium sp*.

**Keywords:** Indole-3-butanoic acid, Isoeugenol, Antifungal and Antibacterial

**INTRODUCTION**

Isoeugenol is naturally occurring product and widely used in flavoring additive and fragrances. Isoeugenol is reported<sup>1</sup> both liquid (*cis*) and crystal (*trans*) isomers, miscible in alcohol, ether, ethanol and propylene glycol. Isoeugenol was synthesized by eugenol and caustic potash isomerization<sup>2</sup> process and purified by distillation<sup>3</sup>. Isoeugenol is also useful in flavoring agent for chewing gum, backed goods and non-alcoholic beverages<sup>4</sup>. Mortelmans et al<sup>6</sup>, was tested isoeugenol against salmonella typhimurium strains all concentrations (303, 10.0, 33.0, 100.0, 250.0, 333.0, and 800.0 g/plate). Isoeugenol was observed to be non-mutagenic. Mutagenicity tests were performed on *E. coli* reported by Sekizawa and Shibamoto<sup>7</sup> and no mutagenic effects was observed. Also isoeugenol was tested against *B. subtilis* strain reported Sekizawa and Shibamoto<sup>7</sup> and they are studies of genotoxic of isoeugenol was found in their article. The reaction of eugenol, isoeugenol and methyl eugenol with various indole acids was reported earlier<sup>8-10</sup>. In view of these, we wish to reports the 'antifungal and antibacterial properties of 4-Hydroxy-3-[(1E)-prop-1-en-1-yl]phenyl 4-(1H-indol-3-yl)butanoate'.

**MATERIALS AND METHODS**

All chemicals and solvents used were of AR grade. Synthesis of the title compound prepared by reported method<sup>11</sup>.

**ANTIBACTERIAL ACTIVITY**

Antibacterial activities of synthesized compound were studied against six human pathogenic bacteria, viz. *E. coli*(G-), *S. aureus*(G+), *S. typhi*(G+), *B. subtilis*(G+), *K. pneumonice* (G+), *P. aeruginosa*(G+) (**Table-1**). For the detection of antibacterial activities, the agar cup method. Nutrient agar (NA) was used as basal medium for test bacteria. The agar media were inoculated with 0.5ml of 24 h liquid cultures containing 107 microorganisms/ml. diffusion times was 24 h at 5°C for all bacteria, and incubation time was 24h at 37°C. Discs with only DMF were used as solvent. Inhibitory activity was measured (in mm) as the diameter of the observed inhibition zones.

**Determination of the Minimum Inhibitory Concentration (MIC)**

Minimum inhibitory concentration means as the lowest concentration that inhibits bacterial growth. To determine minimum inhibitory concentration (MIC), the serial dilution technique was followed using nutrient broth medium. MIC values of the all synthesized compounds were determined against all six bacteria.

**Antifungal Activity**

Antifungal activities of synthesized compound towards five plant pathogenic and mould fungi were studied, viz. *Colletotrichum Gloeosporiodes penz*, *Canilida Albicans*, *Aspergillus Niger*, *Aspergillus Flaves* and *penicillium sp*. Antifungal activity was assessed g/disc) was used as standard fungicides, by the poisoned food technique<sup>12</sup>, in a modified condition<sup>13</sup>. Fluconazole (200 dextrose sugar (PDA) was used as basal medium for test fungi. Glass petri dishes used were sterilized. Sterilized melted PDA medium at 45°C was poured at the rate of 15mL into each petri dish (90mm). After solidification of the medium small portions of the mycelium of each fungus were spread carefully over the center of each PDA plate with the help of sterilized needles. Thus, ready for use after five days of fungus was transferred to a number of PDA plates, which were then incubated at 25°C (incubation). Prepared disc of sample were placed gently on solidified agar plates, freshly seeded with the test

organisms with sterile forceps. A control disc was also placed on the test plates compare the effect of solvent respectively. The plates were then kept in a refrigerator at 4°C for 24hrs, so that the materials had sufficient time to diffuse over a considerable area of the plates. After this the plates were incubated at 37°C for 72hrs DMF was used as solvent to prepare desired solutions (10mg/mL) of the compounds initially and also to maintain proper control.

## RESULTS AND DISCUSSIONS

The physical and analytical properties of the prepared compound previously reported. In this article they are elucidated structural geometry on the basis of spectral data.

### Antibacterial activity

**Table-1** shows the antibacterial activity of the 4-Hydroxy-3-[(1E)-prop-1-en-1-yl]phenyl 4-(1H-indol-3-yl)butanoate compound. It was found that this compound is more effective in inhibiting the microbial growth as compared to standard streptomycin, similar kind of observation was made in many previous studies. The possible reason behind this may be the interaction of the isoeugenol with indole acid derivatives. This newly combination is strong binding with internal atoms. Hence, they are not allowed the normal functioning of the microbial cell. Not only this, their higher temperature may also allow them to use as a potential antimicrobial agent.

**Table-1: Antibacterial activities of 4-Hydroxy-3-[(1E)-prop-1-en-1-yl]phenyl 4-(1H-indol-3-yl)butanoate [Minimum inhibitory concentration (MIC)]**

Conc(ppm)	<i>E. coli</i>	<i>S. aureus</i>	<i>S. typhi</i>	<i>B. subtilis</i>	<i>K. pneumonice</i>	<i>P.aeruginosa</i>
50	4	-	-	-	-	4
75	10	9	12	7	11	12
100	12	11	14	10	13	15
150	15	16	17	13	14	15
200	20	17	19	15	14	16
500	25	19	21	19	16	18
Streptomycin	29	30	27	30	33	39

### Antifungal Screening

The antifungal activities of prepared compound have been assayed at concentration of 500ppm against five plant pathogens and mould fungi. The inhibitory effects of the compound against these organisms are given in **Table-2**. The screening results indicate that synthesized compound shows good antifungal activities against *Colletotrichum Gloeosporiodes penz*, *Canilida Albicans*, *Aspergillus Niger*, *Aspergillus Flavescens* and *penicillium sp*.

**Table-2: Antifungal activities of 4-Hydroxy-3-[(1E)-prop-1-en-1-yl]phenyl 4-(1H-indol-3-yl)butanoate**

Conc(ppm)	<i>Colletotrichum Gloeosporiodes penz</i>	<i>Canilida Albicans</i>	<i>Aspergillus Niger</i>	<i>Aspergillus Flavescens</i>	<i>Penicillium sp</i>
IEIBA	32	27	25	29	22
Fluconazole	29	31	26	31	30

## CONCLUSION

When the prepared molecule was evaluated for their antimicrobial activity it was observed that they are more effective and show good antibacterial and antifungal activities.

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Journal of Advance and Innovative Research Volume 5, Issue 4 (XIII): October - December, 2018 17 ISSN 2394 - 7780

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## ANTIFUNGAL AND ANTIBACTERIAL PROPERTIES OF ISOEUGENOL DERIVATIVE OF INDOLE-3-PROPANOIC ACID

Sandeep Saundalkar<sup>1</sup>, Raj Badekar<sup>2</sup>, Pradeep Shimpi<sup>3</sup> and Rama Lokhande<sup>1</sup><sup>1,4</sup>School of Basic Sciences, Jaipur National University, Jaipur<sup>2</sup>Riva Industries, Ambernath MIDC, Ambernath, Thane<sup>3</sup>Chemistry Department, BNN College, Bhiwandi, Thane, Maharashtra

## ABSTRACT

In the present study, title compound by synthesized reported method. Synthesized compound were screened for their invitro growth inhibiting activity against different strains of bacteria viz *E. coli*(G-), *S. aureus*(G+), *S. typhi*(G+), *B. subtilis*(G+), *K. pneumonice*(G+), *P. aeruginosa*(G+). For the detection of antibacterial activities, the agar cup method. Nutrient agar (NA) was used as basal medium for test bacteria and Antifungal activities of synthesized compound towards five plant pathogenic and mould fungi were studied, viz. *Colletotrichum Gloeosporiodes penz*, *Canilida Albicans*, *Aspergillus Niger*, *Aspergillus Flaves* and *penicillium sp.*

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## INTRODUCTION

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## MATERIALS AND METHODS

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### Antibacterial activity

**Table-1** shows the antibacterial activity of the synthesized compound. It was found that this compound is more effective in inhibiting the microbial growth as compared to standard streptomycin, similar kind of observation were made in many previous studies. The possible reason behind this may be the interaction of the isoeugenol with indole acid derivatives. This newly combination is strong binding with internal atoms. Hence, they are not allowed the normal functioning of the microbial cell. Not only this, their higher temperature may also allow them to use as a potential antimicrobial agent.

**Table-1: Antibacterial activities of Isoeugenolindole-3-propanoic acid [Minimum inhibitory concentration (MIC)]**

Conc(ppm)	<i>E. coli</i>	<i>S. aureus</i>	<i>S. typhi</i>	<i>B. subtilis</i>	<i>K. pneumoniae</i>	<i>P.aeruginosa</i>
50	3	1	-	-	-	3
75	15	11	12	17	21	12
100	19	18	19	20	28	20
150	25	26	29	30	33	35
200	30	31	31	35	34	36
500	35	37	38	39	34	41
Streptomycin	28	30	27	30	33	39

### Antifungal Screening

The antifungal activities of prepared compound have been assayed at concentration of 500ppm against five plant pathogens and mould fungi. The inhibitory effects of the compound against these organisms are given in **Table-2**. The screening results indicate that synthesized compound shows good antifungal activities against *Colletotrichum Gloeosporiodes penz*, *Canilida Albicans*, *Aspergillus Niger*, *Aspergillus Flaves* and *penicillium sp*.

**Table-2: Antifungal activities of Isoeugenolindole-3-propanoic acid**

Conc(ppm)	<i>Colletotrichum Gloeosporiodes penz</i>	<i>Canilida Albicans</i>	<i>Aspergillus Niger</i>	<i>Aspergillus Flaves</i>	<i>Penicillium sp</i>
IEIPA	35	31	33	29	25
Fluconazole	28	30	27	30	33

## CONCLUSION

When the prepared molecule was evaluated for their antimicrobial activity it was observed that they are more effective and show good antibacterial and antifungal activities.

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- Opdeyke D. L. J.; (1975); Monographs: Monographs on fragrance raw materials, food and cosmetic toxicology; Vol-13, 815-817. Comp Color Purity (by GC) % M.P. Elemental Analysis % C Found (Calcd) % H Found (Calcd) % N Found (Calcd) % O Found (Calcd) IEIPA Brown 96.39 208 75.13 (74.78) 6.26 (6.32) 4.17 (4.03) 14.31 (13.75) Compound  $\lambda_{nm}$  Transition IEIPA 330 249  $\pi \rightarrow \pi^*$   $\pi^* \rightarrow \pi$  International Journal of Advance and Innovative Research Volume 5, Issue 4 (XIII): October - December, 2018 17 ISSN 2394 - 7780

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ANTIMICROBIAL STUDIES OF *O*-, *M*- AND *P*-SUBSTITUTED BROMOBENZALDEHYDE DERIVATIVES OF BENZILMONOXIMETHIOCARBOHYDRAZIDEDeepak Singh<sup>1</sup>, Raj Badekar<sup>2</sup> Santosh Kulkarni<sup>3</sup> and Rama Lokhande<sup>4</sup><sup>1,4</sup>School of Basic Sciences, Jaipur National University, Jaipur<sup>2</sup>Riva Industries, Ambernath MIDC, Ambernath, Thane<sup>3</sup>Chemistry Dept., K.M. Agrawal College, Kalyan, Thane

## ABSTRACT

Azomethine linkage plays an important role in medical fields such as antimicrobial, anticancer, antiviral and antitubular activities. Antibacterial and antifungal properties of Schiff bases have been identified by various scientists in the past and also lots of work is also going on to identify the unique properties of these Schiff bases. Here another attempt was made to identify the antimicrobial properties of *o*-, *m*- and *p*-substituted bromobenzaldehyde and Benzilmonoximethiocarbohydrazide. Major focus was given on antibacterial and antifungal activities of title compounds.

Keywords: Schiff bases, Antimicrobial, Antifungal, Antibacterial, Benzilmonoxime

## INTRODUCTION

Azomethine group containing (-C=N-) group known as Schiff bases prepared by the reaction between primary amines and aldehydes or ketones group<sup>1-2</sup>. They form a significant class of compounds in pharmaceutical and medical chemistry with several biological applications such as, antifungal<sup>3-6</sup>, antibacterial<sup>7-8</sup>, antioxidant<sup>9</sup>, anticancer<sup>8</sup>, neurological disorders<sup>10</sup> and diuretic activities<sup>11</sup>. They are the important compounds owing to their wide range of industrial applications in food industry, dye industry, analytical chemistry, catalysis, agrochemicals<sup>12-13</sup>. In our previous article<sup>14</sup>, we are synthesized title compounds and they are characterized by elemental analysis and some spectral data. Prepared compounds are one of the best examples of Schiff bases, because two Schiff bases are present.

After scanning of literatures, we are concluded that the Schiff bases are remarkably effective against various strains of microorganisms. In view of this, we wish to antimicrobial evaluation of *o*-, *m*- and *p*-substituted bromobenzaldehyde derivatives of Benzilmonoximethiocarbohydrazide compounds.

## EXPERIMENTAL

*o*-, *m*- and *p*-substituted bromobenzaldehyde derivatives of Benzilmonoximethiocarbohydrazides prepared by reported methods<sup>14</sup>.

## Antibacterial Screening

Antibacterial activity was carried out by agar cup method against *E. coli*(G-), *S. aureus*(G+), *S. typhi*(G+), *B. subtilis*(G+), *K. pneumonise*(G+), and *P. aeruginosa*(G+). Four different concentrations 50, 100, 200, 500ppm were used for determination of the activity. Zone of inhibition was measured in mm.

## Antifungal Activity

Antifungal activities of prepared compounds towards five plant pathogenic and mould fungi were studied, viz. Colletotrichum Gloeosporiodes penz, Canilida Albicans, Aspergillus Niger, Aspergillus Flavescens and penicillium sp. Antifungal activity was assessed g/disc) was used as standard fungicides, by the poisoned food technique<sup>15</sup>, in a modified condition<sup>16</sup>. Fluconazole (200 dextrose sugar (PDA) was used as basal medium for test fungi. Glass petri dishes used were sterilized. Sterilized melted PDA medium at 45°C was poured at the rate of 15mL into each petri dish (90mm). After solidification of the medium small portions of the mycelium of each fungus were spread carefully over the center of each PDA plate with the help of sterilized needles. Thus, ready for use after five days of fungus was transferred to a number of PDA plates, which were then incubated at 25°C (incubation). Prepared disc of sample were placed gently on solidified agar plates, freshly seeded with the test organisms with sterile forceps. A control disc was also placed on the test plates compare the effect of solvent respectively. The plates were then kept in a refrigerator at 4°C for 24hrs, so that the materials had sufficient time to diffuse over a considerable area of the plates. After this the plates were incubated at 37°C for 72hrs DMF was used as solvent to prepare desired solutions (10mg/mL) of the compounds initially and also to maintain proper control.

## RESULTS AND DISCUSSIONS

Table-1 shows the antibacterial activity of the *o*-, *m*- and *p*-substituted bromobenzaldehyde derivatives of Benzilmonoximethiocarbohydrazide and prepared compounds abbreviated as HBMT<sub>o</sub>BB, HBMT<sub>m</sub>BB and HBMT<sub>p</sub>BB respectively. It was found that prepared compounds are effective in inhibiting the microbial growth.

The minimum inhibitory concentrations of the all compounds are 50ppm. Similar kinds of observation were made in many previous studies. The possible reason behind this may be the interaction between Schiff bases group with lipoproteins of the cell and also the effects their higher stability at higher temperature may also allow them to use them as a potential antimicrobial agent.

**Table-1: Antibacterial activities of *o*-, *m*- and *p*-substituted bromobenzaldehyde derivatives of Benzilmonoximethiocarbohydrazide**

Compound	E. coli				S. aureus				S. typhi				B. subtilis				K. pneumonice				P.aeruginosa			
	50	100	200	500	50	100	200	500	50	100	200	500	50	100	200	500	50	100	200	500	50	100	200	500
HBMT <sub>o</sub> BB,	14	19	22	25	14	19	22	24	12	14	16	17	12	13	15	20	18	22	22	20	20	22	21	23
HBMT <sub>m</sub> BB	17	22	25	27	19	23	23	25	18	21	22	22	18	20	17	20	22	23	23	21	12	13	12	15
HBMT <sub>p</sub> BB	18	22	29	31	18	21	22	25	17	18	19	20	17	19	20	21	18	20	26	28	17	19	20	23

### Antifungal Screening

The antifungal activities of prepared compounds have been assayed at concentration of 500ppm against five plant pathogens and mould fungi. The inhibitory effects of the compounds against these organisms are given in **Table-2**. The screening results indicate that synthesized compounds shows good antifungal activities against Colletotrichum Gloeosporiodes penz, Canilida Albicans, Aspergillus Niger, Aspergillus Flavescens and penicillium sp.

**Table-2: Antifungal activities of *o*-, *m*- and *p*-substituted bromobenzaldehyde derivatives of Benzilmonoximethiocarbohydrazide**

Conc(ppm)	Colletotrichum Gloeosporiodes penz	Canilida Albicans	Aspergillus Niger	Aspergillus Flavescens	Penicillium sp
HBMT <sub>o</sub> BB,	15	11	13	19	15
HBMT <sub>m</sub> BB	16	10	12	15	14
HBMT <sub>p</sub> BB	17	13	09	21	19
Fluconazole	28	30	27	30	33

### CONCLUSION

The '*o*-, *m*- and *p*-substituted bromobenzaldehyde derivatives of Benzilmonoximethiocarbohydrazide' was evaluated for their antimicrobial activities. It was observed that effective antimicrobial activities and minimum inhibition concentrations is 50ppm. This concludes that certain processes of condensation dominantly affect the biological behavior of the compounds with higher potential against some bacterial and fungal strains.

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**FARMERS' RESPONSE ON IMPROVING PERFORMANCE OF PRADHAN MANTRI FASAL BIMA YOJANA IN ODISHA****Mamata Swain<sup>1</sup> and Basanti Renu Hembram<sup>2</sup>**Professor<sup>1</sup> and Research Scholar<sup>2</sup>, Department of Economics, Ravenshaw University, Cuttack**ABSTRACT**

*The agricultural risks such as occurrence of natural calamities, pest attack and plant diseases are unpredictable and thereby non-preventive in nature which leads to uncertainty in crop production. Such events necessitate a crop insurance mechanism for transfer of risk as an adaptation measure. Pradhan Mantri Fasal Bima Yojana (PMFBY) is an areabased crop yield insurance scheme introduced in Odisha in Eastern India since Kharif 2016. This study attempts to assess the satisfaction level of farmers with the scheme and also highlight the suggestions made by the farmers to improve the operational efficiency of the scheme. The study is based on a field survey conducted in the drought prone Bolangir district in Western Odisha. A total of 200 households were interviewed with pre-designed questionnaires. The study observes that PMFBY has not gained wide acceptance as most of the insurance users remained neutral or were dissatisfied with the scheme. Delay in compensation payment, large loss assessment unit and non-coverage of individual and independent risk lead to dissatisfaction among the users of the scheme. However, the non-users had not adopted the insurance as they were lacking in premium paying capacity and considered documentation of PMFBY to be complex. For improving the efficiency of PMFBY, the farmers put forth some important suggestions such as: incorporating more cash crops under the scheme, individual assessment of crop loss and quick settlement of claims. To increase the coverage of the scheme, the implementing agencies as well as PRIs, NGOs, CBOs and SHGs functioning in rural areas need to undertake sufficient awareness creation activities about the operational mechanism and benefits of the scheme. Rural agents at the household/village level can act as better service providers of insurance.*

*Keywords: Crop Insurance, Performance, Pradhan Mantri Fasal Bima Yojana. Odisha*

**1. INTRODUCTION**

In India, risks in agriculture are endemic and inherent as crop production depends on various climatic parameters such as rainfall, temperature, sunshine, humidity etc. Crop growth, water use and yield are largely determined by weather during the growing season. Even with minor deviations from the normal weather, the efficiency of extremely applied inputs and food production is seriously impaired (Mall *et al.*, 2006). Extreme weather events such as drought, flood, cyclone and storm surge impose huge crop loss and destabilise rural livelihoods. Also infestation of pest attack and plant diseases very often causes crop failure. Sometimes, erratic input supply and technology failure also reduce the crop yield. Thus, the small holder farmers operate in a very precarious environment and these risks are unpredictable and thereby non-preventive in nature.

Government takes many steps such as flood proofing, drought proofing, watershed management, extension of irrigation facility, technology development, provision of insurance, relief measures etc. to reduce production risk. At the same time farmers take a wide variety of adaptive measures including ex-ante measures before the event of crop loss and ex-post measures after the crop loss to cope with the production risk associated with climatic aberrations. The ex-ante measures mostly aim at smoothing income, whereas the ex-post measures are mostly consumption smoothing (Morduch, 1995). The income smoothing measures include changes in cropping pattern, intercropping, mixed farming and sowing drought/flood resistant seeds, increasing irrigation efficiency and income diversification. The ex-post measures usually adopted by the farmers are drawing down of savings, borrowing, sale of assets and migration.

Despite taking all precautionary measures, whenever there is a crop loss crop insurance comes to rescue the farmer. Crop insurance is a risk transfer mechanism and a risk adaptation measure that transfers the risk from the insured farmer to the insurer company. Farmers pay a small nominal amount as premium for insuring their output against an uncertain larger amount of loss, which will be compensated by the insurance company in the event of crop damage due to non-preventable risks. Insurance has great potential to provide income support to farmers, both by protecting them when shocks occur and by encouraging greater investment in crops that increases their yield and farm income. Therefore, there is a great need for crop insurance to provide economic support to farmers, stabilize their farm income, induce them to invest in agriculture, reduce their indebtedness and decrease the need for relief measures in the event of crop failure (Hazell, 1992).



Many insurance schemes have been implemented by Odisha in the past since 1979 viz.: Pilot Crop Insurance Scheme, Comprehensive Crop Insurance Scheme (CCIS), National Agricultural Insurance Scheme (NAIS), Weather Based Crop Insurance Scheme (WBCIS), Modified National Agricultural Insurance Scheme (MNAIS), and the latest Pradhan Mantri Fasal Bima Yojana (PMFBY).

## **2. SALIENT FEATURES OF PMFBY**

Adhering to the guidelines of the Government of India, Odisha has implemented PMFBY in all the thirty districts since 2016. PMFBY provides comprehensive insurance coverage against crop loss on account of non-preventable natural risks such as (i) Natural Fire and Lightning, (ii) Storm, Hailstorm, Cyclone, Typhoon, Tempest, Hurricane, Tornado etc. (iii) Flood, Inundation and Landslide, (iv) Drought, Dry Spells, (v) Pest/Diseases etc. This scheme is compulsory for loanee farmers, who have availed crop loans from institutional sources of finance and non-loanee farmers can also opt for the scheme voluntarily. The objectives of the scheme are to provide financial support to the farmers in the event of crop failure, to stabilise their income, to encourage them to adopt innovative and modern agricultural practices and to ensure flow of credit to the agriculture sector.

In PMFBY, the risk coverage of crop cycle has increased which include not only crop loss during plant growth stage but also prevented-sowing and post-harvest losses. Inundation has been incorporated as a localized calamity in addition to hailstorm and landslide for individual farm level assessment. An area approach has been adopted for settlement of claims for widespread damage. For more effective implementation, a cluster approach has been adopted under which a group of districts with variable risk profile have been allotted to an insurance company through bidding for a longer duration up to 3 years.

Notified Insurance unit has been reduced to Village/Village Panchayat for major crops. Uniform maximum premium of only 2%, 1.5% and 5% is to be paid by farmers for all Kharif crops, Rabi Crops and Commercial/horticultural crops respectively. There is provision of individual farm level assessment for post-harvest losses against the cyclonic and unseasonal rains for the crops kept in the field for drying up to a period of 14 days, throughout the country. The scale of finance in each district for each crop forms the basis for calculation of sum assured. This roughly corresponds to costs incurred in cultivation of crops and gives farmers adequate financial protection without any capping as followed in earlier schemes. The sum assured has doubled in the case of PMFBY in comparison to earlier schemes.

PMFBY is an actuarial model-based scheme where token premium is charged from the client farmers, and government pays the balance premium quoted by insurance companies selected by states through transparent bidding. However, the full liability of payment of claims lies with the insurance companies. The claim amount is credited electronically to the individual farmer's bank account. Remote Sensing Technology, Smart phones and Drones are used for quick estimation of crop losses to ensure early settlement of claims. A Crop Insurance Portal has been launched. This is used extensively for ensuring better administration, co-ordination, transparency and dissemination of information. Despite being one of the important tools of risk management, participation of farmers in crop insurance scheme is very low in Odisha. During 2013-14, the percentage of gross cropped area under crop insurance was only 15.13%. Moreover, more than ninety per cent of insured farmers were loanees and thus, compulsorily covered under the scheme. Thus, voluntary participation in insurance schemes has been extremely low in the state which is a matter of great concern. The present study attempts to critically examine the responses of farmers regarding their satisfaction levels with the scheme and their suggestions for improving the functional efficiency of the scheme in drought prone Bolangir district in Odisha with micro-level data collected through a field survey.

## **3. OBJECTIVES**

In the above backdrop, the objectives of the study are

- (i) To assess the satisfaction level of farmers with the PMFBY and identify the causes of dissatisfaction if any;
- (iii) To ascertain the suggestions made by the farmers for improving the efficacy and effectiveness of the PMFBY.

## **4. METHODOLOGY AND STUDY AREA**

In order to assess the operational efficiency of the PMFBY, a multi-stage stratified random sampling technique was used to select the households for the field survey. In the first stage Bolangir district has been selected as the study area because of its high vulnerability to drought in comparison to other districts. Bolangir is an agriculturally backward district with high incidence of mass and chronic poverty. In the second stage, a representative block namely Bangomunda was selected from the district. From this block, six villages namely,

Bhalumunda, Jurabandh, Sangamara, Turekela, Tentelpara, Kuturabeda were selected according to highest coverage of PMFBY. Lastly 80 loanee PMFBY users, who were compulsorily covered under PMFBY and 80 non-loanee PMFBY users, who voluntarily purchased PMFBY were randomly chosen from the selected villages. To explore the reasons for non-adoption of crop insurance, 40 non-users of PMFBY were also randomly selected. Thus, a total of 200 households were included in the study. Primary data were collected from these households by direct interview method with the help of structured questionnaires. The field survey was conducted for the Rabi 2016-17 and Kharif 2017 season.

## 5. SURVEY FINDINGS

### 5.1 Socio-economic Characteristics of PMFBY Users and Non-users

The functional efficiency of any agricultural insurance scheme depends on its adoption rate. The adoption of insurance in turn depends on various socio-economic characteristics of farmers which include their social configuration, education level, sources of income, size of land holding, asset ownership and farm income. Therefore, the socio-economic profile of insurance users and non-users in the study area has been examined and presented in Table 1.

A comparison of the socio-economic characteristics of users and non-users of crop insurance reveals that a majority of the loanee (80%) and non-loanee (60%) PMFBY users and non-users (77.5%) belong to SEBCs. However, the percentage of SCs and STs insurance users is greater in the case of non-loanee (37.5 %) than that of loanee (18.8 %) insurance users. Thus, the lower castes are more risk averse, and voluntarily adopting crop insurance as a risk management tool (Table 1).

**Table-1: Socio-economic Profile of PMFBY Users and Non-Users**

Characteristics	PMFBY Users		PMFBY Non-Users
	Loanee	Non-Loanee	
<b>Total Households</b>	80	80	40
<b>Caste in %</b>			
General	1.2	2.5	7.5
Socially and Economically Backward Classes	80.0	60.0	77.5
Scheduled Castes	10.0	27.5	7.5
Scheduled Tribes	8.8	10.0	7.5
<b>Family Size (Member per Household)</b>	5	5	5
<b>Education in %</b>			
Below Primary	48.8	63.7	42.5
Primary and above	51.2	36.3	57.5
<b>Farmer Class in %</b>			
MF/SF	42.5	32.5	62.5
Others	57.5	67.5	37.5
<b>Yield rate (Qtl/Ha)</b>	11.54	16.16	14.88
<b>Income (Rupees/Household)</b>			
% of Income from Cultivation	56.5	49.9	32.5
% of Income from Non-agricultural Wages	11.4	17.2	25.3
% of Income from Other Sources	32.1	32.9	42.2
<b>Farm Income</b>			
Gross Income/Hectare (in Rs)	13228.77	13757.57	15954.75
Total cost of Cultivation/Hectare (in Rs)	27824.12	36581.28	36090.82
Imputed Value of Family Labour/Hectare (in Rs)	12787.68	16318.2	13019.34
Paid-out Cost of Cultivation/Hectare (in Rs)	15036.44	20263.08	23071.48
Net Income/Hectare (in Rs)	-1807.67	-6505.51	-7116.72

Source: Field Survey.

The proportion of farmers having education of primary level (class 5) and above is 51.2 per cent in case of loanees, 36.3 per cent in case of non-loanees and 57.5 per cent in case of non-users. Therefore, it cannot be concluded that farmers with higher literacy rate have gone for insurance. As regards size of land ownership, a higher percentage of non-users are marginal and small farmers (62.5 %), owning land less than two hectares in comparison to loanee (42.5%) and non-loanee (32.5%) insurance users. With regard to sources of income, cultivation is the major source of income for all the sample households. Nevertheless, the percentage of income from cultivation to total

income is significantly greater for loanee(56.5%) and non-loanee(49.9%) insurance users than that of non-users (32.5 %). Thus, the farmers, who are more dependent on agriculture to earn their livelihood, are buying insurance.

During Kharif 2017, the per hectare yield rate of paddy for loanee and non-loanee insurance users and non-users was 11.54 quintals, 16.16 quintals and 14.88 quintals respectively (Table 1). The non-loanee insurance users thus have a higher yield rate, indicating that progressive farmers come forward to insure their crops voluntarily. As the survey year was a drought year, almost all the households had a below normal yield. According to the farmers, the normal yield of Kharif paddy in their villages is 29 qtls/ha. Because of low yield owing to drought condition, the net income per hectare of Kharif paddy arrived at by deducting the cost of cultivation from gross income is found to be negative for all sample households. Among the users of crop insurance, the amount of loss met by the non-loanees (Rs.6506) is higher in comparison to loanees (Rs.1808), which has prompted them to adopt crop insurance voluntarily. However, it is observed that the highest amount of loss is borne by the non-users (Rs 7117/ha).

### 5.2 Satisfaction with Crop Insurance

The farmers were asked to gauge their level of satisfaction with the insurance schemes, the results of which appear in Table 2. The results show that only 6.2 per cent of the total loanee PMFBY users and 3.8 per cent of the non-loanee PMFBY users expressed their satisfaction with the scheme. Thus, most of the insured farmers are either neutral having no strong opinion on the scheme or are dissatisfied with the scheme.

**Table-2: Satisfaction of Insurance Users with PMFBY: Frequency of Responses of Insurance Users**  
Number of Households

Level of Satisfaction	Loanee	Non-Loanee
Strongly Dissatisfied	0 (0.0)	1 (1.2)
Dissatisfied	19 (23.8)	9 (11.2)
Neither Satisfied nor Dissatisfied	56 (70.0)	67 (83.8)
Satisfied	5 (6.2)	3 (3.8)
Strongly Satisfied	0 (0.0)	0 (0.0)
Total	80 (100.0)	80 (100.0)

Source: Field Survey.

Note: Figures within parentheses indicate percentages of total.

In order to find out the reasons for their dissatisfaction, the insurance users were asked to rank the three most important reasons as 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup>. The percentage weighted score is calculated by assigning the value of 3, 2 and 1 to first important, second important and third important rank, respectively. Table 3 gives the data on the frequency of responses and the percentage weighted score on various causes of dissatisfaction.

**Table-3: Reasons for Dissatisfaction with PMFBY: Frequency of Response of Insurance Users**  
Number of Households

Reasons	Loanee-Rank				Non-Loanee-Rank			
	1 <sup>st</sup> Reason	2 <sup>nd</sup> Reason	3 <sup>rd</sup> Reason	Weighted Score in%	1 <sup>st</sup> Reason	2 <sup>nd</sup> Reason	3 <sup>rd</sup> Reason	Weighted Score in%
High Premium	69	4	1	4.2	39	3	2	5.8
Delay in Compensation Payment	4	41	31	48.0	32	15	3	27.9
Loss assessment unit is very large	2	27	29	27.8	5	26	15	17.7
Individual, independent risk is not covered	0	3	13	19.8	1	29	9	15.2

Proper facilities are not available at financial institutions	0	0	1	0.2	0	2	23	27.1
Payout is very low	0	0	0	0.0	0	2	25	6.3
Total	75	75	75	100.0	77	77	77	100.0

Source: Field Survey.

Note: The total number of satisfied loanee users is 5 and satisfied non-loanee users is 3 as shown in Table 3.

Both loanee (48%) and non-loanee (27.9%) insurance users were not satisfied with PMFBY primarily due to delay in compensation payment. Likewise, users of the PMFBY also complain about individual, independent risk not being covered under the scheme and express their dissatisfaction relating to the unit area being very large for loss assessment. The non-loanees (27.1%) were also dissatisfied because of non-availability of proper facilities at financial institutions (Table 3). During personal interaction with insurance users, it was observed that many loanee farmers compulsorily covered under PMFBY indicated ignorance about the coverage of their crops under crop insurance. Thus, over all the PMFBY failed to stabilise the insurance users' income and provide them economic support during adverse circumstances.

### 5.3 Reasons for Non-adoption of Crop Insurance

The sample non-users of crop insurance were interviewed to explore the reasons for non-adoption of PMFBY. Table 4 gives the data on the frequency of responses and the percentage weighted score on various causes of non-adoption by the non-users.

**Table-4: Reasons for Not Adopting PMFBY: Frequency of Responses of Insurance Non-Users**  
Number of Households

Reasons	Non-User-Rank			Weighted Score in%
	1 <sup>st</sup> Reason	2 <sup>nd</sup> Reason	3 <sup>rd</sup> Reason	
Not aware of crop insurance	0	0	0	0.0
Too complicated to understand and use	0	0	0	0.0
Govt. will provide disaster relief/aid	0	0	0	0.0
Lack of premium paying capacity	22	8	9	37.9
Not aware of the facilities available	0	0	0	0.0
Not satisfied with crops covered	0	1	0	0.8
Not satisfied with area approach	0	0	0	0.0
Inadequate publicity of the scheme	0	2	0	1.7
Complex documentation	8	26	6	34.2
Lack of service/co-operation from the bank	0	1	0	0.8
No faith in scheme	0	0	0	0.0
No faith in agency	0	0	0	0.0
Delay in claim payment	0	1	10	5.0
Not satisfied with indemnity level	1	0	6	3.8
Difficulties in opening bank accounts	1	0	5	3.3
I am tenant	0	0	0	0.0
Others, specify	8	1	4	12.5
Total	40	40	40	100.0

Source: Field Survey.

