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## Dr. K. VICTOR BABU

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### Editorial.....

It is heartening to note that our journal is able to sustain the enthusiasm and covering various facets of knowledge. It is our hope that IJMER would continue to live up to its fullest expectations savoring the thoughts of the intellectuals associated with its functioning .Our progress is steady and we are in a position now to receive evaluate and publish as many articles as we can. The response from the academicians and scholars is excellent and we are proud to acknowledge this stimulating aspect.

The writers with their rich research experience in the academic fields are contributing excellently and making IJMER march to progress as envisaged. The interdisciplinary topics bring in a spirit of immense participation enabling us to understand the relations in the growing competitive world. Our endeavour will be to keep IJMER as a perfect tool in making all its participants to work to unity with their thoughts and action.

The Editor thanks one and all for their input towards the growth of the **Knowledge Based Society**. All of us together are making continues efforts to make our predictions true in making IJMER, a Journal of Repute

**Dr.K.Victor Babu**  
**Editor-in-Chief**

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## RC STRUCTURAL BEHAVIOR OF HOLLOW CORE AND RCC SLAB

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### Abstract

The analysis and design of slabs are interactive area of research work. Nowadays due to demand of economy and fast construction Hollow Core Slabs (HCS) have proven to be more desirable as compared to RCC slab. There might be an accountable difference in cost within a year of construction of same square feet of area. For this we really need to minimize the time without compromising the quality. One of the elements which is widely used are Hollow Core Slabs which are quick to setup and are generally cost effective. HCS units have good sound and thermal properties and long spans which is easy to achieve economically.

Present study involves a RC framed structure (G+21) each for HCS and RCC slab located in Seismic Zone II, III, IV and V. The main objective of the study is based on analysis of two structure i.e. one having hollow core as flooring and other having RCC slab as flooring. Structural parameters included for comparison are shear, moment, deflection, axial force, storey shear and displacement. Separate models were generated for HCS and RCC slab for each Seismic Zones II, III, IV and V and were compared Zone wise. Study was carried to show how HCS are economical over RCC slab by comparing the structural behavior of building element which are columns, floor and footings.

**Keywords:** Hollow Core Slabs (HCS), Reinforced Cement Concrete (RCC), voids, Pre-stressed, Shear, Moment, Deflection, Axial force, Storey shear and Displacement.

### Introduction

The analysis and design of slabs are interactive area of research work. In the earliest of 20<sup>th</sup> century Reinforced Concrete floors or slabs were built on regular basis. But nowadays due to demand of economy and fast construction Hollow Core Slabs (HCS) have proven to be more desirable as compared to RCC slab. As we know if the construction time of any project increases it also increases the cost of construction. There might be an accountable difference in cost within a year of construction of same square feet of area. For this we really need to minimize the time without compromising the quality. There is wide range of structural element available in market with enhanced structural properties compared to conventional one. One of the elements which is widely used are the precast structural elements which are produced in factories with great accuracy and skilled supervision. Among this we have Hollow Core Slabs which are quick to setup and are generally cost effective.

Hollow core slabs are precast, pre-stressed elements generally used as flooring. They usually consist of continuous voids which run along the length to reduce the self-weight. The reduction in dead load of element reduces the depth of other structural elements.



The concrete is pressed along the voids to provide strength around the voids and avoid failures. Specification of hollow core slabs available typically 0.9m to 1.25m wide and 150mm to 300mm thick. The span of these slabs may be achieved up to 18m.

Cores are typically either circular or elliptical. The hollow core slabs can afford a reduction in self weight of 30% or more compared with solid slab of same depth. This ultimately reduces the depth of other structural members to minimum.

### Literature Review

(Ihsan A. Al-Shaarbaf, Adel A. Al- Azzawi &RadhwanAbdulsattar, 2018), this paper is based on literature reviews related to previous research and studies on HCS. Based on the past researches this paper suggests it is feasible to use HCS one way slab as a roofing member for buildings. The NSM-CFRP strengthening method majorly supports the bending and shear load capacity of prestress HCS. The reduction in shear span to depth ratio for solid slab causes larger flexural strength by about 29.06% and ultimate deflection by about 17.79%. There is a reduction in cross sectional area extends between 29% to 35% for block slabs, which ultimately leads to reduction in weight of the HCS compared to conventional slabs i.e. RCC slab.

(Prateek Ghosh, 2016), in this study comparison has been done between RCC and steel framed structures using Hollow core concrete slabs as utility. The study concludes that precast concrete constructions are very common in low seismic regions as they are cost effective, quick to assemble and build. Have lower self weight, use fewer raw materials. Widely used in India, Europe, USA and Canada.

(L.J. Woods, D.K. Bull and R.C. Fenwick, 2008), this paper is based on performance of HCS under gravity loads. Paper includes the importance of negative bending moments in HCS and conditions how it is exposed to the negative bending moments. Paper gives what should be included in HCS slab design to avoid failures due to shear and flexure in negative bending moment regions.

(K.Soundhirarajan, M.Raghupathi, R.Ragupathi, K.Sathishkumar, V.Sureshkumar, 2018), this paper is based on study of structural behavior of HCS. The study concludes that HCS are most widely known for providing economical, efficient floor and roof system. HCS provides the efficiency of a precast member for load capacity, span range and deflection control. It also suggests that the top surface of HCS can be prepared by installing non-structural fill concretes ranging from 15-50mm thick depending on type of material used or by casting a composite structural concrete topping.

(K.M. Monisha, G. Srinivasan, 2017), this paper is based on comparative study on structural behavior of HCS and RC slabs. Study suggests that cost efficiency of prestress hollow core slab is high. Load carrying capacity of RCC slab is 20% less when compared to prestress hollow core slab.

(Prasad Bhamare, Sagar Bhosale, AkshayGhanwat, Shubham Gore, Sheetal Jadhv, Sachin Patil, 2017), this paper concludes the design of precast members is economical if proper care is taken while designing. The cost and time duration of traditional construction is high when compared to precast construction. Better concrete quality can be achieved with lighter concrete units.



### Methodology

G+21 building was selected for modeling in ETABS software. The building was fairly symmetric in plan and elevation having plan dimension of 60m x 48m. Two models (each for hollow core and RCC slab) was prepared for Zone II, III, IV, V. In ETABS the load for RCC slab was taken as defined by the software itself and for Hollow core slab load was reduced by 33% based on literature review. Rest loading patterns selected were same for both the models.

The analysis was run for comparing the behavior of columns, beams, floors and footings. Based on the results extracted from ETABS, three columns were selected (as shown in ETAB Model) in both the models (case I and case II) and were compared for shear, moment and axial forces. Floor was compared for displacement and storey shear (case I and case II) and footing was compared for Base shear.

Graphs were prepared on the basis of comparison shown in results and discussions.

### Building Specifications

Case I	Case II
<ul style="list-style-type: none"> <li>• Slab type: RCC slab</li> <li>• Storey: G+21</li> <li>• Plan Dimension: 60m x 48m</li> <li>• Height of each storey: 3.5m</li> <li>• Column Size: 750mm x 750mm</li> <li>• Beam Size: 300mm x 700mm</li> <li>• 4 model each for Zone II, III, IV and V.</li> <li>• Building is fairly symmetric in plan and elevation.</li> <li>• Soil Condition: Medium Soil</li> <li>• Importance Factor: 1</li> <li>• Response Reduction: 5</li> <li>• Assume Slab Thickness: 300mm Calculation (d) = (L/35)</li> <li>• Slab Dead Load = 7.5 kN/ m<sup>2</sup></li> <li>• Live Load: a) On Roof: 1.5 kN/m<sup>2</sup> b) On Floor: 3 kN/m<sup>2</sup></li> <li>• Floor Finish: 1 kN/m<sup>2</sup></li> <li>• Material: M 40 Grade concrete &amp; Fe 500 Reinforcement</li> <li>• Unit Weight: Concrete- 25 kN/cum</li> </ul>	<ul style="list-style-type: none"> <li>• Slab type: Hollow core slab</li> <li>• Storey: G+21</li> <li>• Plan Dimension: 60m x 48m</li> <li>• Height of each storey: 3.5m</li> <li>• Column Size: 750mm x 750mm</li> <li>• Beam Size: 300mm x 700mm</li> <li>• 4 model each for Zone II, III, IV and V.</li> <li>• Building is fairly symmetric in plan and elevation.</li> <li>• Soil Condition: Medium Soil</li> <li>• Importance Factor: 1</li> <li>• Response Reduction: 5</li> <li>• Assume Slab Thickness: 300mm Calculation (d) = (L/35)</li> <li>• Slab Dead Load = Reduced by 33% = 5.025 kN/m<sup>2</sup></li> <li>• Live Load: a) On Roof: 1.5 kN/m<sup>2</sup> b) On Floor: 3 kN/m<sup>2</sup></li> <li>• Floor Finish: 1 kN/m<sup>2</sup></li> <li>• Material: M 40 Grade concrete &amp; Fe 500 Reinforcement</li> <li>• Unit Weight: Concrete- 25 kN/cum</li> </ul>

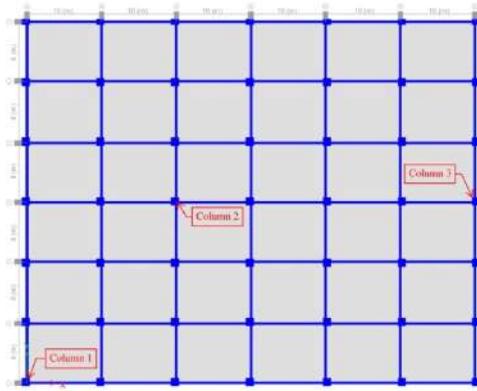
### Material Properties

- a) Concrete:  
 Concrete with following properties is considered for study.
- Characteristic compressive strength (fck) = 40 MPa
  - Poisson Ratio = 0.2

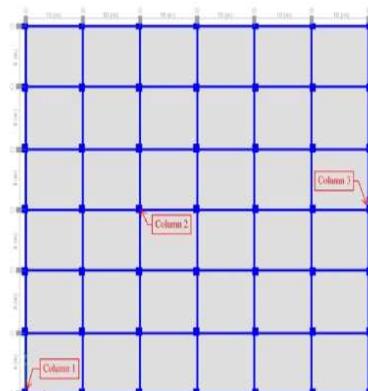
- Density = 25 KN/m<sup>3</sup>
  - Modulus of Elasticity (E) = 5000 x  $\sqrt{f_{ck}}$  = 3.16x10<sup>4</sup> MPa
- f<sub>ck</sub> is the characteristic compressive strength of concrete cube in MPa at 28-day

- b) Steel:
- Yield stress (f<sub>y</sub>) = 500 MPa
  - Modulus of Elasticity (E) = 2x10<sup>5</sup> MPa

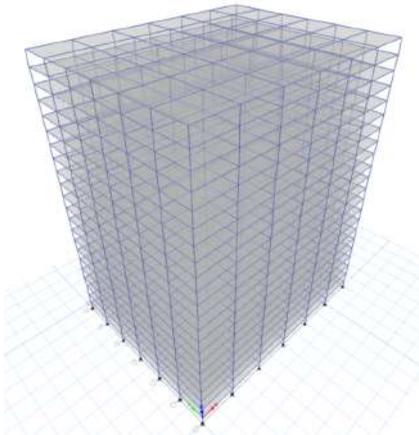
### ETABS Model



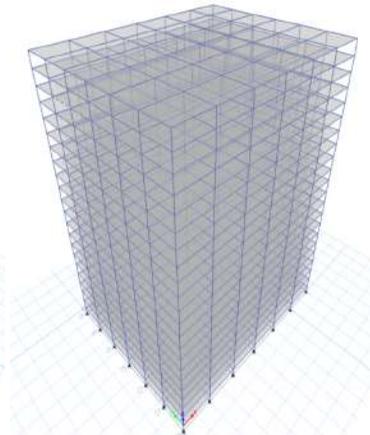
ETAB Model RCC Slab-2D



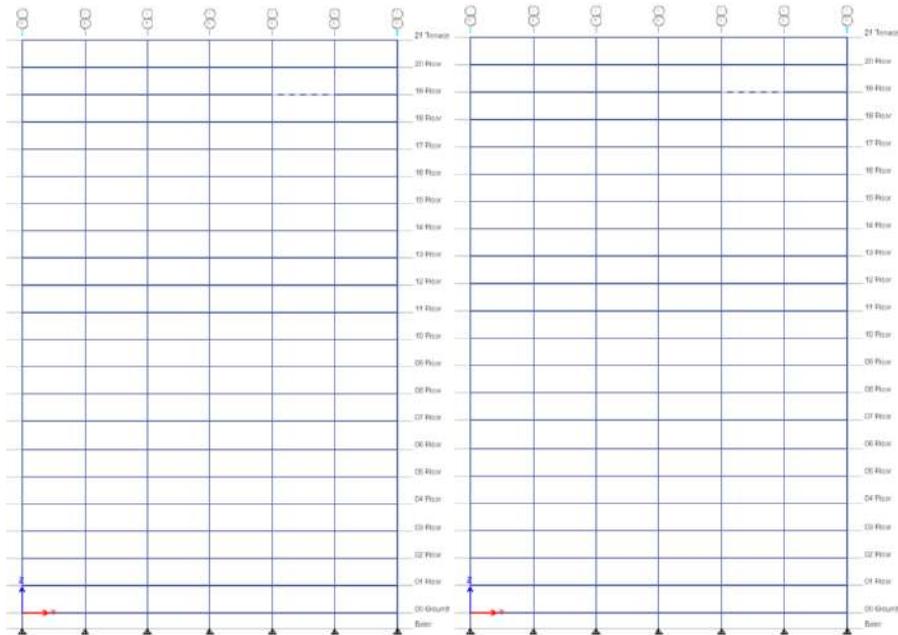
ETAB Model HC Slab-2D



ETAB Model RCC Slab-3D



ETAB Model HC Slab-3D



ETAB Model RCC Slab-Elevation

ETAB Model HC Slab-Elevation

## Results and Discussion

Axial force: The maximum axial forces in the three columns in longitudinal and transverse direction is considered for analysis in seismic zone II, III, IV and V for case I and case II :

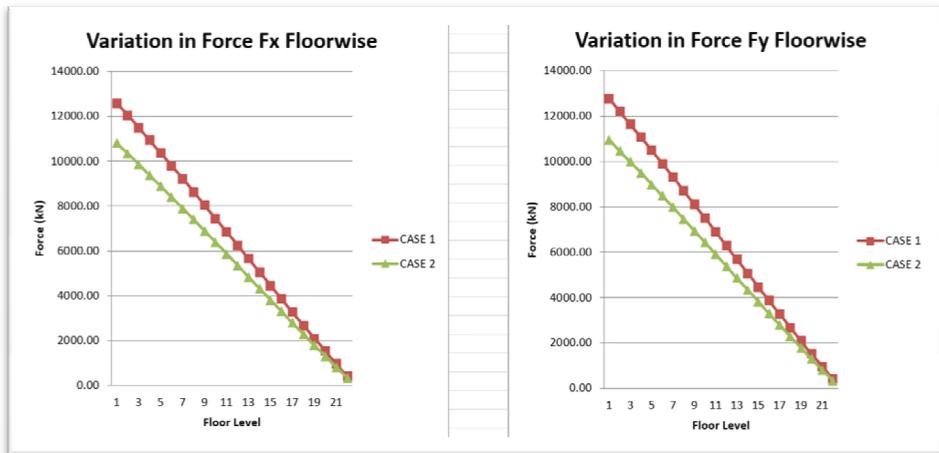
- Axial force on all the three columns is longitudinal and transverse direction is less for case II compared to case I for every storey.
- On comparing Axial force reduction in % wise following points can be observed :
- For column 1 the reduction in axial force in case II is between 14% to 18.5% compared to case I and can be seen in all 4 Seismic zones.
- For column 2 the reduction in axial force in case II is between 17% to 22% compared to case I in all 4 Seismic zones.
- For column 3 the reduction in axial force in case II is between 14% to 20% compared to case I for zone II, III and IV and for zone V the reduction is between 12% to 20%.
- Graph has been shown for Column 1 for Zone II.



Column 1				Column 1			
LC	FLOOR LEVEL	CASE 1	CASE 2	LC	FLOOR LEVEL	CASE 1	CASE 2
1.2(DL+LL+EQX)	0	12589.04	10802.32	1.2(DL+LL+EQY)	0	12779.21	10954.49
1.2(DL+LL+EQX)	1	12043.89	10331.80	1.2(DL+LL+EQY)	1	12215.75	10469.30
1.2(DL+LL+EQX)	2	11492.18	9855.98	1.2(DL+LL+EQY)	2	11647.33	9980.09
1.2(DL+LL+EQX)	3	10933.09	9374.22	1.2(DL+LL+EQY)	3	11072.51	9485.72
1.2(DL+LL+EQX)	4	10366.71	8886.58	1.2(DL+LL+EQY)	4	10491.15	8986.09
1.2(DL+LL+EQX)	5	9793.45	8393.42	1.2(DL+LL+EQY)	5	9903.59	8481.46
1.2(DL+LL+EQX)	6	9213.92	7895.21	1.2(DL+LL+EQY)	6	9310.39	7972.30
1.2(DL+LL+EQX)	7	8628.86	7392.56	1.2(DL+LL+EQY)	7	8712.28	7459.18
1.2(DL+LL+EQX)	8	8039.07	6886.10	1.2(DL+LL+EQY)	8	8110.07	6942.78
1.2(DL+LL+EQX)	9	7445.42	6376.56	1.2(DL+LL+EQY)	9	7504.66	6423.80
1.2(DL+LL+EQX)	10	6848.85	5864.67	1.2(DL+LL+EQY)	10	6897.02	5903.04
1.2(DL+LL+EQX)	11	6250.34	5351.23	1.2(DL+LL+EQY)	11	6288.18	5381.33
1.2(DL+LL+EQX)	12	5650.93	4837.08	1.2(DL+LL+EQY)	12	5679.24	4859.55
1.2(DL+LL+EQX)	13	5051.72	4323.10	1.2(DL+LL+EQY)	13	5071.37	4338.64
1.2(DL+LL+EQX)	14	4453.83	3810.21	1.2(DL+LL+EQY)	14	4465.81	3819.60
1.2(DL+LL+EQX)	15	3858.48	3299.37	1.2(DL+LL+EQY)	15	3863.84	3303.47
1.2(DL+LL+EQX)	16	3266.87	2791.56	1.2(DL+LL+EQY)	16	3266.82	2791.34
1.2(DL+LL+EQX)	17	2680.25	2287.78	1.2(DL+LL+EQY)	17	2676.12	2284.31
1.2(DL+LL+EQX)	18	2099.84	1789.03	1.2(DL+LL+EQY)	18	2093.13	1783.51
1.2(DL+LL+EQX)	19	1526.66	1296.09	1.2(DL+LL+EQY)	19	1519.04	1289.89
1.2(DL+LL+EQX)	20	961.83	809.89	1.2(DL+LL+EQY)	20	955.12	804.44
1.2(DL+LL+EQX)	21	403.23	328.72	1.2(DL+LL+EQY)	21	399.36	325.59

Loading in X-direction (Zone II)

Loading in X-direction (Zone II)

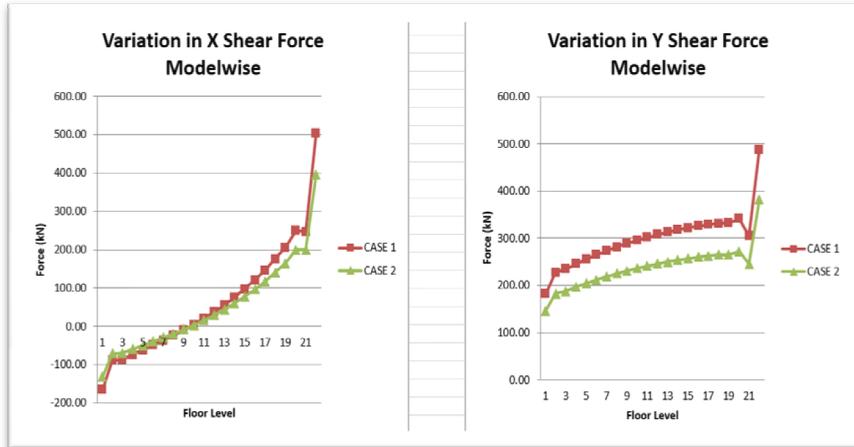


Axial force graph of Column 1 (Zone II)

Shear Force: The maximum shear forces in the three columns in longitudinal and transverse direction is considered for analysis in seismic zone II, III, IV and V for case I and case II :

- On observing the data shear force in X and Y direction for case II is less than case I, valid for all seismic zones.
- There will be reduction in Area of steel (Ast) for case II as shear force is directly proportional to Ast and hence the structure will be economic.

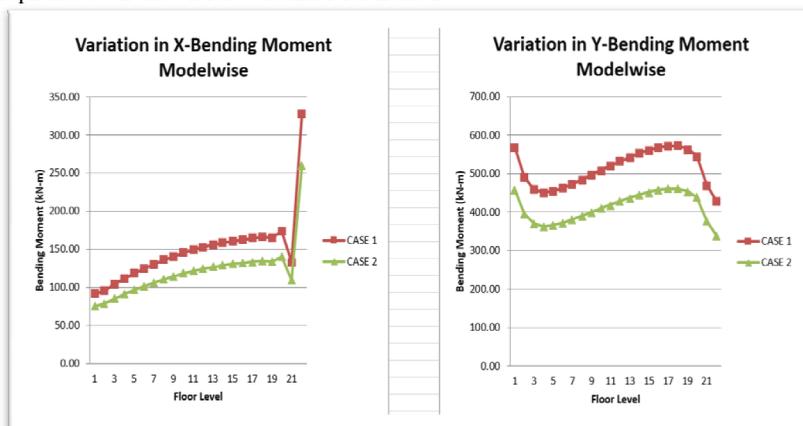
- It can be observed that the reduction of shear force percentage wise is between 18% to 22% for case II compared to case I.
- Graph has been shown for Column 3 for Zone III.



Shear force graph of column 3 (Zone III)

Bending Moment: The maximum Bending Moment in the three columns in longitudinal and transverse direction is considered for analysis in seismic zone II, III, IV and V for case I and case II :

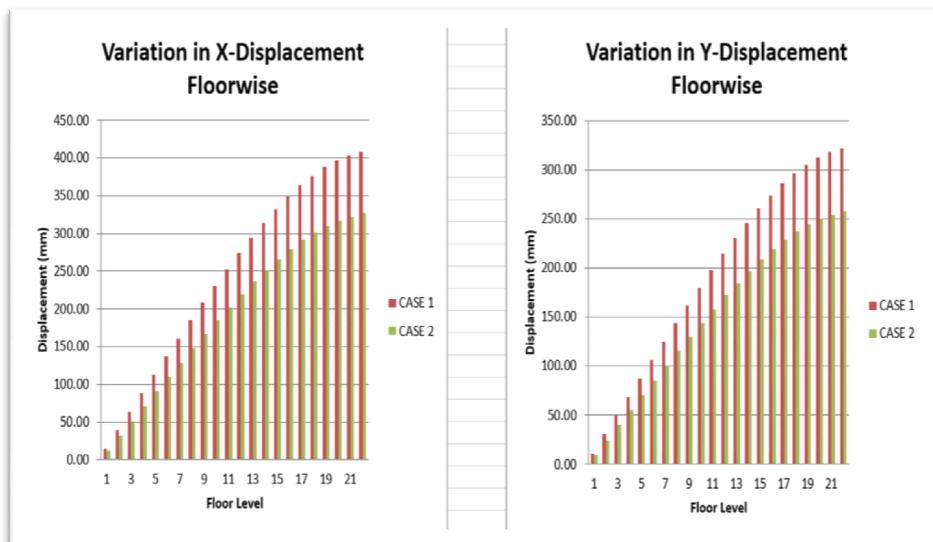
- On observing the data bending moment in X and Y direction for case II is less than case I, valid for all seismic zones.
- There will be reduction in Area of steel ( $A_{st}$ ) for case II as bending moment is directly proportional to  $A_{st}$  and hence the structure will be economic.
- It can be observed that the reduction of bending moment percentage wise is between 17% to 21% for case II compared to case I.
- Graph has been shown for Column 1 for Zone IV.



Bendingmoment graph of column 1 (Zone IV)

Displacement: Plots of storey level displacement in longitudinal or transverse versus height are made for the two cases, all imposed on same graph:

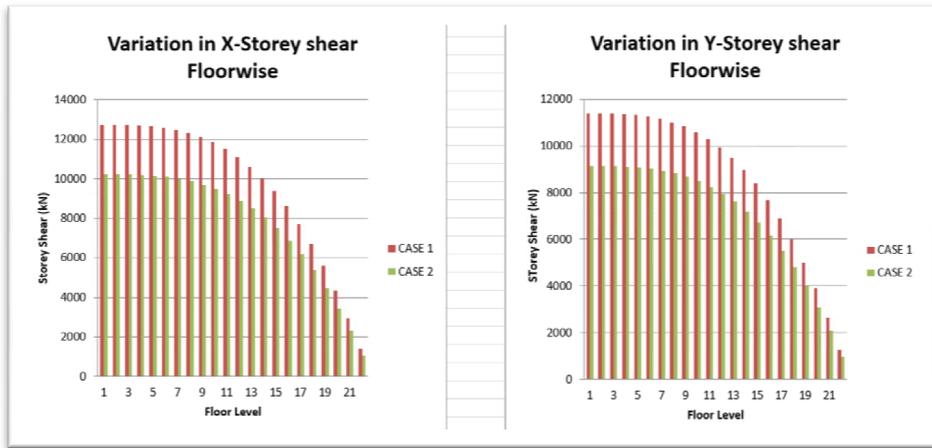
- From the graph it is observed that for case II displacement of storey in X & Y direction is less compared to case I, zone wise.
- As the zone changes from II to V, the value of displacement increases for both cases, but Case II displacement remains less from case I in every seismic zone.
- Storey level in X & Y direction, displacement of case II is around 20% less for every floor when compared to case I in each zone.
- Graph has been shown for storey level displacement for Zone V.
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Storey level displacement graph for Zone V

Storey Shear: Plots of storey shear in longitudinal or transverse versus height are made for the two cases, all imposed on same graph:

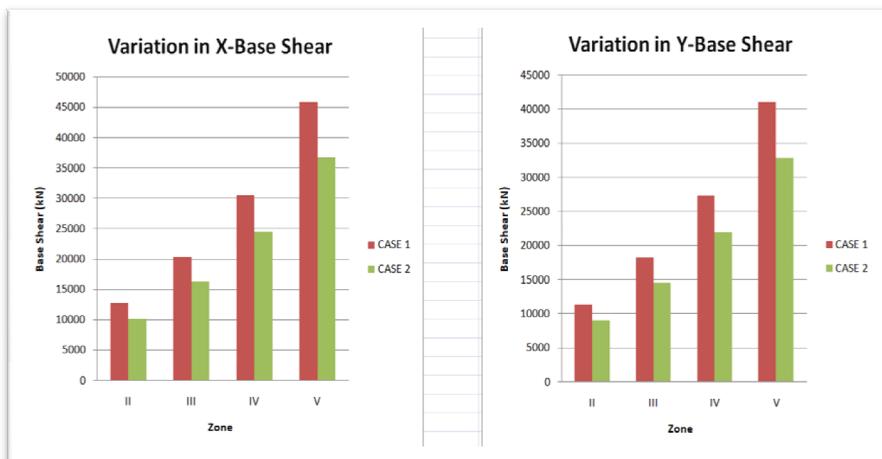
- From the graph it is observed that for case II Storey shear in X & Y direction is less compared to case I, zone wise.
- As the height of building increases the reduction value of storey shear in case II goes on increasing compared to case I.
- Considering each zone the reduction in storey shear percentage wise for case II is from 19% (ground floor) to 23% (terrace) compared to case I.
- The reduction of storey shear percentage wise for case II compared to case I is constant if we compare zone wise.
- Graph has been shown for storey shear for Zone II.



Storey Shear Graph for Zone II

Base Shear: Base shear in the three columns in longitudinal and transverse direction is considered for analysis in seismic zone II, III, IV and V for case I and case II :

- Due to load reduction of 1/3 in HCS there is a reduction in base shear of case II compared to case I.
- Base shear goes on increasing as zone changes from II to V but the value of base shear for case II remains less when compared to case I.
- There will be reduction in area of steel of the footing as base shear is directly proportional to area of steel.



Base shear graph



## Conclusion

Based on analysis it can be concluded that loading on columns, beams and footings for hollow core model is less compared to RCC slab model, hence the sizes and reinforcement of the members will be less for hollow core structural members.

It can be concluded that hollow core buildings will take less time for erection than RCC buildings as hollow core is precast and manufactured in factory with quality control. Thus reducing the cost of project and hence economical.

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**APPROACH OF THE INDIAN JUDICIARY IN  
INTERPRETING “PROSTITUTION” AND OTHER  
PROVISIONS OF THE IMMORAL TRAFFIC  
PREVENTION ACT, 1956**

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**ARTICLE:**

Judiciary being the guardian of law and justice, in many circumstances has done a great move so as to fill up the vacuum persisting in the law. Similarly judiciary has also contributed a lot to tackle the issue of prostitution. In this research article will be focusing on some of the major decisions rendered by Indian judiciary in the most sensitive area of prostitution wherein we can see that judiciary has also added on to the confusions and anomalies that exists in the Immoral Traffic Prevention Act, 1956 because of the change in definition of prostitution and prostitute

*“Justice is considered, as a logical requirement of any society for it is a part of human nature to expect justice and be intolerant to injustice. Justice enjoins upon everybody to preserve the basic order of society and prohibits everyone to disturb it. Within the framework of parliamentary democracy and federalism, judiciary thus plays an important role in the governance of the country. Indian judiciary is an arm of the social revolution, upholding the equality and dignity of men.”*<sup>1</sup>

-Prostitution always remains as a running sore in the body of civilisation and destroys all notorious and frightful that none can do it. This malignity is daily and hourly threatening the community at large slowly but steadily making its way onwards leaving a track marked with broken hopes. Therefore the

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<sup>1</sup>online at [www.preservearticles.com](http://www.preservearticles.com)(visited February 2019)



necessity for appropriate and drastic action to eradicate this evil has become apparent...<sup>2</sup>

Along with Immoral Traffic Prevention Act, 1956 there are very many other Acts and many provisions in Indian Penal Code 1860 which deals directly or indirectly with prostitution and related activities. In this chapter I would like to analyze the approach of Indian judiciary in interpreting prostitution and prostitutes and other provisions of Immoral Traffic Prevention Act, 1956.<sup>3</sup>

The very word prostitution in layman's point of view or from society's view point means an act by which a woman offers his or her body for money or luxury and if we construe accordingly prostitute is one who offers her body in return of money. The very same view point was reflected in the Suppression of Immoral Traffic in Women and Girl Act, 1956 wherein prostitution was defined as an act of female offering her body for promiscuous sexual intercourse for hire, whether in money or in kind<sup>4</sup> and the word prostitute was also construed accordingly.<sup>5</sup> So prostitute means the female who offers her body for promiscuous sexual intercourse for hire, whether in money or kind. But this very definition of prostitution and prostitute got changed after the amendment<sup>6</sup> which renamed SITA into PITA and defined prostitution as sexual exploitation or abuse of persons for

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<sup>2</sup>*Vishal Jeet v. Union of India* (1990) 3 SCC318

<sup>3</sup>Here in after referred to as PITA, 1956.

<sup>4</sup>SITA, 1956 Section 2(f) - Prostitution means the act of a female offering her body for promiscuous sexual intercourse for hire, whether in money or in kind.

<sup>5</sup>SITA, 1956 Section 2(e) - Prostitute means a female who offers her body for promiscuous sexual intercourse for hire, whether in money or in kind.

<sup>6</sup>Amendment Act 44 of 1986.



commercial purpose by third parties like pimps, brothel owners and other and the word prostitutes shall be construed accordingly.<sup>7</sup> Thus in the last chapter we have come to the conclusion that Indian legislators have committed a big error by confining the conceptual changes in PITA only to prostitution, prostitute and brothel only and by not extending the same to rest of the Act. The PITA deals with prostitution and related activities not only a social but also a socio economic problem therefore the provisions of the Act are more preventive than punitive.

Now when we analyse various case laws delivered by Indian judiciary after the change in definition of prostitution and prostitute, one definitely land on to a conclusion that even though judiciary says about change in definition of prostitution and prostitute in Immoral Traffic Prevention Act, 1956, judiciary is still having the same mind set and notion as that of the old definition of prostitution and prostitutes. This is very much evident from judiciary's attitude and way of interpreting prostitution and prostitutes with respect to various other provisions of the PITA, 1956 while deciding some of the case laws.

***BholanathTripathi v. State of UttarPradesh***

When we look into the case of *BholanathTripathi v. State of Uttar Pradesh*<sup>8</sup>, which was a case came up before the court as a public interest litigation via a letter. The facts of the case is quite interesting one. A letter was addressed to then Chief Justice of India by a certain BholanathTripathi, a journalist, which has been registered as a writ petition. The letter was to bring in to the notice of the Court the

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<sup>7</sup>PITA, 1956 Section 2(f) . - Prostitution means the act of a female offering her body for promiscuous sexual intercourse for hire, whether in money or in kind

<sup>8</sup>*BholanathTripathi v. State of Uttar Pradesh* 1990 Supp (SCC) 151



plight of one Kanchan Devi. Kanchan Devi was being held in captivity and who was also forced into prostitution by one Srivastava. The situation described in the letter was that the said Srivastava had paid forty five thousand rupees to Kanchan Devi's father and bought her from him. Now under the guise of a marriage Srivastava is holding her in confinement. He is also using her to earn money from prostitution. Honourable Supreme Court in this case held that, -If allegations regarding forcing his wife into prostitution proved against husband, he is liable to be immediately punished.

One thing which is to be noted in this case is that it was decided by Indian Supreme Court in the year of 1990. That shows it was decided after the change in definition of prostitution and prostitute. So when we look in to the order of court it is clear from the words that court is saying that husband who forces wife in to prostitution is liable to be punished immediately. According to new definition of prostitution and prostitute, here the husband is the prostitute who sexually exploits or abuse his wife for commercial purposes. Husband does the act of prostitution. So according to new definition of prostitution husband should be punished for prostitution and not for forcing wife into prostitution. But court uses the phrase

*„husband who forces wife in to prostitution“* is liable to be punished. If we construe the words of court by giving literal interpretation it will render the order of court meaningless. It is very evident from the facts and circumstances of the case that court here is intending to punish that husband who forces his wife to offer her body to any person other than him for promiscuous sexual intercourse for hire, whether in money or in kind. So it is very obvious that the court still considers the term



Prostitution with same old notion which was there before amendment, that is to say as an act of female offering her body for promiscuous sexual intercourse for hire whether in money or in kind.

So according to new definition of prostitution, husband should be punished for prostitution and not for forcing wife in to prostitution. But here also lies the problem. Even though there was change in definition of prostitution and prostitute it was not at all extended to rest of the Act. Even now there is no punishment for prostitution as such in PITA. Prostitution is punishable only when it is carried on in public place or in the vicinity of public place. So if the husband is sexually exploiting or abusing his wife for commercial purposes at his own home or any other place other than public place/vicinity of public place he cannot be punished for that. This means that if husband does the act of prostitution, he will be or can only be punished if and only if he does the act of prostitution in public place or in the vicinity of public place.

But according to the old definition of prostitution the husband could have been punished under section 5(1) PITA.<sup>9</sup> According to new definition of prostitution he cannot be held liable as he is not procuring his wife or attempts to

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<sup>9</sup>Section 5(1) PITA 1956-. Procuring, inducing or taking person for the sake of prostitution.—(1) Any person who— (a) procures or attempts to procure a person whether with or without his/her consent, for the purpose of prostitution; or (b) induces a person to go from any place, with the intent that he/she may for the purpose of prostitution become the inmate of, or frequent, a brothel; or (c) takes or attempts to take a person or causes a person to be taken, from one place to another with a view to his/her carrying on, or being brought up to carry on prostitution; or (d) causes or induces a person to carry on prostitution; shall be punishable on conviction with rigorous imprisonment for a term of not less than three years and not more than seven years and also with fine which may extend to two thousand rupees, and if any offence under this sub-section is committed against the will of any person, the punishment of imprisonment for a term of seven years shall extend to imprisonment for a term of fourteen years: Provided that if the person in respect of whom an offence committed under this subsection, is a child, the punishment provided under this sub-section shall extend to rigorous imprisonment for a term of not less than seven years but may extend to life.



procure his wife for prostitution or causing his wife to carry on prostitution. But here he does the very act of prostitution. He is forcing his wife to hire her body for sexual intercourse which is not defined as an offence in the Act after the change in definition of prostitution and prostitute.<sup>10</sup> According to new definition of prostitution section 5(1) can now be read as a section which says about punishment for compelling a person to indulge into prostitution which means compelling a person to sexually exploit or abuse another person for commercial gain. So here the question is whether the husband is compelling his wife to sexually exploit or abuse someone else for commercial purpose??<sup>11</sup>... So when the answer to this question is a NO...the question which automatically bounces from there is whether he can be punished under Section 5(1) according to changed definition of prostitution...??<sup>12</sup>

All these anomalies exists now due to the change in definition of prostitution and prostitute and legislators failure to make necessary changes accordingly to rest of the provisions of the Act. But it is very interesting to note that the judiciary has also not gone in to such anomalies or irony which exists because of the change in definition of Prostitution. Judiciary has either scooted or left those anomalies unnoticed by sticking on to the same old concept of prostitution while deciding this particular judgment.

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<sup>10</sup> P.S.Seema, *Prostitution – The Unnoticed Dimensions in Indian Legal Scenario*, 8 Amity Law Review 31 (January- June 2012.)

<sup>11</sup> PITA, 1956 Section 5(1) (cited in note9)

<sup>12</sup> PITA, 1956 Section 5(1) (cited in note9)



*Sangeeta and Anr v State*

In *Sangeeta and Anrvs State*<sup>13</sup> the Delhi High Court ruled, –prostitution itself is not a criminal offence. What is punishable under the Act is sexual exploitation or abuse of persons for commercial purposes.... Here the court says that sexual exploitation or abuse of persons for commercial purpose is punishable by sticking on to new definition of prostitution. But at very same time court says that prostitution itself is not a criminal offence. According to the old definition prostitution was not an offence *per se*. It is very obvious that here the court uses the term prostitution in same old sense which was there before the amendment. Here in this case also we can very well arrive at a conclusion that even though the definition of prostitution and prostitute got changed the court still have the affinity or mind set towards the old definition of prostitute. This confusion would not have arisen if the legislators who brilliantly made conceptual changes to prostitution and prostitute showed the same brilliance in making changes accordingly to other provisions of the Act too.