Two most important reasons for not taking up insurance as reported by the non-users are lack of premium paying capacity (37.9 %) and complex documentation (34.2%). Moreover, they also complained that the time duration within which they must go for insurance was too short. Few non-users also cited other reasons for non-adoption such as delay in payment of the claims, dissatisfaction with indemnity level and difficulty in opening bank accounts. However, all the non-users were aware of the crop insurance scheme and none of the respondents suggested unawareness as a cause of non-adoption of PMFBY. But, most of the non-users do not understand the mechanism and modality of the crop insurance scheme due to low level of financial literacy.

### 5.4 Improving Scheme Performance

The respondents were interviewed to suggest measures to improve the operational efficiency of the scheme. Table 5 throws light on various suggestions put forth by the respondents.

**Table-5: Suggestions for Improving PMFBY by Insurance Users and Non-Users: Frequency of Responses**  
Number of Households

Suggestions	Loanee User Suggestion				Non-Loanee User Suggestion				Non-User Suggestion			
	1st	2nd	3rd	Weighted Score in%	1st	2nd	3rd	Weighted Score in%	1st	2nd	3rd	Weighted Score in%
Cover more crops	65	-	1	40.8	23	8	1	17.9	2	-	2	3.3
Individual assessment	10	32	-	19.6	38	7	1	26.9	12	12	6	27.5
Reduce premium	4	39	23	23.5	18	41	5	29.4	1	-	1	1.7
Quick settlement of claims	1	7	29	9.6	1	12	30	11.9	16	1	1	21.3
Making scheme voluntary	-	1	21	4.8	-	11	19	8.5	5	10	6	17.1
Gram panchayat as unit of loss assessment	-	1	5	1.5	-	-	12	2.5	2	15	9	18.8
Insurance service at your doorstep / at village level	-	-	1	0.2	-	1	7	1.9	-	-	7	2.8
CCEs to be conducted in the presence of villagers / insurance company's representatives	-	-	-	0.0	-	-	4	0.8	-	-	4	1.7
Raise the indemnity level percentage from 60 % to 80-90%	-	-	-	0.0	-	-	1	0.2	2	2	4	5.8
Others (specify)	-	-	-	0.0	-	-	-	0.0	-	-	-	0.0
Total	80	80	80	100.0	80	80	80	100.0	40	40	40	100.0

Source: Field Survey.

The majority of the loanees with weighted score 40.8 per cent suggested that covering more crops will improve the operational efficiency of the scheme. Other important suggestions are reduction of the premium rate charged and individual assessment of crop loss. Similarly, a majority of the non-loanee advised reduction of premium, individual assessment of crop loss and covering more crops for advancement of the scheme. The non-users proposed that along with individual assessment, settlement of claims should be quick. Some respondents wanted the scheme to be voluntary. Comparing the responses of both users and non-users; more proportion of non-users desired that insurance service should be provided at the doorstep of farmers (Table 5).

The farmers were asked to express their views on the reasonableness of the premium rate paid for insuring the crops under PMFBY. Most of the loanee PMFBY users were of the view that the premium they paid for availing crop insurance was reasonable and affordable (51.3%). On the contrary, the non-loanee users were of view that premium paid by them is high (65%) (Table 6). This suggests that further subsidy is required to incentivise farmersto insure their crops.

**Table-6: Opinion on Premium Paid by PMFBY Users: Frequency of Responses of Insurance Users**  
Percentage of Households

Level of Premium	Loanee	Non-Loanee
Very Low	0.0	0.0
Low	7.5	0.0
Reasonable	51.3	22.5
High	37.5	65.0
Very High	3.7	12.5
Total	100.0	100.0

Source: Field Survey.

It is important to analyse how much amount the farmers are willing to pay as insurance premium for their crops. Farmers were personally interviewed about the amount they are willing to pay as premium for insuring their crops. Both loanee and non-loanee users were willing to pay a premium of 4-5 per cent of the sum insured; though the proportion is cent per cent among the loanee, it is 82.5 per cent among the non-loanee users (Table 7). Yet again, majority of the loanee users (51.3%) and non-loanee users (81.3%) were willing to pay a premium of Rs. 300-400 per acre. This shows that greater proportion of the non-loanees are willing to pay a higher rate of premium than the loanees to insure their crop against production risk, as they are more risk averse.

**Table-7: Acceptable Rate of Premium: Frequency of Responses of PMFBY Users**  
Percentage of Households

	Loanee	Non-Loanee
% of Sum Assured		
Upto 2%	0.0	0.0
2-3%	0.0	2.5
3-4%	0.0	15.0
4-5%	100.0	82.5
Rs. Per Acre		
Upto 200	0.0	0.0
200-300	45.0	1.2
300-400	51.3	81.3
400-500	3.7	17.5

Source: Field Survey

#### 5.4.1 Preference for Media

The low coverage of insurance has been attributed to inadequate awareness generation activities by insurance agencies. Thus, attempt is made to find out the various mediums which will be more effective in generating awareness among farmers about insurance. As revealed in Table 8, most of the respondents preferred media like farmers' meeting (*kisan sabha*) and village fair to get proper information. Popular mass media like television, film shows, and newspaper were also preferred by the farmers.

**Table-8: Preference for Media by PMFBY Users and Non-Users: Frequency of Responses**  
Number of Households

Media	Loanee User Preference				Non-Loanee User Preference				Non-User Preference			
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	Weighted Score in%	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	Weighted Score in%	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	Weighted Score in%
Kisan Sabhas	39	11	9	30.8	57	10	3	40.4	5	15	2	19.6
Village Melas	21	40	11	32.1	13	46	5	28.3	23	12	10	42.9
Radio	0	0	1	0.2	0	3	4	2.1	0	0	1	0.4
Television	2	17	20	12.5	3	11	14	9.4	1	4	23	14.2
News paper	18	12	38	24.2	7	10	52	19.4	1	3	2	4.6
Film show in the village	0	0	0	0.0	0	0	1	0.2	10	6	2	18.3
Road shows	0	0	1	0.2	0	0	1	0.2	0	0	0	0.0
Others	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0
Total	80	80	80	100.0	80	80	80	100.0	40	40	40	100.0

Source: Field Survey.

#### 5.4.2 Preference for Service Provider

To increase the coverage of the scheme, policy makers would need to take necessary steps to provide insurance services in a conducive atmosphere by friendly agents. In this context, the responses of the surveyed households were elicited regarding the different agents who, according to them, would be more helpful in providing them adequate insurance services. Table 9 shows the preference of insurance user and non-user regarding their preference of service providers.

**Table-9: Preference for the Service Provider by PMFBY Users and Non-Users: Frequency of Responses**  
Number of Households

Media	Loanee User Preference				Non-Loanee User Preference				Non-User Preference			
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	Weighted Score in%	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	Weighted Score in%	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	Weighted Score in%
Rural agent at your doorstep	37	10	9	29.2	56	8	9	40.2	6	25	5	30.4
Rural agent at your village level	21	28	13	27.5	15	25	27	25.4	28	10	5	45.4
Commercial Bank	1	2	3	2.1	1	4	1	2.5	0	0	0	0.0
Co-operative Bank	18	29	18	27.1	5	9	3	7.5	1	0	10	5.4

Regional Rural bank	1	0	3	1.3	0	2	6	2.1	0	0	8	3.3
Self Help Groups	0	0	2	0.3	0	1	4	1.3	2	2	12	8.4
NGOs	2	11	28	11.7	1	28	25	17.5	1	1	1	2.5
Post office	0	0	4	0.8	2	3	3	3.1	2	2	1	4.6
Others	0	0	0	0.0	0	0	2	0.4	0	0	0	0.0
Total	80	80	80	100.0	80	80	80	100.0	40	40	40	100.0

Source: Field Survey.

According to majority of users and non-users, rural agents at the door step and at the village level would be better service providers. Among the users, while the loanees considered that co-operative banks also would provide better insurance services, the non-loanee expressed preference for the Non-Governmental Organizations (NGOs) as a better provider of insurance service. The non-users preferred the Self-Help Groups (SHGs) regarding the same. Thus, it is observed that rural agents who can come to individual household and at the village level are preferred to other service providers of insurance.

## 6. CONCLUSIONS AND POLICY IMPLICATIONS

Drought is the major risk factor in the study region of Bolangir district. Crop insurance is recognised to be a basic instrument for maintaining stability in farm income, through promoting technology, encouraging investment, and increasing credit flow to the agricultural sector. The survey findings reveal that a significant proportion of insurance users were not satisfied with the PMFBY. As low as 6.2% of loanees and 3.8% of non-loanee expressed their satisfaction with the scheme. The important reasons for dissatisfaction with the scheme as reported by insurance users are delay in compensation payment, very large loss assessment unit. The users also complain about individual and independent risk not being covered under PMFBY. The non-users had not adopted insurance due lack of premium paying capacity and its complex documentation.

For improving the performance of the scheme, the farmers suggested that the insurance facility may be extended to different cash crops such as cotton and sunflower. Also, individual assessment of crop loss must be done, and quick settlement of claims must be initiated. With regard to the premium rate paid by the farmers, non-loanee farmers were of the view that premium paid by them is high. However, greater proportion of the non-loanee are willing to pay a higher rate of premium than the loanees to insure their crop against production risk, as they are more risk averse.

To increase the coverage of PMFBY, steps need to be taken to explain the operational mechanism of the scheme to farmers in simple terms in their local language. Rural agents who can come to individual household and at the village level can act as better service providers of insurance. There is a requirement for awareness creation by not only implementing agencies, but also PRIs, NGOs, CBOs and SHGs functioning in rural areas need to be encouraged to play an important role. Implementing agencies include various functionaries of the Dept. of Agriculture & Farmers' Empowerment, Dept. of Co-operation, Dept. of Rural Development, banks, cooperatives, AICI, public and private insurance companies.

The study also recommends the encouragement of micro-insurance for the poor through the participation of banks, co-operatives, NGOs, PRIs, SHGs, and microfinance institutions. Government is required to focus more on regulatory roles and infrastructure development while, private insurance service providers should be encouraged in executing the scheme and improving the insurance product. Technical assistance, subsidy and reinsurance facility need to be provided to the private insurance companies to promote crop insurance in rural areas.

## ACKNOWLEDGMENT

The principal author is thankful to the Indian Council of Social Science Research, New Delhi for awarding Senior Fellowship for full-time research that enabled to prepare this paper.

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**GANDHI'S 'EXPERIMENTS' IN SOUTH AFRICA (1893-1914): CASTE AND UNTOUCHABILITY**

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**ABSTRACT**

*It is generally assumed that in his struggle against racial discrimination of Indians in South Africa, Gandhi did nothing for the uplift of the 'Untouchables' there which formed a significant component of South Africa's Indian population. It is also stated that neither did he aim to eradicate untouchability among the Indian immigrants. This paper questions the above hypothesis and argues that Gandhi had disapproved of untouchability since childhood, but, he first began to publicly criticise it in South Africa. He was deeply involved with issues relating to indentured Indians, of which the 'Untouchables' were an intrinsic part. He widely advocated on their behalf and for the uplift of their living conditions and status. By working single-mindedly to eradicate racial discrimination in South Africa, Gandhi's work among the 'Untouchables' served two purposes. It revealed and shaped Gandhi's outlook on caste and untouchability and he became an ardent exponent of its eradication.*

**Keywords:** 'Untouchables', caste, Gandhi, South Africa, untouchability

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**[1]**

The South African sojourn of Gandhi, extending with some gaps from 1893 to 1914, began at the instance of an Indian merchant. A stay that was meant to be a short stopgap for the struggling young lawyer, turned into a twenty-one-year long stay, with spells of short stays in India and England. When Gandhi arrived in South Africa in 1893, the issue of Indian immigration was a highly contentious topic. From the outset, Gandhi became aware of the racial discrimination directed against the Indians living in Durban. This brought him into direct contact with the Indian "underclasses," (Swan 1985: 242) including the indentured labourers. The "underclasses," which constituted well over ninety percent of South Africa's Indian population, (Hunt 1986: 427) were mostly low caste 'Untouchables' (Lelyveld 2011: 24). The indentured labourers worked in the most wretched conditions on the South African sugar plantations and coal mines, and they laboured under the worst aspects of their employment, "over-long hours of toil, the most arduous drudgery, ill-use, climactic differences, insufficient food supply, temptations to immorality, petty fines and punishments" (Polak 1909: 24). Henry Polak regarded the system as one of "temporary slavery": "A mere chattel, a machine, a commercial asset to be worked to its fullest capacity, regardless of the human element, careless of the play of human passions. The system lends itself to heartlessness and cruelty" (*ibid*: 21-22). Moreover, any breach of contract by the indentured labourers was regarded not as a civil matter but as a criminal offence. According to Hugh Tinker, the system of indentured Indian labour with its inhumanity and brutality functioned as "a new system of slavery" (1974).

**[2]**

Indian indentured labour with a large component of the 'Untouchables' became one of Gandhi's central concerns in South Africa in both words and actions. The inhuman conditions in which indentured labourers lived and worked in South Africa made him look at untouchability in ways that was radical for a 'caste Hindu'. Eleanor Zelliot has stated that Gandhi "is said to have spoken and written more on untouchability than on any other subject" (1996: 150). In all historical fairness, writes D. R. Nagaraj, "it must be admitted that it was he who made untouchability one of the crucial questions of Indian politics" (2014: 24). Gandhi's parleys on untouchability were rooted in his childhood days. In South Africa, his recollections of untouchability rested on an experience of impressionable age of twelve years when he had disregarded his mother's warning to not to touch Uka, an 'Untouchable', who came to clean latrines in his house. Gandhi often had tussles with his mother when she chided him for touching Uka and insisted that he undergo "purification." Even though he had obeyed his mother, he had protested that "untouchability was not sanctioned by religion, that it was impossible that it should be so." He told his mother that "she was entirely wrong in considering physical contact with Uka as sinful" (CW 19: 569-75). Referring to the story, Pyarelal writes that the event planted in Gandhi's soul a seed of rebellion against untouchability (1965: 217). This got unfolded in South Africa when Gandhi came face to face with the inhuman treatment that the Whites meted out to the Indian indentured labourers. They were racially abused and discriminated against, they could reside only in prescribed and congested ghettos, in some areas they could not stay outdoors after 9 P.M. nor could they use public footpaths, they had no voting rights and they



had to register and pay a poll-tax in South Africa (Chandra 2015: 280). It was not long before that Gandhi came to equate the conditions of Indians in South Africa with those of the 'Untouchables' in India. Gandhi wrote:

"It can be truly said that there is no difference between these locations and the Untouchables' quarters in India. Just as the Hindus believe that touching the Dhedhs or residence in their neighbourhood would lead to pollution, so did the Europeans in the Transvaal believe [...] that physical contact with the Indians or living near them would defile them" (CW 29: 32-33).

In his early life, Gandhi also showed a remarkable irreverence for caste orthodoxy. At the age of nineteen, he got into trouble with his Modh Bania caste council when he defied it to go abroad in 1888. Gandhi was outcasted, but he refused to perform penance (Sarkar 2011: 178). In London, Gandhi had lived with the Christian Josiah Oldfield, in a breach of caste rules (Guha 2013: 67). Gandhi also admitted that during his stay in England, he ate at restaurants as well as at the house of an Englishman and that he had no objection to eating food prepared at European hotels, or by a Christian or a Muslim. (Gandhi 1964: 92-100). Bhikhu Parekh argues that though Gandhi had long disapproved of caste restrictions and untouchability, it was in South Africa that he began to publicly criticise it (1999: 237). It was there, Gandhi wrote, that "I had realised my vocation in life" to liberate the 'Untouchables' from the 'trauma' of untouchability (1950: 338). On the eve of the Poona Pact (1932), he recalled that the uplift of the 'Untouchables' first struck him as an idea and a mission in South Africa. "The idea did occur to me in South Africa and in the South African setting," Gandhi told his secretary Mahadev Desai (Desai 1953: 185).

When Gandhi reached Natal on 24th May 1893, Indian indentured labourers had already been around for more than three decades. Joseph Lelyveld points out that most of the indentured labourers were low caste. According to him, the proportion of those deemed to be 'Untouchable' among the Indians "seems certain to have been significantly higher in South Africa than in India, where it was estimated, at the time, to be about twelve percent nationally, and as high as twenty percent in some regions" (2011: 25). Judith Brown argues that "the immigrant labourers were predominantly low caste or Untouchable, totally uneducated, inarticulate and defenceless" (1990: 31). Gandhi was alive to their oppression and when he made it a cause, he was aware of the overlap between the indentured and the 'Untouchables' (Lelyveld 2011: 25). In September 1893, barely four months after his arrival in South Africa, Gandhi wrote to the Natal's Press referring, inter alia, to the "starvation wages" on which Indian indentured labourers, then constituting the majority of the Indian population in Natal, came to its shores (CW 1: 63). From 1894, when Gandhi began his public life with the founding of the Natal Indian Congress (hereafter N.I.C.) in South Africa, he started advocating on behalf of the Indian indentured labourers. Gandhi's initial remarks on actual instances of oppression were spoken in 1894 as Honorary General Secretary of the N.I.C.: "If I am to depend upon one-tenth of the reports that I have received with regard to the treatment of the indentured Indians on the various estates, it would form a terrible indictment against the humanity of the masters on the estates" (CW 1: 186).

Ill-treatment of the Indian indentured labourers was rampant in South Africa. Gandhi made a record of an early instance: "An Indian named Balasundaram was, in 1894, so ill-treated by his master that two of his teeth were nearly knocked out; they came out through his upper lip causing an issue of blood sufficient to soak his long turban in it." Gandhi sent Balasundaram along with his Tamil clerk to the office of the Protector of Indian Immigrants. Balasundaram had already been to the Protector's house once only to be told to come later to his office. So he went instead to the Magistrate, who kept Balasundaram's turban and sent him to hospital for treatment. When a few days later Gandhi again sent Balasundaram to see the Protector in his office, the latter asked Balasundaram to be left alone in the office and then secured a written document from him saying he had no complaints to make. Gandhi, however, questioned this: "Was it right for the Protector to have taken such a document from the man?" Against the Protector's warning that the case would come to naught in the face of Balasundaram's written statement, Gandhi took up the cause before the Magistrate and secured Balasundaram's transfer to another employer (CW 2: 16-18).

Gandhi describes the case as a turning point in his life. "It reached the ears of every indentured labourer, and I came to be regarded as their friend," he says in his autobiography. "A regular stream of indentured labourers began to pour into my office," and he got to know their "joys and sorrows" (Gandhi 1927: 360-61). "I became more their brother than a mere adviser, and shared in all their private and public sorrows and hardships" (Gandhi 1929: 84). Gandhi "emerged virtually as a one-man legal aid society for these poor Indians," wrote a reputed Gandhian scholar, Nagindas Sanghavi (2006: 129). Gandhi's involvement with the indentured labourers increased between 1899 and 1902 when he helped organise the Indian Ambulance Corps in Natal during the South African War (CW 3: 134-35; 153-54). Hundreds of "free Indians," including the indentured, had offered their services for this cause (CW 3: 158). As he stayed on, Gandhi learned more of the rough conditions in

which indentured Indians lived and worked; and gradually his compassion increased for the poor labourers, many of whom belonged to the low caste 'Untouchables'.

[3]

During the course of his campaign against South Africa's racist policies, Gandhi was repeatedly told by the Whites that men in glass houses were better advised not to throw stones at others (Parekh 1999: 237). The South African Whites were minutely aware of the hypocrisy of the 'caste Hindus' in refusing to fight against the caste inequality in their own homeland. For example, the Johannesburg *Star* had published a speech delivered in the ordinary general meeting of the shareholders of the Consolidated Gold Fields of South Africa held in London, and addressed by an Englishman, Lord Harris, the President, on 12th November 1903:

"It seems to me to be somewhat short-sighted to make permission for the recruiting of coolies for the mines dependent on better treatment for the trading class. [...] Coolies are not a highly educated class; they are merely manual labourers and the treatment they would receive would certainly not be worse, probably better, than the treatment they would receive on mines in India, and certainly infinitely more considerate than the treatment they would receive from the higher castes in India itself" (CW 4: 75-76).

Leading White-owned newspapers in South Africa also carried cartoons depicting discrimination in India on the basis of birth and colour. The cartoon showed Gopal Krishna Gokhale sitting in a big armchair being offered a broom as a bouquet by a White man. The caption below the cartoon read: "Before you ask us to wipe out injustice, you must clean your own home with it" (Gandhi 1957: 104).

Gandhi set out to remove one's own shortcomings before pointing a finger at others. Persistently, he chose to attack untouchability in South Africa. For example, he began to publicly decry the caste system for its inequalities. He criticised its "hypocritical distinctions of high and low" and "caste tyranny," which had made India "turn [her] back on truth and embrace falsehood." When satyagraha sent many Indians to prison, Gandhi rebuked as cowards those prisoners who refused to eat food touched by the 'Untouchables' or to sleep near them (CW 9: 180-81). And he warned a Tamil meeting, against reproducing in South Africa, the strong caste divisions of their Madras province (CW 12: 495). Gandhi learnt to couple untouchability with racism in South Africa. In 1894, a Pretoria barber had refused to shave him, fearing that he would lose his White clients. Gandhi understood. He quenched his resentment by remembering that "we do not allow our barbers to serve our Untouchable brethren." Gandhi writes in his autobiography that the barber's treatment towards him was "the punishment for our own sins, [which] saved me from becoming angry" (Gandhi 1927: 496). Typically, Gandhi's cavil was accompanied with a stress on self-criticism. He had established linkages between the plight of the Indians in South Africa with that of the 'Untouchables' in India. Gandhi pointed out that

"Today we have become the Untouchables of South Africa. [...] The ancient Jews regarded themselves as the chosen people of God, to the exclusion of all others, with the result that their descendants were visited with a strange and even unjust retribution. Almost in a similar way the Hindus have considered themselves Aryas or civilised, and a section of their own kith and kin as Anaryas or Untouchables, with the result that a strange, if unjust, nemesis is being visited [...] upon the Hindus in South Africa" (Gandhi 1929: 79-80).

Gandhi realised that so long as the 'caste Hindus' treated their own people as 'Untouchables', they could not consistently blame the South African Government for treating them as 'Untouchables' in South Africa. As Gandhi put it:

"Just as in India some of us ['caste Hindus'] oppress the Bhangis ['Untouchables'] and force them to dress in some particular fashion and use obsequious language lest we be polluted by their proximity [*sic*], it has fallen to our lot to be treated like Bhangis here in the Transvaal" (CW 6: 470).

On another occasion, Gandhi noticed that the Europeans in the markets of South Africa seemed to feel polluted by the touch of Indians. Gandhi said that "we have ourselves become Untouchables here" (CW 7: 56). This realisation made him introspect critically. He came to look upon the treatment meted out to all the Indians in South Africa, be they 'caste Hindus' or 'Untouchables', as punishment by the divine. In essence, he felt the punishment to be a reward for the Indians for the discriminatory treatment meted out to the 'Untouchables' in India. Gandhi saw the reactions of the Whites towards Indians as a 'just' retribution. He averred that the "retribution" was for the "miserable condition of the Bhangis" in India, whom the higher castes "look down upon, [...] think ourselves defiled by their touch, keep them at a distance from us and grind them under our heels." Gandhi remarked with severity that for such an attitude "we [should] rain lashes on our own backs" (CW 10: 228-29). The sensory perception that Indians in South Africa were paying for the sin of untouchability was repeated by Gandhi throughout his life.

To Gandhi, Indians in South Africa were reaping the bitter fruits of their own sowing: "Has not a just Nemesis overtaken us for the crime of untouchability? Have we not reaped as we have sown? [...] We have segregated the 'pariah' and we are in turn segregated in the British Colonies" (CW 19: 242). "We who are responsible for Indian untouchability are ourselves victims of it in South Africa. It is a case [...] of 'the biter bitten'" (CW 32: 476). Gandhi recalled in 1920 that on a visit to India from South Africa in 1901 when he had recounted to Gopal Krishna Gokhale the plight of the Indians in South Africa, Gokhale had called it "the fruit" of untouchability practised by the Hindu society. Gandhi had "immediately agreed" (CW 19: 149).

Racism and untouchability were thus made equivalents, the inhumanity of one matching the other. Such an attitude of Gandhi reflects his "truthfulness," writes Gopal Guru, as he had "the moral capacity to become humble in front of the experience of [the 'Untouchables']" (2017: 99). Referring to these virtues, Joseph Lelyveld quotes Gandhi as saying that the 'Untouchables' have "a right even to spit upon me, [...] and I would keep on smiling if they did so." According to Lelyveld, "this resolutely smiling face was not a mask" but a measure of the man (2011: 204).

There was no element of compromise in Gandhi's attitude towards untouchability even in South Africa. Gandhi understood the need to spread his message against untouchability as early as 1905, when he wrote in *Indian Opinion* in South Africa that there was no distinction between the Brahmins and the 'Untouchables' (CW 4: 430), meaning thereby that they were equal in Gandhi's perception. He was equally insistent in his own family circle about this and wanted that no one should practice untouchability. In a letter sent from South Africa, to his relative Chhaganlal in 1907, Gandhi wrote: "Do not allow the useless and wicked superstitions about untouchability to come in your way" (CW 6: 435). He also encouraged Raojibhai Patel, who wanted to come from India and work at the Phoenix Farm, to "fearlessly oppose injustice from the caste" (CW 11: 191). In South Africa, Gandhi also wrote to Mahomed Seedat, an Indian Muslim immigrant in Durban, that "members of the lower castes are not base," and he considered "it a godly act to take care of them" (CW 4: 454). By 1910, he was writing in *Indian Opinion* that it would be a "great honour" for the 'caste Hindus' to be born as 'Untouchables' (CW 10: 229).

In 1913, Gandhi led an army of over 2,000 miners and marched into Transvaal from Natal. This was the 'Great March' of the Indian miners in defiance of the South African immigration laws. Gandhi was feeding his followers with his own hands in the thick of this struggle, as described by a reporter on the scene, "consisting mostly of the very lowest castes of Hindus," with "the merest smattering of Mohammedans" (Lelyveld 2011: 116). It is said that his 'self-suffering' satyagrahis were sometimes less united. Some 'caste Hindus', after their arrest and in the tight quarters of a jail, refused to eat food prepared by the Muslims or fellow prisoners of the lower caste. One satyagrahi objected to sleeping near another from the scavenger sub-caste. He was afraid his own caste would punish him, perhaps even brand him as outcaste if his propinquity to an 'Untouchable' became known. Gandhi acknowledged that "Indians of all communities and castes lived together in the jail, which gave us an opportunity to observe how backward we are in the matter of self-Government." Speaking about caste in a specifically South African context for the first time, he came to denounce "these hypocritical distinctions of high and low" and the "caste tyranny" that lay behind them." He advised the Indians who joined the movement to resort to satyagraha against the caste evil wherever they found it. Gandhi felt it necessary for the successful outcome of the Indian struggle in South Africa (CW 9: 180-81). Speaking to his most loyal supporters, the Tamils of Johannesburg, Gandhi said, the Tamils had "shown so much pluck, so much faith, so much devotion to duty and such noble simplicity." They had "sustained the struggle for the last eight years." But after acknowledging the Tamils, there was "one thing more." Gandhi knew that they had carried over caste distinctions from India. If they "drew those distinctions and called one another high and low and so on, those things would be their ruin. They should remember that they were not high caste and low caste but all Indians" (CW 12: 472).

#### [4]

The system of indentured Indian labour was a burning issue in South Africa and Gandhi had touched upon it as early as 1894, when he wrote an "Open Letter" to the members of the Natal Colonial Legislature. Imported by the thousands on "starvation wages" and held "under bondage," (CW 1: 187) these workers lacked anything that could be described as "moral education" (*ibid*: 184). Gandhi also confessed his "inability to prove that they are more than human" (*ibid*: 183). A Johannesburg newspaper named *The Critic* carried the editorial that the evil from which the Indians suffered was not from without but from within:

"If then his fellow countrymen have condemned themselves by unbreakable laws to a menial lot [...] how can Mr. Gandhi expect to help them? The class of Hindoos which swarms in Natal and elsewhere is necessarily of the lowest caste and, under the circumstances, do what they will, they can never raise themselves into positions which command respect, even of their fellows."

Gandhi, the newspaper continued, should “begin his work at home [...] by making him [the ‘caste Hindu’] understand his own faults and difficulties.”

Pyarelal Nayyar, writing in response to *The Critic*’s news, argues that

“The barbed shaft penetrated to the core of [Gandhi’s] heart. The truth burst upon his heart with the force of revelation that so long as India allowed a section of her people to be treated as pariahs, so long must her sons be prepared to be treated as pariahs abroad. To destroy the [...] evil of “untouchability” [...] root and branch became his passion. So seared was his soul that as a token of expiation for the treatment meted out to the “outcastes,” he ultimately took to scavenging, declaring that India’s independence could wait but not the eradication of “untouchability”” (1965: 477-78).

Gandhi would later admit that he regularly confronted the point made in the editorial in South Africa. “During my campaigns in South Africa,” Gandhi recounted in June 1916, “the Whites used to ask me what right we had to demand better treatment from them when we were guilty of ill-treating the ‘Untouchables’ among us” (CW 13: 278). In the words of Narayan Desai, this marked a permanent impression on Gandhi and beckoned him to look within himself and the society (2009 1: 225).

On his return visit to India in 1896, Gandhi began his work at home against untouchability in the days when there was a plague outbreak in Bombay. As a member of the Sanitation Committee of Rajkot, he made the inspection of latrines his special task. In the homes of the upper castes the latrines were “dark and stinking and reeking with filth and worms.” He went on to inspect the ‘Untouchables’ quarters also. The “first visit in my life to such a locality,” he acknowledged. He faced opposition from his committee members, as only one member was ready to go along for inspection of the ‘Untouchables’ locality. “To the rest it was something preposterous to visit those quarters.” However, the ‘Untouchables’ had no latrines. “Latrines are for you big people,” they told Gandhi. They relieved themselves in the open, but, to his surprise, they kept the hovels where they lived, cleaner than the more substantial homes of the upper castes (Gandhi 1927: 296-97). Henceforth, sanitation and hygiene became the main parts of his reform agenda. In later years, whenever he visited a residential institution, the first thing he did was to inspect the latrines.

The Sanitation Committee also visited a Vaishnava Haveli (temple), where “it found refuse and leaves, used as dinner plates, dumped by the devotees in an odd corner. Kites and crows hung over the place. The flies and the stink coming out from the dump was enough to make one feel sick. Such a flagrant disregard of cleanliness, enjoined as a ritual in Hindu injunctions, pained Gandhi deeply, and he resolved for a thorough physical and moral clean-up of the Hindu sacred places all over India (Pyarelal 1965: 720). “As the locus of Brahminical authority, the temple” had become, argues Anupama Rao, “a symbol of Dalits’ exclusion from religious worship and the most potent site of Dalits’ denigration” (2010: 88). Gandhi, therefore, points out Susan Bayly, “looked above all to the Hindu temples as the domain in which to attack the ‘evil’ aspects of caste and untouchability” (1999: 248).

Defiance sharpened in South Africa where Gandhi had no scruples about inter-dining (Gandhi 1927: 219). He overcame the caste restriction of compulsorily dining with one’s caste and throughout his life he ate with people of different faiths as well as castes, including the ‘Untouchables’. He also tells us that he used to invite English friends and Indian co-workers to eat at his home. He would regularly visit a Christian family for dinner and eat his vegetarian food in their company while they ate their non-vegetarian food (*ibid*: 373-74). Gandhi writes that “in South Africa, Untouchable friends used to come to my place and live and feed with me” (Gandhi 1929: 343).

Gandhi did “unclean” work himself and even forced it on his family and associates by breaking pollution taboos and engaging in labour that was considered very profoundly polluting: Shoemaking, leatherwork and cleaning of toilets. In fact, cleaning toilets persisted all his life (Sarkar 2011: 178). He also learned washing his own clothes in South Africa, a skill which was the preserve of the ‘Untouchables’. When an English barber in Pretoria refused to cut his hair for fear of losing White customer, Gandhi took to self-help by cutting his own hair (Brown 1990: 41).

The first sign that Gandhi had started to connect latrine cleaning, with his convictions about untouchability, cropped up back in Durban in 1897 or 1898. By his own account, Gandhi turned vicious in an argument with his wife, Kasturba, over the emptying of a chamber pot that had been used by Vincent Lawrence, one of Gandhi’s law clerks, whom he described as “a Christian, born of Panchama parents.” “But to clean those used by one who had been a Panchama seemed to her to be the limit,” says Gandhi. She carried the clerk’s pot but did so under vehement protest, weeping and upbraiding her husband, who responded by demanding sternly that she should

do her duty without complaining. "I will not stand this nonsense in my house," he shouted, according to his own account. "Keep your house to yourself and let me go," she replied. "I caught her by the hand, dragged the helpless woman to the gate [...] and proceeded to open it with the intention of pushing her out." She then sued for peace, and he admitted to remorse (Gandhi 1929: 56-58).

This incident, which took place in 1897 (CW 19: 288-90) or 1898 (Gandhi 1929: 59), argues Rajmohan Gandhi, "is proof above all," not only "of Gandhi's temper and coerciveness on the occasion," but also of his "opposition to untouchability" (1995: 231). It took Kasturba time and effort to accept her husband's stand on the subject. Others close to Gandhi were also unwilling or critical, one of them being Lakshmidas, Gandhi's elder brother. In a letter he wrote to V. S. Srinivasa Sastri on 20th September 1932, Gandhi recalled the dispute with Lakshmidas: "I remained in banishment from my eldest brother for, I think, fourteen years. Year after year he sent me curses by registered post. I rejoiced in his curses. [...] One of the reasons for his wrath was this very question of untouchability" (CW 51: 102).

In 1901, Gandhi returned with family to India intending to resettle there. He visited Calcutta in December 1901 to attend his very first annual meeting of the Indian National Congress. "Even here I was face to face with untouchability," he said, describing the precautions that the high 'caste Hindus' from South India felt they had to take in Calcutta in order to dine without being polluted by the sight of the 'Untouchables'. Gandhi noted with disgust that the Tamil delegates observed caste separation so rigidly that they insisted on a special kitchen for themselves:

"A special kitchen had to be made for them [...] walled in by wicker-work [...]. It was a kitchen, dining room, washroom, all in one – a close safe with no outlet [...]. If, I said to myself, there was such untouchability between the delegates of the [Indian National] Congress, one could well imagine the extent to which it existed amongst their constituents" (Gandhi 1927: 519).

Gandhi tells another story about the Calcutta Congress – his readiness to do the scavenger's job in the Calcutta latrine, one of his signature causes against untouchability. He was shocked at the dirty habits of some of the delegates, and their refusal to do the cleaning, which they considered as the work of the 'Untouchables'.

"There were only a few latrines, and the recollection of their stink still oppresses me. I pointed it out to the volunteers. They said pointblank: "That is not our work, it is the scavenger's work." I asked for a broom. The man stared at me in wonder. I procured one and cleaned the latrine [...]. Some of the delegates did not scruple to use the verandahs outside their rooms for calls of nature at night [...]. No one was ready to undertake the cleaning, and I found no one to share the honour with me of doing it" (*ibid*: 520).