If we take the case of *State v. Gaya*<sup>14</sup>, which was decided before the change in definition of prostitution and prostitute that is in 1960 the Bombay High Court held that PITA –*never intended that the women or girls used for such traffic should be liable to punishment.*” The Bombay High Court was very right in understanding the object behind enacting PITA.

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<sup>13</sup> *Sangeeta and Anr v. State* 1995 Cri. L.J 392.

<sup>14</sup> *State v. Gaya* 1960 Cri. L.J. 893 (Bom.), para.4



Now when we look in to the case of *Guria v. State*<sup>15</sup> which was decided by Honourable Supreme Court in 2009 we can see that the very same view point as expressed by judiciary in *State v. Gaya*<sup>16</sup> was echoed. The Supreme Court held that –It is unfortunate that the Investigating Officers and the Courts ordinarily fail to bear in mind a distinction between the rescued children including girls, on the one hand, and the persons who have been organizing such immoral traffic. This word of Supreme Court clearly implicates something that even after the drastic conceptual changes made to PITA there still exists a big issue with respect to victims of prostitution and prostitute in India.

***Gaurav Jain v. Union of India***

In *Gaurav Jain v. Union of India*<sup>17</sup> public spirited Advocate Gaurav Jain filed a writ petition before the Supreme Court of India based on an article "*A Red light trap: Society gives no chance to prostitutes' offspring*" in '*India Today*' dated July 11, to seek improvement of the plight of the unfortunate fallen women and their progeny. He had asked for establishing separate educational institutions for the children of the fallen women. After hearing all the State Governments and Union Territories which were then represented through their respective standing counsel, observed in 1989 in *Gaurav Jain vs. Union of India & ors.*<sup>18</sup> that "*segregating children of prostitutes by locating separate schools and providing separate hostels*" would not be in the interest of the children and the society at large and also directed that they "*should be*

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<sup>15</sup> *Guria v. State* Criminal Appeal No. 1373 2009 [Arising out of SLP (CrL) No. 2585 of 2006], para. 9

<sup>16</sup> *State v. Gaya* 1995 Cri. L.J 392.

<sup>17</sup> *Gaurav Jain v. Union of India* (1997)8 SCC 114

<sup>18</sup> *Gaurav Jain v. Union of India & ors.* 1990 Supp. SCC 709



*segregated from their mothers and be allowed to mingle with others and become a part of the society". The court by rejecting the prayer of petitioner had ordered that "Children of prostitutes should, however, not be permitted to leave in inferno and the undesirable surroundings of prostitute homes".*

Here also the court talks about children of victims of prostitution and court is addressing whether such children is needed to be put in separate schools and hostels and court orders that they should be surely be put into common pool along with other students if not they will be discriminated according to Art 14 of Indian Constitution and that will further create problems. But court committed the error by bracketing the children of victims of prostitution as children of prostitutes. From this it is evident that court is still with the same old notion of prostitution and prostitute.

This case was decided after the change in definition of prostitution. Here in this case the court and the petitioner is talking about children of victims of prostitution but uses the phrase *-children of prostitutes"* with the old notion of prostitute who hires her body for promiscuous sexual intercourse for money or in kind. If we construe by giving literal interpretation it will like rehabilitating and matter of education of children of pimps , brothel owners, keepers etc. But the court as per the new definition of prostitution meant children of victims of prostitution. This shows that even though the definition has changed the mind set or affinity of court towards the old concept of prostitution hasnot.

Court also constituted a Committee comprising S/Shri

Mahajan, R.K. Jain, Senior Advocates and others including M.N. Shroff, Advocate, as its Convenor for knowing into the correctness of the facts. Even the



committee which was set up was with the same old notion of prostitution and prostitute. The committee talks about rehabilitation of prostitutes which includes child prostitutes. The committee talks elaborately about the child prostitution and how can it be prohibited and be rehabilitated. Whether there is any child prostitutes...? If someone gives the answer for it a yes..then definitely it can be concluded that term prostitute and prostitution is understood in the old sense. The intention of neither the committee nor the court was obviously not to rehabilitate prostitutes as per the new definition. It was certainly to rehabilitate the victims of prostitution. So it is also clear that here prostitute and prostitution is used with the same notion as that of old definition of prostitution. The committee too considered prostitution as an act of women who offers her body for sexual intercourse for hire for money or kind and prostitutes as woman or girl who does prostitution. The court addressed many issueslike:

- What are the rights of the children of fallenwomen?
- Modules to segregate them from their mothers and others so as to give them protection, care and rehabilitation in the mainstream of the national life?
- What succour and sustenance can be provided to the victims of fleshtrade?

The court observes that victims are often poor, illiterate, ignorant sections of society and prostitute is being considered as an object rather than a human being. The also says that prostitute is also a human being. Here also the court is talking about the old prostitutes , but what is to be noted here is that the old prostitute is now the victims of prostitution.



Justice Ramaswamy while deciding the case also observed that :

*".....'Prostitution' means the sexual exploitation or abuse of persons for commercial purposes and the expression 'prostitute' shall be construed as it is defined under Section 2(f) of ITP Act. After the amendment to the ITP Act, 'prostitution' means sexual exploitation or abuse of person for commercial purpose.*

*Therefore, prostitution is not confined, as in the ITP Act, to offering of the body to a person for promiscuous sexual intercourse. Normally, the word 'prostitution' means an act of promiscuous sexual intercourse for hire or offer or agreement to perform an act of sexual intercourse or any unlawful sexual act for hire as was the connotation of the Act. It has been brought within its frame, by amendment, the act of a female and exploitation of her person by an act or process of exploitation for commercial purpose making use of or working up for exploitation of the person of the women taking unjust and unlawful advantage of trapped women for one's benefit or sexual intercourse. The word 'abuse' has a very wide meaning everything which is contrary to good order established by usage amounts to abuse. Physical or mental mal-treatment also is an abuse. An injury to genital organs in an attempt of sexual intercourse also amounts to sexual abuse. Any injury to private parts of a girl constitutes abuse under the JJ Act. 'Public place' means any place intended for use by, or accessible to the public and includes any public conveyance. It is not necessary that it must be public property. Even if it is a private property, it is*



*sufficient that the place is accessible to the public. It must be a place to which public, in fact, resorts or frequently.”*

The above extract from the judgment shows that though the judge in the starting says about the changes occurred to the definition of prostitution and prostitute thereby by way of amendment judge still catch holds in his mind the old notion of prostitution and prostitute.<sup>19</sup> The Judge here uses the words prostitution is not confined to offering of the body to a person for promiscuous sexual intercourse which is the old definition. So herein he says or try to say that prostitution now means hiring the body for promiscuous sexual intercourse for money or kind and also to its exploitation.<sup>20</sup> includes a The judge here is referring to definition of word ‘neglected juvenile’ in juvenile justice Act, 1986, which includes inter alia a juvenile who –lives in brothel or with a prostitute or frequently goes to any place used for the purpose of prostitution, or is found to associate with any prostitute or any other person who leads an immoral, drunken or deprived life Here also the definition is used with the same old notion of definition of prostitute.

In 1986 by way of amendment though PITA changed definition of prostitution and prostitute and brothel it came in to effect only on 1987. The Juvenile Justice Act 1986 refers to the same old definition of prostitution as the changed definition came in to effect only on 1987 and the parliament also committed a big mistake by not amending the Juvenile Justice Act 1986 accordingly which is clear from the definition of child in need of care and protection in Juvenile Justice

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<sup>19</sup>*Bholanath Tripathi v. State of Uttar Pradesh* 1990 Supp (SCC) 151 (cited in note 8)

<sup>20</sup>*Bholanath Tripathi v. State of Uttar Pradesh* 1990 Supp (SCC) 151 (cited in note 8)



Care and Protection Act,2000 wherein child who is living with a prostitute is absent.<sup>21</sup>

***SahyogMandal v. State ofGujarat***

In *SahyogMandal v. State of Gujarat*<sup>22</sup>the petitioner challenged the provisions of Sections 7(1)(b), 14 and 15 of the Immoral Traffic (Prevention) Act, 1956 saying that they violate the fundamental rights guaranteed under Articles 14, 19 and 21 of the Constitution of India. The petitions also challenged the notification dated 23.2.2000 issued by the Commissioner of Police under the provisions of Section 7(1)(b) of ITPA by which the areas within the jurisdiction of Chakla Bazaar Police Station, Surat were notified rendering carrying on prostitution in any premises within those areas as an offence. The petitions the alleged atrocities committed by the police on the women in Red Light Area (Chakla Bazar), , arresting them without following the procedure established by law. They were also forcibly evicted from their homes. Petitioners contented that the women engaged in sex work are entitled to right to privacy, and equal protection of law. The petitioner also sought a direction to be issued on the respondents to formulate a rehabilitation plan of a permanent nature which did not separate these women from their family members and which would be finalized after a thorough study and with their participation and consent. The High Court was stuck with the question that : *“Is prostitution a form of exploitation to be abolished or an occupation to be regulated?”* The Court held that the purpose of section 7 and 8 of PITA is to prohibit prostitution in public places and it not discriminatory or arbitrary and therefore do not violate right toequality

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<sup>21</sup> *BholanathTripathi v. State of Uttar Pradesh 1990 Supp (SCC) 151 (cited in note 8)*

<sup>22</sup> *SahyogMandal v. State of Gujarat [2004] 17 ILD 340 (Guj)*



guaranteed under Indian Constitution. It is also not violative of right to life guaranteed under Art 21 of Indian Constitution. The High Court ruled that the provisions of PITA call for identifying the victim-prostitutes, girls or other persons who are trafficked or exploited by pimps, procurers or brothel owners. If this objective is not achieved it will be like violation of human rights. The court held that it does not recognize as a fundamental prostitution as a fundamental right. Here also court uses the term prostitution in the old sense which is hiring body for promiscuous sexual intercourse for money or in kind. So by keeping this old notion of prostitution the court rules that court cannot recognize prostitution as a fundamental right. This shows that even though there was change in definition of prostitution the court still have the same mind set as that of the old definition of prostitute.

The Court also issued certain important directions in this case so as to regulate the power of police with regard to this issue. One such direction issued by the court was with respect to setting up of State Level Rehabilitation Committee. The State Level Rehabilitation Committee will take up the issue of effective supervision and control of the rehabilitation of the prostitutes operating in Chakla Bazaar area of Surat on priority basis.

This particular direction issued by the Court shows that the court still have the same old notion of prostitute. This is because if we construe the guideline by giving literal interpretation it direction will mean to address issue of rehabilitation of prostitutes which includes third parties like pimps, brothel owners, keepers as according to new definition. But what is the need to rehabilitate prostitutes?? According to new definition prostitutes are the ones who sexually



exploits or abuse a person for commercial purpose. Rehabilitation is needed for the victims of prostitution. So it is very clear that the intention of the court while issuing this particular guideline was to rehabilitate the victims of prostitution and not the prostitutes who is the real culprit.

Thus in very many cases Indian Judges uses the term „rehabilitation of prostitutes“, „forcing wife to prostitution“, „children of prostitutes“ „child prostitutes“ and a lot many other terms of like nature. This resulted in confusions and contradictions.... Which is mainly because of error from the part of legislature by confining the conceptual changes in PITA to prostitution and prostitute and by not extending it to the rest of the Act. The question automatically arise is that, Judiciary is sticking on to which definition of prostitution... ?? Is judiciary relying upon new definition which defines it as sexual exploitation or abuse of persons for commercial purposes..?? or Is Judiciary relying completely on to the old definition of prostitution, an act of hiring body by a woman or girl for promiscuous sexual intercourse for money or in kind, which is like an echo of society’s attitude towards prostitution....??

It can be said that even the judiciary has not addressed this issue or looked on to the irony that exists in PITA after the amendment in 1986, wherein the very concept and meaning of prostitution and prostitute got changed. Instead Judiciary has also added on to the confusions and contradictions which exists in PITA now.

From the analysis of above case laws delivered by Indian Courts it is very clear that though Judiciary talks much about change in definition of prostitution



and prostitute by way of amendment in 1986 judiciary still has in his mind the very old notion as definition of prostitute and prostitution.

Thus it can be said that even the judiciary has also not addressed the biggest error done by legislators who failed to amend the rest of the Immoral Traffic Prevention Act, 1956 in resonance with the change in definition of prostitution and prostitute.



## LANGUAGE OF WOMAN-A STUDY BASED ON ASSAMESE LANGUAGE

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### ABSTRACT:

Sociolinguistics is an important part of Linguistics. The term sociolinguistics means many things to many people, and of course no one has a patent on its definition. It is seen that there are differences in language between each people of a society. It is based on age, profession etc. The difference of using language is also based on gender. There are some differences between the language used by man and the language used by woman. Mainly, social system is the main fact that influenced in the language of woman.

**Kye-Words:** Society, Language, Woman.

### INTRODUCTION:

Sociolinguistics is an important part of Linguistics. The field of sociolinguistics is too large. Language and society both are replete to each other. The relation between language and society are discussed in Sociolinguistics. With the help of Sociolinguistics, we can get the variation of language, its discussion and description etc. The term sociolinguistics means many thing to many people, and of course no one has a patent on its definition.(Das, 2015:10)It is seen that there are differences in language between each people of a society. It is based on age, profession etc. The differences may be in selection of word, use of word, symptom of saying word or style of saying word etc. The difference of using language is also based on gender. There are some differences between the language used by man and the language used by woman. In this paper, we will try to discuss the language used by woman. The study will base on Assamese language.

### AIMS AND OBJECTIVES OF THE STUDY

- The aim of the study is to discuss the language used by woman with the help of Assamese language.
- It will also focus the difference of using language based on gender.

### METHODOLOGY

- The information related to the above study is collected through observation.
- The secondary data are collected from various published documents of the recent times including the subject related publications.



## LANGUAGE OF WOMAN

The Assamese society is a Patriarchal society. So there are some general conceptions on woman in this society. For these conceptions, the talking styles of woman are different from man. Women have a different way of speaking and produce a subordinate position in society. Woman experience linguistic in two ways; in the way they are taught and in the way general language use treats them. (Lakoff, 2004:39).

Woman has their own style of speaking. There are some general characteristics of the style of speaking of Language. Some of these are mentioned below-

- There are lexical hedges on fillers in woman's speaking style. Ex. You know, sort of etc.
- The use tag questions. Ex. You are doing that; are not you?
- The use sentence of empty adjectives. Ex. Devine, charming.
- They used hypercorrect grammar.
- They use super polite form of language.
- They generally avoid slang words.

Generally, woman precise colour terms more than man. A woman can say various name of a colour like parrot green, sea green, leaf green, light green, dark green, off white, snow white etc. Woman used to care about the interior side of a home, even educated and financially settled woman too. So they are perfect in choosing the colors also.

Woman speaks their words with the style of request. It seems that they need support. Ex. I am wearing this dress. May I? Some Sociolinguists say that women are more emotional and hesitating than man. So they used these styles of language. According to R W Fasold, '...greater use of this form by women could mean that women more often than men, are presenting themselves as unsure of their opinions and thereby as not really having opinions that count very much.'

There are some traditional prohibitions on woman in Assamese society. These are believed as the quality of a woman. Some of these are mentioned below-

- (a) Woman cannot speak loudly
- (b) Woman cannot laugh so much
- (c) The language of woman must be polite
- (d) Woman cannot use slang words
- (e) The speaking style pr language of woman must be polite etc (Pathak,2008:30)

There are some traditional popular practices also based on woman in Assamese society. Some of these are mentioned below-

- (a) *Noir xoman bobo kon Aair xoman hobo kon-* (No one can be like mother)
- (b) *Maak valehe Jiyek Jati-* (Like mother like daughter) etc.

There are some proverbs introduced traditionally in the name of Dak. These are known as "*Dakar Basan.*" With the help of these proverbs and popular practices we can know the social status of woman in a society.



It is seen that women always use the standard form of language more than man. It is only because of social difference. According to some sociolinguists, women are more careful in their social status. Some sociolinguists say that the main fact of difference of language based on gender is Taboo. Woman cannot use the taboo words easily in Assamese society and other societies also. It would appear, than that women have not universally accepted the position in the lower ranks, and that, out of awareness, and in a socially acceptable and non-punishable way, women are rebelling. (Fasold, 1984:55)

### CONCLUSION

From the above discussion, it is learnt that social difference is the main fact that influenced in the language of woman. Some traditional popular practices, customs and proverbs also influence in it. The Assamese society is a patriarchal society, so gender division is another factor which influence in the language or talking style of language.

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## THE EVOLUTION OF NOVEL CORONA VIRUS DISEASE (nCOVID-19) OUTBREAK: EPIDEMIOLOGY AND CONSEQUENCES

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### Abstract

The current outbreak of nCovid-19 in Wuhan City, Hubei Province of China, causes pneumonia with unknown etiology, have drawn the attention of international public health emergency concern, as it was previously experienced in the previous outbreak of SARS-CoV in 2002–2003 at Saudi Arabia and China respectively, and now 2019-nCoV. The emergence of nCovid-19 result in fatal respiratory and intestinal track infections in humans and animals, and are suspected to be originated from seafood market with wildlife trading that were assumed to be involved in the current occurrence of 2019-nCoV, and is the seventh member of the Coronaviridae to infect people due to absence of antiviral drug, nor vaccine yet to be develop. This review will focus on the epidemiological consequences of SARS-CoV-2, and to curtail the transmission means of the virus within Hospital, Family or other crowded environment that may result to consequences into fatal condition of; fever, cough, muscular soreness, or dyspnea and many other unknown symptoms to be identified, and highlight safety guidelines that will avoid further increase of the virus that may resulted to fatal consequences around the globe.

**Key words:** Coronavirus; nCovid-19, Consequences, Epidemiology

### Introduction

The recent emergence of nCovid-19 was originated Wuhan city, china and rapidly extend into 213 countries around the world with a total cases of four million four hundred and eighty five, six hundred and ninety eight (4,485,698) confirmed cases around the world as of 14th May, 2020. According to a research by (1), the current novel corona virus disease was caused by SARS-CoV-2, and now draw the global attention due to febrile outbreak in December, 2019 that cause pneumonia of unknown etiology but was confirmed to have an epidemiological link with seafood wholesale market where live birds are sold. Later, the issue was quickly reported to World Health Organization in late December, 2019 by the Chinese Health Authorities due to fear that the virus may be persistence into serious threat to public health concern (2). In view of that, a meeting was organized by WHO, in conjunction with Global Research for Infectious Disease Preparedness, for the purpose of identifying ways that accelerate, contribute and fund priority research to curtail the outbreak and prepare for the future outbreaks by inviting almost 400 top scientists in the world to met at Geneva Headquarter dated 11<sup>th</sup> to 12<sup>th</sup> February, 2020 to find the rationale behind the current



level of nCOVID-19 that give ascend to an eruption of viral pneumonia infection by nCovid-2019 (3) (4) (5). According to (6) observed that, most initial cases are cluster with some clinical history report by patients with fever, cough, difficulty in breathing, headache, sore throat, chest pain, diarrhea, nausea and vomiting are at high risk level of infection (2) (7). However, from the history show that two zoonotic corona viruses of SARS and MERS resulted in severe illness and death over the past 35 years of coronavirus replication (8). The virus belongs to the subfamily Coronavirinae, Coronaviridae, and order Nidovirales, and has single stranded, positive sense RNA and assume to have largest genome known to infect humans, and consist the following genera; Alpha, Beta, Gamma, and Delta coronavirus (9), (10). Similarly, the current occurrence of nCovid-19 with no antiviral drugs nor vaccines that resulted in several mortality rate, and incidence of some carriers with no symptoms, but traditional public health intervention measures shows a significant of less effective control measures of the epidemic potential of SARS (11) (12). Moreover, the recent outbreak were considered to be highly pathogenic considering the previous outbreak in 2002 and 2003 at Saudi Arabia and China, where most infected individual develop a sign of mild infections (13) (14). The successive isolation of the virus from the patients and molecular study show the pathogen is a novel coronavirus as identified by Committee of International Taxonomy of Viruses (15). The assessed novelty of virus publically named as nCoV-2019, but later was renamed by WHO as COVID-19 (16). However, a (18), highlighted that China implement public health measures and quarantined in many cities, due to economic consequences to curtail intense spread of the virus around the world, and control the recent epidemic by highlighting the significance of timely and appropriate decisions through activating human and material resources of serious global threat and consequences (19).

### **SARS-nCovid-19**

The recently identified 2019-Cov in Wuhan city, China, 2019 that resulted to an unknown pneumonia in the previous emergence of humans SARS-CoV in 2002 that resulted to a global pandemic, and lasted for good eight months as investigated, the virus were suspected to be originated from “wet markets” of animal sources in China with sign of fever, difficulty in breathing, fatigue and other related symptom (21)(22).

### **Diversity of Corona Virus**

Coronaviruses belong to Corona virinae subfamily in the family of Coronaviridae of order Nidovirales (23). On the basis of phylogenetic interaction and genomic structures, the subfamily consists of Alpha ( $\alpha$ ), Beta ( $\beta$ ), Gamma ( $\gamma$ ) and Delta ( $\delta$ ) coronavirus genera (24). The alpha Coronaviruses and betacoronavirus infect only mammals, and sometimes livestock (25). The Gamma and delta-Cov infect birds, and some infect mammals. Alpha coronavirus and deltacoronaviruses are responsible for respiratory illness and gastroenteritis for both human animals by the two pathogenic viruses of SARS and MERS- CoV, and stimulate the persistent severe infections in infants, young children and elderly people with underlying chronic condition (26).

### **Evolution/Origin of nCovid-19**

The evolution and origin of nCoV may be of zoonotic origin that are linked to the seafood market with wildlife trading, and also bats may likely be the expected host of



all present known virus in previous SARS and MERS potent disease of 2002–2003 with a dozen of civets mammals assumed to be a natural source of human infection (27) (28). Generally, the zoonotic spillover infections or epidemics in humans by the involvement of intermediate hosts, that create an additional complexity of analyzing multi host species of viruses (29). However, the virus epidemic had animal exposure before developing the symptoms in market place were also victims (30). Further investigation revealed that, the virus be transmitted to human by another animal host cannot directly infect humans, unless they undergo mutation and confirmed the wild animals were also involved in the current virus outbreak with an unknown etiology (28) (31). But the virus is yet to be identified as which species and under what incident it crossed the group barrier to infect humans from earlier early investigations that indicate that the virus can jumped from bats to human (32) (27) (33).

### **Epidemiology of nCovid-19**

The nCOVID-19 pandemic has expanded and exported into a growing number of countries in late 2019, from city of Wuhan, China, to other countries in the world (35). The first confirmed prevalence outside china identified and diagnosed on 13 of January, 2020 in Bangkok (36). However, there are significant misconception in the way of revealing the epidemiology and scientific aspects of the virus (37). Recently, as of 3 May 2020, 01:00 GMT+1, there are almost **3,357,205** cases, with **238,730** mortality rate in **215** countries around the globe (38). The virus generally be monitored in three phases; local exposure to wholesale wet meet market, speedy expansion and virus increase within hospitals, and rapid increase of cluster cases that account for 50–80% in Beijing and Shandong (39) (40). The emergence of nCOVID-19 is been considered to be limited infectious disease, with mild sign that can easily be improve in 1–2 week, and cause five different outcomes; asymptotically infected persons, mild, severe, critical and death in almost all research article and review report cases (41).

### **Viral Etiology**

Up till now, the recent research on nCovid-19, shows that the virus is of zoonotic origin, through Chinese horseshoe bats source with pangolins as the most likely to be a middle host (42) (43). The main infection source of nCOVID-19 are patients that develop pneumonia as a result of Respiratory droplet transmission, that serve as the main route of transmission, or through contact with infected person (44). Although, the spread means and source of virus and among people remain unknown, while the figure of cases increases especially due to human to human interaction (45). The SARS-CoV-2 however attack and destroy the lower respiratory tract of major human receptor spike (S) glycoprotein virus.

### **Clinical Symptom of nCovid--19**

The recent nCOVID-19 clinical manifestation yet to be completely identified due to frequent findings by researchers regarding the symptom from mild to severe, fever, cough, fatigue, pneumonia, dense dyspnea with also less common reported symptoms of headache and diarrhea and resulted to death (46) (47) (33). According to the guidelines published by current epidemiological studies of nCovid-19 through NHC recommended regarding the incubation phase to be within 3-7 days, and a maximum of 14 days with chance of breathing difficulties within or more than one week of infection (48).



### **Characteristics of nCovid-19**

The Coronaviruses are enveloped, non-segmented, positive sense single stranded RNA, with range of size between twenty six thousand to thirty seven thousand (26,000-37,000) base pair, and also the known largest virus genome among RNA, with genomic structure of 5' UTR replicase) and 3' UTR poly(A) tail, with an accessory genes interspersed surrounded by the structural genes of 3' prime end (49), (50).

### **The Risk factors of nCovid-19**

The risk and danger associated with nCOVID-19 depend on the nature and characteristics of the virus, and means of spreads within the society and result into illness due to severe complications of pneumonia that can resulted to the damage of heart, liver, or kidney as well as affecting the blood and immune system of other people and lead to renal, or multiple organ failure that may result in death (51). However, the absent of vaccine development, result in nonpharmaceutical interventions to overcome the most important response strategy to people with chronic health condition (46). Based on the observed epidemiological characteristics of nCovid-19 by European Union, that assumed everyone in the population is said to be susceptible, due to a risk factors that increase the inclination of rapid spreads of the virus, with an enormous public health, substantial fatal outcomes by economic and societal interruption as well as considering the risk of exposure to severe illness of nCovid-19 (52).

### **Risk exposure of nobel Covid-19**

The risk cases exposure of COVID-19 and instance of the public spread of the virus has been reported at elevated risk of coverage that depend on their location, those that are in frontline of infection include Healthcare workers, close contacts with infected persons, Travelers returning from an international trip are at level exposure, but depend on where they traveled (53).

### **Severe Illness Risk of nCovid-19**

The Epidemiological characteristics of severe illness of Covid-19 are most likely People at the age of sixty years and above or People with underlying chronic disease condition that live in a long-term nursing home within all ages, with history medical complications (54).

### **Pathological Characteristics**

The nCOVID-19 pathological characteristics show similar characteristics features with SARS and MERS corona virus (55). Recently, report indicate that, the first patient known to have died from SARS-CoV-2 infection through an autopsy of samples collected from lung and found that the pathological features of the result are related with Acute respiratory distress syndrome, as pneumocytes and hyaline was observed in the lung tissue (56).

### **Covid-19 Mode of Entrance**

The entrance of nCovid-19 are within the virion and host by delivering Nucleocapsid into the host cell that solely rely on their fusion envelope (57). The binding of protein to the receptor by means of endocytosis with fusion and endosomal compartment of spike glycoprotein that mediate the virus entry by primary determinant of cell pathogenesis that is responsible to receptor binding as well as mediating the virus entry into the host membranes by driven the conformational change of spike protein in modifying the



proteins that will direct the diversity and triggers the activity of the protein. Though, coronavirus entry mechanisms are complex due to the present different species and strains, the virus envelop fusion occur directly at the cell surface after binding with receptor and or endocytosis (58).

#### **Symptomatic Stage of Transmission**

The symptomatic stage of nCOVID-19 is a condition whereby an individual develop a sign that are compatible with virus infection transmission from person to person. The data published from recent virologic report provide an evidence of primarily virus transmission from symptomatic populace to non-symptomatic that in close contact due to respiratory droplets, direct contact or by contact with contaminated objects (59) (60). However, most symptoms emerge at an incubation period of 5.2 days from the onset stage, and death ranged 6 to 41 days with 14 days median with common symptom at onset period of virus illness, such as fever, cough, and fatigue, and other symptoms of sputum and headache (52) (47) (61) (62).

#### **Pre-symptomatic transmission/Incubation period of nCovid-19**

The incubation phase of COVID-19 between the time of disclosure to the time of infection during the period is termed as “pre-symptomatic period” (63). However, an infected persons may be contagious at their pre-symptomatic stage of virus transmission through the tracing efforts of confirmed clusters cases, with COVID-19 from 1 to 3 days before the symptom develop (64) (65).

#### **Asymptomatic Stage of transmission**

The virus transmission stage of an infected person who does not show any sign but was confirmed through laboratory test to be positive, and does not develop any symptoms. Though in some research article reports carried out in laboratory, confirmed some cases that are truly asymptomatic, and till date no documented asymptomatic transmission to be reported as part of contact tracing efforts in some countries (66).

#### **Consequences**

The existing physical research of the current virus pandemic within the people are bound to be long term implications in terms of socioeconomic and emotional impact due to rapid increase of fear and unease among people with uncertainty of the disease, attached with essential of socially disruptive of lockdown and quarantine, and may likely result in significant psychological and psychiatric disturbances with post traumatic stress disorder, and behavioral disorders (67).

#### **Susceptibility**

The Pregnant women are more susceptible of the virus, especially the SARS-CoV-2 as cited by many research article and review, considering the anatomical, reproductive endocrine and immune changes during pregnancy that show worse prognosis than non pregnant women, and were supported by many Epidemiological data that confirmed their susceptibility, morbidity, and mortality (68). Based on the statistical data obtained and result, clearly shows that pregnant women are at high risk to be infected with the viral diseases, which have been proved to be closely related to physiological changes in the respiratory, circulatory, secretory, and immune systems during pregnancy (69). However, an individuals with underlying chronic condition especially older people age of sixty years and above, have high transience rates of 50%. Similarly, children with



fewer outdoor activities that likely to contract the virus considering the fatality rate of SARS that ranges within 7% to 17%, from the aforementioned findings that children may likely be less susceptible with the virus than pregnant women and older age people with underlying chronic disease will also be high level of susceptibility (70).

#### **Antiviral Therapy**

The antiviral treatments is based on the administration of anti bacterial that avoid secondary infections and steroids that transform cytokine deregulation (71). Presently, there is no antiviral therapy for nCovid-19, but an attempt to study the in vitro susceptibility of various compounds with potentiality of anti-SARS activity are in process by developing The cytokine deregulation hypothesis first treatment protocols for SARS patients were recommended to administer a steroid in combination with ribavirin that will serve and modulate the exacerbated cytokine response, because the treatments of Nobel Coronaviruses disease infection remain ineffective (72), (73).

#### **Diversity of Pathogenesis**

The recent understanding of nCovid-19 pathogenesis infection is still yet to be fully identified for SARS symptoms of the virus that are associated with increasing number, rate fatalities in the epidemic region of China by National Health Commission, as reported the details of the first death range to 17 by 25 January, 2020, death cases increased to 56. However, percentage of nCOVID-19 reported cases to be two thousand six hundred and eighty four (2684) approximately 2.84% as of Jan 25, 2020 and the median age of the deaths to be 75 years that are attributed to the “common cold”, and sometimes result into severe infections in infants, young children and elderly people (74) (75).

#### **Safety Measures/Control**

The current virus has no effective therapy or vaccine to curtail the pandemic outbreak of the virus, safety measures by means of controlling the source of infection and develop early precautionary measures by isolation technique, supportive treatment and sensible publishing epidemic information regarding the epidemic virus to avoid unnecessary fear, as well as individual to develop personal hygiene by wearing fitted mask, ventilation and avoid congested area to ease CoVs infection (76). However, an extensive control transmission measures of the virus should also be established by controlling the current outbreak and susceptible populations of children, health practitioners, elderly people, public health officials and researchers who have interested in the 2019-nCoV research (2), (77). Also, a suspicious person who has a contact with infected person should be advised to be quarantine for good 14 days from the last day of contact with positive patient (78).

#### **Conclusion and Feature Perspective**

The pandemic potential of nCovid-19 remain a global public health threat to the entire world, Though an extensive measures are required to reduce association of person to person interaction infected with the virus and to control the further outbreak. The countries affected with previous epidemic virus battles with SARS and MERS-Cov outbreak have not gained enough experience till the current emergence of nCovid-19 that has received worldwide. In future a unique attention and efforts to protect or reduce



transmission should be strictly implemented, by providing safety guidelines around the world in general so as to curtail further excessive spread of the virus in future.

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## DETERMINANTS OF DEMAND FOR HIGHER EDUCATION IN MAJOR STATES

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### Abstract

Demand for higher education has been estimated at region or state or national level in foreign countries. There are hardly any specific studies on estimation of aggregate demand function on higher education in across all the state level in India. Earlier empirical studies on demand for higher education focused on factors that influenced college and university enrolment such as effect of changes in tuition, income and cost of education (price) etc. Only a few studies estimated aggregate demand function on higher education. The studies included Campbell Siegel (1967), Chang and Hsing (1996) and Yang (1998). To fulfill the gap, the main aim of the study was to identify the macro-economic determinants on demand for higher education in major states of India. To examine this objective, the study has adopted cross-sectional analysis during 1993-94, 1999-2000 2004-05 and 2005-06. To estimate the aggregate demand function for higher education, multiple regression method through Ordinary Least Square Method (OLS) was used. This study reveals that per capita income, availability of HE facilities and percentage of rural population either positively or negatively associated with demand for higher education in the model-1. As like, in the model-2 explicit that employment in public sector and literacy rates are influencing factors on demand for higher education in major states of India.

**Key words:** Major States, Demand For Higher Education, Determinants, Socio-Demographic Variables.

In present scenario, investment in higher education makes a vital contribution to accelerate the process and rate of economic growth, through increase in productivity. The rapid growth of higher education in many countries has transformed higher education from elite to mass, leading to increase in demand for higher education. We need to look at the Indian higher education system as it has been democratized. When compared to other countries, there is a large number of students from lower social-economic strata contributing to a sizeable proportion of total enrollment for higher education (Tilak, 2004).

India is one of the largest democratic countries in the world. It is the second highly populated country and possesses the third largest education system in the world in terms of number of students enrolling in schools. It also has been following democratic principles on education. It is the effect of constitutional provision given to education in general, from Directive Principles to Right to Education (RTE) Act. Consequently, the states also play a major role in the provision of education to the people. In this context,



State has to be responsible in providing education from elementary to higher education. It has been spending huge amounts for Universalisation of Elementary Education (UEE) to the ever-increasing 6-14 age-group population. Still, India has been unable to achieve the goal of Universalisation of Elementary Education. In the second stage too, questions of achieving Universal secondary education adds to the complexity of the problem. The state spends more on elementary education in every Annual budget. It is for this reason the state is unable to spend more on higher education. Consequently, it has been unable to meet social demand for higher education.

On the other hand, increasing social demand for higher education is fueled by a desire for higher education from large sections of people of India in the hope of attaining better quality of life and greater social equity. Even the poorest of the poor are now willing to make personal sacrifices to provide higher education to their children. Changing social attitudes like providing opportunities for girls to obtain the highest possible levels of education, to enable them to acquire respectable status in life has increased the demand for higher education. The growth of various development sectors such as agriculture, manufacturing and services will generate additional demand for competent human resources through the higher education system.

The demand for higher education is expected to rise significantly at least in the next two decades. Impact of public policy on school education leads to increase in high school enrollment and reduction in school dropout rate, and also among special population groups, like first generation learners, women, minorities, rural population and weaker sections (SC/ST), opting for higher education. The increasing social demand for higher education is fueled by a desire for higher education from large sections of people of India in the hope of attaining better quality of life and greater social equity. It is considered as a means of upward social mobility and greater economic security, especially from the first generation learners. Even the poorest of the poor are now willing to make personal sacrifices to provide higher education for their children.

Consequently, exponential growth in enrollment particularly during the new economic reform period raises the question of why rapid growth in aggregate demand. Pattern of growth in the enrollment for professional/technical courses raises the question of why preference is for technical courses at the individual choice level? At the same time, it analyses the variation and backwardness in accessing higher education from people of different regions, religions, social and income groups of the nation. This situation raises the questions about the determinants of demand for higher education at across all the major states in India. In addition, this study needs to look out for socio-demographic factors and such others influencing the demand for higher education at national level.

#### **Theoretical background and related literature**

According to human capital theory, people consider education as an investment. The investment is attractive when the benefits exceed the costs associated with the education programmes. The benefits are typically expressed in terms of earnings (wage premium) connected with the (level of education) training programme; whereas the costs include tuition fee payments and foregone labour market earnings (Shultz, 1961; Becker, 1975; Blaug, 1966; Bowen, 1977). This view, however, ignores any consumption value of schooling (Blaug, 1966). Individual students are presumed to be enrolling for higher

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education based on a rational educational calculus, or on an internal rate of return, equalising the costs and benefits of alternative investment (enrollment) options. Education possesses characteristics of both consumption and investment. It is useful to distinguish between consumption good and investment good. The consumption motive recognizes the fact that individuals find education useful in itself. Viewing education as such, a demand specification can be derived using standard neo-classical theory of consumer behaviour; the consumer chooses that bundle of goods and services that gives him the highest possible utility, given certain (budget) constraints. Being a consumption good the demand for higher education may vary with own price, prices of substitute commodities and income. In theory, as income and price of substitute education increases price and demand increases and vice-versa (Berger and Thomas Kostal, 2002). Income can take the form of disposable household income, own income and student loans. Demand should vary positively with income. The price of education must be viewed broadly and consists of two components, direct and indirect costs. Direct cost refers to tuition and other out-of pocket costs such as books and differential living cost. The indirect cost component in the price of education is more substantial as it entails the opportunity cost, i.e. the loss of income while going to school. Demand for education should vary negatively with these cost components. Empirical work based on this was frequently encountered in literature (Campbell and Siegel, 1967; Feldman and Hoenack, 1969 and Hoenack and Weiler, 1975).

The existing literature on the Economics of Education usually view education as an investment good, and individuals invest in higher education until the marginal rate of return from additional education is equal to market rate of interest. The rate of return is calculated from the expected costs and benefits of higher education and the market interest rate represent the cost of borrowing to finance educational investment (Galper and Dunn, 1969). The investment motive for higher education is based on human capital which assumes that (higher) education enables students to become more productive workers with a higher earning potential. Thus, cost of higher education (including current labour market conditions) and future earnings determine the demand for higher education. Thus, lower current costs and a higher stream of future earnings would be associated with higher levels of enrollment. Most of the empirical studies combine these two motives. Therefore, the demand for higher education is a function of direct and indirect cost/prices (tuition and foregone earnings), prices of substitute education, income and a proxy for higher earnings potential from obtaining a college education. Numerous empirical studies confirm the combined approach and support the theoretical implications; i.e. positive wealth effect and different direct versus indirect costs effect (Mark Blaug, 1966; Galper and Dunn, 1969; Psacharopolus, 1973 & 1981; Hopkins, 1974; Handa and Skolink, 1975, Jackson and Weathersby, 1975; Joseph Schaafsma, 1976:). More recent studies include Kodde and Ritzen, 1984; Schwartz (1985) and Paulsen and Pogue for Japan; Huijsmen *et al* (1986) of the Netherlands; and King (1986) for Puerto Rico. (Duchesne and Nonneman, 2000).