V. S. Naipaul considers Gandhi's fierce feelings about sanitation and untouchability a by-product of his time in South Africa (2002: 68-84). Joseph Lelyveld adds that it was not just living in South Africa that inspired it. It was Gandhi's musing about reading Leo Tolstoy that had etched a deep impression on Gandhi's soul. Lelyveld quotes from Tolstoy's *The Kingdom of God Is Within You* to substantiate his point: "We are all brothers – and yet every morning a brother or a sister [carries out my chamber pot]." By the time he got to the Calcutta meeting in 1901, Gandhi had read Tolstoy's *What Is to Be Done?*, where he returns to the question of human feces. "The laws of God will be fulfilled," writes Tolstoy, "when men of our circle, and after them all the great majority of working-people, will no longer consider it shameful to clean latrines, but will consider it shameful to fill them up in order that other men, our brethren, may carry their contents away" (2011: 37).

On leaving Calcutta at the end of January 1902, Gandhi resolved to travel alone across India by train on a third-class ticket in order to experience firsthand the crowding, squalor, and filth that were the lot of the poorest travelers. Pyarelal writes that Gandhi wanted to bring himself "into intimate touch with a wide cross-section of the Indian humanity with whom it was his ambition to merge himself" (1986: 394). Gandhi bought a blanket, a rough wool coat, a small canvas bag, and a water jug for his expedition. It was not a political gesture to attract attention, as no one was paying him any attention in 1902, except for Gopal Krishna Gokhale, who was touched by Gandhi's earnestness. Gokhale brought him some food for the journey and said: "I should not have come if you had gone first-class but now I had to." After that trip across India, Gandhi made it a rule always to travel third-class in India (Lelyveld 2011: 51). This was a turning point in Gandhi's life laden with portents.

##### [5]

One of the charges that had been levelled against the Indians in South Africa, "not without a certain amount of truth" Gandhi candidly admitted, was that they were slovenly in their habits and did not care to keep their homes and surroundings clean (Gandhi 1927: 503). Gandhi was never tired of telling the Indian community to clean their homes and surroundings (Desai 2009: 321). In the meetings of the Natal Indian Congress and on

other occasions, Gandhi arranged for lectures and discussions on personal hygiene, sanitation and cleanliness (*ibid*: 211). As a result of his labour since his settlement in Natal, the leading men of the community had begun to keep their homes spick and span. But on finding that the municipal authorities were feeling nervous when it was reported that plague was imminent in Durban in 1903-04, he took another step forward and, after consulting the city leaders who had desired the cooperation of the Indian community and gaining their approval, he started house-to-house inspection of latrines. But, as in India so in South Africa, it saddened Gandhi to find that he could not count upon the cooperation of his people in doing their duty. "At some places I met with insults, at others with polite indifference." Gandhi wrote:

"These experiences taught me that without infinite patience it was impossible to get the people to do any work. It is the reformer who is anxious for the reform, and not the society from which he should expect nothing better than opposition, abhorrence and even mortal persecution" (Gandhi 1927: 503-04).

Sanitary reform however had become a passion with Gandhi in South Africa. He did scavenging work in South African prisons himself. When satyagraha sent many Indians, including Gandhi, to prison, he cleaned the prison latrines of his own accord (CW 8: 117). Gandhi recounted in his jail experiences in South Africa that when a 'Kaffir' warder had asked him "to clean the latrines specially set apart for the Indians," he readily agreed. In fact, Gandhi thought he "was the best person for such work." Personally, he wrote, "I feel no shame in this kind of work. I think we should accustom ourselves to it. [...] We assume that lavatories are bound to be unclean, and thus we frequently invite the charge of being dirty." Moreover, it was an honourable work for him. (CW 9: 147). Claude Markovits argues that Gandhi's focus on the cleaning of toilets must be found in "his desire to fight traditional conceptions of purity and impurity, in which Gandhi saw a perversion of Hindu ideals." As such, "Gandhi was undoubtedly a moderniser and an enemy of tradition" (2004: 117).

#### [6]

Rajmohan Gandhi argues that it was his reading of John Ruskin's *Unto This Last* in South Africa that firmly converted Gandhi to social equality (1995: 232). Gandhi had drawn three conclusions from the book: "The individual's good is contained in the good of all; a lawyer's work is no more valuable than a barber's; and a life of labour is the life worth living." Gandhi "arose with the dawn, ready to reduce these principles to practice" (Gandhi 1929: 108). The Phoenix Settlement, which Gandhi founded in 1904 near the Phoenix Station after returning to South Africa in 1902, was an immediate outcome. The settlement refused admission to any ideas of high and low, or superiority and inferiority. Not only were the settlers at Phoenix a heterogeneous group consisting of Hindus of different castes, Christians, Jews, and Muslims, but there was also no strict division of labour amongst them. "Mine would be considered an essentially heterogeneous family," Gandhi wrote in his autobiography, referring to this period, "where people of all kinds and temperaments were freely admitted. When we think of it, the distinction between heterogeneous and homogeneous is discovered to be merely imaginary. We are all one family" he wrote (Gandhi 1929: 131). By the strictest Hindu standards, the Westerners in his circle, some of whom now joined his household, were 'Untouchables' (Lelyveld 2011: 85). This was the ultimate rejection of caste. Gandhi also gave up his *tulasi-kanthi* in South Africa (Kolge 2107: 44), besides defying casteism by sharing their home and kitchen with Henry and Millie Polak, both Christians, (Guha 2017) and also on another occasion, sharing a home with a Muslim family. According to Ramachandra Guha, such acts reflected transgression of caste by Gandhi (Guha 2013: 67).

Claude Markovits argues that in the dominant Brahminical culture of India, manual labour is linked to the castes which occupied the lowest position. The first step, therefore, for Gandhi was to rehabilitate manual labour, traditionally despised by the upper 'caste Hindus'. Gandhi first tried to put into effect this idea in South Africa at the micro-social level of the communities he formed in the Phoenix Settlement and the Tolstoy Farm (2004: 116). In order to publicise the idea of the dignity of manual labour, Gandhi relied primarily on the exemplary value of his ashrams, which he viewed as some kind of laboratory for social experiments. Gandhi worked closely with low-caste coolies and even invited them to live on the Phoenix Settlement and the Tolstoy Farm, where every ashramite irrespective of caste, religion, or gender, including the 'Untouchables', had to do daily manual labour. Ravjibhai Patel, who had joined the settlement in 1912 at the age of twenty-four, gave an account of the daily manual labour: "At 7 A.M. (after breakfast) farming commenced. Gandhi called for two hoes. He took one and gave me the other. I was holding a hoe for the first time in my life. We began to prepare plant beds for fruit trees" (1990: 102).

In 1908, Gandhi opened a Phoenix School for both the children at the Phoenix Settlement and for the Indian children from outside the settlement. In the school's curriculum, there was no emphasis on teaching the students their ancestor's calling. On the other hand, every student had to learn and respect manual labour. Gandhi made it clear that in this school "Indians of any caste or community will be admitted. No distinctions will be made in

such matters as food, etc.” (CW 9: 135). Since there was no hostel on the premises for the outside students, Gandhi made it a rule that every settler had to house two or three boys belonging to different castes and religions to experience inter-dining (Gandhi 1957: 59). Gandhi introduced a common kitchen for the settlers around the end of 1910. Both, the meals and the breakfast were taken together by all the ashramites (Desai 2009: 432). In November 1910, Gandhi wrote to Maganlal Gandhi, who was taking care of the Phoenix Settlement:

“There is only one thing uppermost in my mind and that is to introduce the common kitchen [at the Phoenix Settlement]. You are not to do it forcibly. If you go on pleading with Santok and Ani gradually, they will be agreeable [...]. Let Santok and Ani sleep together [in the same room]. It is as well if they begin to sleep together before dining together” (CW 10: 348).

The impulse behind the Tolstoy Farm, which Gandhi established in 1910, was the *Hind Swaraj* (Desai 2009: 432). The settlers of the Tolstoy Farm hailed from Gujarat, Tamil Nadu, Andhra Pradesh and North India. There were Hindus of different castes, and Muslims, Parsis and Christians. There was a single kitchen, and all dined in a single row. The food was simple and strictly vegetarian but Gandhi was determined that “if the Christians and Mussalmans asked even for beef, that too must be provided for them.” However, Gandhi was happy that “neither the women nor the men ever asked for meat” (*ibid*: 439). Dinanath Gopal Tendulkar writes that “the settlers worked harder on the farm than in the prisons. It was obligatory on all, young and old” (1951: 143). One such task was to cut firewood (Desai 2009: 433). Apart from agriculture, carpentry, cobbling and tailoring were introduced on the farm (*ibid*: 429). Everyone had to perform every kind of work on a rotational basis including cooking, gardening, cleaning, scavenging, shaving, and cutting hair. In order to make them self-supporting, small industries like sandal-making and carpentry were started. Gandhi himself learnt the craft of making sandals and taught it to the other settlers as well. He also started a school, where he experimented with “co-education,” which he called “most fearless of its type” (Gandhi 1950: 243). Tendulkar called it a “daring one” (1951: 143). Gandhi did not give any thought to organising community life in his ashrams along caste lines or on the basis of varnashram dharma. Gandhi’s experiments were aimed as an effort to break all caste discrimination.

#### [7]

The paper has argued against the much held notion that from 1894 till his return to India in 1915, Gandhi “never thought of the Untouchables and never even enquired after Uka” (Ambedkar 1945: 243). In fact, Gandhi had publicly criticised untouchability from his earliest years in South Africa. As early as 1905, Gandhi held that the Brahmins and the Untouchables were equal in his eyes (CW 4: 430). In his own family circle, he insisted that no one should consider work normally done by a sweeper as polluting (CW 6: 435). He had nearly thrown his wife out of their house in Durban because she clung to the “useless and wicked superstitions” (Gandhi 1929: 56-58). In 1909, he was publicly decrying the notion that there were “high” and “low” castes and even “caste tyranny.” He berated as cowardly the satyagrahi prisoners who would not eat food touched by the ‘Untouchables’ or sleep near them in jail (CW 9: 181). He had told Tamils in a meeting that they would have come to South Africa in vain if they brought with them the strong caste divisions from Madras (CW 12: 495).

As his departure to India neared, the indentured labourers with whom Gandhi had marched against the practice of untouchability in South Africa became a preoccupation. He ended his farewell letter to the Indians of South Africa by penning these words above his signature: “I am, as ever, the community’s indentured labourer” (CW 12: 486). In Durban, Gandhi addressed indentured labourers as “brothers and sisters,” then pledged: “I am under indenture with you for all the rest of my life” (CW 12: 471-72). These feelings deepened with his passionate engagement with the Indian indentured strikers in Natal and Transvaal. Caste lines blurred as they marched with him across the veldt. It was a contest of what Gandhi called “high and low,” and he had finally found a way to align himself with the “low.”

Writing in *Indian Opinion* in 1908, Gandhi had asserted that the ‘caste Hindus’ could not expect to have swaraj so long as they subjected the ‘Untouchables’ to “severe privations,” and whom they “hardly ever treated as human beings.” Gandhi understood the hypocrisy of the ‘caste Hindus’: They “curse the British for denying us our rights,” while they refuse to give the same rights to the ‘Untouchables’. Reminding the ‘caste Hindus’, Gandhi asserted that they can win swaraj only when they drove out untouchability root and branch. Gandhi wrote: “It may well be that the British preside over an empire and prosper because of the blessings of these lepers [‘Untouchables’] while we live in misery because of their curses” (CW 8: 179-80).

An important feature of Gandhi’s attack on untouchability was that he criticised its continued existence as hindering national unity and as harming the cause of India’s independence. He had argued in *Hind Swaraj* in

1909 that “independence, if it was not accompanied by a deep change in social priorities, would be pointless.” Claude Markovits points out that “from the time of his return to India in 1915, Gandhi combined political activity with social reform” (2004: 115). Gandhi’s years in South Africa therefore formed an important chapter in his path to not only become a leading political figure of the twentieth century but also to make the abolition of untouchability central to India’s struggle for swaraj. Joseph Lelyveld states that in South Africa Gandhi had “struggled for the legal equality of Indians and Whites. This had led him, inevitably, to the issue of equality between Indian and Indian. He crossed the caste boundary before he crossed the class boundary” (2011: 24-25).

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**INCREASING IMPACT OF SELF-HELP GROUPS ON WOMEN EMPOWERMENT AND POVERTY ALLEVIATION: A STUDY OF RELIABILITY**

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**ABSTRACT**

*[Self Help Groups (SHGs) play a crucial role in creating entrepreneurship among rural and urban poor. This creates employment opportunities among poor people which ultimately results into the enhanced financial security and social status for its members, especially women. SHGs are key to women empowerment and ensuring regular income to rural and urban poor. The overall impact not only helps to empower women only but also increases social and financial stability among rural and urban poor, their standard of living and the education of their children. The study also focuses on impact of Govt. support in their success as a micro entrepreneur. Proper Govt. support increases the chance of survival of these micro entrepreneurs who need to challenge the established players and MNCs with huge money power in terms of marketing, branding, advertising, packaging, and distribution. A reliability test using Cronbach Alpha has been done to check internal consistency of the responses collected from the micro entrepreneurs.]*

*Keywords: Self Help Groups, Poverty Alleviation, Women Empowerment, Financial and Social Status of women entrepreneurs, Govt. Support to SHGs, Cronbach Alpha.]*

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**INTRODUCTION**

Self Help Groups are a strong medium to promote entrepreneurship among impoverished groups. A self-help group (SHG) is a village-based financial intermediary committee usually composed of 10–20 local women or men. Their success as entrepreneurs is critical in enhancing the per capita income of rural poor and poverty alleviation. Moreover, the association of women with self-help groups plays a key role in improving the social status and livelihood of woman, whose condition is more vulnerable in the context of Rural India.

Even in 2019, two third of Indian population stay in villages and Government of India has seen Self Help Groups as a major tool to encourage rural entrepreneurship and self-reliance of the population. As per NABARD Report (2011), 53.4 percent of poor rural household are covered under SHG- bank linkage programme in India. Success of self-help groups is critical for the success of poverty alleviation.

Self-help groups cater the employability needs of a large portion of our population. It acts as a tool of employment generation and poverty alleviation, especially in rural regions, where infrastructural constraints creates hurdles in job creations. It also empowers the status and position of women in the family as well as society. A woman as a part of successful SHG can be financially independent and lead to success in issues like gender equality. In urban areas, where a large number of population is migrating from rural India the role of SHGs become more vital. As the cost of living of families residing in urban areas is very high in comparison to rural, the nurturing of SHGs can really be fruitful in providing the urban poor a source of livelihood.

With this view, the researcher has tried to analyze the secondary data to identify the variables selected for the current study and the effectiveness of various Government schemes to strengthen the SHGs and its impact on financial status of women in the society and poverty alleviation. This research paper is of the view that SHGs are the key to empower the poor population by creating employment opportunities and accessibility to new markets for their products. SHGs can act as rural organizations tapping urban markets and ultimately we can see money and capital flowing from urban to rural areas.

**OBJECTIVES OF THE STUDY**

- To find out the role of SHGs in women empowerment
- To find the impact of those schemes on households and its role in poverty alleviation
- To find out the effectiveness of various Government Schemes on SHGs

**RELEVANCE OF THE STUDY**

The success or failure of a SHG has great impact on a very large part of rural society and the urban poor. In most of the cases, failures occur due to unawareness of SHGs of various Government support and schemes. Although now a days, many SHGs have started availing support from various Government agencies and NGOs, but still a lot of efforts are required. A proper unbiased study on **Impact of Government Schemes on SHGs**

**for poverty alleviation and Women Empowerment** is thus, needed to assess the current situation and to find out what measures have already been taken and what can further be done in future so that SHGs can play a key role in poverty alleviation.

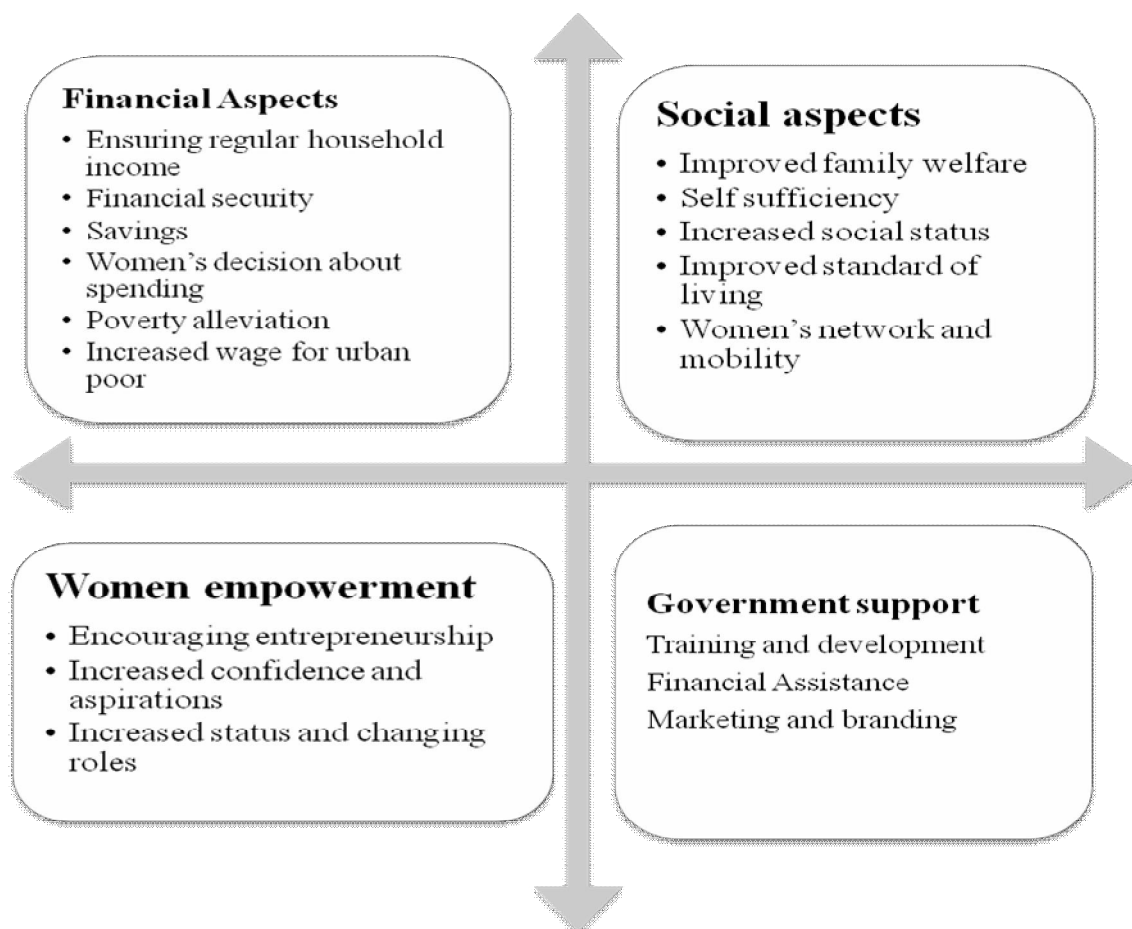
The present study was undertaken in primarily in Gautam Buddh Nagar district of Uttar Pradesh. Few areas of Delhi – NCR has been also covered for the study. The total population of UP state is 20 Crore (2011 census) out of which 23 percent population live in urban areas and 77 percent in villages. It comprises 75 districts and 18 divisions.

This district comprises 4 blocks namely, Bisrakh, Dankaur, Jewar and Dadri and having 122 villages. Due to wide coverage area out of four blocks one block i.e. Dadri was selected randomly. In Gautam Buddh nagar, there are 73 SHGs in total district. As we selected Dadri Block, it has total 18 SHGs working in different different villages.

To analyze the working of SHGs, 10 SHGs were visited with the help of block officials. Many visits were made and meeting was held with *Pradhan's* of the SHGs but only 5 SHGs from Dadri block provided the relevant information. The information gathered from SHGs was analyzed by using percentages only. In Uttar Pradesh, 208540 Self Help Groups have been formed till 2017.

The paper is the summarization of the findings of a pilot research done to find out the effect of these SHGs on women empowerment and poverty alleviation in the above areas. This paper also tries to analyze the effect and extent of Government support in various aspect like marketing and branding, distribution & micro finance to embrace entrepreneurship.

#### Variables studied



#### RESEARCH METHODOLOGY

##### Source of data collection

The researchers have collected both primary and secondary data for the current study. For collecting primary data a self-constructed questionnaire was administered to 100 women associated to self-help group in Delhi-NCR region. But only 62 filled questionnaires could be collected from the respondents. Secondary data has been collected from official websites and newspapers.

### Research tool applied

To measure the internal consistency and reliability of the responses **Cronbach Alpha** has been used.

$$\alpha = \left( \frac{k}{k-1} \right) \left( 1 - \frac{\sum_{i=1}^k \sigma_{yi}^2}{\sigma^2 x} \right)$$

Where

k refers to the number of scale items

$\sigma_{yi}^2$  refers to the variance associated with item i

$\sigma^2 x$  refers to the variance associated with the observed total scores

### ANALYSIS AND INTERPRETATION

This section of the paper presents the results derived from descriptive, reliability and item analysis.

Case Processing Summary			
		N	%
Cases	Valid	207.00	100.0
	Excluded <sup>a</sup>	.00	.0
	Total	207.00	100.0
Weighted by the variable FinancialAspect1			
a. Listwise deletion based on all variables in the procedure.			

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.764	.760	17

The Reliability statistics table presents the value gives  $\alpha$  is 0.764 which indicates a significant level of internal consistency of the scale.

Summary Item Statistics							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Variances	2.055	1.322	2.517	1.194	1.903	.072	17
Inter-Item Covariances	.328	-.396	1.038	1.434	-2.621	.096	17
Inter-Item Correlations	.157	-.186	.475	.661	-2.554	.021	17

Following table indicates that removal of any question, except financial aspects, would result in a lower Cronbach's alpha. As the correlation of all the questions related to financial aspects have very low.

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
FinancialAspect1	53.8889	119.633	.128	.239	.767
FinancialAspect2	54.2174	117.627	.160	.354	.767
FinancialAspect3	54.5072	116.892	.157	.488	.768
FinancialAspect4	54.5797	115.429	.215	.312	.763
FinancialAspect5	54.8551	112.319	.333	.429	.754
FinancialAspect6	54.3140	105.896	.564	.484	.735
SocialAspect1	54.5024	105.154	.559	.539	.734
SocialAspect2	54.7101	111.527	.371	.391	.751
SocialAspect3	54.7874	113.256	.306	.416	.756
SocialAspect4	55.0676	112.471	.321	.531	.755
SocialAspect5	54.4879	111.707	.346	.478	.753
WomenEmpowerment1	55.0918	108.589	.396	.257	.748

WomenEmpowerment2	54.8841	112.715	.296	.486	.757
WomenEmpowerment3	54.7198	107.766	.438	.506	.744
Governmentsupport1	54.6522	110.480	.392	.565	.749
Governmentsupport2	54.6039	107.794	.495	.583	.740
Governmentsupport3	54.7488	108.422	.413	.498	.747

## CONCLUSION

The study shows that SHGs are contributing significantly in the upliftment of the status of women in many aspects. Financial stability and social status of the respondents increased considerably due the entrepreneurial activities of SHGs. Various Govt. schemes and easy access to micro finance also helped the SHGs to carry out their operations. But to have a sustained demand and to fight with the tough competition by established players in the market, SHGs need to opt for modern marketing, branding, packaging and distribution techniques. The rise of entrepreneurship will definitely affect the employment rates, per capita income, and social security in the area. A lot has been done in this area and many milestones are yet to be achieved.

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**NATIONALIST PRESS AND BEGINNING OF MASS AGITATION IN MADRAS PRESIDENCY, 1914-1917**

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**ABSTRACT**

*Annie Besant was a seasoned political propagandist and recognized the importance of the press for propagating what she thought best in the interest of the country. Through medium of the New India and the Commonweal Annie Besant had acquired the effective instruments to voice the nationalist message and became one of the most influential voices in India. The Hindu, Desabhaktan and the Swadesamitran carried the strong tradition of nationalist message.*

*Keywords: Nationalist Press, New India and the Commonweal, Internment, Defense of India Act.*

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It has been argued by scholars that in the 1880s the components of English educated class did not have, by themselves, any real social weight. The structure of local power had been deeply affected, since the 1880s, by the decision of the Government of India to tighten its control at the local level. But at the same time it attempted to placate the influential persons like the native landlord merchants and bankers, whose interests had been affected by tariff policies. This matter had been the subject of widespread agitation led by the newly-born Indian National Congress founded in 1885. The political agitation in the 1880s showed that the British themselves needed to know the realities of the province and the locality to make the working of the colonial system smooth and economic.

The result was the opening to "indigenous talent" of some top positions in the field of bureaucracy, law and education. Those were the only three connecting networks between the provincial capitals which were the locus of the bureaucratic power and their hinterlands; Madras and its presidency. The men who had the necessary technical and linguistic competence were, of course, the Western-educated. As political mediators, they acquired a conspicuous influence and with the 1909 Minto-Morley reforms, which allowed a wider participation by the Indian in the highest councils of power, the Western-educated made this already great influence greater.

At the beginning of this process the Indians in the top places of bureaucracy, law and education were recruited by the British covenanted servants on a personal basis, through a system of "naked" patronage. The former, in turn, developed their skills to fill that patronage system; "politics," came to mean the struggle between the factions to sway the nodal points of the Indian-controlled patronage system in law, education and bureaucracy. According to this model, even the 1905-07 Moderate-Extremist clash can be largely explained, if we go beyond the ideological masks worn by the two groups, as a struggle between the people who were "in" the patron system (the moderates) and those who were not (the extremists). When Annie Besant, already past 46 years old, settled in Madras, the struggle for control of the patronage system reserved to the Westernized had produced two main groupings in Madras: one based in Egmore were extremists and the other in Mylapore were called Moderates.<sup>1</sup>

Being a member of Theosophical Society, Annie Besant quickly rose in its hierarchy. She was involved in educational and social reforms. She fought against child marriage, established and supported schools for the children of the depressed classes and worked for the uplift of the women in Madras. Her most remarkable attainment in the field of social and educational work was the foundation of the Central Hindu College in Benares, later to become the Hindu Benares University. Annie Besant joined the Indian National Congress and became directly involved in national politics in 1914. To a large extent this decision was a logical outcome of her previous public life in London and her service as a Theosophist in India.<sup>2</sup>

*Journalistic Propaganda:* She was a seasoned political propagandist and recognized the importance of the press for propagating what she thought best in the interest of the country she adopted.

The first step was taken in 1914 to purchase an old English daily, the *Madras Standard*, which was renamed *New India*. Now Annie Besant had an organizational arm which targeted the educated and student population of the presidency. It is significant to note that when she started *Commonweal* on January 2, 1914 and *New India* on July 14, 1914 the Madras authorities did not ask her to deposit the securities which, according to the 1910 Press Act, they were entitled to request. Through these media Annie Besant had acquired the effective instruments to voice the nationalist message and became one of the most influential voices in India. Besides *New India* she owned a weekly *Commonweal*, and four religious magazines like *Theosophist* and *The Adyar Bulletin* which

made her the most powerful press baron in Madras. No doubt there were other newspapers in English and Tamil, Telugu and Urdu.<sup>3</sup>

Minto-Morley Act of 1919 having been proved ineffective quite clearly, the majority of the dominant indigenous groups in Madras had become convinced that the war in Europe was creating a favorable situation for getting, at least an additional share of power. But Mrs. Besant had cast her net not only towards her immediate supporters but through them towards her critiques. Her advocacy for immediate Home Rule and her increasing effort at the all-India level to bring the Extremist party back into the Congress were making concrete, though slow, inroads into those segments of the Madras Western-educated elite which, up to that moment, had been bitterly hostile to Mrs. Besant. *The Hindu*, the influential nationalist daily owned by S. Kasuri Ranga Iyengar, which in previous years had sponsored a bitter campaign against Mrs. Besant now had distinctly changed its approach and begun to follow with interest Mrs. Besant's political activity.<sup>4</sup>

On the occasion of the Irish rebellion, Mrs. Besant who was the only public figure in Madras to assess correctly the importance of the event drew a clear though implicit parallel between the Irish and the Indian situation. She ascribed the uprising to "desperation," naturally caused by "misgovernment," and condemned it as due to a mere desire "to call the attention of the world to the state of affairs in Ireland," while stressing the "undoubted sincerity and idealism of the rebels' motives."<sup>5</sup>

In her newspapers Annie Besant published a series of articles on self-government and advocated a campaign to mobilize groups in India. Militant revivalism, with a wide diffusion of Theosophy, was also at the base of the alliance between its lodges and native and other similar organizations. Another weapon in Mrs. Besant's armory was her sway over educational trusts. It was a result of her previous intensive work in Madras Presidency alone, and she controlled some 20 schools and colleges, while her personal role in the creation of the Benares Hindu University was too well known. All this meant that Mrs. Besant could rely on an extended network of patronage through the Young Men's Indian Association, which she founded.<sup>6</sup>

The outbreak of First World War in 1914 gave a new impetus to the nationalists as they were disappointed with the limited reform of 1909 after a long and bitter wait. The genesis of the Home Rule Leagues may be traced in the background of political lead articles that appeared in the most popularly read newspapers. She went to the 1915 annual meeting of the Congress held in Bombay and she attempted to convince Gopal Krishna Gokhale to readmit Bala Gangadhar Tilak and his party to the Congress. She discussed the idea of Home Rule Movement with the moderate leadership of the Congress. But her proposal, opposed initially by many of the most influential leaders, such as Surendranath Bannerjee was referred to the congress committee for decision at its next annual meet.

All these developments prompted the Government of Madras to ask the C.I.D. for a confidential report on the activities of Theosophical Society.<sup>7</sup> The Government of Madras had followed Mrs. Besant's doings with ever growing pre-occupation. In August 1915 it could console itself with the thought that, although the *New India* articles were subjects of comment in such authoritative nationalist papers as the *Bengalee* and the *Bombay Chronicle*, the Besant edited daily was "not a paper of great influence among the Madraseds." However, by December 1915, the Madras civil servants had realized with bewilderment that *New India*, thanks to its "mischievous and misleading articles" had become the most popular paper in Madras, with a circulation of 10,500 copies superior to that of any other local paper.

Up to the second half of 1916 the only measures taken by the Government of Madras against Annie Besant had consisted in warning her three times privately. These steps had been utterly ineffective and the Executive Council had become increasingly worried by both the support that Annie Besant had gained among many of the leading Madras politicians and her influence on the students. An influence, it was apprehended, which could lead them to terrorism. Therefore the Madras Government had begun to discuss what might be the most effective way of tackling Mrs. Besant. A way open to them was to ask the Irish lady to deposit security for '*New India*,' according to the Press Act of 1910. Sivaswami Iyer was repeatedly attacked by *New India*. In September 1916, a lecture presided over by him, in his capacity as Vice-Chancellor of the Madras University, was interrupted by students sympathizing with the Home Rule movement.

From the perusal of the intelligent reports received, the majority of the members of the Governor's Council got the impression that the influence of Mrs. Besant had been important in preventing the Society from developing anti-British propaganda and that her loyalty to the British causes.

But the civil servants recognized that her journalistic success was only the outer face of deeper changes in the local structure of indigenous politics. In her campaign against the abuses of the British and for immediate Home

Rule, Annie Besant had brought behind herself both her Theosophical followers, such as Sir S. Subramania Iyer and Mr. Justice Sadasiva Iyer, and her political friends, such as C.P. Ramaswami Iyer and Govindaraghava Iyer. All the influential leaders had espoused the cause of Home Rule.

Although the time for Home Rule agitation was set as "after the War", the tone of '*New India*' became more radical. Mrs. Besant, taking her cue from the work of the Public Services Commission, stated that if an unsatisfactory report was published during the war she threatened an immediate and vehement agitation. In the 25th September issue of *New India*, she announced her intention to start a movement for the attainment of Home Rule for India through a "strong, steady and sustained agitation" in the press and on the platform.<sup>8</sup>

Popularity of the Movement: The Home rule campaign highlighted the issues of the common man. For example, prominent Home Rule politicians picked up the issue of emigrant labour and called on the government to regulate more closely and, in some instances, stop completely the emigration. The Home Rule League made a criticism of the failure of government's policy which affected economic interests of the Muslims in the important hide and skin trade, which was hit by the dislocation of communications.<sup>9</sup>

Home rule press highlighted the pitiable condition of Indian merchants who sought to break the financial privileges of European business houses. It had taken up the cause of the workers. In Madras city it drew support not only from the middle and lower classes but also from the labouring class. The Home rulers based at Adayar in Madras were able to articulate their grievances. The Home rulers in Madras were successful in organizing native labor and establishing first formally constituted Madras Labour Union in Madras.<sup>10</sup>

The Home Rule Press and the Home Rulers in Madras saw labour as a significant force to be a part of the political movement. B.P.Wadia, Home Ruler with the backing of Annie Besant, acknowledged the potential power of the working class to become an integral part of the national movement. He observed: "It is necessary to recognize the labour movement as an integral part of the national movement. The latter will not succeed in the right direction of democracy if the Indian working classes are not enabled to organize their force and come into their own."<sup>11</sup>

These political views expressed in the *New India* and the *Commonweal* alarmed the members of the Executive Council of the Madras Government. One of its members, Sir Harold Stuart who, although he did agree that Annie Besant was not 'disloyal' to the raj pointed out that, after following her doings in India for a long time, he had "constantly found her magnifying the superiority of the Indian and seizing opportunities to inflame racial feelings by exaggerating cases of ill treatment of Indians by Europeans." Sir Harold Stuart's apprehensions seemed to come true some months later when, as from April 1915, Mrs. Besant started displaying "anti-English and anti-missionary bias in some rather foolish speeches delivered in Madura, as well as in her leading articles."<sup>12</sup> He suggested stern action by the government of India as the matter was of all India-character.

Accepting his suggestion, the Council wrote a letter to the Government of India asking them to make use of the Defense of India Rules of 1915 to deport Mrs. Besant from India. The Government of India answered declining to take action. They pointed out that the annual meeting of the Congress was near and that there were signs of dissent with Mrs. Besant's line, which might surface on that occasion. This resulted in the Madras Government's decision to wait and see.<sup>13</sup>

The alternative line was sponsored by Sir Alexander Cardew, another member of the Executive Council. Cardew gave a subtler point of any government repressive policy. He suggested that the motivation of any repressive policy should not appear to the Indian public to be prevention of free political discussion, but of "political discussion in an improper manner". Therefore Mrs. Besant had to be persecuted because of the "impropriety" of her political style. However, Cardew was strongly against the idea of her internment. The reason for this restraint was, as Cardew opined that, Mrs. Besant "would be represented as an old woman ruthlessly torn from her home, confined away from her friends and subjected to a discipline every item of which would be criticized as harsh and unwanted. She would become a martyr to the cause of Indian self-government and she would constitute an immediate object of agitation to secure her release." Cardew suggested two possible courses of action. The first was to renew the request to the Government of India with a copy of the Nellore speech to deport Besant from the sub-continent. Failing this, the second best was to prohibit her, under the Defense of India Rules, from taking part "in any public meeting and from making any speech or giving any lecture or address in any meeting, public or private." In both cases the effect of stopping Mrs. Besant's political activities without "making a martyr of her" would be reached.<sup>14</sup>

In the 28th February 1916 issue of *New India* she urged the ruling Chiefs to get rid of the control of the Residents. Soon afterwards, presiding over the Chittoor District Conference, she stated that "she was not going to modify her language until she was silenced by force."