Demand function studies in higher education attempt to test the investment and consumption motives of higher education (Campbell and Siegel, 1967). They viewed that individual investment decisions in higher education on the basis of variables such as

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the expected cost, expected benefits and utility of educational points. In their models, financial attributes of educational institutions (e.g. tuition fee, financial aid, housing and cost of commuting) are frequently included. They found that demand for enrollment was positively associated with expected monetary and real yields from education, income and consumer price index and inversely associated with nominal and real cost of education.

Elchanan Cohn (1978) estimated demand for higher education in South Carolina, United States. The model employed explanatory variables such as educational attainment of adult population, overall rate of unemployment, rate of youth unemployment; population density, per capita income, proportion of Blacks in the population; distance, and average reading level of students. Hsing and Chang (1996) examined some of the determinants of enrollment at private colleges and universities between 1964-1991. They defined demand for higher education as a function of tuition, and other costs, income, wage rate and unemployment rate. It was observed that increase in unemployment rates leads to an increase in enrollment for higher education while higher wage rates cause enrollment to decline. Yung (1998) estimated the demand for higher education for the United States during the period 1955-1965. The conventional model of demand for higher education is a function which consists of tuition, income, wage rate and unemployment.

Hopkins and Thomas (1974) used their demand function, expenditure per enrollment as one of the explanatory variables. They found that there was a significant negative association between public expenditure and private enrollment. This study used the public expenditure per student based on public subsidy and expected positive relationship between public expenditure per student and enrollment. Income is an important factor which can influence the demand for higher education when education has a consumptive value. An alternative interpretation is that credit market problems are alleviated when the average income increases (Canton and Jong, 2004). These two views predict that a positive correlation exists between university enrollment and per capita income.

Unemployment is expected to influence income and employment expectation of students as well as opportunity costs of attending university. Since unemployment rates for upper (higher) secondary young graduates is very high, they have lower chances of getting a job and, therefore, opportunity cost of attending universities will be lower as well. Unemployment increases uncertainty, which implies an increase in the demand for higher education (Albert, 2000; Nicholas, 1989; Chang and Hsing, 1996; and Yang; 1998). Expected employment motivates one to go for higher education as it gives security and higher earnings. The higher unemployment rate of university graduates lowers the level of demand for university education (Nicholas, 1989). Many demand studies on education have not considered supply (Muller and Rockerbie, 2004) and several demand functions on higher education operated with supply constraint. This study argues that greater facilities for higher education increases enrollment demand.

Elchanan Cohn (1978) used independent variables such as educational attainment of adult population, density of population and proportion of black population; it gives a notion about using the socio-demographic variables in demand models. The study has



employed these socio-demographic variables such as people living below poverty line, literacy rate of population, proportion of rural and deprived (SC/ST) population in the aggregate demand function for higher education.

### Methodology

The major objective of the study was to identify the macro-economic determinants on demand for higher education in major states in India. To examine this objective, important factors used to understand demand determinants are based on studies by Campbell and Seigel (1967), Cohn (1978), Hsing and Chang (1996), Yung (1998) and Buss, Parker and Rivenburg (2003). For fitting models, cross-section data were used for estimating aggregate demand for higher education.

Aggregate demand for higher education is based on a cross section of major states and is estimated for three time periods as data from various rounds of National Sample Survey by NSSO is available only for 1993-94, 1999-2000, 2004-05 and 2005-06. Cross-sectional analysis data were collected for major states of Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. Secondary data were collected from UGC Annual Reports, Selected Education Statistics (SES), Analysis of Budget Expenditure on Education, Indian Economic Survey, Manpower Profile, Selected socio-economic Indicators – India, Statistics of Indian Economy by Reserve Bank of India (RBI), Census reports and various rounds of National Sample Survey by National Sample Survey Organisation (NSSO). These three models used Ordinary Least Square (OLS) in multivariate regression. The basic framework of the model is

### Model -1

GER= f (Macro-economic variables, Socio-demographic variables and availability of higher education facilities)

### Model -2

Log Enroll = f (Macro-economic variables, Socio-demographic variables and availability of higher education facilities)

### General Specification of the Model (Model-1& Model-2)

In the present study, linear regression equation is estimated for major states Model-1 and Model- 2.

In the present study, linear regression equation is estimated for India

$$Y = a + \beta_1 \text{peps} + \beta_2 \text{Pcnsdp} + \beta_3 \text{Peremppus} + \beta_4 \text{heipl} + \beta_5 \text{Perbpl} + \beta_6 \text{Perlrpop} + \beta_7 \text{Perrpop} + \beta_8 \text{Perscst} + U$$

Where Y= GER / Log Enrollment (Model-1 & 2)

a	=	Constant term
Peps	=	Public expenditure per student
Pcnsdp	=	Per capita Net State domestic Product
Peremppus	=	Employment in organized public sector
Heipl	=	Availability of HE facilities measured in terms of Institutions per lakh eligible population



Perbpl	=	Below poverty line measured as % of population living below poverty line
Perlrpop	=	Literacy rates
Perrpop	=	Rural population as a percentage of total population
Perscst	=	population (SC/ST) as percentage of total population
U	=	Error term

**Aggregate Demand Function for Major States**

The study has also taken up the cross-sectional data for estimating demand function of higher education in India derived from major states of India in model-1 and model-2. The study has taken four different time periods such as 1993-94, 1999-2000, 2004-05 and 2005-06 respectively. The data collected for 15 major states in India include Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. In this way, this model got 60 observations of pooled Cross-sectional data. The cross-sectional data are observed at a single point of time for several individuals, countries, states, etc.

$$x_i, i = 1; : : : ; N. \dots\dots\dots(1)$$

The study interests lies in modeling the distinction of single individuals, and heterogeneity across individuals. Hence, the study used a Pooled OLS method. Pooling data refers to two or more independent data of the same type. Observations are viewed as repeated measures at each point of time. So parameters can be estimated with higher precision due to an increase. The main feature of pooling data is that it takes heterogeneity into account; get individual specific estimates, to understand the dynamics of change and to minimize bias due to aggregation. (See Appendix Table: 2. Summary statistics of the pooled cross-section data)

It treats all observation as equivalent and OLS method of estimation follows as usual.

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + u_{it} \dots\dots\dots(2)$$

In this case the error term captures "everything". It has ignored time and space.

In model-1, Gross enrollment ratio is used as dependent variable along with a set of explanatory variables. Here, per capita net state domestic product is used as income variable. In addition, demographic variables such as percentage of rural population and SC/ST population are used in the model.

**Model - 1: Demand Function for Major States (4 periods)**

In this model, Gross enrollment ratio (GER) is used as dependent variable with a set of explanatory variables such as public expenditure per student, per capita income, employment in public sector, availability of higher education facilities, percentage of people lying below poverty line and literacy rates, percentage of rural and SC/ST population for estimating demand function of higher education of major states in India.



The estimated equation derived from pooled cross-section analysis of major states for the year 1993-94, 1999-00, 2004-05 and 2005-06 are given below:

$$\begin{aligned}
 Y = & 5.287834 - 0.00000730\text{Peps} + 0.00203\text{Pcnsdp}^* - 0.005732\text{Emppus} + 1.14236\text{Heispl}^* \\
 & (2.87) \quad (-0.77) \quad (7.48) \quad (-0.84) \quad (4.22) \\
 & + 0.0092847\text{Perbpl} - 0.0070677\text{Lirpop} - 0.0277766\text{Perrpop}^{**} + 0.0017274\text{Percst} \\
 & (0.90) \quad (-0.36) \quad (-2.00) \quad (0.09)
 \end{aligned}$$

$R^2 = 0.8038$ ,  $F=32.88$ , No. of Obs. = 60 (15 States during 4 periods)

This fitted pooled OLS method of model-1 & 2 is test for multi-collinearity and VIF test (See Appendix: *Diagnostics of Pooled OLS Method for Model-1*).

The co-efficients associated with per capita income (*Pcnsdp*) and availability of higher education facilities (*Heispl*) was found to be positive and significant at 1 per cent level. Co-efficient associated with rural population showed expected sign (negative) and significant at 5 per cent level, whereas coefficients of other variables such as public expenditure per student (*Peps*), employment (*Emppus*), below poverty line (*Perbpl*), and literacy rates (*lirpop*) were not significant even at 10 per cent level.

Let us explain the variables which were found to be significant in the regression. Availability of higher education facilities had positive co-efficient and significance at 1 per cent level. It shows that if availability of higher education institutions per 1 lakh of population in 18-23 years age group increases by one, then, Gross enrollment ratio of higher education goes up by 1.4.

With regard to increase in per capita income it is understood that 0.00203 unit increase in the gross enrollment ratio in per cent terms is caused by one unit (Rs.) increase in per capita income of all the states. In other words, if per capita income goes up by 10000 rupees, it will increase higher education gross enrolment ratio by 2.03 units.

Rural population expected sign (negative) and significant at 5 per cent level. The falling proportion of rural population to total population is seen to raise the demand for higher education. One unit fall in rural population in terms of proportion leads to an increase in one unit demand for higher education. In the era of economic reform change it has been observed that industrialization has increased the pace of urbanization. The falling proportion of rural population is an index of urbanization. This has caused greater demand for higher education. Here, it may be observed that the three variables namely, availability of higher education facilities, per capita income and rural population are also significant explanatory variables in explaining demand for higher education for major states in model -1.

#### Model - 2 Demand Function for Major States (4 periods)

In this model-2, Log enrollment was used as dependent variable with same set of explanatory variables such as public expenditure per student, per capita income, employment in public sector, availability of higher education facilities, percentage of people lying below poverty line and literacy rates, percentage of rural and SC/ST population for estimating demand function of higher education of major states in India. The estimated equation derived from pooled cross-section analysis of major states for the year 1993-94, 1999-2000, 2004-05 and 2005-06 are given below.



$$Y = 6.17541(17.25) - 0.000000141(0.00) \text{Peps} + 0.000111(1.58) \text{Pcnsdp} + 0.002720(2.22) \text{Emppus}^{**} + 0.001089(0.18) \text{Heisl}$$

$$-0.0011682(0.47) \text{Perbpl} - 0.0070469(1.77) \text{Lirpop}^{***} - 0.0016391(0.46) \text{Perrpop} - 0.0062205(1.42) \text{Perscst}$$

$R^2 = 0.2194$ ,  $F = 0.1294$ , No. of Obs. = 60 (15 States during 4 periods)

The linear regression shows that employment in public sector (*Emppus*) and literacy rates are influencing factors on demand for higher education in major states. The coefficient associated with employment showed expected sign (positive) and significant at 5 per cent level. On the other hand, the coefficient of literacy rates showed unexpected sign (negative) and significant at 10 per cent level. Other variables like public expenditure, per capita income, availability of higher education facilities, below poverty line, percentage of rural and SC/ST population were not significant even at 10 per cent level. After running the regression, the fitted pooled OLS method of model 1 is test for multicollinearity and VIF test (See Appendix: *Diagnostics of the Cross Sectional Data*). Employment is one of the most influencing factors on demand for higher education. People prefer higher education to get job security and higher earnings. It is predicted in the linear regression that employment is positively associated with enrollment and is significant at 5 per cent level. It shows that 1 unit of increase in employment in public sector, increases the enrollment by .0027 units. In other words, if increase in employment in public sector is one thousand, it leads to an increase in enrollment by 2.72 per cent. This means that increase in employment opportunity in public sector, increases the demand for higher education due to security of job and higher earnings. Literacy rate determines the education and health status of any society. In this regression model, literacy rate was included as one of the explanatory variables. Literacy rates expected to show a positive sign, showed a negative effect with 10 per cent level of significance. It is interesting to observe that people are aware of the importance of higher education. They are willing to provide higher education to their children who may lead to increase in demand for higher education whether they are literate or illiterate. Here, it may be observed that public expenditure is positively associated with enrollment and significant with variables thus explaining demand for higher education of major states in model- 2.

### CONCLUSION

The study concludes that to examine the determinants of demand for higher education of Indian major states for using cross-sectional analysis data for the period of 1993-94, 1999-2000, 2004-05 and 2005-06. Aggregate demand function of major states in model -1 explicit that availability of higher education facilities, per capita income and literacy level are also significant explanatory variables associated with enrollment at across all major states in India. As like, model-2 explicit that employment in public sector and literacy rates are influencing factors on demand for higher education in major states. The study has been used different dependent variable in the model -1 and 2 with set of



explanatory variables. The study also used appropriate statistical test before fitting the model. These two models are explained the demand function for major states by influencing the significant explanatory variables which might be positively or negatively significant. We have need to decide which one is the best fittest model for estimating demand function of major states for further research.

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**APPENDIX**

**Demand for Higher Education of Major States (Model-1 & Model-2)**

**Summary statistics of the pooled cross-section data for demand function of major states**

Variable	Obs	Mean	Std. Dev.	Min	Max
States	60	8	4.356954	1	15
Year	60	1050.25	962.3053	93	2005
heer	60	523422.7	341497	98749	1506702
logenroll	60	5.632167	0.2835495	4.99	6.18
ger	60	7.121833	2.569971	1.41	12.65
peps	60	10955.28	12414.58	584	98203
pcndsdp	60	12346.17	8513.115	1019	30690
empus	60	26.508	26.72545	4.06	86
heispl	60	12.00183	6.575814	1.4	30.9
prbpl	60	26.05017	15.47011	3.61	80.37
prlit	60	66.06867	11.08633	41	92.27
rural	60	70.80533	11.87558	38.38	90
scst	60	24.59783	8.950336	8.1	52.7

**Model -1: Diagnostics of Pooled OLS Method**

**Cameron & Trivedi's decomposition of IM-test**

Source	Chi2	df	p
Heteroskedasticity	40.95	44	0.6032
Skewness	8.89	8	0.3519
Kurtosis	0.12	1	0.7335
<b>Total</b>	49.95	53	0.5936

**Breusch-Pagan / Cook-Weisberg test for heteroskedasticity**

H0: Constant Variance

Variables: fitted values of ger

Chi2 (1) = 2.70

Prob > Chi2 = 0.1000

Like model 1, though Chi-square value is small yet statistically not significant. So we estimated robust Standard Error.



**Test of Multi-collinearity –VIF Test**

Variable	VIF	1/VIF
peps	1.12	0.895111
pcndsdp	2.55	0.391501
empt	1.29	0.777167
heispl	1.52	0.655769
prbpl	1.38	0.725949
prlit	2.48	0.403228
rural	1.3	0.766289
Scst	1.3	0.769664
<b>Mean VIF</b>	<b>1.62</b>	

With mean value of VIF, 1.62, there is no problem of multicollinearity with regard to pooled OLS method.

**Model -2 Diagnostics of Pooled OLS Method**

After running the linear regression, multicollinearity and heteroskedasticity using VIF test and Cameron & Trivedi decomposition of IM- test was checked.

**Cameron & Trivedi’s decomposition of IM-test**

Source	Chi2	df	p
Heteroskedasticity	40.70	44	0.2568
Skewness	3.39	8	0.9077
Kurtosis	2.62	1	0.1054
<b>Total</b>	<b>55.71</b>	<b>53</b>	<b>0.3733</b>

**Breusch-Pagan / Cook-Weisberg test for heteroskedasticity**

H0: Constant Variance

Variables: fitted values of log enroll

Chi2 (1) = 0.21

Prob > Chi2 = 0.6486

Low chi-square but not statistically significant and hence, we have go to robust SE.



**Test of Multicollinearity - VIF Test**

Variable	VIF	1/VIF
peps	1.12	0.391501
pcndsdp	2.55	0.895111
empt	1.29	0.77167
heispl	1.52	0.655769
prbpl	1.38	0.725949
prlit	2.48	0.403228
rural	1.3	0.766289
Scst	1.3	0.769664
<b>Mean VIF</b>	<b>1.62</b>	

With mean value of VIF, 1.62, there is no problem of multicollinearity with regard to pooled OLS method.



**NEED OF ETHICAL VALUES AND PROFESSIONAL ETHICS IN TEACHING  
PROFESSION: A STUDY**

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**Abstract**

Today Ethics is one of the most concerning issues. The moral value of people is gradually degrading with passage of time and development of society. In order to fulfill their personal requirements people are ready to indulge themselves in any kinds of unethical practices. Although ethical and moral character of a child is largely influenced by his or her family but the teacher's role cannot be denied. A teacher can raise the morality of a student by encoring the ethical practices which help them to develop an in depth knowledge and awareness of their own and other cultures. In this paper an attempt has been made to focus on the concept of ethics and its relation with the teaching profession and finally a code of ethics for teachers in professional education has been recommended.

**Keywords:** - Ethics, Unethical Practices, Morality, Code Of Ethics.

**1. Introduction**

The word ethics has been derived from Greek word 'ethikos' which means ones moral character. Ethics is a part of Philosophy which deals with systemizing, defending and recommending the concept of right and wrong conduct. It helps the people to understand what is wrong and what is right. If anyone has proper knowledge of good and bad then they could control his or her activity within the moral boundary. Ethics is universally accepted. It is applicable everywhere whether incase of personnel life, professional life, business trade and commerce. Ethical behavior is the way a living creature acts and their behavior explains about their morality. The tradition education system was different from the modern system as in traditional education more emphasis was given mainly to the educational values while in modern education these values does not find any place. At present educational institutions are now transformed into a commercial business houses which has been established for earning profit not for value enrichment in the field of education. People are also ready to pay any amount in order to get better education for their siblings. Teaching is a noble profession where teachers provide selfless service to the people of society so that students could enhance their knowledge, ability and establish themselves in life but due to commercialization of education system ethical values are not getting much importance in these commercial educational organizations as main objective of these organization is to earn profit not enrich values. People who are directly or indirectly engaged in teaching profession should have to maintain high standard of professional ethics or high moral value in order to discharge his or her duties and responsibility properly. They have to set an



example in society by discharging his duty honestly in any adverse condition so that people of society could trust them and student could want be like him.

Professional ethics is need of present time as many educational institutions are not getting teacher having proper knowledge of professional ethics. Now as days despite of having all kinds of educational degrees, extra qualifications, subject knowledge, professional ethics are not found in the people who wanted to be teacher. Since teaching is not just about sharing knowledge of subject-matter with the students, it is just beyond that. Teacher plays a significant role not only in educating the people society but also give stress in bringing out the potentialities form the learners and nurture it accordingly and provide new talent to the society. Teaching is regarded as noble profession as it contributes in nation building by creating good quality human resources, responsible citizens, socialized individual and creative personality. Human resource is the best resource of any nation as it has capability to develop a great nation by their creativity and endless efforts. India is the only nation where more than 65 per cent of total population is of below the age of 35, which mean India is the country of young people and it has potential to become super power. Igniting the mind of young people and guiding them to the right direction is the responsibility of the teachers'. Hence this profession requires a lot of commitment, dedication and sincerity towards their institution and learners. So, if they do not have the knowledge of profession ethics, it will become a barrier in the development of institution, education system, learners, society and nation as a whole and ultimately it will affects the overall performance of the student as well as nation.