Soon Mrs. Besant's influence rose meteorically and her example began to be followed by the vernacular press. This caused the Madras top Civilian's nerves to snap. Although the Government of Madras had been unofficially encouraged by Sir Reginald Craddock the hard-liner in the Government of India to make use of the Press Act against Mrs. Besant, the Madras Executive Council had correctly assessed this course of action as desired by Mrs. Besant herself and bound to turn to her own advantage as early as April 1915.

At first, Lord Petland, the Governor, seemed to incline towards Cardew's first proposal. However, in the same period, the Central Government lacked a coherent policy for dealing with Annie Besant. It was not prepared to take action against her. Left to itself, the Government of Madras, after following the necessary procedure, confiscated the security deposited for *New India* and asked for a new deposit of 10,000 rupees. Moreover even *Commonweal* was put under security for 5,000 rupees.

It was a very hard blow, calculated to put an end to Mrs. Besant's journalistic activities. At first it seemed to have reached its target. Annie Besant in the August 29, 1916 issue of *New India*, declared her intention to suspend publication of her papers while appealing to the High Court.<sup>15</sup>

Support of editors Guild: However, the prestige and influence then attained by the sponsor of Home Rule agitation were demonstrated by the fact that she immediately received an offer of pecuniary assistance which allowed her to pay the requested money and go on with her journalistic campaign. The government's repressive action misfired. Much criticism in all part of India was leveled against it. On August 31, 1916 the Madras Committee of the Press Association of India, in a meeting held at the *Hindu* office resolved to start a Press Defense Fund immediately. *The Hindu's* editor, Kasturi Ranga Iyengar, appealed to the public for subscription especially for *New India* and *Commonweal*. Not less than seventy papers- both English and vernacular – participated and condemned the repressive policy. Throughout the country protest meetings were held. The emotional wave was so strong that men such as Madan Mohan Malaviya, Tej Bahadur Sapru, and Satyendra Sinha- leading nationalist politicians, who were not enthusiastic about Home rule Movement, felt compelled to speak against the Madras Government.<sup>16</sup>

This was also the occasion for some of Mrs. Besant's allies to come out into the open. G.A. Natesan, the publisher, editor of the *Indian Review* and a prominent University Senator who, up to that moment, had appeared to please both the government and Mrs. Besant, now openly came out in favour of the latter contributing to *New India* (August 2, 1916) a strongly worded criticism of the Press Act and the government of Madras' use of it. Taking this position, G.A. Natesan brought his own supporters with him. One of them was Karunakara Menon, the editor of *Indian Patriot*, who was financially indebted to Natesan. Two others were the brothers Yakub and Hamid Hasan, who had been in the past provided with funds by him. They were the two leading Muslim politicians in Madras. Yakub was a Legislative Councilor and the Secretary of the Madras Muslim League, while both wielded a wide influence over the Muslim student community.<sup>17</sup>

Even though her petition against the order of the forfeiture was dismissed in the Madras High Court, her image as a fighter continued to rise throughout the country.

An almost year later i.e., May 15, 1916, the Madras Government made precisely this very mistake and directed the Advocate- General to demand Rs. 2000 as security from Mrs. Besant for *New India*. Clumsily enough, the British authorities neither preceded their order with an official warning, nor made the reason of their decision known.

Mrs. Besant made the most of all these mistakes. The final result was precisely what the Madras Executive Council had foreseen months before. Public meetings protesting against the demand for security, often coupled with the call for public subscription on behalf of *New India*, were held in Madras, at Ootacamund (Ooty), at Cuddalore, at Madura and in other places. The editors of the most influential Indian-owned newspapers in the Madras Presidency wrote a letter to the Press Association of India, requesting its intervention. The British civilians noticed the progressive siding with Mrs. Besant even of "thoroughly well meaning and moderate men." Even worse, they realized that precisely the order to furnish security had at last secured for her some real recognition of her services" even among the Madras extremist party.

The bulk of the extremist party was at this point of time led in Madras by Kasturi Ranga Iyengar and others. At the very moment of depositing the security for *New India*, Mrs. Besant had stated in her daily that she intended to go quietly on as before" in such a way as to compel the Madras Government to confiscate her security. As a matter of fact Annie Besant not only increased the tempo and the sharpness of her denunciations against "British misrule" both in the press and on the public platform, but widened the scope of her political activities. In spite of her promise at the Bombay Congress, she clearly moved towards the formation of a Home Rule League.<sup>18</sup>

*New India* of July 7, 1916 appeared with an account of the organization and methods on which the new body would be based. According to this programme, written by its organizing secretary, G.S. Arundale, a Theosophist, branches were established throughout the country; every member had to become a propagandist, bound to the task of preaching Home Rule "in the tram-car, in the train, in the Court, at the wedding, at the club, at caste dinners"; pamphlets had to be circulated and placed in clubs, associations and reading rooms; a League room had to be opened in every town and village, lectures had to be delivered in vernacular; every member had to study the two last political books by Annie Besant (on which were largely based her public speeches), namely *How India Wrought for Freedom* and *India: a Nation*. More concretely Mrs. Besant began to gear to her Home Rule campaign the numerous net-works that she controlled. For the first time the Madras Government received evidence that the Theosophical lodges and the mofussil branches of the Young Men's Indian Association were taking part in the distribution of Home Rule political literature.

A trusted follower of Mrs. Besant, J.H. Cousins, was sent as Principal to her college in Madanapalle with special instructions to preach Home Rule to his students so as to spread the agitation. Articles from *New India* were printed in leaflets and were widely circulated. One of them, criticizing the reservation of special places for Europeans on trains, brought about a series of deputed between Indian students on one side, Europeans and Eurasians on the other. All this culminated on the July 27 in a free fight at the Madras Fort Station in the course of which several persons were injured.<sup>19</sup>

Far from risking the mere forfeiture of the security for *New India*, what Annie Besant had really at stake was her personal liberty. She apprehended her internment and asked Tilak to pilot Home Rule Movement through the Indian National Congress. Actually, after a new extremely disturbing speech by her at Nellore (17 June 1916), the Madras Executive Council had once again felt itself compelled to take up the problem of the most effective way to deal with Mrs. Besant. In the ensuing discussion two different lines took shape. One was sponsored by Sir Harold Stuart. He proposed issuing an order internment Mrs. Besant "in some suitable place; prohibiting her from publishing anything of a political character; subjecting all her correspondence to censorship." He also suggested the forfeiture of Mrs. Besant's two books: *How India Wrought for Freedom* and *India- a Nation*. He understood that this act might cause "the risk of alienating some men of moderate and sober opinions", but in his opinion it might disallow "anarchy to take root in Madras as it has taken root in Bengal."

The Extremists position towards Mrs. Besant had begun to change with the beginning of her Home Rule campaign as the Government of Madras repressive policy put the extremists in the awkward position of having to choose between their personal resentment against the moderates based in Mylapore, and the necessity to take sides on a public issue which involved problems such as Home Rule and the freedom of press, viz. some of the main tenets professed by the extremist group in Madras. In the first case the extremists risked cutting themselves off even from the Tilakite wing of the nationalist movement. Because ideology has its own dynamism, their leader Kasturi Ranga Iyengar, editor of *the Hindu*, a strenuous opponent of Annie Besant in the Madras Provincial Congress Committee earlier, now as the secretary of the local branch of the Press Association sponsored the letter on behalf of *New India* to the Press Association of India. This was the first public step of the extremists towards Mrs. Besant's positions.<sup>20</sup>

As the Home rule Movement spread in the cities and towns, the counter move against the Home Rule Movement was initiated by a small group of highly placed civilians in Madras. They began to look around for the initiatives of a few *zamindars* who wished to oppose the League.<sup>21</sup> The South India Liberal Federation, a Non-Brahmin association in Madras, opposed the Home Rule League demand on the grounds that 'if a class oppresses another, there will be no way open for the oppressed class to get Justice.' In fact, Tamil Press in Madras stoutly defended Home Rule Movement.<sup>22</sup> Thiru.Vi.Kalayanarasundaram Mudaliar through his columns in the *Desabhaktan* wrote that communal antagonism prevailing in Tamil Nadu was the greatest impediment for attaining Home rule. The *Desabhaktan* further accused the justicites as suffering from Anglo-mania and branded them as enemies of Tamil culture. It held out the hope that Home rule alone would infuse new blood into 'Mother Tamil'.<sup>23</sup>

In addition to the *Desabhaktan*, the *Swadesamitran* was another nationalist newspaper which attempted to counter communal politics and spread Home Rule ideas. These papers carried the message of Home Rule to the people. In short, they outweighed communal propaganda indulged in by the Justice party at a crucial point of political change in Madras Presidency. It may be said free and radical ideas which germinated in the pre-war period became the substance of the press in the war period. The role of the *New India* and the *Commonweal* set the stage for a very strong criticism of the colonial Government in the subsequent period by the nationalist press like *The Hindu*, *Desabhaktan* and the *Swadesamitran*, two native popular newspapers.

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**RADICALS OR REFORMISTS: A STUDY OF YOUTH'S PERSPECTIVE ON WHAT CONSTITUTES A GREEN MOVEMENT**

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**ABSTRACT**

*Green Movement is an ideology and social movement regarding concerns for protection, conservation and improvement of the environment. Keeping in view the present deteriorating environment, studying consumers for want of what constitutes green movement is the foremost step in understanding what the latter stands for. Every individual's concern vis-a-vis environment is increasing but so far as how much he/she contributes to reduce the damage already done can only be determined by inquiring about their actions. The Present study tries to identify these actions and roles which an individual perform in order to understand the fact whether they are extremists (Radicals) or moderates (Reformists). Put otherwise, it is vital to understand whether an individual believes in anti consumption approach or thinks there can be means (innovative and/or sustainable) through which this environmental deterioration can be reduced. This paper incorporates the quantitative approach to study the research objectives. Sampling has been done effectively and the tool that has been employed to work on the data collection is particularly questionnaires where the questions were close ended. A survey was conducted in order to target the youth. The sample has been taken mainly from urban city of Srinagar, Jammu and Kashmir. In all, 97 questionnaires were filled and reciprocated enthusiastically by the respondents. They were asked a total of 36 questions. 63.9% of the sample consider themselves as reformist. The results indicate that there is a significant difference between radicals and reformists when it come to pricing of greener products. The result here indicates the radicals not only concentrate their level of awareness of risks on their individual self only but also extend it to broader environment ranging from community to entire planet in comparison to reformists.*

*Keywords: Green movement, Youth, Radical green discourse, Reformist green discourse*

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**INTRODUCTION**

Green Movement is an ideology and social movement regarding concerns for protection, conservation and improvement of the environment. This movement is a broad generic term which helps in understanding the different types of local struggles and conflicts concerned with livelihood issues vis-a-vis ecological security within the larger context of sustainable debate. "A Social Movement is an organized attempt by a number of people united by a shared belief to effect or resist changes in the existing social order by non-institutionalised means." (International Encyclopaedia of Sociology)

Tong and Yanki (2005) point out Green Movement is also a type of Social Movement that involves an array of individuals, groups and coalitions that perceive a common interests in environmental protection and act to bring about changes in environmental policies and practices. The need of the hour is to promote harmony with nature. And establishing harmony in today's multi-cultural world is the most difficult challenge for this Green Movement.

Keeping in view the present deteriorating environment, studying consumers for want of what constitutes green movement is the foremost step in understanding what the latter stands for. Every individual's concern vis-a-vis environment is increasing but so far as how much he/she contributes to reduce the damage already done can only be determined by inquiring about their actions. The Present study tries to identify these actions and roles which an individual perform in order to understand the fact whether they are extremists (Radicals) or Moderates (Reformists). Put otherwise, it is vital to understand whether an individual believes in anti consumption approach or thinks there can be means (innovative and/or sustainable) through which this environmental deterioration can be reduced.

**What amounts to a Radical Green Discourse**

Radical Green Discourse is a scenario where consumer believes that there are hardly any truly environment-friendly products. They are a strong supporters of most anti-consumption activities. Anti-consumption assumes a variety of forms. These forms range from resistance to rejection, and have varying degrees of visibility. Resistance, for instance, can take the form of active behaviors in the market place (e.g. boycotting, ethical consumption, voluntary simplicity) (Fournier, 1998; Craig-Lees, 2006). Rejection, in contrast, involves products not purchased; services not accessed; and brands not chosen, which all represent rather more passive behaviors, and are therefore much more difficult for marketing managers to recognize and counteract.

Iyer and Muncy (2009) classify anti-consumers as Global Impact Consumers and Simplifiers According to them, GIC are interested in reducing the general level of consumption for the benefit of society or the planet. They do not believe that the current level of consumption is good for society as a whole. The two most common reasons global impact consumers give for this form of anti-consumption are environmental concerns and material inequity. They hold the belief that the modern consumption of current times is causing irreparable damage to the earth's ecosystem or that over-consumption by the wealthier nations or classes is contributing to poverty problems in lesser developed nations or the poorer classes of society. Dobscha (1998) performed a two-year study of anti-consumers who felt consumption promoted "waste and environmental degradation". She found that anti consumers did not adopt the prevalent view that consumption was a major indicator of a nation's prosperity (Borgmann, 2000). Instead, they argued that it was over-consumption that created many of society's problems. Many of the participants even refused to be called consumers because of the negative connotations the term held for the term. Goldman (2002) refers to these anti-consumers that so passionately oppose marketing as "enemies of global capitalism."

The second group of anti-consumers is best characterized as simplifiers. This group wishes to drop out of the fast-paced, high-consumption society and move to a simpler, less consume oriented lifestyle. They are not the frugal materialists identified by Lastovica (2006), who are reducing consumption in one area to increase consumption in other areas. Neither are they forced by changing economic circumstances to reduce consumption. Rather, they believe that maximizing their consumption, as is commonly done, has undesirable consequences, such as stress and distraction from higher pursuits (Etzioni, 1998; Fischer, 2001; Shaw and Newholm, 2002; Zavestoski, 2002). There may also be a spiritual or ethical component to the simplifiers' anti-consumption beliefs; they believe that it is morally abhorrent to focus so much energy on self-serving consumption activities (Shaw and Newholm, 2002; Wilk, 2006). According to Shaw and Newholm (2002), ethical consumers are surrounded by important decisions of whether to consume with sensitivity through the selection of more ethical alternatives or whether to reduce levels of consumption to a more sustainable level through voluntary simplicity.

Research indicates that a substantial portion of the population believes that over-consumption can create feelings of stress, fatigue, unhappiness, or disillusionment (Zavestoski 2002). Zavestoski concludes that consumers may no longer be associating consumption with the creation of a healthy self. The Harwood Group (1995) found that 72% of participants agreed or strongly agreed with the statement that "many of us buy and consume things as a substitute for what's missing in our lives." Rather than improving society, simplifiers are attempting to obtain a happier lifestyle through buying only what is needed. Jenkins (2006) conducted a study of simplifiers in which he observed that those who reduce their consumption habits seemed happier after doing so than they did prior to the change.

Antio, Heiskanen and Heinenen in their study reveal that radical consumers think multi-national corporations as immoral agents. They call these radicals as 'Anarchist'. For them, an anarchist argues that if one wants to take the environment and social justice seriously, one needs to go beyond the prevailing role of a 'responsible consumer'

### **What constitutes Reformists Green Discourse?**

Consumers who obey green practices as a part of the day-to-day choices such as recycling of various kinds of products, sorting waste, packaging preferring products labelled as environment friendly. Autio (2006) call these green consumers as "Environmental Heroes". These Environmental Heroes are committed to the green consumer ethos and are willing to make economic sacrifices for the good of the environment and moral principles.

Different with radical perspectives, reformist is more compromised, for example green consumption, likes Girst (2007) said that green consumption involves the manufacture of products that are more environmentally sustainable, used by niche markets located mostly in the wealthy economies. In terms of environmental and social sustainability this has led to the development of markets for organic foods, fair-trade goods, the Forestry Stewardship Council accreditation scheme for timber produce and the Marine Stewardship Council's sustainable fishery certification scheme and green investment products, amongst others. These green product will supporting by green market and it's more compromised because it's no compulsion to choose. But, there is a regulation to arrange these movement like ecological modernization system that related to market environmentalism under the umbrella of sustainable development.

Hence Reformist green discourse is a scenario where a consumer is a well informed, rational and morally exemplary social actor

### Radicals and their differences from Reformists?

Various dimensions on which radical actions can be compared to those of reformists

#### ➤ Attention to information about Green Movement

Radicals and reformists are both sensitized to issues related to the current environment. Researchers studying environmental problems are gradually paying attention to how the public sees these newly emerging “attitude objects” (Stern, Dietz, Kalof, & Guagnano, 1995), and the number of studies of public perceptions of issues such as global warming is progressively growing (Dunlap, 1998; O'Connor, Bord, & Fisher, 1999). The emergence of global environmental problems as major policy issues symbolizes the growing awareness of the problematic relationship between modern industrialized societies and the physical environments on which they depend (Stern et al., 1992). Recognition that human activities are altering the ecosystems on which our existence—and that of all other living species—is dependent and growing acknowledgment of the necessity of achieving more sustainable forms of development give credence to suggestions that we are in the midst of a fundamental re-evaluation of the underlying worldview that has guided our relationship to the physical environment (Milbrath, 1984). This attention to information force both radicals as well as reformists to behave in an environment friendly way, former approach being anti-consumption and latter being rationale.

#### ➤ Attitudes towards Green Movement

The environmental attitude was measured by the New Ecological Paradigm scale (Dunlap, Van Liere, Mertig, & Jones, 2000), which made it possible to understand certain aspects of environmental attitudes and concerns.

To measure respondent's environmental attitude we used the New Ecological Paradigm scale. The scale has a number of versions. The original scale (New Environmental Paradigm Scale) is made up of 8 corresponding and 4 conflicting statements, using the 4 degree/scale Likert scale. In 2000, the authors reviewed the original scale and this resulted in a new version with the total number of statements extended to 15 (Hawcroft and Milfont, 2010). As a result, the previous three facets were modified to 5. The modified 15 statements are made up of eight corresponding (odd numbered) and seven contradictory (even numbered) statements.

#### ➤ Product Usage

Product usage is the consumer purchasing patterns. Consumers who are concerned with the environment and are knowledgeable about the environmental issues when shopping try to purchase only eco-friendly products (Laroche, Bergeron & Barbaro-Farleo, 2001).

Reformists generally prefer environment friendly products. They consider reduced packaging materials, organically grown food as well as on a scientific approach to environmentally sound consumption. Not misusing energy, buying energy efficient products, believing in innovative and cleaner technological advancements, favouring greener products is the ideology of any reformists. In contrast, radicals are of the opinion that no true/ real environment friendly products exists. They are pure anti-consumption theorist believing simply in rejection, reduction and resistance mode of consumption.

#### ➤ Price Sensitivity

The American Marketing Association defined price as the formal ratio that indicates the amount of money needed to acquire a given quantity of goods or service). Premium Price is an extra amount paid for product instead of the normal price.

Consumers often complain of high prices of green products in comparison to conventional ones. Though concern for the environment will induce green purchase decision, high price can hamper the actual purchase where consumers are price sensitive.

Radicals are more committed than reformists and as such would be ready in providing extra efforts to environmental resource stewardship and not purchasing a product from companies with a reputation of environment polluting. In contrast, Reformists are careful in their behavior. Autio, 2006 observed that one of the main obstacles to green consumption in the life of young people is the premium prices of the environment friendly products. However the young people who are committed to the green consumer ethos, possess awareness and skills are willing to make economic sacrifices for the benefit of environment

#### ➤ Motivation for participation in Green Movement

Knowledge about the impact of deteriorating environment is a lucrative cause attracting modern day youth towards Green Movement. Key triggers to any sustainable consciousness prevalent among consumers include health risks and perceptions of low quality air & water, additives in foods, UV rays and so on. The question here arises whether the reformists or radicals tend to concentrate their level of awareness of risks on their individual self only or extend it to broader environment ranging from community to entire planet

**Kashmir milieu**

Kashmir is located in the Himalayan Region. The Study of its ecology assumes importance for Green Movement. The State of Kashmir does not only face ecological problems such as denuded forests, frequent landslides, cloudbursts, irregular rainfall patterns, lost natural herbs and plantation, shrunken Dal and Wular Lake, population spread without adequate land-use policy. But also uncertainties due to unrests which hampers the implementation of any Environmental Protection measures.

**Need**

Global Environmental degradation is moving towards a stage when it would be difficult for any individual to restore its original form. To advance any State's green revolution, McGougall (1993) asserts that the consumers play an essential role. The limited existing research into how youth in Kashmir construct their opinion about this degrading environment forms the basic purpose for conducting the present study. This study will assist the practitioners in segmenting, targeting and fulfilling the needs of youth of this region. Coming up with innovative and sustainable ideas in order to lessen the degradation already done to the current environment of the Srinagar city.

**OBJECTIVES**

The present study lay its focus on the following two broad objectives:

- Critical review of existing literature available
- To identify whether youth is radical or reformist in their approach about views on what constitutes a Green Movement

**HYPOTHESES**

*H<sub>01</sub>: There is no significant difference between radicals and reformists when it comes to attention of information about green movement*

*H<sub>02</sub>: The attitude towards green movement of radicals is no different from reformists*

*H<sub>03</sub>: There is no significant difference between behavior of product usage of radicals from reformists*

*H<sub>04</sub>: Price sensitivity to green products of both radicals and reformists is no different*

*H<sub>05</sub>: Motivation for participation in Radicals and Reformists is not significantly different*

**METHODOLOGY**

This paper incorporates the quantitative approach to study the research objectives. Sampling has been done effectively and the tool that has been employed to work on the data collection is particularly questionnaires where the questions were close ended. A survey was conducted in order to target the youth in the age bracket between 15 to 29 years,

In order to study the abovementioned objectives, a scale was constructed after thorough review of literature. The questionnaire was constructed and consisted of 36 items wherein the concept of radical and reformist behavior of consumer was developed. the respondents were asked to rate each item on a 5-point likert scale where in 1= strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree. The questionnaire was validated by experts and reliability was established using Cronbach's Alpha by way of initial pilot test. Cronbach's Alpha Based on 5 Standardized Items turned out to be .763. The questionnaire so developed for this study was administered using convenience sampling to 110 youth.

**SAMPLING**

A sample of 110 educated young people was chosen keeping in view their perspective on whether they were believe the current environmental issues are significant.

In view of the above the sampling technique implemented was convenience and judgemental sampling and only those respondents were considered who were aware about the present day environmental deterioration. In all, 97 questionnaires were filled and reciprocated enthusiastically by the respondents. Participation was voluntary. The sample has been taken mainly from Srinagar region. The data was collected for of this study from September, 2018 to December, 2018.

**RESULT**

A total of 97 completed questionnaires were obtained in which 56% were female and 44% were male. The description of the data so collected is reflected in the frequency tables below:

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-22	41	42.3	42.3	42.3
	23-29	56	57.7	57.7	100.0
	Total	97	100.0	100.0	

Maritalstatus					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Married	12	12.4	12.4	12.4
	Unmarried	85	87.6	87.6	100.0
	Total	97	100.0	100.0	

Edulevel					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	H S	2	2.1	2.1	2.1
	UG	22	22.7	22.9	25.0
	G	27	27.8	28.1	53.1
	PG	41	42.3	42.7	95.8
	PhD	4	4.1	4.2	100.0
	Total	96	99.0	100.0	
Missing	System	1	1.0		
Total		97	100.0		

Occupation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Student	61	62.9	62.9	62.9
	Prof	6	6.2	6.2	69.1
	SE	13	13.4	13.4	82.5
	GE	8	8.2	8.2	90.7
	PE	9	9.3	9.3	100.0
	Total	97	100.0	100.0	

Radical or reformist					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Reformist	62	63.9	63.9	63.9
	Radical	35	36.1	36.1	100.0
	Total	97	100.0	100.0	

The above data shows majority of the respondents are students with 61% and are unmarried (85%) falling in the age groups of 15-22 (41%) and 23-29 (56%). and most importantly, 63.9% of the sample consider themselves as reformist.

## FINDINGS AND DISCUSSION

Group Statistics					
	Radical or reformist	N	Mean	Std. Deviation	Std. Error Mean
Hyp1	Reformist	62	3.1882	.35274	.04480
	radical	35	3.4973	.39680	.06707
Hyp2	Reformist	62	3.6323	.46408	.05894
	radical	35	4.1781	.36470	.06164
Hyp3	Reformist	62	2.8504	.64362	.08174
	radical	35	3.6631	.40643	.06870
Hyp4	Reformist	62	3.4234	.65691	.08343
	radical	35	4.1714	.45686	.07722
Hyp5	Reformist	62	3.6449	.49637	.06304
	radical	35	4.2131	.33604	.05680



Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Hyp1	Equal variances assumed	.001	.976	-3.961	95	.000	-.30911	.07804	-.46404	-.15418
	Equal variances not assumed			-3.832	64.004	.000	-.30911	.08066	-.47024	-.14798
Hyp2	Equal variances assumed	1.183	.280	-5.988	95	.000	-.54584	.09116	-.72681	-.36487
	Equal variances not assumed			-6.400	84.988	.000	-.54584	.08529	-.71541	-.37626
Hyp3	Equal variances assumed	1.742	.190	-6.742	95	.000	-.81274	.12055	-1.05206	-.57341
	Equal variances not assumed			-7.612	93.718	.000	-.81274	.10678	-1.02475	-.60072
Hyp4	Equal variances assumed	6.543	.012	-5.965	95	.000	-.74804	.12540	-.99699	-.49909
	Equal variances not assumed			-6.580	90.766	.000	-.74804	.11368	-.97386	-.52222
Hyp5	Equal variances assumed	4.758	.032	-6.030	95	.000	-.56822	.09423	-.75528	-.38116
	Equal variances not assumed			-6.696	91.752	.000	-.56822	.08486	-.73676	-.39969

Independent sample t-test was used to measure the difference in radicals and reformists perspectives on green movement.

*H01: There is no significant difference between radicals and reformists when it comes to attention of information about green movement*

The above results show that there is no significant difference between radicals and reformists when it comes to attention of information about green movement since p-value is greater than 0.05. Hence the results match with the earlier review of literature where it was found both radicals as well as reformists are sensitized to issues related to the current environment. This attention to information force both radicals as well as reformists to behave in an environment friendly way, former approach being anti-consumption and latter being rationale.

*H02: The attitude towards green movement of radicals is no different from reformists*

The results clearly indicates that the attitude of both reformists and radicals is no different towards green movement since p-value>0.05. This was measured on NEP and the mean score of both the groups is on the higher side, meaning thereby that both possess a pro-environment attitude.

*H03: There is no significant difference between behavior of product usage of radicals from reformists'*

Again the results clearly indicate that there is no significant difference between behavior of product usage of radicals from reformists' since the p-value is .190 and which is greater than 0.05. Hence null hypothesis is accepted. Reformists generally prefer environment friendly products and so do radicals. The mean score clearly indicates the strength with which they believe strongly about greener technologies as the score turns out to be 2.8504 ( which is moderate low for reformists) and 3.6631(moderately high for radicals) . As supported by literature which indicates that radicals are even ready to sacrifice their wants for the betterment of environment in comparison to reformists who may not act pro-environment in absence of a greener products.

*H04: Price sensitivity to green products of both radicals and reformists is no different*

The results indicate that there is a significant difference between radicals and reformists when it come to pricing of greener products as the p-value<0.05. the above results match with the existing literature where it was found

radicals are more committed than reformists and as such would be ready in providing extra efforts to environmental resource stewardship and not purchasing a product from companies with a reputation of environment polluting. In contrast, reformists are careful in their behavior. (Bhate, 2002); Autio, 2006 observed that one of the main obstacles to green consumption in the life of young people is the premium prices of the environment friendly products. However the radicals who are committed to the green consumer ethos, are willing to make economic sacrifices for the benefit of environment.

*H05: Motivation for participation in Radicals and Reformists is not significantly different*

The result indicates that there is a significant difference between radicals and reformist when measured on motivation for participation in green movement. The result here indicates the radicals not only concentrate their level of awareness of risks on their individual self only but also extend it to broader environment ranging from community to entire planet in comparison to reformists.

### **LIMITATIONS**

This study is a quantitative study but in order to study the perspectives of consumers towards green movement a thorough qualitative study will add different dimensions to this research. Due to paucity of time it could not mature, but could be done in the near future. The study area is restricted to urban city of Srinagar and the same may be extended to the most polluted urban cities of the India. Also, increasing the number of questionnaires may enhance the generalizability of findings.

### **CONCLUSION**

The present deteriorating environment, studying consumers for want of what constitutes green movement is the foremost step in understanding what the latter stands for. Every individual's concern vis-a-vis environment is increasing but so far as how much he/she contributes to reduce the damage already done can only be determined by inquiring about their actions. The Present study tries to identify these actions and roles which an individual perform in order to understand the fact whether they are extremists (Radicals) or moderates (Reformists). Put otherwise, it is vital to understand whether an individual believes in anti consumption approach or thinks there can be means (innovative and/or sustainable) through which this environmental deterioration can be reduced. A sample of 110 educated young people was chosen keeping in view their perspective on whether they were believe the current environmental issues are significant. A total of 97 completed questionnaires were obtained in which 56% were female and 44% were male. Majority of the respondents are students with 61% and are unmarried (85%) falling in the age groups of 15-22 (41%) and 23-29 (56%). And most importantly, 63.9% of the sample consider themselves as reformist. The results show that there is no significant difference between radicals and reformists when it comes to attention of information about green movement. The results clearly indicates that the attitude of both reformists and radicals is no different towards green movement. The results clearly indicate that there is no significant difference between behavior of product usage of radicals from reformists'. The results indicate that there is a significant difference between radicals and reformists when it come to pricing of greener products. The result here indicates the radicals not only concentrate their level of awareness of risks on their individual self only but also extend it to broader environment ranging from community to entire planet in comparison to reformists.

As one is aware of the fact that Global Environmental degradation is moving towards a stage when it would be difficult for any individual to restore its original form. To advance any State's green revolution, McGougall (1993) asserts that the consumers play an essential role. The limited existing research into how youth in Kashmir construct their opinion about this degrading environment forms the basic purpose for conducting the present study. Now since the picture is clear about what the youth thinks of green movement, the study will assist the academicians and practitioners in segmenting, targeting and fulfilling the needs of youth of this region. The practitioners should come up with innovative and sustainable ideas in order to lessen the degradation already done to the current environment of the Srinagar city as the number of reformists is more than the radicals keeping in view the fact that they are price sensitive.

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## SIMULATION OF METALLIC PARTICLES IN SINGLE PHASE GAS INSULATED BUSDUCT

Anuja Gavali<sup>1</sup> and Dr. Surekha Deshmukh<sup>2</sup>Student<sup>1</sup>, M.E. (Power System), Pune Vidyarthi Griha's College of Engineering and Technology, PuneProfessor<sup>2</sup>, Department of Electrical Engineering, Pune Vidyarthi Griha's, College of Engineering and Technology, Pune**ABSTRACT**

There is an better alternative for air insulation technology i.e. SF<sub>6</sub>, in modern days due to its high dielectric strength and arc quenching properties. Nowadays, the quantum of SF<sub>6</sub> gas insulated substations is increased because of its compactness, less maintenance and also lower space requirement. Even though there is rising trend of development of gas Insulated Substations, there are major or minor failure reports of GIS as per CIGRE survey studies. One of the major reasons for the failure of these gas insulated substations (GIS) is due to the metallic particle contamination. The free metallic particles move in the gas insulated busducts due to influence of electric field and lead to the breakdown of the insulating properties of SF<sub>6</sub> and thus failure of GIS. The present work is an attempt to determine the random movement of metallic particles. The Aluminium, Copper and Silver wire type particles which are mostly generated due to manufacturing defects, with length 12mm and radius 0.2mm are considered to be present on the inner surface of the enclosure. The simulation results show that the 3 dimensional representation of particle trajectories i.e. displacement of the particles in the gas insulated busduct. In order to determine the randomness of motion of particle Monte-Carlo method used in MATLAB simulation.

*Index terms:* Gas Insulated Busduct, Lift Off Field, Monte-Carlo, Radial movement, Particle trajectory.

**I. INTRODUCTION**

Nowadays there is tremendous rising trend of power supply demand due to industrialization & urbanization. Hence the development of gas insulated substations is inevitable due to lack of land which overcomes the difficulty such as requirement of large space for the clearances necessary to maintain dielectric space in between equipments & also that from the ground for air insulated substations. Even though the advantages of gas Insulated Substation such as compactness, less maintenance over outdoor air insulated substation, due to higher equipment cost ; it is very much essential to avoid the failures of GIS and study the causes of faults in GIS. The statistical study of causes of GIS failure clearly shows that the probability of GIS failure due to presence of metallic particles inside the GIS chamber is almost 20% and higher than that of other causes.

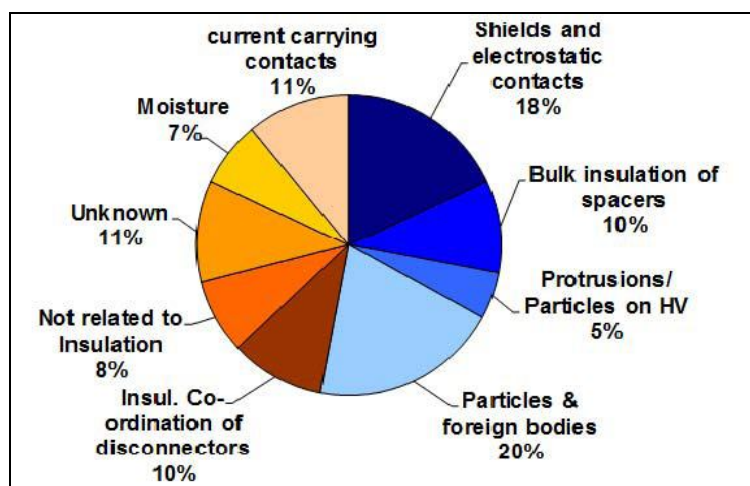


Fig-1: Relative distribution of major causes of GIS failures as per CIGRE Survey

The failure of GIS is caused by partial discharges happened inside the GIS which is explained by various partial discharge theories are not only dependent on the metallic particles or impurities inside GIS chamber but also on the moment of particles. The moment of metallic particles is caused by various forces acting on it which varies with various electrical and mechanical parameters, the impact of which is studied in this project for analysis of GIS failure.