The profession code of ethics provides some framework of guidelines so that a professional could conduct their work with commitment, full dedication, sincerity, honesty with integrity. A professional has to perform their duty as per the ethical code of conduct to get best result otherwise problem may arise in achievement of core objective of the profession. The professional ethics deal with principles, values that professional implemented to create a conducive atmosphere in the workplace. Professional knowledge and skills is a key element of success that every profession should acquire to do their services with determination and full commitment. Every professional has certain aim and objectives and in order to achieve those objective the professional apply those acquired code of professional ethics. Professional code of ethics helps a professional to complete their work very easily without any obstacle.

The professional code of ethics that has been developed for the teachers are purposely protects the rights of students. It becomes very important for the teachers to understand their work ethics and values before entering in teaching profession. As a teacher, they have huge role to play in the entire teaching learning process. They should be active in educational process and encourage and reinforce the students be converted into active learner by using different strategies and techniques. It is also important for the teachers to understand the individual differences, intellectual level, interest and attitudes of the learner so that teaching could be done as per their level of understanding. Also they could put more emphasis on providing freedom to the student so that they could express their problems without any hesitation and fear. The professional code of ethics play most important role in developing personality and behavior of the teachers. If teachers

apply all those code of ethics in the teaching profession, undoubtedly it will develop the educational institutions, society, community and nation as a whole.



## 2. Necessity of Professional ethics in teaching profession:

Educational institutions are considered as the temple of knowledge which play vital role in bringing development in the society by sharing knowledge among the people of society. The teachers are the key elements of the education system. Without them the whole education system cannot function properly and teaching and learning process hamper. The teachers' plays significant role in the educational process and their selfless service they can bring desired changes in the behavior of the students. Students are the future of any nation and it the teacher who can guide their activities towards right direction. It is the teacher who understands the latent potential of a student and brings them out and makes them realize the inner strength and encourage them to achieve everything by their endless efforts. A teacher can fulfill all the aims and objectives by applying his ability, teaching aptitude, content knowledge, pedagogy and most important professional ethics. Some important people already states that the teachers should be unbiased while teaching and evaluating students. Buber (1970) suggests that teacher –student relationships ought to be characterized by a principle of reciprocity. Since, communication is the key element in the teaching learning process. Teachers must put emphasis on creating respectful relationship with students.

In absence of professional ethics in teaching profession severe problem may arise and that become an obstacle on way development of students. Teachers act role model, source of inspiration, and act as motivator students. They have the capability to develop leadership quality among the students. In most of the cases it has been found that student always wanted to be like their favorite teacher and for that they try to follow the footprints left by their favorite teachers. A teacher must have good behavior and positive attitude towards everything related to their profession and students. One of the important roles of teacher is to solve real life problems, issues and barriers of the



students that come across during the teaching learning process. It has been already mentioned earlier that a teacher should proper knowledge of professional ethics. If they fails to understand and implement it, then they might not be satisfied with their profession and thus, it will hamper the performance of the students. In order to continue this development process society needs well-trained teachers.

The teachers must follow code of profession ethics and values to discharge their duty and responsibility successfully.

Important code of professional ethics needed for a teacher to conducting teaching and learning process more efficiently and effectively.

- A teacher should always keep themselves update as per the need of present environment.
- A teacher should have ability to adapt themselves in any environment.
- The teacher should always be honest towards his or her profession.
- The teacher should be unbiased in any situation especially during the evaluation of progress of the students.
- The teacher should respect all students equally irrespective of their cast, creed, religion, socio economy status, gender, and colour.
- The teacher should try to develop a good respectful relationship with the students so student can easily trust their teacher and share their problem without any hesitation.
- Teacher should communicate with care and affection with the students.
- Teacher must act wisely in all kind of adverse situation.
- Teacher should always keep themselves away from any kinds of conflicts and controversial issues.
- Teacher should always keep it in his or her mind that he or she has to set an example and so act accordingly.
- The vision and mission of the teachers should be clear in all respect so that they could control their activity towards achievement their goal.
- A teacher should provide all kinds of opportunity to students to excel in all aspects.
- A teacher should always remain active in teaching and learning process.

### 3. Conclusion

It is the duty and responsibility of teachers at all level that they should put emphasis on imparting quality education to each section of the society irrespective of their cast, class, religion. Most importantly the main duty of a teacher is to bring optimum development in each and every section of the society without any biasness towards a particular cast, group, class, or religion. Teacher should have equal respect for all group of society. Teachers should try to develop professional ethics within them so that they could perform their duty very honestly. The teachers should take the responsibility in his shoulder to take the teaching profession to the highest peak by performing their duty very efficiently and their endless efforts. Therefore, for successful teaching, the knowledge of professional ethics and its implementation is very essential for teachers.



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## EFFECTS OF ADVERTISING ON COLLEGE YOUTH FOR BUYING TWO-WHEELERS: A CASE STUDY OF BELAGAVI CITY, KARNATAKA

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### Abstract:

The Indian advertising industry has grown a rate of 9.4% over 2018 to reach 68.475 crore by the end of 2019. The industry will grow by 10.9% to reach 75.952 crore by the end of 2020. It is expected to grow at 11.38% CAGR to reach a market size of 1,33,921 crore by 2025. Advertising has become a potent tool of marketing to influence the audiences by informing or reminding them about the existence of the product in the market and persuade them to make the buying decision. Considering two-wheelers, the top players in the market are the brands which incurred the highest advertising expenses. The study focuses on finding out the effects of advertising among the college youth for buying two-wheelers. The study has found that advertising has positive effects among the youth and even influence them to make the buying decision. Moreover, television is considered to be the most preferred media for advertising two-wheelers.

**Key words:** Advertising Effects, Youth, Media, Two-wheelers.

### 1. Introduction

India is a growing economy, providing huge opportunities for the growth of various industries. Though the global media and entertainment industry is showing slow growth rate in 2017, India is expected to be one of the opportunistic markets to show rising trends against the global trend. The advertising industry is one of the most important sectors of the media and entertainment industry. Indian government provides remarkable support to the advertising industry. India is the 2nd fastest growing advertising market in Asia (Goldstein Research, 2019). The industry will grow by 10.9% to reach 75.952 crore by the end of 2020. It is expected to grow at 11.38% CAGR to reach a market size of 1,33,921 crore by 2025.

The concept of advertising is of prime importance in marketing. Of all the marketing weapons, advertising is renowned for its long-lasting impact on viewer's mind, as its exposure is much broader (Katke, 2007). The present economy is characterized by excessive specialization, mass production and competition (Costa, 2012). All these have led to increase the importance of advertising in the modern and



international market scenario. In order to survive in such a stiff competing business world, one has to grab the consumer's attention by way of influencing their awareness, attitude and buying behavior through advertisements. An advertiser's primary mission is to inform and persuade the prospective customers. Advertising provides information about the product, its availability along with the price and persuades the prospective customers to make the buying decision.

The word "*Advertising*" has been derived from Latin word "*Ad vertere*" which means "*to turn toward*". A standard definition has been proposed by Philip Kotler which says "any paid form of non-personal presentation and promotion of ideas, goods or services by an identified sponsor." Advertising enables the consumers to compare various alternatives available in the market and helps them in exercising their right of free choice in choosing the products and services available. Thus, popularization of products and services is the basic aim of advertising (Ramaswami and Namakumari, 2004).

Advertising through all mediums influences audiences, but television is one of the strongest medium of advertising and due to its mass reach: it can influence not only the individual's attitude, behavior, life style, exposure and in the long run, even the culture of the country (Latif and Abideen, 2011).

Indian Print media contributes a significant portion to the total advertising revenue, accounting for almost 41.2 per cent, whereas TV contributes 38.2 per cent, and digital contributes 11 per cent of the total revenue. Outdoor, Radio and Cinema make up the balance 10 per cent. India's digital advertisement market is expected to grow at a compound annual growth rate (CAGR) of 33.5 per cent to cross the Rs 25,500 crore (US\$ 3.8 billion) mark by 2020. The Internet's share in total advertising revenue is anticipated to grow twofold from eight per cent in 2013 to 16 per cent in 2018. Online advertising, which was estimated at Rs 2,900 crore (US\$ 435 million) in 2013, could jump threefold to Rs 10,000 crore (US\$ 1.5 billion) in five years, increasing at a compound annual rate of 28 per cent (Media Reports, 2019).

## 2. Review of Literature

The Indian advertising industry has evolved from being a small-scaled business to a full-fledged industry. The advertising industry is projected to be the second fastest growing advertising market in Asia after China. Advertisement is one of the major tools that all business firms use for persuasive communication and its effectiveness depends on the extent to which the advertising message is received and accepted by the target audience (Singh and Kaur, 2011).

Advertiser's primary objective is to reach the prospective customers and influence their awareness, attitudes and buying behavior. They spend a lot of money to keep individuals (markets) interested in their products. To succeed, they need to understand what makes potential customers behave the way they do (Abideen and Saleem, 2011). This involves the study of consumer behavior: the mental and emotional process and the physical activities of people who purchase and use goods and services



to satisfy particular needs and wants (Arens, 1996). O'Guin and Faber (1989) examined that once buying behavior is developed, the individual face a great difficulty in controlling buying even after its detrimental effects are recognized.

As a promotional strategy, advertiser provides a major tool in creating product awareness and condition the mind of a potential customer to take final purchase (Ayanwaleet *al.*, 2005). El-Omari (1998) stated that many organizations relate their success with creative advertising campaigns. Reddy (2006) explained that the awareness of Hero Honda motor bike has been highly influenced by advertisements. Bashir and Malik (2010) state that advertisement persuade the consumer to purchase at least once in a lifetime and moreover, consumers considered advertisement as a reliable source of knowledge as compared to the others such as friends, neighbor and reference group opinion.

Moreover, the advertisement appeal and its effectiveness are positively related. Abideen and Saleem(2011) in their study observed that people purchased those brands with which they are emotionally attached to it. In their study they had investigated relationship between independent variables which are environmental response and emotional response with attitudinal and behavioral aspect of consumer buying behavior.

They conclude that consumer purchase products by emotional response rather than environmental responds which are created through advertisement as audio, video and text form. Kotwal et al (2008) felt that television and advertising together present a lethal combination and has become an integral part of modern society. Nagar (2009) explained that television is a better medium compared to the web in getting viewer's attention and Web are less effective in changing attitudes of the viewer.

### **3. Objectives of the Study**

The present study aims to achieve the following objectives:

- To study the most preferred media for advertising of two-wheelers among the college youth
- To study the effects of advertising on college youth segment
- To explore the form of ads which creates greater impact upon the buying behavior of the college youth

### **4. Significance and Scope of the Study**

This study was conducted to find the effects of advertising on buying behavior of college youth with reference to their two-wheelers. Advertisement is in everywhere in our life. Television, billboards, radio, magazines, web and newspaper are the most common mediums through which advertisement reach us. In order to use different strategies to influence their consumer buying behavior, advertisers and marketers are more concerned to know the consumers buying patterns as well as their motives.

Two-wheelers have become a more of fashion statement for the youth apart from its utility purpose as a means of transport. Advertisements of two-wheelers are more concerned about depicting the body design, mileage, performance and so on.



Therefore, it is important for the advertisers to know the elements of good advertisement to make it more influencing and effective for consumer’s psyche.

### 5.Methodology

The descriptive research design was applied for the study. The study was based upon the primary survey and primary data has been collected from 250 respondents with the help of structured questionnaire. In the study, five under graduate Colleges in Belagavi city were considered on the basis of convenience sampling method. Presently, 13 under graduate colleges located in different location of the city are affiliated under Rani Channamma University, Belagavi. A college representing each zone of the city i.e., North and South were selected based on convenience sampling. A sample size of 50 college youth who owns as well as drives a two-wheeler vehicle from each of the selected college (total 250) were considered for the present study. Simple random sampling method was used for selecting the sample.

### 6.Results and Discussions

The advertising industry is a global, multibillion-dollar business that serves as a conduit between manufacturers and consumers. Study analyzed effects of advertising on college youth for buying two-wheelers in Belagavi city.

#### 6.1 Demographic Profile of the Respondents

The table below describes the demographic characteristics of the respondents. A total sample of 250 was considered for the study an out of that 77.6 percent of the respondents were male, 76 percent of the respondents belongs to the age group of 20-24 years and 70.8 percent were living in the family having a total income of Rs. 1-2 lakh per annum.

**Table 1: Distribution of Respondents on the Basis of Demographic Variables**

Demographic variables		Number of Respondents	Percentage
1. Gender	Male	194	77.6
	Female	56	22.4
Total		250	100
2. Age	15-19 years	53	21.2
	20-24 years	190	76.0
	25 years and above	7	2.8
Total		250	100
3. Family income	1-2 lakh	177	70.8
	2-3 lakh	48	19.2
	3-4 lakh	12	4.8
	>4 lakhs	13	5.2
Total		250	100

Source: Field Survey



## 6.2 Preferred Media

It can be inferred from the Table 2 that television was found to be the most preferred media for advertising two-wheelers among the youth which was represented by 62.6 percent of the total respondents. Apart from television, newspaper (20.4 percent) and web (11.2 percent) were also found as the effective media for advertising while magazines, radio and billboards were found to be less effective for advertising of two-wheelers.

**Table 2: Descriptive Statistics of Preferred Media**

Media	Number of Respondents	Percentage
Billboards	5	2
Television	157	62.8
Radio	3	1.2
Newspaper	51	20.4
Magazines	6	2
Web	28	11.2
<b>Total</b>	<b>250</b>	<b>100</b>

Source: Field Survey

## 6.3 Effects of Advertising

The following Table 3 clearly indicates the effects of advertising on college youth for buying two-wheelers. The respondents were given a question regarding how advertising affects them, the forms of ads which create greater impact upon them as well as the urge created by the advertisement.

**Table 3: Effects of Advertising on College Youth**

Advertising Effects	No. of Respondents	Percentage
1. Recall	2	0.8
2. Positive Impression	70	28
3. Interest	146	58.4
4. Desire to purchase or explore	29	11.6
5. Others	3	1.2
<b>Total</b>	<b>250</b>	<b>100</b>
Form of ads creating greater impact	No of Respondents	Percentage
1. Just the printed words	10	4.0
2. words with sound	24	9.6
3. A moving action-oriented ad	98	39.2



4. picture depicting a scene/ story	93	37.2
5. colorful printed ads	19	7.6
6. Others	6	2.4
<b>Total</b>	<b>250</b>	<b>100</b>
<b>Does an advertisement urge you to buy a new brand?</b>	<b>No of Respondents</b>	<b>Percentage</b>
Yes	168	67.2
No	82	32.8
<b>Total</b>	<b>250</b>	<b>100</b>

Source: Field Survey

The effects of advertising on the sample college youth shows distinct features which are listed below:

1. The study shows that advertising effects respondents by creating *interest* for 146 respondents (58.4 percent), followed by creating *positive impression* for 70 respondents (28 percent), *desire to purchase or explore* for 29 respondents (11.6 percent), *recall* for 2 respondents (0.8 percent) and *others* for 3 respondents (1.2 percent).

2. As can be seen, a moving action oriented ads create impact on 98 respondents (39.2 percent), picture depicting a scene/story effects 93 respondents (37.2 percent), followed by words with sound for 24 respondents (9.6 percent), colorful printed ads for 19 respondents (7.6 percent), just the printed words for 10 respondents (4.0 percent) and others for 6 respondents ( 2.4 percent).

3. The study observes that 168 respondents (67.2 percent) agrees and 82 respondents (32.8 percent) disagrees that advertisement urge them to buy a new brand.

To find out the relationship between preferred media and advertising impact, correlation coefficient was used to measure the significance level. The table below indicates the correlation coefficient.

**Table 4: Correlation**

	Preferred Media	Impact
Preferred Media	1	-0.10
Impact	-0.10	1

Source: Field Survey

From the above table, it can be observed that the correlation coefficient value is -0.10. Therefore, it can be concluded that there is no significance relationship between the preferred media and the advertising impact.

## 7. Conclusion

Advertising affect the viewers and have an influence on the buying behavior. The repeated message will make people increasingly accept the advertisement (Goldstein, 1998). For the present study, data has been collected from 250 college going students who owns as well as drives two-wheelers. The study finds that television is the most preferred media for advertising two-wheelers which can be due to the different types of commercials exposed by the companies through television. Dangerous stunts are performed in ads to capture the attention of the viewer thus; such stunts are clearly



demonstrated through television ads. Furthermore, the study also revealed that advertising affects the respondents by creating interest for 146 respondents (58.4 percent), a moving action-oriented ad creates greater impact on 98 respondents (39.2 percent) and 168 respondents (67.2 percent) agrees that advertisement urge them to buy a new brand. Thus, from the above results we can conclude that advertising has positive effects on the college youth for buying two-wheelers. Finally, the advertising and marketing sector in India is expected to enjoy a good run. Growth is expected in retail advertisement, on the back of factors such as several players entering the food and beverages segment, e-commerce gaining more popularity in the country, and domestic companies testing out the waters. The rural region is a potentially profitable target. Study suggest future research on rural areasthat help automobiles sector to sell two-wheelers more in rural areas. That could mean more launches, more advertising spends and profit.

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## ANALYSIS OF SOCIAL MEDIA FEATURES

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### Abstract

Social media is a term used to describe the type of media that is based on conversation interaction between people online. Social media are media designed to be disseminated through social interaction, using highly accessible and scalable publishing technique. For almost two decades the web has changed the world and revolutionized how information is stored, published, searched and consumed. The ripple effect has spread so wide that it impacts not just business and industries but crosses over into politics, medicine, media and breaches geographical location, cultural boundaries and ultimately affects people's day to day lives. Social media is about networking and communicating through text, video, blogs, pictures, status updates on sites such as Facebook, Myspace, LinkedIn and twitter. The present study analyses the social media networking sites in terms of their features.

**Key terminology:-** Social Media, Features.

Globalization of digital platforms and social media has transformed our society. Social Networking Sites (SNS) have emerged as popular sites. They have come to be sophisticated means for people to enjoy shared experiences, creating linkages between communities and satisfying the need to be networked. With the phenomenon and proliferation of SNS and their pervasion in everyday practices, the social media scape in India has been redrawn and it has enhanced our online experiences.

**The various types of social media sites are as follows.**

Community Social Networking Sites

Media Sharing Sites

Social Bookmarking Sites

Blogging Social Networks

Music Social Networks

### HISTORY OF SOCIAL MEDIA

The first hint of social networking websites was witnessed in the year 1995 through formation of Classmates.com by Randy Conrad. The website helps members find, connect and keep in touch with friends and acquaintances from school life. In early 2008, Nielsen Online ranked Classmates as number 3 in unique monthly visitors among social networking sites.

After two years, in 1997 Sixdegrees.com launched - the first manifestations of a social networking websites in the present format. It allowed users to list friends, family members and acquaintances



and see their connection with any other user on the site. However, the service of the company stopped in the year 2000. In 1999, the Livejournal emerged to facilitate one way exchange of journals between friends. Cyworld.com, was created in South Korean in 2001 through which users could have “apartment like” spaces which makes for a sim-world like experience.

In 2002, sites, such as Friendster and Fotolog were launched to facilitate people to form groups of friends across the Web. Friendster website is also used for dating, discovering new events, bands and hobbies. The year 2003 witnessed the inception of a series of sites including MySpace.com, hi5.com and LinkedIn. MySpace.com was launched after eUniverse employees with Friendster saw its potential and mimicked the more popular features of the social networking site. MySpace became the most popular social networking site in US 2006 and the 100th million account was created on August 9 2006.