The major sources of the metal particles are Machining debris, Poor mechanical assembly, Expansion joints, and other defects in metal parts. The presence of such metal particles can cause serious deterioration of the dielectric strength of the SF<sub>6</sub> gas depending on their size, shape and location and also one of the major factor

causing failures of GIS. These particles are not only fixed on phase conductor, enclosure, spacers but randomly moving in gas insulated busduct. This paper is an attempt to determine the random behavior of such metallic particles and probability of crossing the coaxial gap and causing flashover can be estimated. This paper deals with computer simulation to determine the movement of metallic particle.

## I. THEORETICAL STUDY

Figure shows a cross sectional view of a typical horizontal single phase SF<sub>6</sub> gas insulated busduct. The particle is assumed to be at rest on inner enclosure. A particle at rest on grounded enclosure, it has no charge density distribution on its surface.

But as soon as, it experience as surrounding electric field, charge will be developed on its surface. After acquiring sufficient charge, particle lifts and starts moving in the direction of electric field. But this motion of the particle in an electric field experiences several forces that oppose their movement. The forces may be divided in to Electrostatic force ( $F_e$ ), Gravitational force ( $F_g$ ) and Drag force ( $F_d$ )

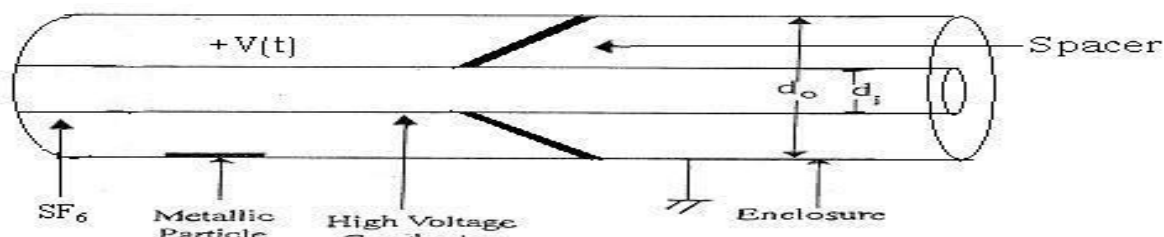


Fig-2: Schematic diagram of typical gas insulated busduct.

### Electrostatic force-

The charge acquired by a horizontal wire like particle is given by

$$Q = 2 \pi \epsilon_0 r l E(t) \quad \dots\dots(1)$$

where  $r$  and  $l$  are the radius and length of particle,  $\epsilon_0$  is permittivity constant and  $E(t)$  is electric field on particle

$$E = \frac{V_m \sin(\omega t)}{[r_0 - y(t) \ln(\frac{r_0}{r_1})]} \quad \dots\dots(2)$$

where  $V_m$  is the peak value of the applied voltage and  $r_0$  is enclosure inner radius and  $r_1$  is conductor radius  $Y(t)$  is the displacement of the particle from enclosure surface towards to the electrode. Hence assuming  $K$  as correction factor, Electrostatic force is given by

$$F_e = K Q E(t) \quad \dots\dots(3)$$

For horizontal wire particle  $K = 0.715$  and for spherical particle  $K = 0.832$

### Drag force

The direction of drag force is always in the opposite direction of motion. It is basically due shock and skin frictions.

$$F_d = F_{d1} + F_{d2} = 6 \pi \mu r \dot{y}(t) K_d \dot{y}(t) + 1.328 (2 \pi r) (\mu \rho_g l)^{0.5} (\dot{y})^{1.5} \quad \dots\dots(4)$$

where  $\mu$  is viscosity of gas,  $\rho_g$  is density of gas,  $K_d(\dot{y})$  is the drag coefficient and it depends on Reynolds number which is degree of turbulence behind the moving particle.

The influence of gas density on drag force is given by

$$\rho_g = 7.118 + 6.332 P + 0.2032 P^2 \quad \dots\dots(5)$$

where  $P$  is the pressure of gas.

### Gravitation Force

$$F_g = mg = p V g = p \pi r^2 l g \quad \dots\dots(6)$$

Where  $p$  is the density of the particle,  $g$  is the acceleration due to gravity.

By considering all the above forces, equation of motion of particle in Gas insulated bus is expressed as

$$m \cdot \ddot{y}(t) = F_e - F_g - F_d \quad \dots\dots(7)$$

$$m \cdot \ddot{y}(t) = \left\{ \left[ (2 \pi \epsilon_0 r l E_{LO}) * \left[ \frac{V \sin \omega t}{[r_s - y(t) \ln(\frac{r_s}{r_1})]} \right] \right] - mg - \dot{y}(t) \pi r [6 \mu K_d \dot{y}(t) + 2.656 [\mu \rho_g l \dot{y}(t)]^{0.5}] \right\} \dots\dots(8)$$

The above equation can be solved by Runge- Kutta method to obtain radial displacement of particle. Also by computer simulation in MATLAB using Monte- Carlo technique, particle trajectories can be obtained.

## II. LIFT-OFF FIELD

When the electrostatic force on the particle equalizes the gravitational force, particle suddenly changes to vertical position and gets lift from its position of rest .Particle then charged according to equation (1)

When particle comes in the close vicinity of electrode it senses attractive forces and when leaves apart from the electrode quickly the attractive forces Due to this situation, a correction factor K is needed to calculate the electric field required to lift a particle off.

$$F_e = F_g$$

$$K Q E(t) = \rho \pi r^2 l g$$

$$0.715 (2 \pi \epsilon_0 r l) E(t) = \rho \pi r^2 l g$$

Therefore E(t) i.e. lift of field

$$E_{LO} = 0.84 \sqrt{\frac{\rho g l}{\epsilon_0}} \quad \dots\dots(9)$$

From above equations above it is cleared that, the lift off field of the particles or charging mechanism is independent of the gas pressure and drag force but can only influence the movement of the particles.

## III. PROBLEM FORMULATION

Following parameters used in the simulation to determine the particle trajectory in single phase GIB

### 1. GIS parameters:

- Diameter of enclosure inner side (do) = 152 mm
- Diameter of conductor (di) = 55 mm
- Gas pressure = 4 bar (absolute)
- Applied GIS voltage = 100 kV
- The SF6 viscosity ( $\mu$ ) =  $15.5e^{-6}$  kg/ms

### 2. Particle parameters:

- Length = 12 mm
- Radius = 0.2 mm
- Particle density = 2700 kg/m<sup>3</sup> (Aluminum)

### 3. Other parameters:

- Restitution factor = 0.8
- Gravitation constant = 9.81 m/s<sup>2</sup>
- 4. Correction factor K = 1 (vertical position).

By substituting the above parameter values, the motion equation becomes

$$\ddot{y}(t) = \frac{3.0132 \sin(\omega t)}{0.076 - 1.0165 y(t)} - 9.81 - 0.014352 \dot{y}(t) - 0.55007 \dot{y}(t)^{1.5} \quad \dots\dots(10)$$



#### IV. RESULTS AND DISCUSSIONS

The random movement of the particle contaminants is obtained in 3 Dimensional graphical representations by solving the motion equation of metallic particle using RK 4th Order method. All the simulations are carried out in MATLAB using Monte Carlo Method. For better observation, the simulations are carried out for particles of different densities in a isolated gas insulated busduct with various dimensions. Aluminum, Copper and Silver wire type particles of length 12 mm and radius 0.2 mm were considered to be present on the surface of grounded metallic enclosure. It is observed that, the displacement of Copper and Silver particle is far less than Aluminium particle of same size.

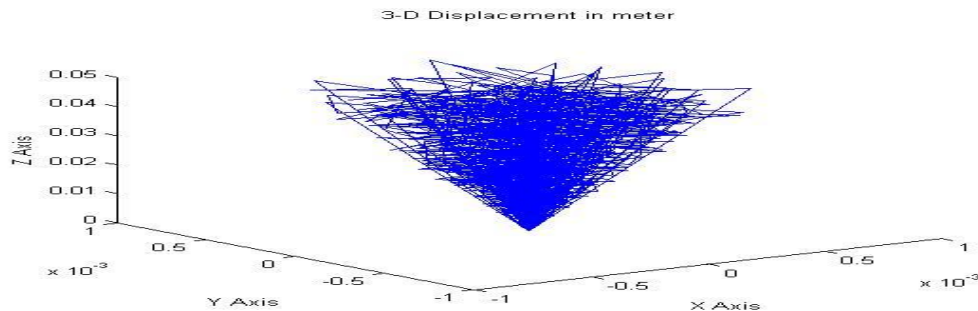


Fig-3: 3 D Graphical representation of movement of Aluminium particle of 12 mm and 0.2 mm radius in 152/55 mm GIB

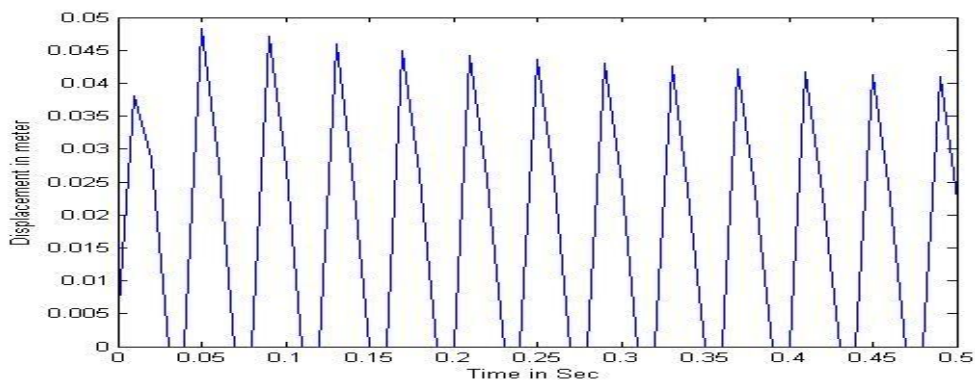


Fig-4: Radial movement of Aluminium particle of 12 mm and 0.2 mm radius in 100KV 152mm/55mm GIB

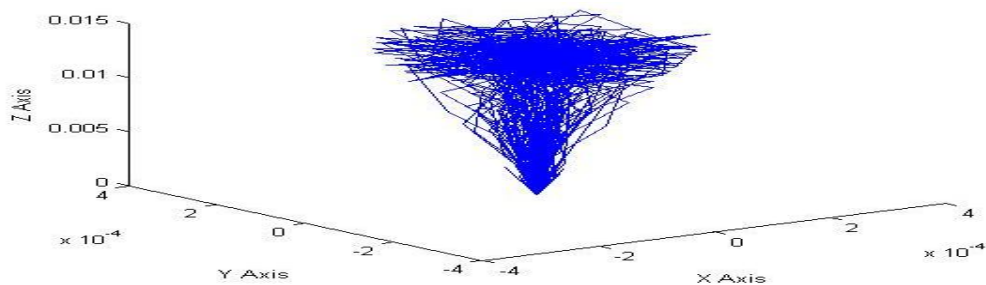


Fig-5: 3 D Graphical representation of movement of copper particle of 12 mm and 0.2 mm radius in 100KV 152mm/55mm GIB

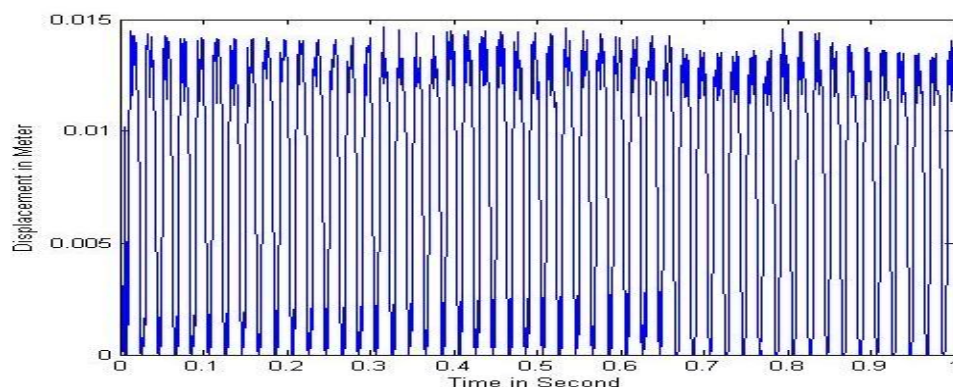


Fig-6: Radial movement of Copper particle of 12 mm and 0.2 mm radius in 100KV 152mm/55mm GIB

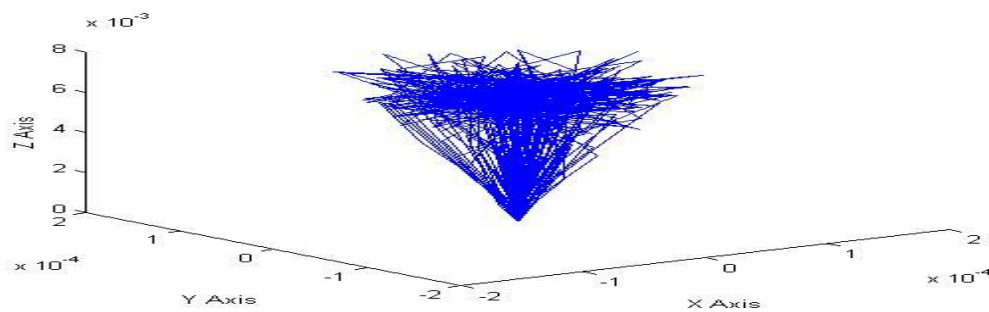


Fig-7: 3 D Graphical representation of movement of Silver particle of 12 mm and 0.2 mm radius in 100KV 152mm/55mm GIB

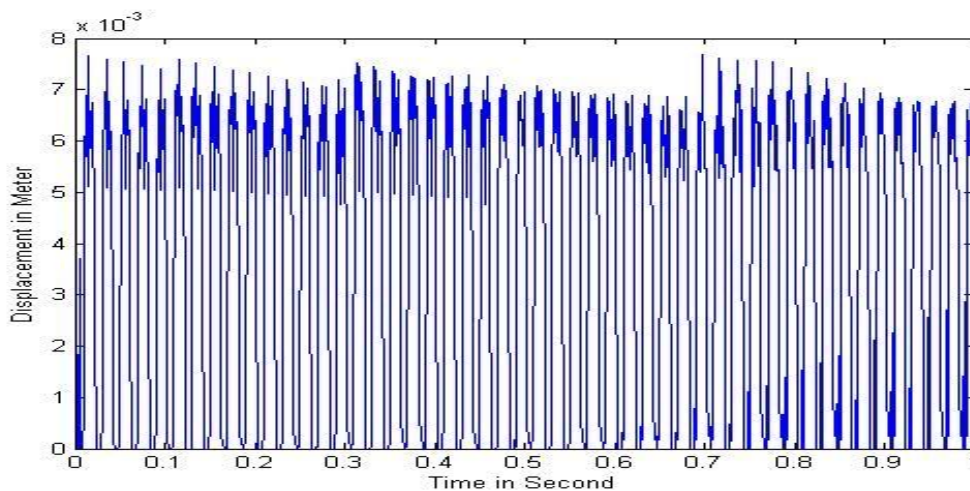


Fig-8: Radial movement of silver particle of 12 mm and 0.2 mm radius in 100KV 152mm/55mm GIB

## V. CONCLUSION

A mathematical model for determining the random motion of particle in single phase gas insulated busduct has been formulated. The results are found in generally good agreement with the published work.. Further it can be concluded that the movement of Aluminium particle is far more than that of Copper and Silver particle.

## VI. ACKNOWLEDGEMENTS

The authors are thankful to the Department of Electrical Engineering PVG's College of Engineering and Technology, Pune and Pune University, for providing facilities and to publish this work.

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**E-SATISFACTION TOWARDS CASHLESS TRANSACTIONS: RE-TESTS MODEL FOR E-TOURISM**

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**ABSTRACT**

*The effects of dependent variables in cashless transactions occurring in e-tourism on consumer behaviour have always been an area of scholarly interest across the world. Limited models in this area make it more interesting to check the suitability of the existing models in different contexts thus the aim of the study is to test the factors associated with e-Satisfaction towards cashless transactions with a pre-identified e-Satisfaction model proposed by Szymanski in 2000. The study attempts to establish a connection between the e-satisfaction model and cashless transactions in e-tourism which effects the online shopping of goods and services related to e-tourism. A number of factors that facilitate customers while doing cashless payments for their purchase over the internet are studied in this research through literature review and the relevant were categorized into four categories that were selected on the basis of past studies. This study is analytical and descriptive in nature. A sample size of 842 is used in this study where all the data were primary in nature. The statistical tests like correlation and regression were used in relation to testing the hypotheses. The results of the study found that convenience, merchandizing, site design, and financial security are the important factors that play a crucial role in the consumer satisfaction or e-Satisfaction towards cashless transactions carried out in e-tourism. The study has also provided confirmation of suitability of the e-satisfaction model in the Indian context and cashless transactions in e-tourism.*

*Keywords: Business management, cashless transactions, e-satisfaction, e-tourism*

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**INTRODUCTION**

For the sustainable economic growth of any country, it is important to have a sustainable travel and tourism industry. In India, there is a remarkable growth in the tourism industry from the very the beginning and it continues to grow at a remarkable rate every year. The introduction of internet communication technology (ICT) and cashless payment systems have crossed the barriers of distances and limited information. The online transactions in e-tourism have contributed to 50 percent of the e-commerce in France (Longhi, 2008), which is indicative that cashless transactions can boost the economy of a country. The tourism in India has contributed 9.4 percent of the country's GDP with a generation of USD 210 billion in the year 2017. This sector has the potential to cross USD 450 billion GDP by the year 2028 (Turner, 2018).

Some of the important factors that have facilitated people to spend on their travel are internet penetration, methods of transactions, initiatives by the government to promote tourism, and the expansion of civil aviation & hotel industry. The emergence of the internet has contributed to the growth of this sector worldwide. The access of the internet has increased from 7.5 percent in the year 2010 to a staggering 29.55 percent by the year 2016 in India (Bhattacharjee, 2016). A large number of local and foreign tourists are attracted towards India, but its ranking at 40<sup>th</sup> place indicates that India is way behind other countries in the Asia Pacific region (Dhaiya, 2018).

The methods of cashless transactions involved in buying e-tourism goods and services are essential for the success of e tourism, without their incorporation in the travel and ticketing portals it had been difficult or might be impossible to get through it. The most common cashless transaction methods in e-tourism are debit and credit cards, E-wallet, internet banking, unified payment interface (UPI). There are a number of pre-identified factors that affect the usage of a cashless transaction while buying and restrict the consumers to avail such services. There are some very common factors like safety and security of the transaction, poor coverage of internet, limited working knowledge of cashless transactions and internet, lack of education & knowledge, high transaction costs, poor reimbursement procedures (Podil, 2017) all these factors are responsible to create a perception in the minds of consumers and restrict them from buying such goods and services. A lot of studies are conducted in India and abroad that have identified and analyzed the factors responsible for e-satisfaction of consumers facilitating e-retailing but the studies focusing on the factors and testing them in cashless transactions in e-tourism are very limited therefore, this study is an attempt to re-test the model of consumer e-Satisfaction towards cashless transactions in e-tourism.

**E- TOURISM IN INDIA**

E-tourism is an integration of design, implementation, and application of information technology and e-commerce in the travel industry. India has a number of historical places and buildings that have an international

significance in ancient art, history, and civilization. Apart from the national importance sites, India is a country of diversity and beauty in almost every state. These beautiful cities and diversity attract billion of tourists every year (*K. Soumya, 2017*), making India a famous hub for national and international tourists from decades. Since the evolution of ICT, there has been a paradigm shift in the competitiveness of the hospitality industry (*Elina, 2013; Sharma, 2015*). The central reservation systems and Global distribution systems have enabled a number of tour operators and travel sites to cater the local and foreign tourist. The hotel reservation sites are providing cashless hotel reservation services that enable the travelers to search, review, select, and buy the accommodations at the convenience of their home (*Sapra, 2017*). There are a number of websites that facilitate travelers to choose and book their travel tickets and accommodation by paying through cashless transactions. In the year around 10.18 million foreign visitors arrived in India which is indicative of growth of over 15.6 percent over the same period. During 2016, 8.8 million foreign tourists arrived in India indicating the growth rate of 9.7 percent over 2015. The domestic tourism was 1613.6 million for the year 2016 that is compared to 1432 million of 2015 indicating a growth rate of 12.68 percent (*Turner, 2018*).

### **INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

ICT is an extended form of information technology. It emphasis the role of unified communication systems like cell phones, computers, internet radio, internet, wireless technologies, software, middleware, digital storage, audiovisual systems that enables the users to access, store, transmit, and manipulate information (*Khyade, 2018*) The communication systems present in ICT have created a new competitive market due to their ability to reach global audiences by allowing local firms and travel agencies to sell their products and services worldwide at an economical rate thus improving the internal efficiency of the firms (*Shanker, 2008*). The tourists are nowadays relying more on the information over the internet which helps them to evaluate different travel modes and accommodations. Though ICT provided great convenience to the consumers, the role of traditional travel agencies is not over because these travel agents are exploring new opportunities and ways to satisfy their customers and providing them custom tailored product and services. Now the travel agents are able to allocate resources for their customers and do more transactions with the help of cashless transactions (*Mihajlovic, 2012*).

With the emergence of ICT, a new platform is created for small and medium enterprises. Travel agencies and tour operators started delivering product and services through central reservation systems (CRS). This system was an airline database which was introduced in the 1950s followed by the introduction of global distribution systems (GDS) in 1980s. CRS has promoted the management and distribution of electronic reservation electronically to far off sales offices and external partners (*Xiaoqiu, 2003*). CRS and GDS have not only facilitated the travel agencies but also helped the consumers in directly checking, managing, and booking their travel tickets and hotels. The CRS and GDS are like microprocessors of a computer that link strategies to get more customers and to increase sales volumes (*Werthner, 2004*), the reservations through CRS and GDS function with the help of online payments which is also known as cashless transactions. Cashless transaction is a process of paying for digitally or none digitally purchased goods and services without any involvement of physical currency.

### **METHODS OF CASHLESS TRANSACTIONS**

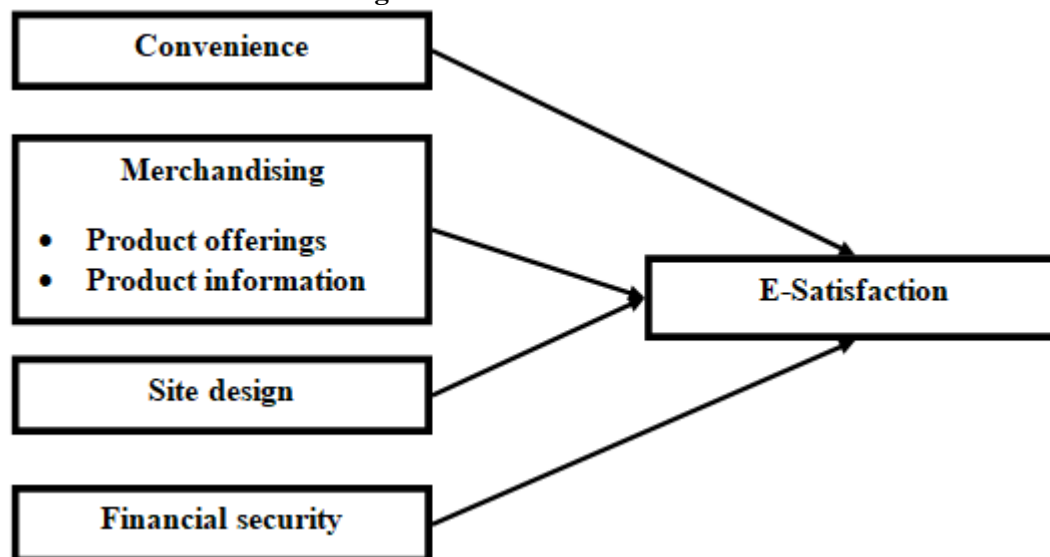
There are a number of ways of doing cashless transactions like paying through credit or debit card, internet banking, e-wallets or mobile wallets apps, prepaid cards, electronic cheques, Unified payment systems, real-time or differed time bank transfer services like NEFT and RTGS, and payment at delivery commonly known as cash on delivery (COD). Around 97 percent of public banks and almost all the private and foreign banks in India are fully computerized and are interconnected making the transaction faster (*Kalyani, 2016*). A number of methods are available nowadays that enable the users to perform transactions for their e-travel buying. Paying through credit and debit cards, e-wallets /mobile wallets, unified payment interface (UPI) are common methods of cashless transaction in India (*Gochhwal, 2017*). The awareness of mobile/e-wallets and their success has surpassed the other methods of transaction across the world (*Sagayarani, 2017*). In India, the payment by E-wallets is ranked first and of debit & credit cards ranked second (*Sreekumar, 2017*). Even after the analysis of various cashless methods, it is difficult to access that which payment option is best (*Kaur, 2015*) because all the methods have their own advantages and disadvantages.

### **CONCEPTUAL FRAMEWORK**

There are various factors responsible for the preference of cashless methods by the customers. These factors sometimes have a direct or indirect effect on the adoption of these methods. Some of the factors that influence customers are originated from a proposed model of e-Satisfaction which has categorized them into four categories namely convenience, merchandizing, site design, and financial security (*Szymanski, 2000*). The same

model was retested by another researcher in 2004 which again proved the reliability of this model (Evanschitzky, 2004) in the area of e-finance and e-retailing hence the study is based on the proven model and checks its reliability in the context of consumer satisfaction towards cashless transactions in a new area of e-tourism. The same factors in these categories are modified according to the literature review to fit in the Indian context and e-tourism sector.

**Figure-1: E-satisfaction model**



Source: Szymanski. (2000), e-satisfaction: an initial examination

### **Convenience**

It is the state of being able to proceed with something without difficulty. Online shopping helps to economize time and effort by making it easy to find items, to locate merchants, and procure offerings (Peterson, 1997). The convenience in e-satisfaction contains three variables namely total shopping time, convenience, and ease of browsing. The satisfaction of e-retailing is measured by two degrees, the first degree to which the consumers are satisfied and the second is to which they are pleased (Zeithaml, 1996). It may be inferred that both degrees are dependent on the convenience which is obtained by the services offered to consumers by e-travel websites and cashless transactions facilities provided by them. Hence,

H1. The e-satisfaction increases as the perception towards convenience in cashless transactions become more positive.

### **Merchandizing**

It is a practice which contributes sales to retail consumers, it is a scientific art that has the ability to modify the consumer behaviour in predictable ways, but it is artistic in the way in which the rules are implemented (Buttle, 1984). The merchandizing is divided into two broad divisions like product offering and product information; the product offering is a customized way of offering specific product and services followed with specific brands to the consumers, whereas product information provides complete knowledge of the product, services, and cashless transactions to the consumers. The conventional stores arrange a variety of products and information in a limited space which is a concerning issue in insuring high profits (Dujak, 2016), but in case of e-retailing, the capacity of websites is endless thus online stores provide a wide range of products and their literature. The merchandizing in this study is divided into two sub-categories namely product offerings and product information. Hence,

H2. The e-satisfaction increases as the perception towards merchandizing of cashless transactions become more positive.

### **Site design**

It is the aesthetic way of presenting a travel website and to represent the products, services, and easy steps in transactions along with convenience and merchandizing. The website design along with other factors plays a significant role in consumer satisfaction and purchase decision on online shopping (Karim, 2013). Site design works as a physical characteristic in websites which is commonly seen in the POS machines while swapping card at a retail store. In the previous studies, it is concluded that the design of retail environments influences offline consumer behaviour (Childers, 2001; Eroglu, 2001), it seems reasonable to assume that the site design may be relevant to online consumer behaviour. Thus, the web interface is expected to strongly influence and

motivate users to use the internet and return to a specific website (Chau et al., 2002). The site design in this study is related to uncluttered screens during transactions, easy to follow steps in doing a transaction, and presenting satisfactory information regarding the success and failure of the transaction. Hence,

H3. The e-satisfaction increases as the perception towards site design with reference to cashless transactions become more positive.

#### **Financial security**

The emergence of ICT has created a boom in all the industries and tourism is the industry which is improved over the decades by this emergence. A large number of online travel agencies are in the continuous process of providing and improving different payment options. The various cashless transaction methods are no doubt increase the volume of sales but they have also attracted scammers and hackers. Cashless transactions over the internet are protected by different security processes but even then the hackers and scammers are able to steal the identity, confidential bank account, pin numbers, telephone numbers enabling them to commit financial frauds to the users of cashless transactions (Kakade, 2017) The safety and security issues across the world have developed a negative perception in the customers that online or mobile transactions are not safe and therefore the biggest cause of consumer dissatisfaction in developing countries (Khan, 2009). The perceived effect of security has a direct effect on the trust (Barkhordari, 2017) and the trust boosts the popularity of the websites and makes customers return, which may be a contributing factor for increased use of these cashless payments. On the basis of the literature review, it may be implied that financial security is highly responsible for consumer satisfaction towards online transactions. Hence,

H4. The e-satisfaction increase as the perception towards financial security in cashless transactions become more positive.

#### **NEED OF THE STUDY**

Many studies have focused on the issues related to e-commerce and online payments but the studies focussing on cashless transactions in e-tourism are very limited in numbers especially in the context of India. The initiative of cashless economy of the government of India has increased online shopping behaviour in last two years. A number of government schemes related to e-governance are totally based on internet platforms and the final applications submissions are subject to successful cashless transactions. The dependence on cashless transactions makes it compulsive to perform cashless transactions and therefore it is so crucial to examine and analyse the factors that affect cashless transactions in e-tourism in India.

#### **OBJECTIVE OF THE STUDY**

To test the model of e-satisfaction in the new context of cashless transactions in e-tourism and to find a suitable relationship between e-satisfaction and its predictors.

#### **RESEARCH METHODOLOGY**

The nature of the study is analytical and descriptive in nature, and Agra city is selected for the research because Agra city is the hub of international and national tourist and holds 45th place in worldwide tourism ranking (Bremner, 2015). A total of 853 questionnaires were obtained by face to face interaction with the tourists at famous tourist spots in the city. The first phase of questionnaires was carried out from August to October in 2018 which followed by another phase from January to February 2019. A total of 842 fully completed samples were used in this study. The objectives are attained by analyzing primary data, the measurement scale and reliability of the data were measured by the Cronbach's Alpha and the internal consistent reliable variance for all 13 items was .80 (80%). The various variables are clubbed into their categories and their coefficient alpha was compared with that of older studies which is shown in Appendix 1. In order to support the hypotheses of the study and to compare the relation of the study with the past studies regression analysis and correlation test were performed.

#### **RESPONDENT CHARACTERISTICS**

The sample for the study consisted of 59 percent of males and 41 percent of females with an average age of 36 years, 2 percent of them were at high school level, 11 percent were at the intermediate level, 36 percent were at the graduate level, 45 percent at the postgraduate level and 6 percent at the doctoral level. Among the both genders, there were 21 percent students, 47 percent employed professionals, 13 percent were self-employed, 2 percent were retired from their jobs, and in females 17 percent were housewives.

## ANALYSIS

Table-1: Regression analysis (for the current study)

Predictor variable	Proposed effect	E-tourism model	
		Standard coefficient (SE)	t-value (p-level)
Convenience	+	.27 (.03)	8.81 (>.05)*
Product offerings	+	.10 (.03)	2.8 (>.05)*
Product information	+	-.05 (.02)	-1.5 (.11)
Site design	+	.27 (.01)	8.2 (>.05)*
Financial security	+	.17 (.05)	5.5 (>.05)*
F model (p-level)		68.85 (>.05)*	
R <sup>2</sup> (R <sup>2</sup> adjusted)		.29 (.28)	

\*Significant at *p* level >.05.

Table-2: Regression results obtained by Szymanski and Hise (2000)

Predictor variable	Proposed effect		
		Standard coefficient (SE)	t-value (p-level)
Convenience	+	.24 (.02)	7.91 (>.05)
Product offerings	+	.01 (.02)	0.31 (.78)
Product information	+	.11 (.03)	3.57 (>.05)
Site design	+	.21 (.03)	7.10 (>.05)
Financial security	+	.21 (.05)	7.23 (>.05)
F model (p-level)		76.36 (>.05)	
R <sup>2</sup> (R <sup>2</sup> adjusted)		.28 (.27)	

Table-3 (a): Regression results obtained by Evanschitzky Heiner , Gopalkrishnan R., et al. (2004)

Predictor variable	Proposed effect	E-shopping model	
		Standard coefficient (SE)	t-value
Convenience	+	.26 (.06)	4.30*
Product offerings	+	.12 (.04)	2.02*
Product information	+	-.05 (.05)	-.74
Site design	+	.14 (.07)	2.25*
Financial security	+	.12 (.04)	2.20*
F model		12.94*	
R <sup>2</sup>		.18 (.17)	

\*Significant at *p* level >.05.

Table-3 (b): Regression results obtained by Evanschitzky Heiner , Gopalkrishnan R., et al. (2004)

Predictor variable	Proposed effect	E-finance model	
		Standard coefficient (SE)	t-value
Convenience	+	.27 (.06)	4.75*
Product offerings	+	-.03 (.05)	-.42
Product information	+	.14 (.06)	2.08*
Site design	+	.26 (.06)	4.21*
Financial security	+	-.03 (.04)	-.52
F model		20.20*	
R <sup>2</sup>		.26 (.25)	

\*Significant at *p* level >.05.

**Table-5: Correlation matrix observed by Szymanski and Hise (2000)**

	e-Satisfaction	Shopping convenience	Product offerings	Product information	Site design	Financial security
e-Satisfaction	1					
Shopping convenience	.41	1				
Product offerings	.18	.28	1			
Product information	.30	.37	.30	1		
Site design	.36	.34	.15	.21	1	
Financial security	.34	.23	.18	.27	.22	1

**Table-4: Correlation matrix (current study)**

	e-Satisfaction	Shopping convenience	Product offerings	Product information	Site design	Financial security
e-Satisfaction	1	.39	.29	.16	.40	.32
Shopping convenience	.39	1	.34	.18	.20	.20
Product offerings	.29	.34	1	.50	.36	.12
Product information	.16	.18	.49	1	.33	.13
Site design	.40	.20	.36	.33	1	.30
Financial security	.32	.20	.12	.13	.30	1

All correlations are statistically significant at  $\leq .05$  (2-tailed).

## RESULTS

The examination for identifying the outliers was performed before conducting the statistical tests and a total of 3 outliers were identified that were excluded from the study. The tests for multicollinearity, and departures from linearity, homoscedasticity were also conducted and the observed standardized residuals are normally distributed. The correlation among the predictors was found to be statistically significant and the highest variance inflation factor (VIF) was 1.52 which falls under the guidelines for excessive multicollinearity. The regression scatter plots also indicate that the assumptions of linearity, homoscedasticity are normal and reasonable.