In 2005, Bebo.com was set up by AOL. Bebo.com is an acronym for “blog early, blog often”. It is similar to other networking sites; the site must include two specific modules, a comment section and a list of users’ friends.

Facebook.com and Twitter.com began its operation in 2006. Facebook.com is the most popular social networking site in India. It was founded by Mark Zuckerberg who studied at Harvard University. The website membership was initially limited by the founders to Harvard students, but was expanded to other colleges. Facebook has met with some controversy being blocked in countries such as, China, Syria and Iran. The original concept for Facebook came from the colloquial name for books given out at the start of the academic year by universities designed to help students get to know one another better.

Twitter.com is a social networking site that that enables its users to send and read messages known as “tweets”. Tweets are text based posts of up to 140 characters displayed on the authors profile page and are delivered to the author’s subscribers known as followers.

The features of social media are that they give instant gratification, easy connectivity, total control, total anonymity, transparency. Besides they are free, cheap, fast and easy, constant, always on they also help to become a microcelebrity and facilitates searchability.

Social media has proven potential for mobilising attention and accountability to women’s rights, and challenging discrimination and stereotypes. Obstacles remain in translating women’s online advocacy to pushing for systemic change through policy. Strategies to enhance social media’s potential for women’s empowerment include facilitating their access to technology; increasing women’s representation in public life and media; and working with a cross-section of actors. Social media has proved to be a powerful vehicle for bringing women’s rights issues to the attention of a wider public, galvanising action on the streets of cities around the world and encouraging policy makers to step up commitments to gender equality. Recent cases in Turkey and India reflect the potential of social media to bridge the gap that often separates grassroots women’s activism from policy-making processes. The explosion of social media and unprecedented use by women of new technologies represents important opportunities to bring gender equality and women’s rights issues to the forefront of both policy making and media attention. In 1995, the Beijing Platform for Action recognised and predicted the media’s “potential to make a far greater contribution to the advancement of women”. This call has been echoed in the proposed targets under Goal 5 of the post-2015 Sustainable Development Goals (SDGs). Like in 1995, challenges remain in utilising media to combat discrimination, counter gender stereotypes and raise awareness of women’s rights issues. While globally, women are greater users of social media than men (McPherson, 2014), many women, especially in developing countries, still do not have access to this technology due to infrastructure, costs and discriminatory social norms (ICRW, 2010). This briefing note examines the extent to which social media can be an effective lever to amplify women’s voices and identify strategies to better facilitate their impact on decision-making processes. Over the past seven years, the OECD



Development Centre’s Wikigender platform<sup>1</sup> has been engaging with a cross-section of gender equality actors, from civil society to governments, as a means of promoting women’s voices in policy-making fora. This note will present key arguments shared during a recent Wikigender online discussion on “Advancing women’s rights through social media: which strategies?” It will review successful social media campaigns, analyse current obstacles, and conclude with recommendations on how social media can effectively broaden the scope for action on women’s rights and gender equality within a post-2015 agenda.

**A Birds eye view of social media networks/Application is presented in the table**

Site		USERS	LAN GUA GES	ABOUT
Facebook	1059	2.2 billion	101	To network with friends and relatives, you can also access different Facebook apps to sell online and you can even market or promote your business, brand and products by using paid Facebook ads.
WhatsApp	1000	1.5 billion	60	gives ability to communicate and share instantly with individuals and groups. The WhatsApp call feature is just the icing on the cake!
QQ(Tencent)	853	899 million	50	It can be used to stay in touch with friends through texts, video calls and voice chats. It even has a built-in translator to translate your chats
WeChat	697	963 million	20	This is an all-in-one communications app for messaging and calling (similar to WhatsApp) that enables you to connect with the people of your choice
QZone	640	645 million	1(one)	It enables you to share photos, watch videos, listen to songs, write blogs, maintain diaries and so on. It also empowers you to choose the accessories and customize the look and feel of your QZone webpages.
Tumblr	555	420 million	18	Tumblr serves as a social media cum micro blogging platform that can be used to find and follow things that you like. You can also use it to post anything, including multimedia, to a short-form blog. Moreover, it gives you the flexibility to customize almost everything.
Instagram	800	800 million <sup>33</sup>	33	Social networking platform that was completely based on sharing photos and videos. This photo sharing social networking app thus enables you to capture the best moments of your life, with your phone’s camera or any other camera, and convert them into works of art This is possible because Instagram allows you to apply multiple filters to your photos and you can easily post them to other popular social networking sites, such as Facebook and Twitter. It is now part of the Facebook empire
Twitter	320	330 million	34	This social networking site enables you to post short text messages (called tweets), containing a limited number of characters, to convey your message to the world. With the growing craze for online shopping, Twitter also makes it possible to promote your businesses and even shop directly through tweets.
Google+	300	540 million	61	Owned by the tech giant Alphabet (Google), this interest-based social networking platform enables you to stay in touch with people by sharing messages, photos, videos, useful links to sites and so on. It also extends support for



				video conferencing through Hangouts and allows businesses to promote their brands and products through Google+ business pages
Baidu Tieba	300	300 million	3	a social forum network based on the keyword searches in the Baidu search engine. This discussion forum works on the unique concept of allowing you to create a social network group for a specific topic, using the search, or even to join an existing online social group.
Skype	300	300 million	36	one of the most popular communication-based social networking platforms. It allows you to connect with people through voice calls, video calls (using a webcam) and text messaging. You can even conduct group conference calls. And, the best part is that Skype-to-Skype calls are free and can be used to communicate with anyone, located in any part of the world, over the internet.
Viber	249	900 million	30	is known for its instant text messaging and voice messaging capabilities. You can also share photos and videos and audio messages, using Viber. It offers you the ability to call non-Viber users through a feature named Viber Out
Sina Weibo	222	392 million	3	This is a highly popular microblogging social platform in China that is known for its hybrid mix of Twitter's and Facebook's features.
LINE	215	217 million	40	LINE is a globally available messaging social network that enables you to share photos, videos, text messages and even audio messages or files. In addition, it allows you to make voice and video calls at any time of the day.
Snapchat	200	301 million	20	This is an image messaging social platform that enables you to chat with friends by using pictures. It allows you to explore news and even check out live stories that are happening around the world.
YY.com	122	300 million	1(one)	YY is a major video-based social networking platform in China that enables group video chats. In such chats, more than 100,000 members can watch a single person doing an activity. Such an activity can be anything from giving a tutorial video to singing karaoke, which helps the users earn virtual currency that they can later convert into cash.
VKONTAKT E (VK)	100	460 million	80	VK is one of the largest social networking platforms in Russia and has quite similar features to Facebook.
PINTEREST	100	200 million	26	This is a photo sharing and visual bookmarking social media site or app that enables you to find new ideas for your projects and save them. So, you can do DIY tasks or home improvement projects, plan your travel agenda and so on by using Pinterest.
LINKEDIN	100	106 million	24	It is used across the globe by all types of professionals and serves as an ideal platform to connect with different businesses, locate and hire ideal candidates
REDDIT	100	542 million	74	This social media platform enables you to submit content and later vote for the content. The voting determines whether the content moves up or down, which is ultimately organized based on the areas of interest
TARINGA	75	75 million	1(one)	Taringa is one of the largest social networking platform in Latin America and allows users to share their experiences, content and more.
FOURSQUARE	40	45 million	12	This is a local search- and discovery-based social media platform that enables you to find the ideal places (based on



				your location) to go to with friends and loved ones. It also gives appropriate search results for the best food outlets, night entertainment places and more in your area. The social networking feature is now available in a separate app named Swarm
RENREN	30	31 million	1(one)	This is the largest social networking site in China and is literally a platform for everyone. It has been highly popular with the youth due to its similarity to Facebook, as it allows users to easily connect with others, quickly share thoughts and posts, and even update their moods.
TAGGED	25	300 million	7	This is a great social media site based on friendship and dating and, in 2011, it acquired another social networking platform called hi5. It enables you to socialise with others through games, browsing profiles, common interests and so on.
BADOO	20	60 million	47	This dating-based social networking site operates in more than 200 countries. It shares details about people nearby in your area and even about people whom you may have bumped into in real life.
MYSFACE	20	864 million	14	This is a music-focused social networking site and provides an interactive and user-submitted network of friends. It also provides blogs, groups, personal profiles, pictures, videos and so on.
STUMBLEUPON	25	30 million	1	StumbleUpon is an intelligent social networking platform that finds or discovers content and recommends the same to its users. You are thus empowered to discover webpages, images, videos and so on and then rate them as per your interest and taste.
The-Dots				is a networking platform that helps everyone involved in the creative process connect, collaborate and commercialise helping build a stronger, more profitable and diverse creative sector.
KIWIBOX		3 million	3	This is a community-based social networking site, especially for those who live in New York. It offers an online magazine to target teens through fashion tips, advice and chat. It also allows young adults to let everyone know about their skills and interests.
SKYROCK		21 million	7	Skyrock is a French social networking site that offers its users a free and personal web space to create and post blogs, add profiles and exchange messages. Apart from French and English, it is also available in five other languages.
DELICIOUS		9 million	50	It is known for being the leading social bookmarking service. Having been launched in 2003, Delicious is ideal for storing, sharing and discovering web bookmarks. It also allows its users to tag them with any keywords.
SNAPFISH		40 million	16	Snapfish is a web-based photo sharing social networking site that offers unlimited storage to its members for uploading photos. You can thus put away your storage space concerns for your vast collection of images.
REVERBINATION		3.8 million		This is the ideal social networking platform for musicians and professionals to connect with others in the music industry. It offers different tools to musicians to manage their careers and offers them the right access to their music industry partners and fans.
FLIXTER		2.98 million	13	This is an American social networking site for people who



				love movies and want to connect with like-minded people by sharing their movie reviews and ratings. Its users are likely to learn about movies and get information about new movies.
CARE2		40 million	1	This social media site helps activists connect around the globe with similar individuals, businesses and organisations that are making an impact on society. It also encourages people to lead a healthy and green lifestyle.
CAFEMOM		8 million	1	This ad-supported social networking website is a community for mothers and mothers-to-be that enables them to get support and advice on various topics, such as pregnancy, fashion, health and food. It also helps them learn from the experiences of other mothers.
RAVELRY		7 million	2	Ravelry is a community-based social network that is targeted at people who are interested in fibre arts, such as spinning, knitting, weaving and crocheting. Such people can share their own collections, different ideas and learn from the experiences of other members for better collaboration possibilities.
NEXTDOOR		160 thousand	4	This is a private social networking platform for neighbourhoods in the US. The objective is pretty simple: allowing users to get connected with the people in their area
WAYN		20 million		Wayn is a travel- and lifestyle-based social networking platform and offers its users the ability to discover where to go, what to do and how to meet like-minded people to share their experiences
CELLUFUN		2 million	7	This social gaming community can easily be accessed on the move from any mobile device. With this mobile gaming-based social network, users can socialise, create avatars, play games and purchase virtual goods.
YOUTUBE		1.5 billion	76	YouTube is the world's largest video-sharing social networking site that enables users to upload and share videos, view them, comment on them and like them. This social network is accessible across the globe and even enables users to create a YouTube channel where they can upload all their personally recorded videos to showcase to their friends and followers.
VINE		200 million	25	This is an entertainment-based, short-form video sharing social media site where members can easily share videos that are six seconds long. It belongs to the Twitter family and allows easy integration with other social networking platforms to share and watch videos.
CLASSMATES		70 million	5	Classmates allows users to find, connect and keep in touch with friends and acquaintances from school and college. It is also possible for users to upload their yearbook from their school years.
MYHERITAGE		80 million	42	This is an online genealogy social platform which supports more than 42 languages and empowers its users to create family trees, upload and browse through family photos and manage their own family history. It could also be used by people to find their ancestors and get more information about them.
VIIDEO		65 million	7	Viideo is an online business-based social networking site that helps business people, mostly those in Europe, connect with one another. It is available in about different languages.



XING		14 million	16	This professional social networking site offers features that are similar to LinkedIn's features, with its main users based in Switzerland, Austria and Germany. However, it is unique in the sense that it enables closed group discussions between the members of a certain company or business.
XANGA		27 million	3	This blogging-based social networking platform hosts weblogs, photo blogs and social networking profiles for its users.
LIVEJOURNAL		30 million	33	This San Francisco-based social networking site is available in Russia, as Zhivoy Zhurnal or Zhe Zhe. It enables users to maintain a diary, blog or journal, along with privacy controls.
FRIENDSTER		115 million	13	Friendster was previously a social networking site to find friends and stay in touch, but is now a social gaming network for game lovers in Asia.
FUNNY OR DIE				This comedy video social website is aimed at bringing together the funniest videos from the web. Celebrities follow this social platform a lot and it enables users to share, upload and rate videos.
GAIA ONLINE		26 million		Gaia Online is an anime-themed social networking and forums-based website. It gives users access to avatars, virtual world, games and so on.
WE HEARTIT		45 million	23	This photo-sharing social media site, which is available in more than 20 languages, is ideal for users' daily dose of inspiration or motivation. It enables users to view and share highly inspirational images with their friends
BUZZNET				This social media site allows users to share content on the basis of their personal interests in the form of videos, photos and journals. It also seamlessly integrates with Facebook.
DeviantArt		25 million	1	DeviantArt is regarded as the largest online social networking community for art lovers and artists. It enables users to take photos of their artwork and share them with others.
FLICKR		87 million	10	It serves as a platform to upload numerous high quality images, especially by photographers or people who love photography. It is also an efficient online photo management and sharing service.
MEETME		4.5 million	14	Formerly known as myYearbook, MeetMe is aimed at users who want to find new friends and chat with them. This makes it highly popular among teens and young students.
MEETUP		8 million	12	This social networking portal enables you to find groups of like-minded people, who have similar interest to you, near your locality (anywhere in the world). It also facilitates offline group meetings and you can become a part of such groups and their discussions.
TOUT			1	Tout is a social networking cum micro-blogging platform that allows you to view and share videos that are 15 seconds long. The videos that are shared on this platform are known as touts
MIXI		14 million	1	This is a popular Japanese social networking service that has around 20 million active users. It enables you to connect with your friends and loved ones in a convenient way and even based on your areas of interest.



DOUBAN		200 million	1	This Chinese social networking site has something for registered as well as unregistered users. It enables registered users to record information and create content based on music, films, books and events in the cities of China. Unregistered users of Douban can find reviews and ratings of books, music and movies.
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**Data Analysis and Interpretation**

Number of Users				
	Frequency	Percent	Valid Percent	Cumulative Percent
upto 10 million	14	23.3	23.3	23.3
10 million to 100 million	20	33.3	33.3	56.7
100 million to 500 million	15	25.0	25.0	81.7
500 million to 1000 million	8	13.3	13.3	95.0
1 billion and above	3	5.0	5.0	100.0
Total	60	100.0	100.0	

The above table shows that 14 social media networks/ applications have user less than 10 million. The dots, KIWI BOX, Delicious, Reverbnation, Flixter, Cafemom, Ravelary, Cellufun, Meetme, Meetup are the social media networks which belong to this category.

Twenty social media networks/ applications have users between 10 million to 100 millions. Taringa, Foursquare, Renren, Badoo, Stumbleupon, Skyrock, Snapfish, Care2, Wayn, Classmates, Myheritage, Viadeo, Xing, Xanga, Llivejournal, Gaia Online, We Heartit, DeviantArt, Flickr are the social media networks which belongs to this category.

Fifteen social media networks/application have users between 100 million to 500 million. Tumbler, Twitter, Baidu tieba, Skype, Sina Weibo, line, Snapchat, YY.com, VKONTAKTE, Pinterest, LinkedIn, Tagged, Nextdoor, vine, friendster are social media networks belongs to this category

Eight social media networks/applications have user between 500 million to 1000 million. QQ tencent, Wechat, QZone, instagram, Google+, viber, Reddit, Myspace are the social networks/ Applications which belongs to this category.

Three social media networks/applications have users more than 1000 millions. Facebook, Whatsapp and youTube are three social media networks which have more than one billion users.

LANGUAGES				
	Frequency	Percent	Valid Percent	Cumulative Percent
Up to 10 languages	29	48.3	48.3	48.3
11 to 50 languages	25	41.7	41.7	90.0
51 to 100 languages	5	8.3	8.3	98.3
More than 100 languages	1	1.7	1.7	100.0
Total	60	100.0	100.0	



The above table shows that 29 social media networks/ Application are available up to ten different languages. QZone, Baidu Tieba, Sina Weiba, YY.Com, Taringa, Stumbleupon, Renren Tagged, The Dots, KiwiBox, Skyrock, Reverbnation, Care2, Ravelry , Cafemom, Nextdoor, Xanga, Wayn, Video, Cellufun, Classmates, Gaia Online, Funny or Die, Buzz net, DevianArt, Douban, FLickr, Tout, Mixi are the social networks/ Applications which facilitates user up to ten different language.

Twenty five social media networks are available more than ten different languages up to fifty languages. QQ(Tencent), Wechat, Tumbler, Instagram, Twitter, Foursquare, Skype, Badoo, MySpace, Viber, line, Snapchat, Pinterest, Linkedin, Flixter, Delicious, Snapfish, Vine, Myheritge, Xing, Livejournal, Friendster, We Heartit, MeetMe, MeetUp are the social media networks which are offering content sharing service in more than ten different language and upto fifty languages worldwide.

Five social media networks/ Application are offering users in more than 50 different languages and up to 100 languages worldwide. whatsapp, Google+, Vkontakte, Reddit, Youtube are the five Social media networks which facilitates in more than 50 language and up to 100 different languages.

Facebook is the only application which is available in more than 100 languages.

### **Conclusion**

The study reveals that Facebook, Whatsapp and YouTube are the three top social media networking sites. This could be because they enjoy maximum features like text, audio, video, text chatting, blog, business, ads, news. And also due to that they are available in many languages and user friendliness. Common man finds it as an easy platform to share his idea, opinion, attitude and beliefs. It has become an alternate platform not only to express ideas, news, attitude, opinion but become micro celebrity. Because is easy connectivity search ability and its24X7. And one important reason why these social media are popular is because there is control and they are transparent. These media are popular because they are cheap to use and fast in their nature. We see that people share lot of videos and pictures to derive instant gratification. Even we see that illiterates in a country like India face book is the one of the top networking site for sharing their attitudes and beliefs. This is leading to pluralism of ideas in a democratic country, but the question is how good this platform is in the hands of antidemocrats.

The second most popular social media networks are as follows. QQ tencent, Wechat, QZone, instagram, Google+, viber, Reddit, Myspace . they are in 50 to 100 languages.

Fifteen social media networks/application have users between 100 million to 500 million. Tumbler, Twitter, Baidu tieba, Skype, Sina Weibo, line, Snapchat, YY.com, VKONTAKTE, Pinterest, Linkedin, Tagged, Nextdoor, vine, friendster are social media networks belongs to this category

Twenty social media networks/ applications have users between 10 million to 100 millions. Taringa, Foursquare, Renren, Badoo, Stumbleupon, Skyrock, Snapfish, Care2, Wayn, Classmates, Myheritage, Viadeo, Xing, Xanga, Llivejournal, Gaia Online, We Heartit, DeviantArt, Flickr are the social media networks which belongs to this category.