The data in the table 1, shows the regression coefficient for convenience, site design, and financial security is statistically significant therefore, we accept the hypotheses 1, 3, and 4 however, the coefficient for product offerings was also statistically significant but the other variable “product information” in the same category does not possess a significant regression coefficient therefore, we fail to accept the hypothesis 2 at this time. Moreover, we have also found that convenience has the greatest impact on the e-Satisfaction level ( $\beta = 0.27$ ) which is followed by site design ( $\beta = 0.27$ ). We found that product offering under merchandizing and financial security have a less practical impact on the e-satisfaction level which is ( $\beta = 0.10$ ) and ( $\beta = 0.17$ ). As shown in table 4, all the correlations are also found to be statistically significant at  $\leq .05$  (2-tailed), where shopping convenience and site design have the highest correlation with e-Satisfaction followed by financial security which stands second after them. A weaker correlation was found between product information however, the product offerings in the same category have a strong correlation after financial security.

## CONCLUSIONS & DISCUSSION

With the help of this research, we conclude that e-satisfaction towards cashless transactions increases as the perception towards product convenience, site design, and financial security become more positive. However, e-Satisfaction towards merchandizing of cashless transactions has a negative effect. The regression analysis results in this research provide strong evidence that the e-satisfaction model proposed by Szymanski and Hise in 2000 is fit to measure the e-Satisfaction in other segments of e-retailing as supported by the studies

conducted in 2004 by H. Evanschitzky which has also proved the suitability of this model. As discussed by them, more countries and segments should be studied by using this model to establish the boundary conditions however; this research covered a method which is used to buy goods and services over e-tourism sites which can help the researchers across the world to get more understanding of cashless transactions and motivate them to explore new and dynamic models for cashless transactions.

One of the purposes of this research was to fill the gap in the literature review and to provide scholars more shreds of evidence for the suitability of this model but to examine the e-satisfaction in broader e-Marketing concept a model with 6 or 8 categories should be proposed. The model of e-Satisfaction should also incorporate other variables like technological, situational factors, socio-economical & cultural factors that can yield better results for future research. An expectancy-disconfirmation analysis should also be carried out with simultaneous comparisons of cashless transactions to brick-and-mortar e-retailing in tourism.

## APPENDIX 1

### Measurement scales and reliabilities

Measurement scale	Coefficient alpha			
	Szymanski and Hise. (2000)	Evanschitzky (2004)		Current study
		E-shopping	E-finance	
<b>Convenience</b> Evaluate e-travel websites relative to traditional Travel agents on each of the following dimensions: <ul style="list-style-type: none"><li><i>Total shopping time with cashless payments</i></li><li><i>Convenience in cashless payments</i></li><li><i>Ease of browsing in cashless payments</i></li></ul>	.69	.61	.67	.79
<b>Merchandising-product offerings</b> Evaluate e-travel websites relative to traditional Travel agents on each of the following dimensions: <ul style="list-style-type: none"><li><i>Number of offerings in cashless payments</i></li><li><i>Variety of offerings in cashless payments</i></li></ul>	.92	.90	.89	.70
<b>Merchandising-product information</b> Evaluate e-travel websites relative to traditional Travel agents on each of the following dimensions: <ul style="list-style-type: none"><li><i>Quantity of information on cashless payments</i></li><li><i>Quality of information on cashless payments</i></li></ul>	.91	.85	.84	.59
<b>Site design</b> In general how good of a job are e-travel websites doing on the following dimensions: <ul style="list-style-type: none"><li><i>Presenting uncluttered screens during transactions</i></li><li><i>Providing easy-to-pay steps</i></li><li><i>Presenting transaction success information and redirecting</i></li></ul>	.72	.76	.81	.69
<b>Financial security</b> Evaluate e-travel websites relative to traditional Travel agents on each of the following dimensions: <ul style="list-style-type: none"><li><i>Financial security of the transaction</i></li></ul>	n.a.	n.a.	n.a.	n.a.
<b>Customer satisfaction</b> Overall, how do you feel about your online travel shopping experience? <ul style="list-style-type: none"><li><i>Very dissatisfied to very satisfied</i></li><li><i>Very displeased to very pleased</i></li></ul>	.88	n.a.	n.a	.85

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**HUMAN ERROR IDENTIFICATION: ANALYSE AND IMPROVE THE KEY ELEMENTAL ACTIVITIES IN ENGINE ASSEMBLY: (WITH REFERENCE OF ASHOK LEYLAND, BANGALORE)**

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**INTRODUCTION**

The **automotive industry** is a wide range of companies and organizations involved in the design, development, manufacturing, marketing, and selling of motor vehicles. It is one of the world's most important economic sectors by revenue. The automotive industry does not include the maintenance of automobiles.

The automotive industry began in the 1860s with hundreds of manufacturers that pioneered the horseless carriage. For many decades, the United States led the world in total automobile production. In 1929, before the Great Depression, the world had 32,028,500 automobiles in use, and the U.S. automobile industry produced over 90% of them. At that time the U.S. had one car per 4.87 persons. After World War II, the U.S. produced about 75 percent of world's auto production. In 1980, the U.S. was overtaken by Japan and then became world's leader again in 1994. In 2006, Japan narrowly passed the U.S. in production and held this rank until 2009, when China took the top spot with 13.8 million units. With 19.3 million units manufactured in 2012, China almost doubled the U.S. production, with 10.3 million units, while Japan was in third place with 9.9 million units. From 1970 (140 models) over 1998 (260 models) to 2012 (684 models), the number of automobile models in the U.S. has grown exponentially.

A **commercial vehicle** is any vehicle used to transport goods or passengers for the profit of an individual or business. Examples of commercial vehicles include pickup trucks, box trucks, semi-trucks, vans, coaches, buses, taxicabs, trailers and travel trailers. Commercial vehicles get passengers and goods where they need to go for any given business. The transport itself may be to get people to personal destinations or to get employees to workplaces, goods may be moved from one business location to another or direct to individual customers. Commercial vehicles designed for heavy cargo, which may involve towed trailer units, are larger, more unwieldy and more powerful than most other vehicles on the road with complex gearing. Driving these vehicles requires great skill and awareness, plus operational and safety training for any additional equipment. Therefore, operating a commercial vehicle requires a special driver's license and commercial markings. Commercial vehicles also include exceptionally heavy vehicles and those that carry large numbers of passengers.

The commercial vehicle sector can be broadly classified as

- LCV (Light Commercial Vehicles)
- MCV (Medium Commercial Vehicles)
- HCV (Heavy Commercial vehicles)
- GVW of 8 to 10 tonnes
- GVW of 10 to 15 tonnes
- GVW of 16 tonnes and above

MCVs and HCVs can also be classified into two categories depending on their usage as **trucks and buses**. Buses are passenger carriers and trucks include goods carriers along with specialized vehicles like dumpers, tractor-trailers etc.

The internal-combustion engine and transmission are the core components the industry participants have focused on, while outsourcing the manufacture of many other components and subassemblies. In a world where vehicles run on electrons rather than hydrocarbons, the OEMs will have to reinvent their businesses to survive. Nonetheless, incumbency is also a strategic strength in this sector.

New technology face significant entry barriers, including

- Manufacturing scale (including engineering prowess)
- End user brand equity (now worldwide)
- Channel relationships (suppliers as well as dealership networks)
- Customer relationship management and market research

Fuel and energy are the wildcards in trucking's future. While natural gas is gaining a lot of attention, electrics and co-powered diesel electric is still a consensus favorite. For the next 10 or so years, the purchase price of an electrified vehicle will probably exceed the price of diesel-fueled commercial models. This difference is due largely to the cost of designing vehicles that can drive for extended distances on battery power and to the cost of the battery itself.

The **Tesla Semi** is an all-electric battery-powered Class 8 semi-trailer truck prototype which was unveiled on November 16, 2017 and planned for production in 2019 by Tesla, Inc. The company initially announced that the truck would have a 500 miles (805 km) range on a full charge and with its new batteries it would be able to run for 400 miles (640 km) after an 80% charge in 30 minutes using a solar-powered "Tesla Mega charger" charging station. Tesla CEO **Elon Musk** said that the Semi would come standard with Tesla Autopilot that allows semi-autonomous driving on highways.

**Mission GEMBA** launched in 2005, is one of Ashok Leyland's most successful initiatives aimed at information spread, developing skills, empowering employees to reach world-class levels of quality, cost and delivery with recognition and reward for performance. GEMBA means work place in Japanese, refers to the shop floor where the value is added. The manufacturing units are divided into function-based GEMBA more than 100 now, each GEMBA runs as an independent business by empowered Gemba Unit Leaders (GULs) chosen based on their performance track record. Mission GEMBA has triggered an attitudinal transformation of the workforce, operational excellence to decongest bottlenecks and continual improvements in several core areas.

Mission GEMBA is designed and developed by steering committee of Ashok Leyland in association with McKinsey & Company. Steering committee of Ashok Leyland comprises COO (Chief Operating Officer), CFO (Chief Financial Officer), MH (Manufacturing Head) and PPH (Project Planning Head). The main agenda of Mission GEMBA is to empower employees for world class performance and to bridge the gap between executives and associates. In 2011, Ashok Leyland receives "Great Place to Work" award which is considered as the big leap forward for Mission GEMBA.

#### The objectives of study:

- To familiarize with current trends in business activities
- To analyze error possibilities and addressing with proper solution
- To finish the given project at high level of accuracy and commitment

#### METHODOLOGY

Methodology helps in giving information about the methods, procedures and techniques used to collect data which increases the efficiency and authenticity of the report.

##### Design

This study was undertaken initially by proper observation for about a fortnight. **Qualitative approach** is practiced for the collection of data. The study is conducted by the collection of two types of data. They are

- Primary Data
- Secondary Data

**Primary data** is the real time data which is specific to the need of the report. It is collected by direct observation, personal interviews etc. In this study, the information regarding the functional activities of Ashok Leyland, Hosur Plant 1 is collected by interacting and interviewing with several associates and executives of the company. For the given project in P15 engine assembly, each and every process is observed visually and interaction with associates and executives is conducted for any further information and clarity.

**Secondary data** is the data which is already in existence. The relevant information is collected by referring company's websites, books, journals, articles etc.

##### Analysis

Internal analysis is done with the help of McKinsey 7S Framework. It helps in understanding and evaluating organization at micro level. Strategical analysis is performed by using SWOT technique. In error identification process, errors are categorized into sixteen types and percentage analysis is done along with Pareto chart, where the types of errors are represented in descending order by bar chart and the cumulative total of the errors are represented by line graph.

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**REVIEW OF LITERATURE**

Literature review is defined as the analysis of the study related to the specific topic by integrating the information from a number of sources. Reviewing articles provides an oversight of recent review focused on the topic. In this report, literature review is conducted to identify and summarize the findings related to the human error identification.

**Purpose of a literature review is**

- To find out what information already exists in my field of research
- To show relationships between previous studies
- To find other people working in my field
- To identify main methodologies and research techniques

**Method of Identifying Latent Human Errors in Work Systems**

*Takeshi Nakajo*

Work system improvements are implemented in various manufacturing processes to prevent problems caused by human errors. However, they are almost always applied to problems which have already occurred. This paper examines a method of identifying latent human errors existing within the work systems beforehand. A procedure for applying failure mode and effect analysis to this identification problem was defined based on over 1000 empirical errors: a work system decomposition criterion and fundamental error modes for listing latent human errors, and then applied to three practical manufacturing processes in order to evaluate its effectiveness.

**Coping with Human Errors through System Design**

*Jens Rasmussen, Kim J. Vicente*

Research during recent years has revealed that human errors are not stochastic events which can be removed through improved training programs or optimal interface design. Rather, errors tend to reflect either systematic interference between various models, rules, and schemata, or the effects of the adaptive mechanisms involved in learning. In terms of design implications, these findings suggest that reliable human-system interaction will be achieved by designing interfaces which tend to minimize the potential for control interference and support recovery from errors. In other words, the focus should be on control of the effects of errors rather than on the elimination of errors per se. In this paper, we propose a theoretical framework for interface design that attempts to satisfy these objectives. The goal of our framework, called ecological interface design, is to develop a meaningful representation of the process which is not just optimized for one particular level of cognitive control, but that supports all three levels simultaneously. The paper discusses the necessary requirements for a mapping between the process and the combined action/observation surface, and analyses of the resulting influence on both the interferences causing error and on the opportunity for error recovery left to the operator.

**Human Errors: Taxonomy for Describing Human Malfunction in Industrial Installations**

*Jens Rasmussen*

This paper describes the definition and the characteristics of human errors. Different types of human behaviour are classified, and their relations to different error mechanisms are analyzed. The effect of conditioning factors related to affective, motivating aspects of the work situation as well as physiological factors are also taken into consideration. The taxonomy for event analysis, including human malfunction, is presented. Possibilities for the prediction of human error are discussed. The need for careful studies in actual work situations is expressed. Such studies could provide a better understanding of the complexity of human error situations as well as the data needed to characterize these situations.

**Human Error Identification Techniques Applied to Public Technology: Predictions Compared with Observed Use**

*C. Baber, N.A. Stanton*

In this paper, we consider the use of human error identification (HEI) techniques as a possible alternative to observation studies for product evaluation. The HEI techniques used were Task Analysis for Error Identification (TAFEI) and Predictive Human Error Analysis (PHEA). The comparison was undertaken in connection with the prediction of errors in the use of a ticket vending machine. Two main findings emerged from the study. First, predictions derived from the HEI techniques compared favourably with errors observed in actual machine use. Second, the HEI techniques took far less time than direct observation to reach comparable levels of performance. Such rates suggest that these techniques can be usefully applied to the study of consumer products.

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**LEARNING OUTPUT - HUMAN ERROR IDENTIFICATION**

Human error is often viewed as a cause of accident in major occasions. It is practically impossible to fully eradicate the human errors because it deals with the personal and psychological factors whereas it can be minimized by understanding the processes through regular training. Poka-yoke is a Japanese slang for mistake-proofing, a term coined by Shigeo Shingo.

The objective of this project is to observe the operations of P15 engine assembly line which helps in understanding the process and identifying key elemental activities. There are sixteen types of possible errors which are already predefined. A matrix is formed where the possible predefined human errors are plotted with respect to the particular key elemental activities. The study is conducted for short block assembly line and main assembly line. The **error identification matrix** for each and every process is attached in the **annexure** of this report.

**Quality Policy**

Ashok Leyland is committed to achieve customer satisfaction by anticipating and delivering superior value to the customer in relation to their own business, through the product and services offered by the company and comply with statutory requirement. Towards this, the quality policy of Ashok Leyland is to make continual improvements in the processes that constitute the quality management system, to make them more robust and to enhance their effectiveness and efficiency in achieving stated objectives leading to

- Superior products manufactured as also services offered by the company.
- Maximum use of employee's potential to contribute to quality and environment by progressive up gradation of their knowledge and skills as appropriate to their functions.
- Seamless involvement from suppliers and dealers in the mission of the company to address customers changing needs and protection of the environment.

**TYPES OF ERRORS**

There are sixteen human error modes particularly helpful to understand while identifying potential human errors.

**Omission:** Forgetting to take out or set materials.

**Excessive/Insufficient Repetition:** Re-executing the finished work; excessively or insufficiently repeated work

**Wrong Order:** Executing two sequential work operations in an inverted order.

**Early/Late Execution:** Beginning or ending the work earlier or later than specified.

**Execution of Restricted Work:** Executing restricted work which is likely to cause poor quality, injuries and accidents.

**Incorrect Selection:** Selecting the wrong parts or material; using the wrong tool.

**Incorrect Counting:** Supplying more materials than specified; transporting fewer parts than ordered.

**Misrecognition:** Misreading work order sheets, meters and records; failing to determine the defective product.

**Failing to Sense Danger:** Failing to sense items not to be approached; failing to sense areas not to be approached.

**Incorrect Holding:** Holding damageable part of materials; holding tools incorrectly.

**Incorrect Positioning:** Setting parts in the wrong position.

**Incorrect Orientation:** Setting parts the wrong way around.

**Incorrect Motion:** Opening valve too fast.

**Improper Holding:** Failing to ensure the parts do not move or dropping parts or tools.

**Inaccurate Motion:** Tightening the nuts and bolts at inaccurate torques.

**Insufficient Avoidance:** Knocking parts into each other and touching machine switches without intention.

**Short Block Assembly Line Operation Sequence**

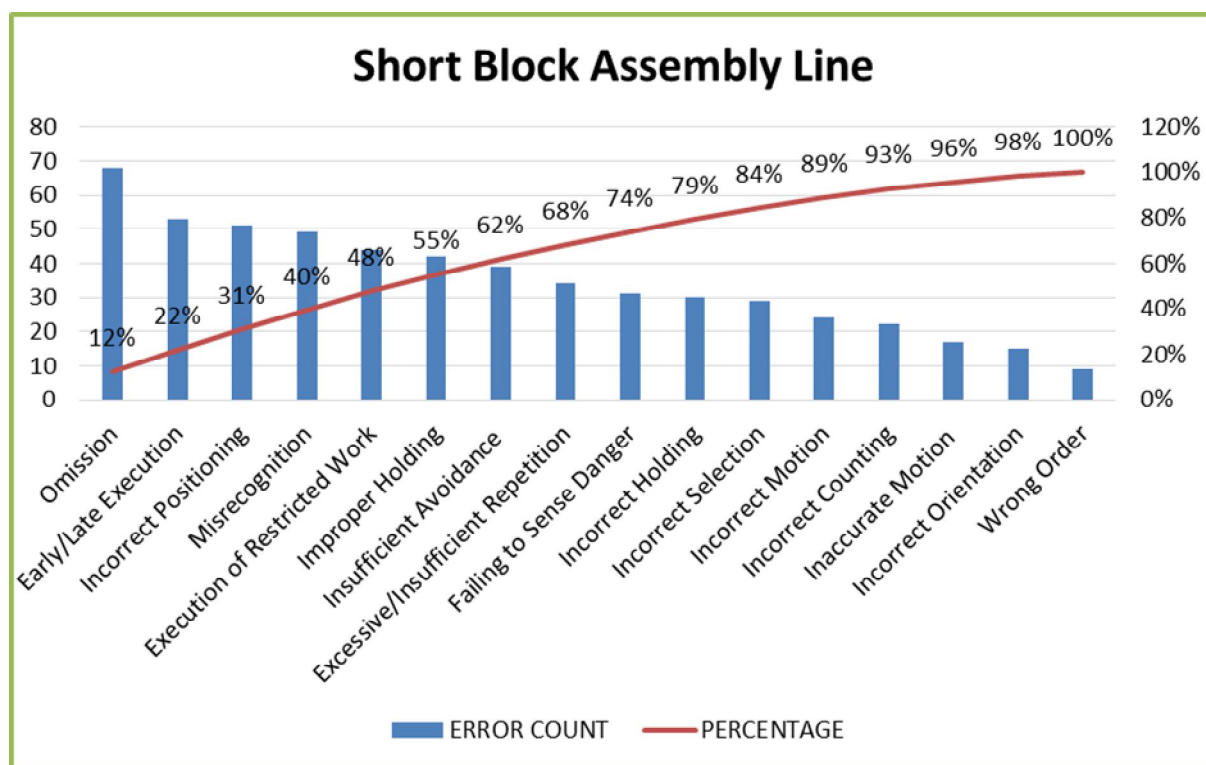
1. Engine Number Marking (Machine)

2. Fitment of Dowels & PCN's
3. Upper Bearing Shell Assembly
4. Crank Shaft, MB Cap & Lower Bearing Shell Assembly
5. MB Cap Bolt Tightening (Nut Runner)
6. In-Process Verification
7. Piston Sub Assembly & Piston Assembly
8. Connecting Rod Bolt Tightening (Nut Runner)
9. Front Oil Seal Pressing
10. Front Oil Seal Housing Assembly
11. Rear Oil Seal Pressing
12. Liquid Sealant Application in Rear Oil Seal Housing (Machine)
13. Rear Oil Seal Housing Assembly
14. RH Engine Mounting Bracket Assembly
15. In-Process Verification - Front & Rear Oil Seal Leak Checking
16. Fitment of Oil Strainer Assembly
17. In-Process Verification - Short Motoring Test
18. Fitment of Crank Shaft Pulley
19. Liquid Sealant Application in Oil Sump
20. Oil Sump Assembly
21. LH Engine Mounting Bracket Assembly
22. Rear Adaptor Housing Assembly

#### Occurrences of Errors in Short Block Assembly Line

ERROR TYPES	ERROR COUNT	PERCENTAGE
<i>Omission</i>	68	12.20%
<i>Excessive/Insufficient Repetition</i>	34	6.10%
<i>Wrong Order</i>	9	1.62%
<i>Early/Late Execution</i>	53	9.52%
<i>Execution of Restricted Work</i>	44	7.90%
<i>Incorrect Selection</i>	29	5.21%
<i>Incorrect Counting</i>	22	3.95%
<i>Misrecognition</i>	49	8.80%
<i>Failing to Sense Danger</i>	31	5.57%
<i>Incorrect Holding</i>	30	5.39%
<i>Incorrect Positioning</i>	51	9.16%
<i>Incorrect Orientation</i>	15	2.69%
<i>Incorrect Motion</i>	24	4.31%
<i>Improper Holding</i>	42	7.54%
<i>Inaccurate Motion</i>	17	3.05%
<i>Insufficient Avoidance</i>	39	7.00%
<b>TOTAL</b>	<b>557</b>	<b>100%</b>

### Pareto Chart for the Errors in Short Block Assembly Line



### Main Assembly Line Operation Sequence

23. Cylinder Head S/A Assembly With Short Block
24. Cylinder Head S/A Tightening With Short Block (Nut Runner)
25. Tappet Clearance Checking
26. Timing Cover - Inner Assembly
27. Cam Shaft Pulley Assembly
28. Water Pump Assembly
29. Idler Pulley Assembly
30. Crank & Cam Pulley Tightening
31. Tensioner Stud Assembly
32. Timing Belt Assembly
33. Coolant Inlet Pipe Assembly
34. Oil Cooler Assembly
35. Injector, Back Leak Connector Assembly
36. FIP Assembly
37. Common Rail Assembly
38. High Pressure Pipes Assembly
39. Starter Motor, EMF Stud Assembly
40. Timing Cover - Outer and Crank Pulley Cover Assembly
41. Cam Sensor Assembly
42. VSV (BS3) / EVRV (BS4) Assembly
43. Crank Sensor Assembly

44. Coolant Outlet Body Assembly
45. Flywheel Assembly
46. Degassing Adaptor Assembly (BS3) / Taper Plug (BS4)
47. Damper Pulley Assembly
48. Cylinder Head Cover Assembly
49. Vacuum Oil Drain Adaptor Assembly
50. Oil Filter Assembly
51. Alternator Assembly
52. Power Steering Pump, Tensioner Assembly
53. Vacuum Oil Drain Hose Assembly
54. Inlet Manifold Assembly
55. Exhaust Manifold Assembly
56. Duct, EGR Pipe-4 Assembly (BS3) / Duct, EGR Pipe-3 (BS4) With EMF
57. Turbo Charger Assembly
58. Turbo Oil Drain Pipe Assembly
59. Turbo Outlet Pipe & Bracket Assembly (BS3) / CATCON (BS4)
60. Power Steering Pulley Assembly
61. Turbocharger Oil Inlet Pipe & Vacuum Pump Oil In and Banjo Adapter Assembly
- 62.1. EGR Sub Assembly
- 62.2. EGR Coolant to EMF & Duct (BS4)
63. S/A of Pipe VSV to EGR Valve (BS3) Assembly
64. Oil Separator S/A Assembly
65. Dipstick Guide & Dipstick Assembly
66. Vacuum Pump - VSV (BS3) / EVRV (BS4) Hose Assembly
67. EGR - EVRV Hose Assembly (BS4)
68. Oil Cooler - Coolant Inlet & Outlet Hose Assembly
69. Routing Clamping Assembly
70. Assembly Leak Testing

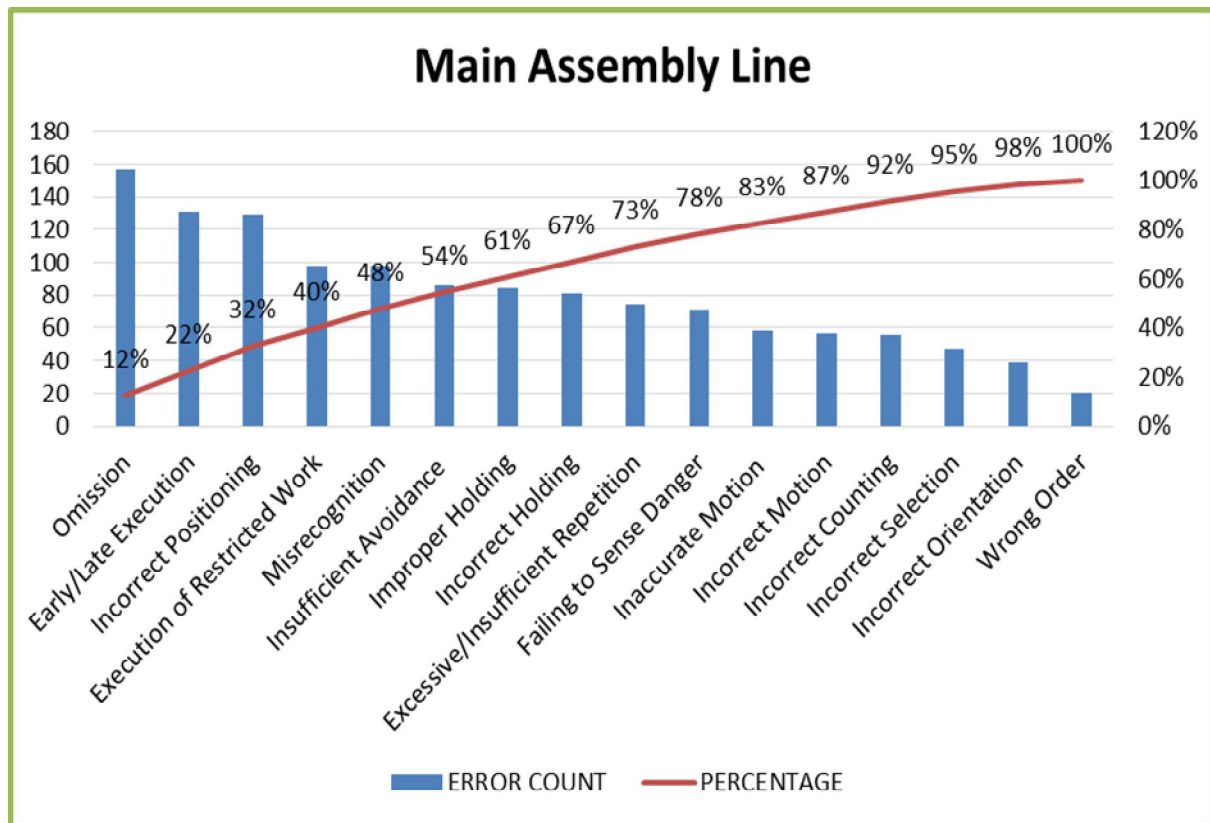
#### Occurrences of Errors in Main Assembly Line

ERROR TYPES	ERROR COUNT	PERCENTAGE
<i>Omission</i>	<b>157</b>	<b>12.21%</b>
<i>Excessive/Insufficient Repetition</i>	<b>74</b>	<b>5.75%</b>
<i>Wrong Order</i>	<b>20</b>	<b>1.56%</b>
<i>Early/Late Execution</i>	<b>131</b>	<b>10.18%</b>
<i>Execution of Restricted Work</i>	<b>98</b>	<b>7.62%</b>
<i>Incorrect Selection</i>	<b>47</b>	<b>3.65%</b>
<i>Incorrect Counting</i>	<b>56</b>	<b>4.35%</b>
<i>Misrecognition</i>	<b>98</b>	<b>7.62%</b>
<i>Failing to Sense Danger</i>	<b>71</b>	<b>5.52%</b>
<i>Incorrect Holding</i>	<b>81</b>	<b>6.30%</b>
<i>Incorrect Positioning</i>	<b>129</b>	<b>10.03%</b>



<i>Incorrect Orientation</i>	39	3.03%
<i>Incorrect Motion</i>	57	4.43%
<i>Improper Holding</i>	84	6.53%
<i>Inaccurate Motion</i>	58	4.51%
<i>Insufficient Avoidance</i>	86	6.69%
<b>TOTAL</b>	<b>1286</b>	<b>100%</b>

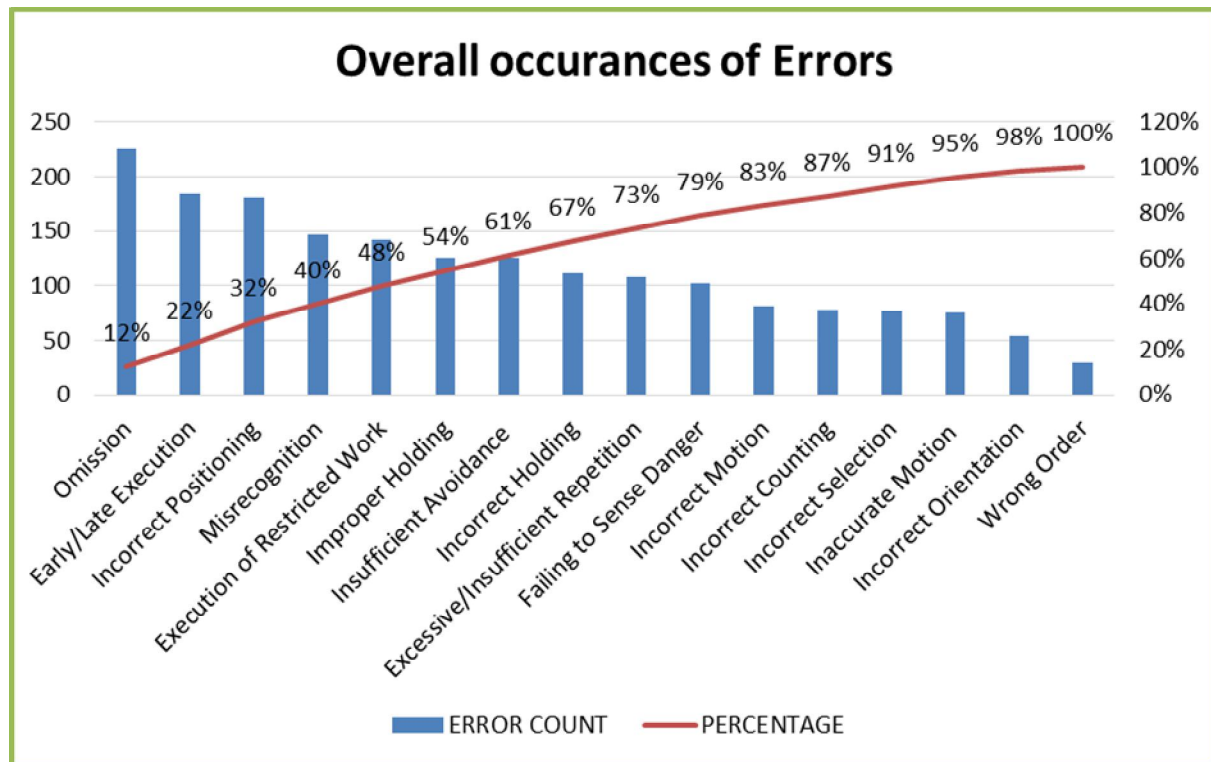
#### Pareto Chart for the Errors in Main Assembly Line



#### Overall Occurrences of Errors

<b>ERROR TYPES</b>	<b>ERROR COUNT</b>	<b>PERCENTAGE</b>
<i>Omission</i>	225	12.21%
<i>Excessive/Insufficient Repetition</i>	108	5.86%
<i>Wrong Order</i>	29	1.57%
<i>Early/Late Execution</i>	184	9.98%
<i>Execution of Restricted Work</i>	142	7.70%
<i>Incorrect Selection</i>	76	4.12%
<i>Incorrect Counting</i>	78	4.23%
<i>Misrecognition</i>	147	7.98%
<i>Failing to Sense Danger</i>	102	5.53%
<i>Incorrect Holding</i>	111	6.02%
<i>Incorrect Positioning</i>	180	9.77%
<i>Incorrect Orientation</i>	54	2.93%
<i>Incorrect Motion</i>	81	4.40%
<i>Improper Holding</i>	126	6.84%
<i>Inaccurate Motion</i>	75	4.07%
<i>Insufficient Avoidance</i>	125	6.78%
<b>TOTAL</b>	<b>1843</b>	<b>100%</b>

## Pareto Chart for the Overall Occurrences of Errors



## Learning Outcomes

ASSEMBLY PROCESS	ERROR COUNT	PERCENTAGE
Short block Assembly Line	557	30.22%
Main Assembly Line	1286	69.78%
<b>TOTAL</b>	<b>1843</b>	<b>100%</b>

Results of the analysis clearly states the top three common errors committed by humans during production process they are **omission, early/late execution and incorrect positioning** and they are interrelated to each other. **Omission** leads to the **execution of process very late** by assembling the component in some other process sequence. It creates a disturbance in continuous process and there is a possibility of **placing the component improperly**. The root cause for all these problems is due to absence of mind in work place which is the common prevalent challenges in maintaining the quality. So the workers in Hosur Plant 1 are constantly assigned to work at different workplace in the same assembly line at a definite time interval in order to avoid boredom. Main assembly line is the place where the high number of spare parts is installed to add value to the engine. So possibility of error occurrence in main assembly line is high when compared to short block and cylinder head assembly line. The errors cannot be eradicated but can be minimized by the factors like motivation, implementation of new strategy, technology, conducting a research and implementation of proposed method. The Pareto charts is useful in identifying which problem need the attention first. It is the combination of line and bar graph which states that the 80% of the effects comes from 20% of its own causes.

## SCOPE OF THE REPORT

The information collected through observation and interviews conducted in several department which helps to land in solid conclusion about the organization and its function. Departments like HR, Production, and Maintenance are visited and information is gathered from department executives and associates. The end result of the organization study is gaining knowledge about the organization culture, structure and its functional activities. The human error identification process in P15 assembly line gives a clear picture on how human errors can impact the quality of the product at the greater extent. The next action taken for minimizing the human error is through giving the levels of sensitivity to each and every process through FMEA analysis.

## CONCLUSION

Organisation study at Ashok Leyland, Hosur Plant 1 helps to understand the functions and importance of organisation culture, value and its business activities. It helps in gathering practical knowledge and helps to interpret the management challenges faced by the executives on daily basis.

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**LIST OF ABBREVIATIONS**

LCV- Light Commercial Vehicles

MCV- Medium Commercial Vehicles

HCV- Heavy Commercial Vehicles

GVW- Gross Vehicle Weight

GTW- Gross Trailer Weight

ISO/TS- International Organisation for Standardisation / Technical Specification

CV- Commercial Vehicle

OBD- On Board Diagnostic

BS- Bharat Stage

CPCB- Central Pollution Control Board

KVA- Kilo Volt Ampere

HP- Horse Power

VFJ- Vehicle Factory Jabalpur

UAV- Unmanned Aerial Vehicle

RFID- Radio Frequency Identification

CNG- Compressed Natural Gas

R&amp; D- Research and Development

GCC- Gulf Cooperation Council

CNC- Computer Numerical Control

SCR- Selective Catalytic Reduction

UDS- Urea Dosing System

JNNURM- Jawaharlal Nehru National Urban Renewal Mission

ARAI- Automotive Research Association of India

HLFL- Hinduja Leyland Finance Limited

NBFC- Non Banking Financial Company

CoE- Centers of Excellence

H1- Hosur Plant – 1

H2- Hosur Plant – 2

GUL- Gemba Unit Leader

COO- Chief Operating Officer

CFO- Chief Financial Officer

MH- Manufacturing Head

PPH- Project Planning Head

RISE- Reward for Individual Search for Excellence

ASN- Advanced Shipping Notification

HR- Human Resource Department

SDC- Skill Development Centre

SOP- Standard Operating Procedure

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ALIMS- Ashok Leyland Information Management System

ERP- Enterprise Resource Planning

SAP- Systems, Applications & Products in Data Processing

GR&D- Goods Receipt & Dispatch

HEI- Human Error Identification

TAFEI- Task Analysis for Error Identification

PHEA- Predictive Human Error Analysis

EVRV- Electronic Vacuum Regulating Valve

EGR- Exhaust Gas Recirculation

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**SOCIAL COMPETENCE OF SENIOR SECONDARY SCHOOL STUDENTS IN RELATION TO THEIR ADJUSTMENT**

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**ABSTRACT**

*The present investigation intended to study the social competence of senior secondary school students in relation to their adjustment. The study was conducted on the sample of 300 senior secondary school students of 11<sup>th</sup> class randomly drawn from two Government and two private schools of district Roopnagar, affiliated to Panjab School Education Board, Mohali, Punjab. Data was collected with the help of social competence scale by Dr. Latika Sharma & Dr Punita Rani and adjustment inventory by Bell. The data obtained were analyzed statistically with the help of Mean, SD, t-ratio and correlation to arrive at the following conclusions: (i) There was significant difference between the social competence of government and private school 11<sup>th</sup> class students. (ii) There was significant difference between the social competence of 11<sup>th</sup> class students with regard to their high, average and low adjustment (iii) There was significant and positive relationship between social competence and adjustment of 11<sup>th</sup> class students.*

*Keywords: Social Competence, Adjustment and School Students*

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**INTRODUCTION**

Social competence means that social, emotional, and cognitive skills and behaviors that everyone need for successful social adaptation. For healthy social development that varies with the age of the child and with the demands of particular situations, social competence is one of the important concepts. A child's social competence depends upon various factors like child's social skills, social awareness, and self-confidence. Here social skills describe the child's ability to use a variety of social behaviors in different and appropriate interpersonal situation. So socially competent children's are those Children who have a variety of social skills and who are socially aware and perceptive. In Broader sense the term social competence used to describe a child's social effectiveness, to describe ability to establish and maintain high quality and mutually satisfying relationships and to avoid negative treatment or criticism from others.

Social competence is one of the most widely investigated areas of human social behavior. In recent decades, more and more emphasis has been placed in educational research on the study of the development of social competence. Social competence is increasingly recognized as vital to school readiness (Carlton & Winsler, 1999). Socially competent children are more successful than their less competent peers in developing positive attitudes towards school and in adjusting to school. Moreover, they get better grades and achieve more (Birch & Ladd, 1997; Ladd, Birch & Buhs, 1999; Webster-Stratton & Reid, 2004; Zsolnai, 2002). Social competence has a positive effect on positive emotions and limiting the effects of negative emotions; on self esteem and the seeking of challenging goals; on the control over one's own behavior and emotions; on the positive outlook on the world and satisfaction with life (McCay & Keyes, 2002).

Ramsey (1986) the nature of social competence can be described as the development of competencies according to the changes in life. He suggested various ways to foster social competence among adolescents. Those are establishing reward system, assigning group activities, giving opportunity to teach, focusing on one behavior at a time, encouragement for the adolescents from the family, assisting students to express their feelings, providing adolescents with choice, provide an appropriate skills, encouraging relieving stress, providing choices for adolescents when it is required and the very important is adjustment of children in various situations.

The school is the first place where the child's first come in contact with the world outside the house. Children gain proficiencies in various abilities such as learning process and home-work, social communication, handling emotion and the management of day to day interacting at home and school. Here the children learn to adjust with other under different circumstances or conditions. They also learn to adjust in society at large with the passage of time and developmental stages. Shaffer (1961) adjustment is the process by which living organism maintains a balance between his needs and the circumstances that influence the satisfaction of these needs and school play vital role in the adjustment of an individual. Crow and Crow (1956) defines "an individual's adjustment is adequate wholesome or healthful to the event that he has established harmonious relationship between himself and the conditions and persons who social environment".

Social competence and adjustment (in particular social adjustment) are much correlated with each other and one effects the other. In the present research, investigator tried to study the difference in the social competence of

Government and private senior secondary school students with high, average and low adjustment. Investigator also tried to find out the correlation between social competence and adjustment of private and government senior secondary school students.

### NEED AND SIGNIFICANCE OF THE PROBLEM

Today in the age of technology, everyone is busy on their electronic communication gadgets. No one has time to interact in family, neighbor, community and society at large. Everyone is busy in their lives. Social values are declining day by day and in results to that there is decline in social competence among the 21<sup>st</sup> century youngsters. There was a time when everyone loves to spend their holidays at their maternal grandparents home but today every youngster doesn't want to go outside during the holidays but everyone loves to spend the time with their electronic gadgets. Social competence develops social skills, social awareness and self confidence among students so it is an important aspect. Social competence also affects the adjustment of the youngster and vice-versa. So keeping above all in the mind, investigator in the present study tried to study the social competence of 11<sup>th</sup> class students in relation to their adjustment.

### OPERATIONAL DEFINITIONS OF THE VARIABLES USED

- 1. Social Competence:** Social competence develops overtime, and the mastery of social skills and interpersonal social interactions emerge at various time points on the development and build on previously learned skills and knowledge. In the present study to study the social competence of 11<sup>th</sup> class students Sharma & Rani social competence scale was used.
- 2. Adjustment:** Adjustment is a process that unfolds through time it being completed when respondents indicated that they felt comfortable and confident. It is the ability to fit himself/herself in various circumstances. To study adjustment level of 11<sup>th</sup> class students Bell adjustment inventory was used.

### OBJECTIVES

1. To study the significance of difference in social competence of Private and Government 11<sup>th</sup> class student's.
2. To study the significance of difference in social competence of Private and Government 11<sup>th</sup> class student's in relation to their adjustment.
3. To study the significant correlation between social competence and adjustment of 11<sup>th</sup> class student's.

### HYPOTHESES

**H<sub>1</sub>:** There exists no significant difference in the social competence of Private and Government school students.

**H<sub>2</sub>:** There exists no significant difference in the social competence of Private and Government school students with regard to their adjustment.

**H<sub>3</sub>:** There exists no significant correlation in the social competence and adjustment scores of 11<sup>th</sup> grade students.

### SAMPLE

The present study consists of 300 students including boys and girls studying in 11<sup>th</sup> class drawn from two Government Senior Secondary schools and two Private school affiliated to Punjab School Education Board, Mohali, Punjab. The 150 students each were taken from both the Government and Private schools. The sample was taken using random sample techniques. The school wise distribution of the sample has been presented in table-1

**Table-1: School-wise distribution of the sample**

S. No.	School	No. of Students
1	Govt. Sr. Sec. School, Jhallian, Roopnagar	87
2	Govt. Sr. Sec. School Behrampur Zimidara, Roopnagar	63
3	Rayat Public Sr. Sec. School, Roopnagar	52
4	GMN Public School, Roopnagar	98
<b>Total</b>		<b>300</b>

### DESIGN

The design of the present study was based on sample of 300 students of Government and Private senior secondary schools of Roopnagar. The variables under the study were Social competence and adjustment of senior secondary school students. Social competence was dependent variable and adjustment was taken as independent/classifying variable. In the present study descriptive survey method of investigation was utilized to know about social competence and adjustment of senior secondary school students.

**TOOLS USED**

1. Social Competence Scale by Dr. Latika Sharma & Dr. Punita Rani was administered.
2. Adjustment inventory by Bell (1934) was used to classify the students into high, average and low adjustment groups.

**PROCEDURE**

In the present study, tools were employed on random sample of 300 students of Government and Private Senior Secondary Schools of district Roopnagar. Before collection of data, permission of the school Principals was taken by explaining to them purpose of the study. After getting permission of the school Principal, social competence scale and adjustment inventory were administered to the students. Instructions were given to the students regarding, how to fill questionnaire and requested the students to give true response to each item. After collecting data, scoring was done and compared by using statistical techniques and then interpreted accordingly.

**ANALYSIS, INTERPRETATIONS AND DISCUSSION OF THE RESULTS**

The statistical techniques such as mean, standard deviation, t-test and correlation were used in the study for the better interpretations. The results are given in the following tables 2, 3, 4 & 5

**Table-2: Mean and SD of Social Competence Mean Scores for Government and Private School 11<sup>th</sup> grade students.**

Variables	Government School			Private School			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
<b>High Adjustment</b>	40	169.32	25.43	40	154.50	20.59	80	161.91	24.17
<b>Average Adjustment</b>	70	145.17	28.21	70	138.90	22.02	140	142.03	25.41
<b>Low Adjustment</b>	40	134.90	27.97	40	128.30	24.65	80	131.60	26.41
<b>Total</b>	150	148.87	30.23	150	140.23	24.35	300		

Source: Field Study 2019

It is observed from table-2 that the mean social competence scores of high, average and low adjustment Government school students were 169.32, 145.17 and 134.90 respectively. The total mean social competence score of Government school students was 148.87. It is further observed that mean social competence scores of high, average and low adjustment Private school students were 154.50, 138.90 and 128.30 respectively. The total social competence means score of Private school students was 140.23. The mean social competence mean scores of government school students were higher than that of Private school students with respect to their adjustment and in total. It is further noticed that mean social competence scores of high, average and low adjustment scores are 161.91, 142.03, 131.60 respectively. This shows that highly adjustable students have high social competence scores than that of average and low adjustment students.

**t-ratio for various sub groups of Government and Private School 11<sup>th</sup> grade students**

In order to test the hypotheses and check the significance of difference between Government and Private school 11<sup>th</sup> grade students, t-ratio was computed in the following table 3.

**Table-3: t-ratio of social competence mean scores between Government and Private school students**

Variable	N	Mean	SD	SE <sub>D</sub>	t-value
Government School	150	148.87	30.23	3.16	<b>2.73**</b>
Private School	150	140.23	24.35		

\*Significant at 0.05 level, (Critical value 1.97 at 0.05 and 2.59 at 0.01 level, df 298)

Table-3 reveals that social competence mean scores 148.87 of Government school students is higher than that of Private school students mean score of 140.23. The t-value testing the significance of mean difference between the social competence scores of Government and Private school students is 2.73 which in comparison to the table value was found significant at 0.01 level. Therefore hypothesis  $H_1$ : "There exists no significant difference in the mean social competence scores of Government and Private school students" is rejected. Government school students exhibit better social competence than that of Private school students. The result of the study was supported with the findings of Romera, Rabanillo, Ortiz, Ruiz, & Bolaños (2017). Pekdogan, & Kanak (2016), Sanwal (2013), Leadbeater (2004) and Mendez (2002) found that social competence of students with regard to various factors and findings were contradicted with studies to Syiem and Nongrum (2014), Kaur (2018) observed no difference in the social competence of school students.

In order to test the hypothesis  $H_2$ , sub hypotheses were tested. Significance of difference between the social competence of various sub groups of Government and Private school 11<sup>th</sup> grade students with respect to their adjustment were tested by computing t-ratios in the following table 4.

**Table-4: t-ratio of different subgroups of Government and Private school students in relation to their adjustment on the scores of social competence.**

Variables		Government School									Private School								
		High Adjustment			Average Adjustment			Low Adjustment			High Adjustment			Average Adjustment			Low Adjustment		
		N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
		40	169.32	25.43	70	145.17	28.21	40	134.90	27.97	40	154.50	20.59	70	138.90	22.02	40	128.30	24.65
Government School	High Adjustment N M SD 40 169.32 25.43	----			4.47**			5.75**			2.86*			6.58**			7.32**		
	Average Adjustment N M SD 70 145.17 28.21	----			-----			1.84			1.83			1.46			3.15*		
	Low Adjustment N M SD 40 134.90 27.97	-----			----			-----			0.82			3.56**			1.19		
Private School	High Adjustment N M SD 40 154.50 20.59	-----			-----			-----			-----			3.65**			5.15**		
	Average Adjustment N M SD 70 138.90 22.02	-----			-----			-----			-----			-----			2.32*		
	Low Adjustment N M SD 40 128.30 24.65	-----			-----			-----			-----			-----			-----		

\*Significant at 0.05 level

\*\*Significant at 0.01 level

(Critical value 1.98 at 0.05 and 2.64 at 0.01 level, df 78)

(Critical value 1.98 at 0.05 and 2.62 at 0.01 level, df 108)

(Critical value 1.98 at 0.05 and 2.61 at 0.01 level, df 138)

Table-4 reveals that mean social competence scores 169.32 of high adjustment students is higher than that of average adjustment students 145.17 of Government senior secondary schools. The t-value testing the significance of mean difference between social competence of high and average adjustment students of Government school is 4.47 which in comparison to the table value ( $t_{0.01}=2.62$ , df 108) was found significant at 0.01 level. This shows that There exists significant difference between the mean social competence scores of high and average adjustment Government school students.

Table-4 reveals that social competence mean score 169.32 of high adjustment students, is higher than that of low adjustment students 134.90 of Government senior secondary schools. The t-value testing the significance of mean difference between social competence of high and low adjustment students of Government schools is 5.75 which in comparison to the table value ( $t_{0.01}=2.64$ , df 78) was found significant at 0.01 level. This shows that there exist significant difference between the mean social competence scores of high and low adjustment Government school students.

Table-4 reveals that social competence mean score, 169.32 of high adjustment Government school students is higher than that of high adjustment students mean score 154.50 of Private schools. The t-value testing the significance of mean difference between social competence of high adjustment students of Government and Private schools is 2.86 which in comparison to the table value ( $t_{0.05}=1.98$ ,  $t_{0.01}=2.64$ , df 78) was found significant at 0.05 level. This shows that there exists significant difference in the mean social competence scores of high adjustment Government and Private school students.

Table-4 reveals that social competence mean score, 169.32 of high adjustment Government school students is higher than that of average adjustment students mean score 138.90 of Private school students. The t-value testing the significance of mean difference between social competence of high adjustment students of Government Schools and average adjustment students of Private school is 6.58 which in comparison to the table



value ( $t_{0.01}=2.62$ ,  $df$  108) was found significant at 0.01 level. This shows that there exist no significant difference in the mean social competence scores of high adjustment Government school students and average adjustment Private school students” is rejected.

Table-4 reveals that social competence mean score, 169.32 of high adjustment Government school students is higher than that of low adjustment students mean score 128.30 of Private schools. The t-value testing the significance of mean difference in the social competence of high adjustment students of Government Schools and low adjustment students of Private school is 7.32 which in comparison to the table value ( $t_{0.01}=2.64$ ,  $df$  78) was found significant at 0.01 level. This shows that there exist significant difference in the mean social competence scores of high adjustment Government school students and low adjustment Private school students.

Table-4 reveals that social competence mean score, 145.17 of average adjustment students is higher than that of low adjustment students mean score 134.90 of Government schools. The t-value testing the significance of mean difference between social competence of average and low adjustment students of Government Schools is 1.84 which in comparison to the table value ( $t_{0.05}=1.98$ ,  $t_{0.01}=2.62$ ,  $df$  108) was not found significant even at 0.05 level. This shows that there exist no significant difference in the mean social competence scores of average and low adjustment Government school students.

Table-4 reveals that social competence mean score, 145.17 of average adjustment students of Government schools is higher than that of high adjustment students mean score 154.50 of Private school students. The t-value testing the significance of mean difference between social competence of average adjustment students of Government Schools and high adjustment students of Private schools is 1.83 which in comparison to the table value ( $t_{0.05}=1.98$ ,  $t_{0.01}=2.62$ ,  $df$  108) was not found significant even at 0.05 level. This shows that there exist no significant difference in the mean social competence scores of average adjustment students of Government schools and high adjustment students of Private schools.

Table-4 reveals that social competence mean score, 145.17 of average adjustment students of Government schools is higher than that of average adjustment students mean score 138.90 of Private schools. The t-value testing the significance of mean difference between social competence of average adjustment students of Government and Private Schools is 1.46 which in comparison to the table value ( $t_{0.05}=1.98$ ,  $t_{0.01}=2.61$ ,  $df$  138) was not found significant even at 0.05 level. This shows that there exist no significant difference in the mean social competence scores of average adjustment students of Government and Private schools.

Table-4 reveals that social competence mean score, 145.17 of average adjustment students of Government schools is higher than that of low adjustment students mean score 128.30 of Private schools. The t-value testing the significance of mean difference between social competence of average adjustment students of Government schools and low adjustment students of Private Schools is 6.77 which in comparison to the table value ( $t_{0.01}=2.61$ ,  $df$  138) was found significant at 0.01 level. This shows that there exists significant difference in the mean social competence scores of average adjustment students of Government and low adjustment students of Private schools.

Table-4 reveals that social competence mean score, 134.90 of low adjustment students of Government schools is lower than that of high adjustment students mean score 154.50 of Private schools. The t-value testing the significance of mean difference between social competence of low adjustment students of Government schools and high adjustment students of Private Schools is 0.82 which in comparison to the table value ( $t_{0.05}=1.98$ ,  $t_{0.01}=2.21$ ,  $df$  108) was not found significant even at 0.05 level. This shows that there exists no significant difference in the mean social competence scores of low adjustment students of Government schools and high adjustment students of Private schools.

Table-4 reveals that social competence mean score, 134.90 of low adjustment students of Government schools is lower than that of average adjustment students mean score 138.90 of Private schools. The t-value testing the significance of mean difference between social competence of low adjustment students of Government schools and average adjustment students of Private schools is 3.56 which in comparison to the table value ( $t_{0.01}=2.64$ ,  $df$  78) was found significant at 0.01 level. This shows that there exists significant difference in the mean social competence scores of low adjustment students of Government schools and average adjustment students of Private schools.

Table-4 reveals that social competence mean score, 134.90 of low adjustment students of Government schools is higher than that of low adjustment students mean score 128.30 of Private schools. The t-value testing the significance of mean difference between social competence of low adjustment students of Government and Private Schools is 1.19 which in comparison to the table value ( $t_{0.05}=1.98$ ,  $t_{0.01}=2.64$ ,  $df$  78) was not found

significant even at 0.05 level. This shows that there exist no significant difference in the mean social competence scores of low adjustment students of Government and Private schools.

Table-4 reveals that social competence mean score, 154.50 of high adjustment students is higher than that of average adjustment students mean score 138.90 of Private schools. The t-value testing the significance of mean difference between social competence of high and average adjustment students of Private Schools is 3.65 which in comparison to the table value ( $t_{0.01}=2.62$ , df 108) was found significant at 0.01 level. This shows that there exist significant difference in the mean social competence scores of high and average adjustment students of Private schools.

Table-4 reveals that social competence mean score, 154.50 of high adjustment students is higher than that of low adjustment students mean score 128.30 of Private schools. The t-value testing the significance of mean difference of high and low adjustment students of Private Schools is 5.15 which in comparison to the table value ( $t_{0.01}=2.64$ , df 78) was found significant at 0.01 level. This shows that there exist significant difference in the mean social competence scores of high and low adjustment students of Private schools.

Table-4 reveals that social competence mean score, 138.90 of average adjustment students is higher than that of low adjustment students mean score 128.30 of Private school students. The t-value testing the significance of mean difference of high and low adjustment students of Private Schools is 2.32 which in comparison to the table value ( $t_{0.05}=1.98$ ,  $t_{0.01}=2.64$ , df 108) was found significant at 0.05 level. This shows that there exist significant difference in the mean social competence scores of average and low adjustment students of Private schools” is rejected.

**Table-5: Correlation between the social competence and adjustment scores of 11<sup>th</sup> class students.**

Variables	N	Value of 'r'
Adjustment and Social competence	300	0.46**

**\*\*Significant at 0.01 level**

(Critical Value 0.195 at 0.05 and 0.254 at 0.01 levels, df 298)

Table-5 shows that positive and significant correlation of 0.46 between social competence and adjustment scores of total sample, which in comparison to the table value was found positive and significant at 0.01 levels of significance. Hence, the null hypothesis  $H_3$ : There exists no significant relationship between social competence adjustment 11<sup>th</sup> class students, is rejected. This shows that adjustment level of students influences their social competence i.e. if they are adjustable in their surrounding then they have better social competence and vice-versa.

## FINDINGS

1. There exists significant difference in the mean social competence scores of Government and Private school students.
2. There exists significant difference in the mean social competence scores of high and average adjustment Government school students.
3. There exists significant difference in the mean social competence scores of high and low adjustment Government school students.
4. There exists significant difference in the mean social competence scores of high adjustment Government and Private school students.
5. There exists significant difference in the mean social competence scores of high adjustment Government school students and average adjustment Private school students.
6. There exists significant difference in the mean social competence scores of high adjustment Government school students and low adjustment Private school students.
7. There exists no significant difference in the mean social competence scores of average and low adjustment Government school students
8. There exists no significant difference in the mean social competence scores of average adjustment students of Government schools and high adjustment students of Private schools.
9. There exist no significant difference in the mean social competence scores of average adjustment students of Government and Private schools.

10. There exist significant difference in the mean social competence scores of average adjustment students of Government and low adjustment students of Private schools.
11. There exist no significant difference in the mean social competence scores of low adjustment students of Government schools and high adjustment students of Private schools.
12. There exists significant difference in the mean social competence scores of low adjustment students of Government schools and average adjustment students of Private schools.
13. There exists no significant difference in the mean social competence scores of low adjustment students of Government and Private schools.
14. There exists significant difference in the mean social competence scores of high and average adjustment students of Private schools.
15. There exists significant difference in the mean social competence scores of high and low adjustment students of Private schools.
16. There exists significant difference in the mean social competence scores of average and low adjustment students of Private schools.
17. There exists significant relationship between adjustment and social competence of 11<sup>th</sup> class students.

### CONCLUSIONS AND RECOMMENDATIONS

From the above all results and discussion, it is clear that there is significant difference in the social competence of Govt. and Private school students. Significant difference found in the social competence with respect to their adjustment in most of the sub groups. Significant correlation found between social competence and adjustment of senior secondary school students. This highlights the importance of adjustment and social competence in the behaviour modification and adaptation in different situations. Findings of this study recommends that there is need to develop social competencies among school going students. This study helps the parents to understand about the social adjustment problems of their children's.

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**MULTI-LEVEL INVERTER BASED POWER QUALITY IMPROVEMENT BY FLOWER POLLINATION ALGORITHM**

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**ABSTRACT**

*Elimination of low order harmonics is the major challenging task during the design of multilevel inverters. Involvement of the selective Harmonic Elimination (SHE) methodology in the design of multilevel inverter has greatly reduced the above challenge. SHE is considered as a low frequency technique, in which the switching angles are predetermined based on solving a system of transcendental equations. In this paper, the design of eliminating the low order harmonics in the cascade 11 levels H-bridge inverter with the support of SHE based Flower Pollination optimization algorithm (FPA) is presented. The results of the FPA based SHE method shows that the required switching angles are calculated competently to eliminate low order harmonics up to 13 orders from the inverter voltage waveform while keeping the magnitude of the fundamental at the desired value which resulted in minimum total harmonic distortion (THD). In addition, for a low number of switching angles, the proposed FPA approach reduces the computational burden to find the optimal solution compared with iterative methods and the resultant theory approach. The results prove that the FPA algorithm provides greater amount balance between exploitation and exploration process compared to other legacy algorithm such as Genetic algorithm (GA) in determining the global solutions.*

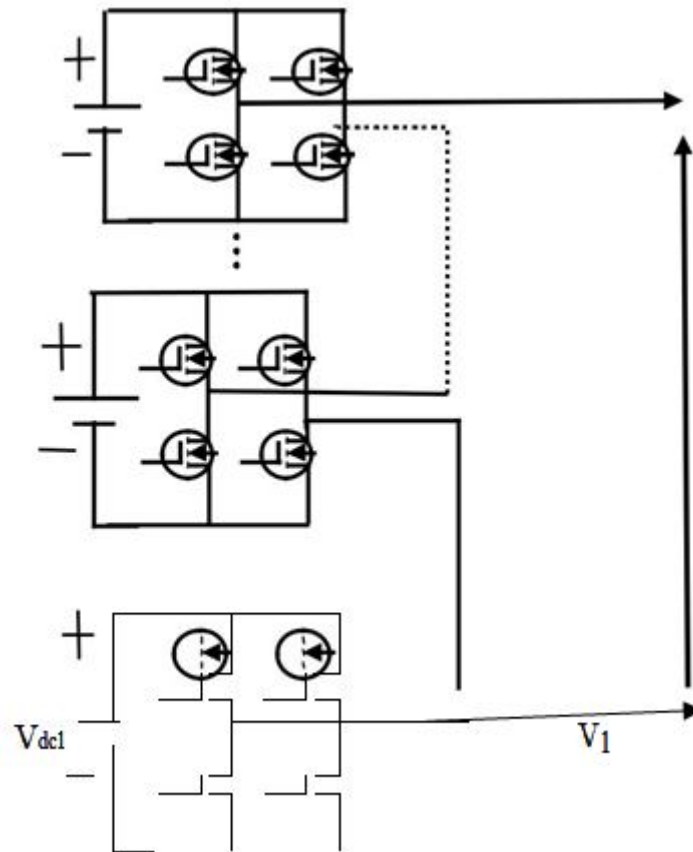
*Keywords: Flower pollination algorithm (FPA), selective harmonic elimination (SHE), total harmonic distortion (THD), genetic algorithm (GA).*

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**INTRODUCTION**

In recent days, the utilization of multilevel inverters for harmonics elimination has been increased a lot in average voltage and high power applications because of their less switching losses and high efficiency. The output voltage of this inverter is synthesized from several levels of dc voltages with different methodologies such as diode clamped and cascaded [1-4]. To limit the output voltage and suppress the undesired harmonics, different sinusoidal pulse width modulation (PWM) [5] and space-vector PWM schemes are suggested for multilevel inverters; however, PWM techniques are not able to suppress harmonics which are in lower order fully. Another approach is to choose switching angles [1] so that specific lower order dominant harmonics are suppressed. This method is known as harmonic elimination.

To eliminate the undesired harmonics in multilevel inverters with equal dc voltages, various modulation methods such as sinusoidal pulse width modulation and space vector pulse width modulation techniques are suggested [6]. Lower order harmonics cannot be completely eliminated by PWM techniques. Programmed PWM technique or Selective harmonic elimination (SHE) PWM technique is used to suppress the specific higher order harmonics such as 5<sup>th</sup>, 7<sup>th</sup>, 11<sup>th</sup> & 13<sup>th</sup> by choosing the switching angles suggested in [7]-[8]. Obtaining the arithmetic solution of nonlinear transcendental equations is one of the main problem associated in this method. Newton-Raphson method is one of the iterative techniques which is used to solve the set of nonlinear equation [9]-[12]. But this method is not feasible to solve the SHE problem for a large number of switching angles. More recently, the total harmonic distortion (THD) of the output voltage of multilevel inverter is minimized by the real time calculation of switching angles with analytical proof. However, this method is only valid for minimizing all harmonics including triple and cannot be extended [13]. Particle swarm optimization technique is one of the modern stochastic techniques which deal with the problem of equal dc sources Fig1 shows the series connection of the single phase H-bridge units with Independent DC sources (SDCSs). These SDCSs may be of constant voltage sources such as batteries, capacitors, fuel cells or solar cells. Each unit produces a positive DC (+ Vdc), zero and a negative DC (- Vdc) voltage at the output. The number of the units depends upon the output voltage.



A cascaded MLI consists of a group of single phase full bridge inverter with four switches of each phase in series. The outputs of single full-bridge converter are connected in series. So the output is the summation of individual converter outputs, which is staircase waveform. The number of total output voltage levels are  $p=2N+1$ , Where  $N$  = total number of DC sources of each bridge. With control strategy, it is possible to bypass the fault bridge without stopping the load, with decrease output. Due to the above features, the cascaded H-Bridge multilevel inverter has been more advantages than clamping diode, flying capacitor multilevel inverters.

## II. HARMONIC-ELIMINATION PROBLEM WITH NON EQUAL DC SOURCES

Because of odd quarter-wave symmetry, the dc component and the even harmonics are equal to zero. By applying Fourier series analysis, the staircase output voltage of multilevel inverters with no equal sources can be described as follows:

$$V(\omega t) = \sum_{n=1,3,5,\dots}^{\infty} \frac{4V_{dc}}{n\pi} \sin(n\omega t)$$

$$x(k_1 \cos(n\theta_1) + k_2 \cos(n\theta_2) + k_3 \cos(n\theta_3) + \dots + k_s \cos(n\theta_s))$$

$$\sin(n\omega t) \quad (1)$$

Where  $k_i V_{dc}$  is the  $i^{\text{th}}$  dc voltage,  $V_{dc}$  is the nominal dc voltage, and the switching angles  $\theta_1 - \theta_m$  must satisfy the following condition:

$$0 \leq \theta_1 \leq \theta_2 \leq \dots \leq \theta_s \leq \pi/2 \quad (2)$$

The number of harmonics which can be eliminated from the output voltage of the inverter is  $s-1$ . For example, to remove the fifth-order harmonic for a five-level inverter, equation set(3) must be satisfied. Note that the elimination of triple harmonics for the three-phase power system applications is not necessary, because these harmonics are automatically eliminated from the line to line voltage

$$k_1 \cos(\theta_1) + k_2 \cos(\theta_2) = (\pi/2)M \quad (3)$$

$$k_2 \cos(5\theta_2) + k_2 \cos(5\theta_2) = 0. \quad (4)$$

In eqn (3), modulation index  $M$  is defined as  $M = V_1/sV_{dc}$  and  $V_1$  is the fundamental of the required voltage.

### III. FPA APPROACH TO DEAL SHE PROBLEM

In this paper, the FPA approach is developed to deal with the SHE problem with non-equal dc sources while there is a increase in number of switching angle and these angles are determined using conventional iterative methods as well as the resultant theory is not possible.

In addition, for a low number of switching angles, the proposed FPA approach reduces the computational burden to find the optimal solution compared with iterative methods and the resultant theory approach. This method solves the asymmetry of the transcendental equation set, which has to be solved in cascade multilevel inverters. The switching angles  $\theta_1, \theta_2, \dots, \theta_s$  in a multilevel inverter for the output waveform can be calculated such that odd and non-triple low order harmonics up to the  $3s-2^{\text{th}}$  order while  $s$  is odd and up to the  $3s-1^{\text{th}}$  order when  $s$  is even can be eliminated so that the cost function gets minimized as follows: Fitness function

$$f(\theta_1 + \theta_2 + \dots + \theta_s) = 100 \cdot \left[ \left| N - \left[ \frac{V_1}{SV_{dc}} \right] \right| + \left( \frac{|V_5 + V_7 + \dots + V_{(3s-2)} \cos(3s-1)|}{SV_{dc}} \right) \right]$$

### IV. DETERMINATION OF BESTSWITCHIN ANLE FOR ELIMINATING THE ODD HARMONICS AND FOR BEST CONTROL OF FUNDAMENTAL VOLTAGE

- Step1: Initialize the objective function as given in FPA approach to deal SHE problem.
- Step2: Initialize a population of flowers X with the population size of NFxN, where NF is the number of flowers as 30 and N is the dimension size depends on the number of switching angle based on the number of separated dc sources SDCS's used for the multilevel inverter.
- Step3: Calculate the fitness cost function for each flower.
- Step4: Find the best minimized Cost function for each flower.
- Step5: Define a switch probability  $P \in [0,1]$
- Step6: While (t<Maximum Generation (1000))

For i=1:n(all n flowers in the population)

If rand<P,

Global pollination has been using below equation.

$$v_i^{t+1} = v_i^t + L(v_i^t - d^*)$$

$$L \sim \frac{\mu \Gamma(\mu) \sin(\pi\mu/2)}{\pi \pi} \frac{1}{s^{1+\mu}}$$

Where  $v_i^t$  is the pollen i or solution vector  $v_i$  at iteration t, and  $d^*$  is the current best solution found among all solutions at the current generation/iteration is the strength of the pollination, which is a step size. Pollinators can move over a long distance with various distance steps, Levy flight distribution is used to mimic this characteristic efficiently. is the standard gamma function, and this distribution is valid for large steps  $s > 0$ . In all our simulations, we have used  $\mu = 1.5$  and  $s \in [0, 10]$ .  $L > 0$  is assumed for Levy distribution.

Else

Draw  $\epsilon$  from a uniform distribution in  $[0,1]$

Randomly choose  $j^{\text{th}}$  and  $k^{\text{th}}$  flower among all the solutions

Do local pollination via below equation.

$$v_i^{t+1} = v_i^t + \epsilon(v_j^t - v_k^t)$$

Where,  $v_j^t$  and  $v_k^t$  are pollens from the same plant species with different flowers.

This essentially mimics the flower constancy in a limited neighborhood

End if

Evaluate new solutions using the objective function

If new solutions are better, update them in the population

End for

Find the current best solution  $d$  based on the objective fitness value

End while

## V. RESULTS AND DISCUSSIONS

In order to validate the computational results as well as the Simulation results are presented for a single phase 11-level cascaded H-bridge inverter. The circuit configuration in the experimental circuit is the same as that in Fig. 1. The inverter uses 30-A 200-V MOSFETs as the switching devices, and the nominal dc-link voltage for each H-bridge is considered to be 20 V. Since the number of output-phase-voltage levels in a cascade multilevel inverter is 11, the number of SDCSs 11 level H-bridge inverter is 5. In the given circuit, there are twenty switching devices connected with diodes in anti-parallel. Among the Five H- Bridges in the circuit the MOSFETs are classified into two, which are upper and lower. We have numbered the upper with the odd numbers and the lower with the even numbers. Actually, there are fourteen instants in the synthesized output voltage. For each instant particular device should only work and the rest should turn off. Here the MOSFET are turned on only in the presence of the gate signal. In case of the zero level there are two possible switching patterns to synthesize the zero level. Unequal DC Source has been used so the K Coefficient of each DC Source is

$$K_2=0.98;$$

$$K_3=0.9;$$

$$K_4=0.86;$$

$$K_5=0.8.$$

The magnitudes of the dc voltage levels in the experiment are considered as follows, which correspond to the  $K_i$  coefficients,

$$V_{dc1} = 21.6;$$

$$V_{dc2} = 19.6;$$

$$V_{dc3} = 18;$$

$$V_{dc4} = 17.2;$$

$$V_{dc5} = 16.$$

$$L \sim \frac{\mu \Gamma(\mu) \sin(\pi\mu/2)}{\pi\pi} \frac{1}{s^{1+\mu}}$$

$$L \sim \frac{\mu \Gamma(\mu) \sin(\pi\mu/2)}{\pi\pi} \frac{1}{s^{1+\mu}}$$

FPA algorithm has been used to determine the optimum five switching angles for the objective minimizing cost function given in equation 5. Two experiments are done to verify the robustness of the FPA. The First experiment is done for a lower modulation index  $M = 0.47$  and second experiment is done for a higher modulation index  $M = 1.075$ . To validate the results of the proposed FPA, the legacy algorithms results such as GA has been compared. GA algorithm has been designed to extract the results. The details of the designed GA algorithm have been elaborated below.

Step-1: Initialization or Random Population Generation

Generation of Switching angles in Degrees

No of Individuals = 30

No of Dimension = 5 (No of Switching Angle)

Population Size = [30 x 5]

Step-2: Fitness Evaluation

The Fitness Evaluation Evaluates the population using the

Fitness Function is same as equation 5.

Step-3: Parent Selection Best Parents of this generation are selected based on the roulette wheel selection for creating next generation.

Step-4: Crossover The crossover operator creates the two new child vector by mating the two best parent using arithmetic crossover method. Crossover site is 0.5 to 0.8.

Step-5: Mutation

The Mutation operator mutates a child by changing any of its genes. Mutation site is 0.01

Step-6: Survival Selection

The Survival selection operator chooses the vectors that are going to compose the population in the next generation. This operator selects the mixture consists of best parent from current generation and mutated child selects the parent that performs better (i.e. Minimum Fitness Value). Survival selection criteria are around 0.8. Best fitness = Minimized switching angles selected in each iteration Best fitness value= Minimized Fitness Value of Each Iteration

Step-7: Repeat the step-2 to step-7 until maximum iteration reached

#### A. Computational Results Of Flower Pollination Algorithm Based Selective Harmonic Elimination

The Proposed flower pollination algorithm for extracting the optimum five switching angles with the objective of minimizing the cost function as given in the equation 5 for 11 level cascaded H-bridge inverter has been implemented for the two modulation index

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**RENDERING OF DIFFERENTLY-ABLED IN BOLLYWOOD**

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**ABSTRACT**

*Cinema is always considered to be a substantial forum that depicts the eventuality in the society. Though it is snagged between falter and factual life but it still executes as a cardinal forum of amusing people, cultivating them and bringing an etiquette change in their practices and attitudes. While there are people who surmise in the ability of cinema to change the society, there are few other who say that the main motto of cinema is just to amuse people. In expression of depiction of physical and mental disorder in films oscillate particularly between two antipode- compassion, encouragement, amusement, lampoon are at one end of gamut while bigotry, buffet, emotional swings are at the other end. The adjacent study is an endeavor to identify the discrepancy of depiction of physical and mental disorder in past and present trend which rationalize benefaction of Bollywood to the society. The contemporary trend is an attempt of filmmakers to create awareness about the disability among the Indian audience. In this paper an effort has been made to find out how differently-abled people are portrayed in Indian Cinema mainly in Bollywood. The data collected for the research work is secondary. This study is exploratory and the method used for research is qualitative. This paper will throw light on how filmmakers make an effort to create awareness among the Indian audience about differently-abled people through the entertainment mode i.e., Films.*

*Keywords: Bollywood, Cinema, Differently-Abled, Disability, Filmmaker, Indian Audience.*

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**INTRODUCTION**

Cinema is conceivably the conventional of all art forms. It is the most favored and most approachable form of art especially in a country like India which produces most number of films in a year as compared to any other country across the globe. Also India is a country where we have maximum number of cinema-going audience. Cinema has the ability to affect people more than any other art form. Hence, it is crucial to divine how the country, its people and its yearnings are depicted in the cinema developed in the country. Cinema as one of the most important medium of mass communication can be noticed at different tier serving with different purposes.

Cinema can be an art form, social deed, social appreciation, or an entertainment. Cinema works simultaneously, it can be all of these and at the same time it works as a reflector unto our lives portraying how exactly we function as a society.

In movies we see that different disease are portrayed where protagonist either overcomes that disorder or die with some emotional feeling. However, disability with different kind of forms has been portrayed in various characters.

One way of looking the films that deal with disabilities as mirrors, which stipulate society's behavior towards the theme is to analyze the history of the interaction between disabilities and films (Norden, 1994). While analyzing disability and cinema, Morris (1991) explain, "*Disability in film has become a metaphor for the message that the non disabled writer wishes to get across in the same way that beauty is used. In doing this, movie makers draw on the prejudice, ignorance and fear that generally exists towards disabled people, knowing that to portray a character with humped back, with a missing leg, with facial scars, will evoke certain feelings with the audience. Unfortunately, the more disability is used as a metaphor for evil or just to induce a sense of unease, the more the cultural stereotype is confirmed.*"

Indian Cinema is often criticized for its stereotype theme of violence, family drama, love, emotion etc. But its focus on these social themes is incredible especially when it comes to analyze the movies which pinnacle the most uncommon disease. In history lot many movies have been made on various diseases at different times but the present trend portraying rare disease in new innovation. It is certain that there are lot of movies produced on themes based on disability and have gained a lot of popularity with good business. But Indian Cinema has made tremendous contribution in recent times by portraying rare diseases associated with disability and making them differentaly-abled.<sup>1</sup>

Since the beginning of Hindi Cinema era, many film makers have made films portraying various diseases in a different thematic way. However, the central theme of the disease was same "*Disability*". The scrutiny of the same would help us to get a comparative study of the past and present trend of Hindi movies based on disease related theme. A close look to the beginning of the disease related theme will uncover some realities.

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**RENDERING OF DISABILITY AS THE CORE MALADY**

Cinema has a great impact on audience's imagination of any disability related theme and this actually makes the study of disability an intricate examination. This actually influences what is derived from traditional social imaginations of disability by what is contemporary social belief on screen portrayals. Rendering of differently abled in Hindi movies has always been the central theme of all these disorders. But the nature of disability in Hindi movies has always been either punishment or reliance.

Initially the movie that portrayed the disability as a punishment was Jeevan Naiya, 1936. This film was directed by Franz Osten and written by Niranjan Pal. The movie portrays an idea of social justice and highlights the problems with traditional beliefs, especially those related to Hindu tenet. In the movie the male protagonist ditch his wife as she belong the family of dancers and subsequently he met an accident and got blind. He was then nursed by the same woman, his wife, whom he ditched due to social taboo.

The disability as punishment for sins that we commit is seen transversely in Hindi cinema. Pran, the wicked father-in-law is blinded in Aadmi (1968), Kasam (1988), again Pran in Jalte Badan (1973) is disabled in police attack. The seventies era was subjugated by the young angry man, in which Gulzar made first attempt by combining some basic discussion of sign language and independent living of deaf in 'Koshish' (1971).

In the same way mental illness is also used in the themes of the movies and is resolute by affirm of the society and the manifestation of political and economic factors which are rampant at an unambiguous time in the past of the culture and society. Cinema as a whole and Bollywood in meticulous has an incredible detachment from reality. In a country like India, the emotions and mental illness must be portrayed accurately as cinema goers are highly influenced by the presence of stars in mainstream cinema. For many years, Hindi cinema aka Bollywood portrayed mentally ill as humorist character (in supporting role) that adds an comical bestowal to the main theme. Though Hindi cinema has developed various aspects in recent years and due to some eccentric reasons still fails to portray mental illness accurately.

*Andrade (2010) examined the extent to which the identified inaccuracies are practically important and offers reasons for the inaccuracies.* The portrayal of mental illness in Hindi cinema by filmmakers is sometimes misinformed. Filmmakers should exhibit better sense of beliefs while creating impressions that might negatively influence health. There have been some astonishing movies on mental disorders which have portrayed this deformity accurately. Most recently, Dr. Atanu Mohapatra's Journal on Portrayal of Disability in Hindi Cinema: A Study of Emerging Trends in Differently-Abled and Prof. Dinesh Bhugra's Mad Taled from Bollywood have comprehensively studies mental illness in Hindi cinema. As per Mohapatra, there are different trends emerging in Indian Cinema mainly Bollywood to portray mental illness where as Bhugra compared Hollywood's portrayal of mental disorder with Indian cinema and concludes that Indian Cinema primarily Bollywood is less progressive. The strength of mass medium can never be hyped. *Film as a medium should be used to advantage to dispel the stigma associated with psychiatric disorders. (Bhugra, 2006)*

Disability portrayed as reliance in Hindi movies is emblematic in nature. Whilst some movies are mainly thematic on dependence nature while some movies have associated characters which are dependent due to disability. Gulzar's Koshish in 1972, Sanjay Leela Bhansali's Black in 2005, Aamir Khan's Taare Zameen Par in 2007 and recently in 2014 Margarita with a Straw are the best portrayals of disability as main characters. Apart from these there were many other movies which are based on associated characters as differently-abled depending on their children. More than a dozen films have been produced in these categories like Khamoshi.

Gender disparity in acuity of specially-abled people in Hindi movies is also apparent in many ways. Differently-abled men are featured more in movies than women with disabilities in Hindi cinema. Also, the differently-abled men are more attracted i.e. women or rather devoted women fall for the men with disabilities (as in Guzaarish), whereas if women has any disability it is rarely loved by men. Also differently-abled women never attain financial self-sufficiency whereas in case of male with disability may not be wealthy but will be independent. Lastly, to conclude with the differently-abled women rarely impact on their physical appearance that is while portraying disability also they look beautiful. On the whole, it can be said that the women in India are twice as weak i.e. female and differently-abled female. This actually is completely opposite of what is portrayed in Hollywood cinema where a differently-abled women have more potency, liberty and sovereignty. On the converse, differently-abled women are frequently the entity of men's commiseration and reliance. In many movies differently-abled women is being rendered as sexually harassed and thus needs the protection from male. Sadma (1983), Khuddar (1994) and Humko Tumse Pyaar Hai (2006) are few examples of differently-abled women with dependency on their counterparts.

Hence, Kanan and Batra (2012) argues that “the imagery surrounding disability in films swings between these two extremes – pity, fun, caricaturing, sympathy, lampooning and awesome heroism are at one end of the spectrum while discrimination, coping-up, emotional swings and aspirations of the human soul are at the other end. And the world over, cinema has either been charitable towards people with disabilities, pitying or laughing at them or portraying their concerns with real sensitivity”.

One hardly finds the splatter of pragmatism, as Hollywood churns movies based on these themes on regular intervals like, “Rain Man”, “My Left Foot”, “A Beautiful Mind” etc. But when it comes to Bollywood there are directors like Gulzar who wakes up once in a blue moon and come up with some touching issues as portrayed in “Koshish” (1972), Sanjay Leela Bhansali came up with “Khamoshi-The Musical” (1996) , “Black” (2005).

These movies were released in appropriate gap and have portrayed life of differently-abled pragmatically with anecdotal degree of sensation. “Koshish” portrayed deaf-mute couple played by Sanjeev Kumar and Jaya Bachchan, living an isolated life and dealing with the outside world. While “Khamoshi” also deals in deaf-mute couple as parents who come as an musical aspirations for their growing daughter. However somewhere in the movie audience feels that the reality is gnarled. The fabulous music which is still fresh in hearts on cinema goers, an enviable cast Nana Patekar, Seema Biswas, Manisha Koirala and Bollywood’s Bhaijaan Salman Khan with the spectacular and magnificent location of Goa which actually holds the audience back seat.

### CONTEMPORARY TRENDS OF RENDERING DISABILITY:

Contemporary trends prove that the commercial movies started late focusing on the portrayal of disability. Hindi cinema today is setting up new trend in exploring disability. In current era of Hindi cinema directors rather than experimenting with new actors they cast superstars as protagonist to portray disability and life of differently-abled and aware cinema goers for the ailment of the disease. These movies not only entertain cinema-goers but also aware them. Hence, we can conclude that this era of Hindi cinema is an exemplar shift in how the directors of today deal with the portrayal of disability from the view point of differently-abled. They actually rather than portraying their image in a sympathize manner portray them or rather urge audience to love and care these differently-abled and also treat them as a part of society and not judging them with their inabilities and allow them to cope with this world in the same manner s a normal person do.

Hindi cinema’s approach or rather positive approach towards disability can be tracked in 2005 when Chennai based NGO; the Ability Foundation organized Ability Fest 2005 “India International Disability Film Festival”. Over 20 feature films and documentaries by and about people with disabilities were screened at a leading cinema theatre with total focus on access. The film festival was an inimitable and inspirational showcase of unique and astonishing movies from across the globe with an intention to aware people about disability and breaking stereotypes about the differently-abled.

In the same year Bhansali’s project Black was released which focused on a girl with disabilities. Other box office hits followed with Taare Zameen Par (2007) under Aamir Khan’s direction, the story revolves around eight year boy, Ishaan who suffers from dyslexia. Further, there have been few movies portraying rare genetic disorders like Progeria (Paa), Asperger’s Syndrome (My Name is Khan), Cerebral Palsy (Margarita with a Straw), Amnesia (Ghajini). This new era is an exemplar shift in how director looks differently-abled. Rather than just making audience sympathies with quandary, the director convey message to treat differently-abled with love and care and treat them equally and should not neglect them due to their inabilities.

“Black”, 2005 is a story of a blind and deaf girl and her relation with his teacher who suffers from Alzheimer. Bhansali started with Khamoshi which was based the same theme of disability, although got ruffled and reached a new zenith with “Black” in which every frame shows his passion and intensity. Bhansali is so perfect in his craft that he came out with such a different theme but the way he told the story without making audience feel pity for the protagonist being blind, mute or deaf.

Black is a story of a young girl Michelle McNally who asphyxiates in the vacuity of her own inner world. She treats her like an animal that always lives in dark, until a peculiar teacher enters in her life and decides to make her ‘a fine young lady’. Michelle McNally born normal but unfortunately due to her illness in her childhood it left her blind, mute and deaf. She was living in her dark work when Debraj Sahay enters in her life as her teacher and teaches her different terms and how to express them. As Michelle grows up she faces new challenges in her life like becoming a graduate, living her life with pride and confidence. She has many obstacles her journey like the world which she live in has no patience for the differently-abled patients also the worsening mental state of her teacher, but Michelle keeps on chasing her goals and describes her story of victory attained in spite of all obstacles.

The other movie based on disability and which qualify in the list of important movies of last decade was “Taare Zameen Par”, 2007 which is story of an eight year old boy who is suffering from mental disorder, dyslexia. This disorder is mainly characterized by difficulties in learning, reading, fluency in speech etc. The movie was box office hit with a strong message for parents to understand their children’s issues and problems which they face in their school life, also give them proper direction when required. This movie also forced parents not to pressurize their children to shine academically but to encourage them in the other fields they are talented in and can excel. This movie is perhaps one of the best showcase which refines the term “Disability” to “Differently-abled”.

In 2008, “U Me Aur Hum” qualified in the list starring Ajay Devgan portraying Alzheimer. Alzheimer is a mental disorder named after German physician Dr. Alois Alzheimer. It is a progressive and fatal brain disease which has no cure till now. This is an irreversible, progressive brain disease that slowly destroys memory and thinking skills, and eventually even the ability to carry out the simplest tasks.

In 2008 Aamir Khan came with “Ghajini” which was based on Amnesia or Short Term Memory Loss. In Amnesia patient forgets short term memory span that lasts for few minutes. Lafangey Parinday, 2009 movie is a story of a dancer played by Deepika Padukone who lost her eye sight before her main event, due to which she loses her confidence in her abilities. She is then mentored back to her excellence in her abilities to dance and hit the floor by her own competitor, Neil Nitin Mukesh, who is expert in Blindfolded Freestyle Fighting and was the reason for her sight loss in an accident. This movie has interesting mixed message of love, friendship. Also the movie accentuates that the differently-abled people can also achieve or rather over achieve if they are treated in the same way as the normal people are. For this role Deepika actually has spent several months with the blind people and observed them to get into the character.

2009, Hindi cinema witnessed the great performance by legendry Mr. Amitabh Bachchan in the movie “Paa” portraying the rare genetic disease “Progeria”. Progeria is a rare genetic condition that causes a person to age prematurely. Children with Progeria appear healthy, but by the age of 2 years, they look as if they have become old too fast. The average life expectancy for Progeria patient is 14years. The movie revolves around an intelligent and witty boy of 12 years Auro who is suffering from extremely rare genetic disorder Progeria. Mentally the boy is 12 years old but appears five times his actual age.

In spite of his situation, Auro is a very happy boy who lives with her mother Vidya who is leading gynecologist. His father Amol Arte is a young and cold blooded politician who is out in this world to prove everyone that ‘politics’ is not bad. Amol is a man with mission and is not aware that Auro is his son as Vidya concealed this to herself. When Amol comes to visit boy’s school he is unaware that Auro is his son and invites him to Delhi to see President’s house. Auro who is aware of the truth, he tries to get his mother and father back together, but his mother Vidya resists as she is still by the fact that Amol want her to abort their first child as he didn’t want to spoil his career. Amol realizes his mistake and proposes Vidya as he was still in love with her. Auro’s health begins to deteriorate as he celebrates his 13<sup>th</sup> birthday but he finally succeeded in reuniting his parents. Auro, succumbing to his disease, says his last words “Maa and Paa” and died with a satisfied smile.

The King Khan also came with his project in February, 2010 named “My Name is Khan” portraying Asperger’s Syndrome which is a kind of Autism and is a Neurobiological Disorder. This mental disorder is typified by difficulty in social interaction. The patient suffering from Asperger’s has normal intelligence and language development, but have some autistic like behaviors and exhibit deficiencies in social and communication skills.

Anurag Basu’s Barfi, which released in September 2012, with the star cast Ranbir Kapoor, Priyanka Chopra as protagonist. This movie is being hyped that it can change the Hindi cinema’s perception of looking towards abilities of the disabled. Mainstream Hindi cinema always had problem in portraying differently-abled flawlessly. Barfi who is deaf and mute but being that even he enjoys his life to the fullest. Barfi experience all the joys of life and lives his life to the full, lives his life as it comes to him and works with his imperfections with a great smile on his face. Due to his jaunty nature it didn’t take too long for Shruti (Ileana D’Cruz) to fall head over heels for Barfi. She falls for her roguish and happy go lucky nature but due to societal pressure end up marrying somebody else. This unanswered love in Barfi’s life force him to start fresh and soon Jhilmil Chatterjee (Priyanka Chopra) an autistic girl enters her life. When others fail to understand Jhilmil only Barfi understands her and stands by her side.

In latest Rani Mukherjee is coming with her new movie Hichki, releasing on 23<sup>rd</sup> March 2018 based on Tourette syndrome. As per the sources this film is adaptation of Hollywood film Front of the Class (2008), which itself was based on, *Front of the Class: How Tourette Syndrome Made Me the Teacher I Never Had* by **Brad Cohen**.

Tourette syndrome (TS or simply Tourette's) is a common neuropsychiatric disorder with onset in childhood, characterized by multiple motor tics and at least one vocal (phonic) tic.

## CONCLUSION

Unlike the post-independence era for many years till the new millennium era and the emergence of communication revolution, movies were based on disability theme but entertainment touch was the major focus. The contemporary trend has changed the concept of entertainment on various aspects and explored new areas and opportunity in making serious movies based on the theme of disability or differently-abled. These movies now not only entertain people but also create social awareness and empathy among the cinema goers and helps in changing attitude of audience towards these differently-abled. NGOs and social activist are encouraging this new move of Hindi cinema. They also add that these movies create awareness and sensitivity among the cinema goers. Most importantly all the experiments done in the movies were successful with a good business also.

Hindi cinema is often criticized for its stereotype themes and rendering of differently-abled, there are few filmmakers who often take risk against the commercial forces. Bhansali made the first attempt by making *Khamoshi* which could not achieve good response at the box office. While his next attempt almost after a decade "*Black*" was a super hit. Hence, the trend to portray differently-abled through the lens started and latest release *Hichki* is a manifestation that with your disability you can achieve anything and everything.

The rendering of differently-abled, in golden era was social but punishment and dependence was the main theme. The contemporary trend not only entertain audience but also aware them. The effort of recent filmmakers in propagating knowledge about the attitude and behavior change among the audience for the differently-abled is actually the best contribution of Hindi cinema which justifies the role to cinema as the part of mass communication. On the other hand, Hindi cinema's attempt of portraying disability through the lens and creating awareness about the physical and mental illness among the Indian audience is notable. Also, the initiative of rendering differently-abled as independent and equal abled y their counterpart is a major contribution of Hindi cinema. This effort further braces the claim of Hindi cinema as a platform for creating awareness amongst the cinema goers for the differently-abled through the lens.

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**ANTIBACTERIAL, ANTIFUNGAL AND ANTIOXIDANT ACTIVITIES OF AEGLE MARMELOS: AN OVERVIEW**

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**ABSTRACT**

*In the recent past due to their low cost easy availability and low toxicity, exploration of plant for their medicinal importance has been increased enormously. Aegle marmelos (bael) is renowned as one of the important plants used in the Indian traditional medicare practices against various diseases. Numerous active phytochemicals including alkaloids, flavonoids, coumarins, terpenoids, fatty and amino acids has been extracted from different parts of this plant and reported to possess several pharmacological, anti-inflammatory, anti-pyretic, antibacterial, antifungal, anticancer, antidiabetic and antioxidative activities against the wide range of microorganisms. In present communication efforts have been made to overview the antibacterial, antifungal and antioxidant activities of the plant in view to arrange the scattered information to a single place which will ultimately be convenient to further study.*

*Keywords: Bael, Human health, Medicinal Values, Pharmacological Activities*

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**INTRODUCTION**

The ethnic people of the world live in the areas which are greatly rich in biodiversity and beneficially India is vastly rich in numerous herbs and plants bestowed by the nature. The plants that exert advantageous pharmacological effects on the animals are commonly designated as medicinal plants (Yadav et. al., 2015). World Health Organization (WHO) has listed over 21000 plant species used for medicinal purposes throughout the world. In India, there are 45,000 species of wild plant out of which 9,500 species are ethno botanically important species. Out of these 7,500 species are used for medicinal purposes in indigenous health practices (Sharma et. al. 2007). Plants derived materials for their medicinal values have been increasing among different section of world societies as they possess less toxicity and side effects (Nigam and Nambiar, 2015).

*Aegle marmelos* (bael) is one of the most important medicinal plants of India (Srivastva et. al., 1996) reported to have various medicinal properties in traditional medical systems against various diseases and many bioactive compounds have been isolated from this plant (Anonymous 1995; Dhiman 2003; Sharma et al 2011). Bael belongs to angiospermic family Rutaceae, which commonly known as wood plant or holy fruit (English) and Bael (Hindi). Bael is a subtropical species and grows best in swamps, alkaline or stony soils having a pH range from 5 to 8. In India flowering occurs in April and May and the fruit ripens in 10 to 11 months after (March to June) of the following year. Bael is medium sized, slow-growing tree; reaches up to 12 to 15 m tall with short trunk having thick, soft, flaking bark and sometime spiny branches. A peculiar fragrance emitted from the leaves when brushed. Fruit is spherical in shape with generally a diameter of 2 to 4 inch. Shell of the fruit is thin, hard but woody in nature. Young fruit is green in colour which becomes yellow on maturity. A clear, gummy sap, resembling gum arabic, exudes from wounds branches (Sudharameshwari 2007, Sekar 2011).

The different parts of bael are used for various therapeutic purposes, such as for treatment of Asthma, Anaemia, Fractures, Healing of Wounds, Swollen Joints, High Blood Pressure, Jaundice, Diarrhoea, and Typhoid Troubles during Pregnancy. Bael has been used as an herbal medicine for the management of diabetes mellitus in Ayurvedic, Unani and Siddha systems of medicine in India. Poultice made of leaves are used for ophthalmia and ulcers. The leaves are used to lowering the blood glucose levels. Other actions like antifungal, antibacterial, antiprotozoal, antispermatogenic, anticancerous, antioxidant and anti-inflammatory are also reported (Solanki et. al. 2012, Saha et al 2016, Chaudhary, 2017, Tripathi and Singh 2017). In the present communication efforts have been made to overview the antibacterial, antifungal and antioxidant activities of the plant.

**CHEMICAL CONSTITUENTS**

Extracts of bael in different solvents were extensively studied by the different researchers and revealed that leaves, stem, root and fruit pulp contain significant amount of tannins, alkaloids, coumarins, steroids, terpenoids, saponins and flavonoids (Dutta et.al 2014, Mujeeb et.al. 2014). Seed oil is bitter in taste and contains palmitic acid (15.6%), Stearic acid (8.3%), linoleic acid (28.7%) and linolenic acid (7.6%), whereas the seed residue has about 70% protein. Reducing sugars such as galactose, arabinose and L-rhamnose are also found in fruit. Various carotenoids present in fruit are responsible for characteristics color of fruit. Root of bael tree contains psoralin, xanthotoxin and scopolotein (Maity et. al. 2009; Brijyog 2017). Different bioactive compounds (chemical structures are depicted in Figure 1) isolated from different parts of the bael are summarized in table 1.

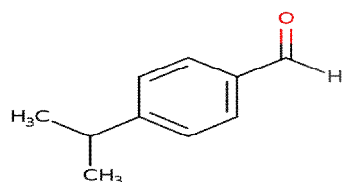
**Table-1: Bioactive compound isolated from various parts of bael**

(Source: Maity et. al. 2009; Sharma et. al. 2011; Kaushik et. al. 2014)

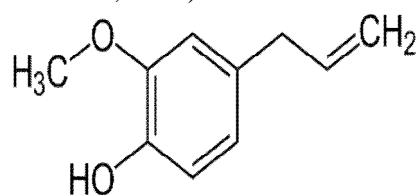
Compound	Source	Biological activities
Skimmianin	Leaf, bark	Anticancer, antipyretic, antioxidant, antimalarial
Aegelin	Leaf	Antihyperglycemic
Lupeol	Leaf	Antiinflammatory, Anti-cancer
Cineol	Leaf	Antiulcer
Citral	Leaf	Antiseptic, antiallergic
Cuminaldehyde	Leaf	Antibacterial, antimicrobial
Eugenol	Leaf	Antioxidant, antibacterial, antimicrobial
Marmesinin	Leaf	Antioxidant
Marmelosin	Fruit	Antibacterial
Marmelide	Fruit	Antiviral, antimicrobial

**Figure-1: Structure of some phytochemicals isolated from various parts of bael**

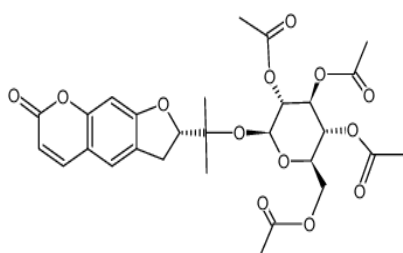
(Source: Maity et. al. 2009; Nair and Barche, 2016)



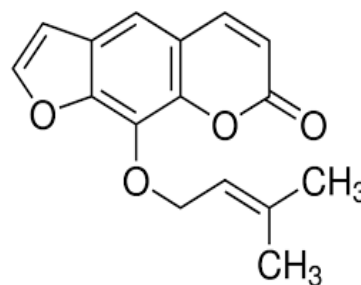
Cuminaldehyde



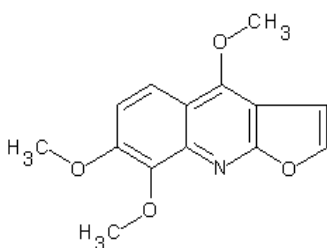
Eugenol



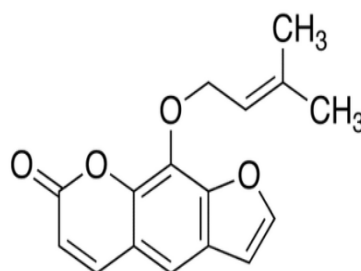
Marmesinin



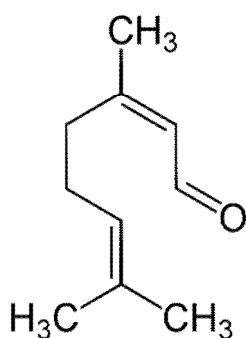
Marmelide



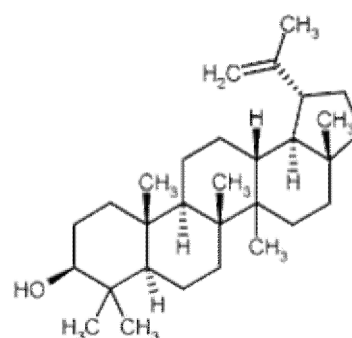
Skimminine



Marmelosin



Citral



Lupeol

### ANTIBACTERIAL ACTIVITY

Bacteria are most versatile disease causing organism, which are normally transmitted through different means such as air, food, soil, and water. These diseases can be successfully treated with various natural products. Among them bael has been traditionally used for the treatment of various infectious diseases and has been extensively reported to inhibit the broad range of pathogenic microorganisms (Maity et. al. 2009). Many in vitro studies revealed the antimicrobial potential of bael extracts towards the pathogenic microorganisms including bacteria and fungi. Extracts of leaves, barks, roots, fruits and seeds in different solvents have been reported to be active against many bacterial strains like *Escherichia coli*, *Streptococcus pneumoniae*, *Proteus vulgaris*, *Staphylococcus aureus*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *Vibrio cholerae*, *Bacillus subtilis*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *Micrococcus luteus*, *Enterococcus faecalis* and *Streptococcus faecalis* (Rajasekaran et. al. 2008; Jyothi and Rao 2010, Sekar et. al. 2011, Yadav et. al. 2015). Extracts of leaves and seeds of bael are reported for the treatment of skin infection generally caused by *Staphylococcus aureus*. The antibacterial activity of bael leaf may be due to presence of cuminaldehyde and eugenol (Mujeeb et. al. 2014). Essential oil of leaf present in the bael has also been reported to prevent the growth of *Escherichia coli*, *Aeromonas* sp., *Pseudomonas* sp. and *Xanthomonas* sp. It has been observed that the antimicrobial activity against gram-negative strains was higher than that of gram positive strains (Gavimath et. al. 2008, Poonkothai and Saravanan 2008, Rajeshkaran et. al. 2008). Various studies revealed that antimicrobial activities of bael may be due to blocking of the protein synthesis either at transcription level / translation level or by preventing the synthesis of peptide-glycan (Kothari et. al. 2011, Mujeeb et. al. 2014; Shantaram et. al. 2016, Chaudhary et. al. 2017). It has been evident from various studies that alcoholic extract of dried fruit pulp of bael is also active against various intestinal pathogens i.e. *Shigella boydii*, *S. sonnei* and *S. Flexneri* and bacteria like *E. coli*, *Salmonella typhi*, *Pseudomonas aeruginosa*. Leaf extract of bael has been reported remedy of various gastrointestinal infections of human as it has the various constituents such as flavanoids, tannins and alkaloids useful in these infections e.g. aegelin, marmelosin, luvangetin (Sumit Bhalla, 2012; Yadav et.al. 2015)

### ANTIFUNGAL ACTIVITY

Fungal diseases like candidiasis and ringworm are very common in the society that may become fatal due to secondary infections. The antifungal activity of the different parts of bael was reported by numerous scientific workers and found to be effective against many strains of fungi. The decoction of the fruit reported to be effective against *Aspergillus niger*, *Aspergillus fumigatus*, *Candida albicans* (Gheisari et. al. 2011). The alcoholic extract shows potential activities against fungus *Penicillium chrysogenum* whereas the petroleum ether and aqueous extract show mark-able activity against fungus *Fusarium oxysporum* (Sivraj et. al. 2011). The antifungal activity of the leaves of bael was reported against several clinical isolates of dermatophytes. Extracts of the leaves were reported for fungicidal activity against *Trichophyton mentagrophytes*, *T. rubrum*, *Microsporum canis*, *M. gypseum*, *Epidermophyton floccosum* (Maity et. al. 2009; Balakumar et. al. 2011). Essential oil obtained from leaves, seeds as well as alcoholic extract of roots show excellent antifungal activity against various fungi like: *Trichophyton mentagrophytes*, *T. rubrum*, *Microsporum gypseum*, *M. audouinii*, *M. cookei*, *Epidermophyton floccosum*, *Aspergillus niger*, *A. flavus* and *Histoplasma capsulatum*. The oil exhibited variable effectiveness against various fungal isolates and 100% inhibition of spore germination of all the fungi tested was reported at 500 ppm. They reported that essential oil from bael may interfere with the  $\text{Ca}^{2+}$ -dipicolonic acid metabolism pathway and possibly inhibit the spore formation. It exhibits the antifungal activity by lowering the vegetative fungal body inside the host or in solid medium (Maity et. al. 2009; Kothari et. al. 2011, Nag et. al. 2015; Chaudhary et. al. 2017).

### ANTIOXIDANT ACTIVITY

Antioxidants are essential substances, which hold the ability to protect body from damages caused by free radicals. Free radicals (super oxide, hydroxyl radicals and nitric oxide) and other reactive species (hydrogen peroxide, hypochloric acid and proxynitrite) produced during aerobic metabolism in the body and cause of oxidative damage of amino acids, lipids, proteins and DNA. Generation of free radicals are cause of various major diseases such as arthritis, Alzheimer's, Parkinson's, diabetes, gastritis, aging, liver diseases, cancer and AIDS (Monika et. al. 2016). Antioxidant, both exogenous and endogenous helps to mitigate the effect of free radicals through different ways. Antioxidants may reduce the toxicities of reactive oxygen species (ROS) by the prevention of its construction, by checking ROS attack, by scavenging reactive metabolites and converting them to less reactive molecules. This antioxidant activity might be due to the presence of phenolic compounds such as flavonoids, phenolic acids and phenolic diterpene present in various medicinal plants in various forms (Chaudhary et. al. 2017). There are numerous phytochemicals isolated from plants such as vitamins A, C and E, polyphenols, coumarine, flavonoids, tannins, lignans, phytoestrogens, saponin, betacarotene, anthocyanins and lycopene well-known for antioxidant properties (Bubolsa et.al. 2013). Free radical scavenging activity of plant



is estimated using a very quick and efficient method DPPH (1, 1 -Diphenyl- 2 -picrylhydrazyl) and claimed that leaf extract have better antioxidant activity than stem bark and root extract. Antioxidant activity of aqueous extract bael on streptozocin-induced diabetic rats and claimed that activity of antioxidant enzymes such as superoxide dismutase, catalase and glutathione peroxidase was increased in the hepatic and renal tissues of diabetic animals. (Tripathi and Singh, 2017, Chaudhary et. al. 2017). In vitro activity of Methanolic extract of *Aegle marmelos* reported to have good antioxidant activity with that IC-50 value  $23 \pm 0.08$ , and can be used as potential inhibitor of free radicals (Sumit Bhalla, 2012).

### CONCLUSION AND PROSPECTS

In present communication effort has been made to overview the medicinal significance of bael with special reference to antibacterial, antifungal and antioxidant activities. It has been concluded from the above discussion that different parts of bael show the significant antibacterial antifungal and antioxidant activities. Almost all the parts of this plant such as leaf, fruit, seed, bark and root are used to cure a variety of diseases. As the pharmacologists are looking forward to develop new medicinal recipes from the natural origins, active phytochemicals of *A. marmelos* can play a very viable role for these drives.

### ACKNOWLEDGMENT

The author is thankful to the authorities of Gandhi Faiz-e-Aam College, Shahjahanpur, U.P., India for providing necessary facilities and encouragement to carry out this study.

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