## WHOSE COMPANY IS IT ANYWAY? IP'S LEADERSHIP ROLE AS CEO IN CIRP

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### Introduction

Like a captain of a ship decides the direction of the ship, the waters it will tread, the distance it will cover and how the crew coordinates; the CEO exercises their leadership duties within a corporate. The role is diverse, broadly categorised in management strategy, market intelligence, planning, control, negotiation, communication, and organisational politics. Albeit this crucial position in a corporate is not permanent and succumbs to the procedures of the IBC if the business faces fiscal default issues.

Once the CIRP is initiated, the power vested in the Board of Directors of the company, including the CEO is suspended,<sup>1</sup> to preserve the business from any form of management malpractice during the insolvency process. The leadership duties are effectively replaced by the Insolvency Professional (IP), as an Officer of the Court,<sup>2</sup> to protect and preserve the asset value of the business as a going concern.<sup>3</sup> The shift in the company leadership is one of the most defining factors of the IBC and its critically regarded insolvency process. At the beginning of the process, an IP is interim (IRP) and is subject to replacement if the Committee of Creditors (CoC) considers so<sup>4</sup>, no justification required.<sup>5</sup>

The effective role of Insolvency Professionals calls for multiple skills in the field of finance, people management, court procedures, stakeholder management, business dynamics, strategic foresight, business valuation and so on. As of March 2020, there are 498 Insolvency Professionals with managerial experience of out a total of 3009.<sup>6</sup> It cannot be reasonably expected of an IP to conduct corporate leadership strategies due to the wide sectoral scope of insolvency cases. This requires formulation of the right team with a combination of experts under the overall supervision of an IP. This article will discuss the how an Insolvency Professional, say, as an “emergency captain” navigates a ship in distress, as opposed to a CEO who is the general captain of the ship, under normal circumstances. For the purposes of the discussion, the IPs duties will encompass the roles of Interim Resolution Professional (IRP) and Resolution Professional (RP).

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<sup>1</sup> Section 17 (1) (b) of the Insolvency and Bankruptcy Code 2016

<sup>2</sup> NCLT Order of Feb 18, 2019 in the case of *Asset Reconstruction Company (India) Pvt. Ltd. Vs. Shivam Water Treaters Pvt. Ltd.* C.P. No. (IB)1882(MB)/2018

<sup>3</sup> Section 17 (1) (a) & Section 20 of the Insolvency and Bankruptcy Code 2016

<sup>4</sup> Ibid Section 22 (2)

<sup>5</sup> *Bank of Baroda Vs. M/s Maa Tara Ispat Industries Private Limited Through Mr. Pramod Kumar Singh.* NCLAT. Company Appeal (AT) (Insolvency) No. 868 of 2019

<sup>6</sup> The Quarterly Newsletter of Insolvency and Bankruptcy Board of India. Jan-March 2020, Vol.14.



## **Human Resources Organization Management Convening the Committee of Creditors**

Among the very first actions the IP undertakes is convening and maintaining an updated list of claims against the corporate debtor.<sup>7</sup> Via this process, the IP shall constitute the Committee of Creditors after classification of all claims received against the Corporate Debtor (CD) and determination of its financial position.<sup>8</sup> This constitution of the CoC draws parallel with the convening of Board of Directors by the CEO. The CoC decides on the ultimate fate of the business at the end of the insolvency process, whether it is reaching a resolution or proceeding with liquidation. The IP leads the insolvency process and facilitates the CoC in resolution seeking, which is the ideal goal. Similar to the CEO leading the Board of Directors towards a corporate goal.

### **Appointment of professionals**

The introduction of an individual to the leadership management of a business takes some getting used to and demands experience- the CEO is not exempt from such. They hire professionals who possess technical expertise. It is impractical to expect an IP to conduct such business operations without help. Thus, the IBC allows the IP to appoint accountants, legal or other professionals<sup>9</sup> to assist the IP. This does not mean that the existing management is completely replaced along with the Board of Directors, since that would not be conducive to the idea of preserving or maximising the asset value of the business as a going concern.

### **Business personnel co-operation**

To ensure a proper flow of managerial duties entrusted upon the IP, the Code mandates all personnel, including promoters related to the business to cooperate with the IP and provide access to documents and records of the business as and when required by the IP to manage the affairs of the corporation.<sup>10</sup> It is essential that the business runs its daily operations during the CIRP, and an equivalent cooperation of the existing personnel is required as it were to the CEO of the business.

The non-compliance of this obligation causes a hindrance in the duties of the IP. The Adjudicating Authority does not shy from taking necessary steps to ensure obligation via legal enforcement authorities and, if necessary, via criminal action against such business personnel or promoters.<sup>11</sup>

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<sup>7</sup> Section 25 (2) (e) of the Insolvency and Bankruptcy Code 2016

<sup>8</sup> Ibid Section 21

<sup>9</sup> Ibid Section 20 (2) (a)

<sup>10</sup> Ibid Section 17 (1) (c) & Section 19

<sup>11</sup> *Ajay kumar. Vs. Shree Sai Industries Pvt Ltd &Anr.*, Company Appeal (AT) (Insolvency) No. 616 of 2019



## Financial & Physical Resources Management

For the purposes of adequate monitoring of the business, the IP is required as per the IBC to take custody of the assets of the Corporate Debtor,<sup>12</sup> and pledge to protect the assets of the business as a going concern.<sup>13</sup> The Insolvency and Bankruptcy Code is very stringent in ascertaining the duties and code of conduct of the IP and the protection of the physical and financial assets of the Corporate Debtor during a CIRP. So much so that the Code has amended the Companies Act 2013 empowering the NCLT to pass instructions to executory authorities for taking control and custody of assets in case the IP is facing difficulties in doing so.<sup>14</sup>

## Raising Interim Finance

A business usually enters insolvency proceedings when it is financially distressed for a certain period of time and finds it extremely difficult to obtain credit from hesitant lenders. When an Insolvency Professional takes over the “wheel” of the business as a going concern, it is important that the corporate stays afloat until a resolution is reached or liquidation is commenced. In this time period, the IBC addresses this issue by allowing the IP to raise “interim finance”<sup>15</sup> - basically, any financial debt raised by the IP during the period of CIRP<sup>16</sup> while managing the operations and affairs of the corporate as a going concern.

Much like the CEO requires the approval of the Board of Directors in relation to financial business decisions, the IP requires prior approval of the creditors whose debt is secured over an encumbered property if the interim finance is raised by providing security of such property of the business.<sup>17</sup> In doing so, the IP must disclose all costs incurred in the CIRP and ensure that such costs are not unreasonable.<sup>18</sup> Such interim finance is treated as a part of the costs incurred during CIRP and is repaid in priority to other debt as part of resolution plan. Such priority also applies in distribution of assets in case the business goes into liquidation.<sup>19</sup> As of March 2020, INR 6.34 crores have been raised in interim finances from 3774 CIRPs.<sup>20</sup>

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<sup>12</sup> Section 18 of the Insolvency and Bankruptcy Code 2016

<sup>13</sup> Ibid Section 20

<sup>14</sup> Section 429 (1) of the Companies Act 2013

<sup>15</sup> Section 25 (2) (c) of the Insolvency and Bankruptcy Code 2016

<sup>16</sup> Ibid Section 5 (15)

<sup>17</sup> Ibid Section 20 (2) (c)

<sup>18</sup> Section 27 of the IBBI (Insolvency Professionals) Regulations, 2016

<sup>19</sup> Section 53 of the Insolvency and Bankruptcy Code 2016

<sup>20</sup> The Quarterly Newsletter of Insolvency and Bankruptcy Board of India. Jan-March 2020, Vol.14.



## Management of contracts

The IP's authority to enter into, amend/modify contracts or transactions on behalf of the CD, including the ones entered into before the commencement of CIRP<sup>21</sup> conclusively follows the duty to protect and preserve the asset value of the business. The authority extends so much so, that the IP has to represent and act on behalf of the CD with third parties, and exercise rights for the benefit of the business in judicial, quasi-judicial or arbitration proceedings.<sup>22</sup> This is ipso facto the role of the CEO in the representation of the business.

## Plan Implementation

### Information for Resolution Applicants

A CEO has a duty to ensure that the staff and the Board of Directors have sufficient and up-to-date information. Similarly, an IP has a pivoting role in information disbursement during a CIRP. The fulcrum of reaching a resolution lies on the management and understanding of information to the CoC. To effectuate this, the IP prepares a preliminary information memorandum containing relevant information for formulating a resolution plan.<sup>23</sup> The detail to which the IP provides information to the CoC is significant in the insolvency process and at this stage the role of IP transcends the role of CEO to encompass duties of the CFO. The IBBI (Insolvency Resolution Process for Corporate Persons) Regulations, 2016 elaborates the information contents the IP has to provide about the CD for the CoC to assess during CIRP in the table below:

Provision	Type of Information
S. 36 (2) (a)	Assets and liabilities significant for value assertion
S. 36 (2) (b)	Latest annual financial statements
S. 36 (2) (c)	Audited financial statements of the CD for the last two financial years and up-to-date provisional financial statements for the current financial year
S. 36 (2) (d)	List of creditors containing the names of creditors, the amounts claimed by them, the amount of their claims admitted and the security interest on such claims
S. 36 (2) (e)	Particulars of a debt due from or to the CD with respect to related parties

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<sup>21</sup> Section 20 (2) (b) of the Insolvency and Bankruptcy Code 2016

<sup>22</sup> Ibid Section 25 (2) (b)

<sup>23</sup> Ibid Section 29



S. 36 (2) (f)	Details of guarantees that have been given in relation to the debts of the CD by other persons, specifying which of the guarantors is a related party
S. 36 (2) (g)	Names and addresses of the members or partners holding at least one per cent stake in the CD along with the size of stake
S. 36 (2) (h)	Details of all material litigation and an ongoing investigation or proceeding initiated by Government and statutory authorities
S. 36 (2) (i)	Number of workers and employees and liabilities of the CD towards them
S. 36 (2) (l)	Other information deemed relevant to the CoC by the IP

### Formulation of Resolution Plan

An IP has an immense role to play during the CIRP, from conducting the entire insolvency process and manage the operations of the CD during the period<sup>24</sup>, to culminate into the main goal of the process- the formulation of the Resolution Plan. Plan implementation and policy recommendations are the visionary duties of a corporate CEO and the IP in a similar fashion, in essence, convenes and conducts the meetings of the CoC, collates and disburses information, makes public announcement for the CIRP<sup>25</sup>, invites prospective Resolution Applicants to put forward their resolution plans<sup>26</sup>, examines each resolution plan received to ensure they meet the standard criteria,<sup>27</sup> and presents the eligible resolution plans at the CoC meetings. The IP checks for these pointers<sup>28</sup> in every resolution plan submitted:

- The payment of CIRP costs in priority to the repayment of other debts of the CD and identification of specific sources of funds to pay the same;
- The repayment of the debts of operational creditors (OCs) which shall not be less than the liquidation value due to OCs in priority to any financial creditor (FC) and before the expiry of thirty days after the approval of a resolution plan by the AA;
- The repayment of the liquidation value due to dissenting FCs before any recoveries are made by the FCs who voted in favour of the resolution plan.

<sup>24</sup> Ibid Section 23

<sup>25</sup> Section 36 of the IBBI (Insolvency Resolution Process for Corporate Persons) Regulations 2016

<sup>26</sup> Ibid

<sup>27</sup> Elaborated under section 30 (2) of the Insolvency and Bankruptcy Code 2016

<sup>28</sup> Section 38 of the IBBI (Insolvency Resolution Process for Corporate Persons) Regulations 2016 read along with Section 30 (2) of the Insolvency and Bankruptcy Code 2016



- The management and control of the affairs of the corporate debtor after approval of the resolution plan;
- The implementation and supervision of the resolution plan;
- It does not contravene any of the provisions of the law for the time being in force.

Once the Resolution plan is approved by the CoC, the IP submits the same to the Adjudicating Authority, professional to the adjudicating authority. Where the resolution plan is approved by the adjudicating authority. Since the inception of the IBC, the AA has not rejected a single resolution plan submitted to it if the resolution plan was in compliance with the requirements.

### Conclusion

An Insolvency Professional plays a defining role during a CIRP, and the leadership duties that come along with that role are vast. Although it is impractical to presume that the IP can envisage all the duties carried out by a CEO in the day-to-day operations of the business, the IP has been granted authority via the IBC and IBBI to perform the duties in an exemplary manner, not just in managing the affairs of the CD but also in steering the CoC towards an affordable resolution plan. Thus the IP closely scrutinizes assets, liabilities, incomes and expenses of the CD. The role of the IP is in essence of the CEO but it is bound by the regulations as they work as an Officer of the Court, and not as an agency.

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i ; kbj.k l j {k.k dh xHkhjrk dls n f k r s g q ob'od Lrj ij bl dh i g y Hkys gh vK/kfud dky ds l eL; kvla dh nu gß yfdu Hkkrh; l k d f r d k b f r g k l b l c k r d k l k {k h g s f d ; g k a i j j a k l s i ; k b j . k l j {k . k d k e g r o f n ; k t r k j g k g A H k k j r h ; 'k k l = k a 1/2 o s k h m i f u 'k n h c k a . k x f k k h m i f u 'k n h v k f n 1/2 e a i z d f i n t k 1/4 w 1/2 v f x u j t y l o k ; j b n i j i f o h j i h i y j r y l h v k f n 1/2 d k i k o / k k u g A u d o y L k u k r u / k e l c f y d b l k b j c k } , o a t s u / k e l l e r l e l r / k e l a e a i z d f d s l j {k . k , o a l o } u d k i k o / k k u f d ; k x ; k A l e ; d s l k f K c n y r h i f j l F k r ; k a r F k v K s k x h d j . k d s c < r s i H k k o d s d k j . k i ; k b j . k d s ? K V d h a i j i M e s o k y s i H k k o d s f u ; i = r d j u s d s f y , l k ; k b j . k l j {k . k l e d k h v u e d o s k k f u d , o a l o s k k f u d i k o / k k u d h " l q v k r g q h A c l o t m b l d s l k ; k b j . k h ; l a d V d h x H k h j r k f n u & i f r f n u c < r h t k j g h g A , d s e a ; g i z u m B u k L o h k k o d g s t r k r g s f d v k f [ k j d k j , d h d k s u l h p u k s r ; k w ; k c k / k k , a g s t s r e k e o s k k f u d i k o / k k u a d s c l o t m l k ; k b j . k l j {k . k d k ; D e d s v i s { k r i f j . k k e l s o a p r j [ k r h g A l k ; k b j . k l j {k . k d h p u k s r ; k a i j p p l z d j u s l s i o z ; g t k u y u k H h v R ; l r e g R o i w k z g s t r k r g s f d l k ; k b j . k D ; k g s l k ; k b j . k l j {k . k l e d k y h u l e ; e a b r u k e g R o i w k z e p n k D ; k a e k u k t k j g k g s r F k b r u s e g R o i w k z , o a x H k h j e p n a l s f u i V u s d s f y , i z k k l f u d L r j i j d k s & d k s u l s i k o / k k u f d ; s x ; s g A D ; k a d b u c k r a i j p p l z f d ; s f u c k b l c k r d s l i ' V u g h a f d ; k t k l d r k g s f d l k ; k b j . k l j {k . k g r q f u f e r o s k k f u d i k o / k k u a d s y k x w d j u s e a d k s & d k s u l h p u k s r ; k j l k e u s v k j g h g A l k ; k b j . k

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xqkoRrkiwz voLFkk ekuo ds 0; ogkj ij fuHkj djrh gA lk; kbj.k dls vlg vfk/d Li'V djs ds fy, lk; kbj.k ds l æak ea foHkku fo}kuka, oa lk; kbj.k fonka }kjk fn; s x; s fopkja dck mYy[ k fd; k tkuk vR; lR egRo iwz gks tkrk gA tks bl idkj gS &

fQVæ us lk; kbj.k dls Li'V djsr gq fy [kk gS fd \*\*tho dh ijflFkr; ka ds leLr rF; fey dj lk; kbj.k dk fueLk djsr gA\*\* - th Rkka ys us bl l æak ea fy [kk gS fd \*\*i Hkkodkj n"kkvka dk og ; kx ftl ea tho jgrs gA lk; kbj.k ; k okroj. dgykrk gA\*\* lk; kbj.k dls Hkkrd ifjosk ds : i ea Li'V djsr gq fot; dækj frokjh us fy [kk gS\*\*lk; kbj.k og Hkkrd ifjosk gS tks tho txr dks vkoir djrk gS ml ds fodkl dls i Hkkor djrk gS rFkk Lo; aml l s i Hkkor gsrk gA lk; kbj.k i Foh ry ij thoka ds fodkl i l o)u , oa l j [kk grq, d h n"kk; aml l u d jrk gS ftudsfcuk thou l Hko ugra gA\*\* lk; kbj.k dls tho & txr dk vius ifjosk l s va%Ø; k ds : i ea Li'V djsr gq fu"kkur fl g us fy [kk gS\*\*tho ftl ekgsy ; k ifjosk ea jgrs gS og ml dk lk; kbj.k dgykrk gA tho vlg lk; kbj.k ijLij , d n"j s dls i Hkkor djsr gS ijLij , d n"j s l s i Hkkor gsrk gA\*\* lk; kbj.k dls tho txr ds pljka vlg ds Hkkrd ?kjs ds : i ea Li'V djsr gq Mh-Mfol us fy [kk gS\*\*lk; kbj.k l s vfkik; tho dks pljka vlg l s ?kjs mu l Hk Hkkrd Lo; i ka l s gS ftuea og jgrk gS ftudk ml dh vknrk ml dh fØ; kvka ij i Hko i M-rk gA bl idkj ds Lo; i ka ea Hkæ tyok; ij feVVh dh idfr outlfr ikdfr l d kku [kfr] ty&ky vkfn l feefyr gA\*\* , e- ts g"kd ksoV-t us i ; kbj.k dls Li'V djsr gq fy [kk gS & \*\*lk; kbj.k mu l Hk ckj n"kkvka vlg i Hkkoka dk ; kx gS tks tho/kfj; ka ds thou muds fodkl vlg mudh vuØ; kvka dls i Hkkor djrk gA\*\* l h- l h- ikd ds vuØ kj \*\*lk; kbj.k dk vFz mu n"kkvka ds ; kx l s gsrk gS tks euq; dks fuf"pr l e; ea fuf"pr LFku ij vkoir djrh gA\*\* bZ ts jk us i ; kbj.k dks oka 'kfr ds : i ea Li'V djsr gq fy [kk gS\*\*lk; kbj.k , d ok'; "kfr ds tks gea i Hkkor djrh gA\*\*

mi ; Ør of.kr foHkku fo}kuka ds fopkja l s Li'V gS fd lk; kbj.k og ekgsy ; k ijflFkr gS ftl ea ge fuokl djsr gA ; gh dkj.k gS fd LFku ekgsy ; k ijflFkr ds cnysr gh lk; kbj.k dh idfr , oa ml dh xqkoYkk ea Hk LoHkkfod ifjoru gks tkrk gA bl s ; g Hk Li'V gS fd lk; kbj.k mu l eLr ok'; n"kkvka vlg i Hkkoka %t s enk tyok; ij rkieku ekS ej feVVh ds idkj i M&i kks vkfn ½ dk , d l feefyr : i gS tks ml ea jgus oks i kf.k; ka dls iR; {k , oa ij k nksuka gh : i ka ea i Hkkor djrh gA lk; kbj.k ds {k- dh 0; ki drk dk vkdyu bl ckr l s Hk yxk; k tk l drk gS fd bl ds vxr ekuo dh l kfrt l k dfrd , oa vkfkt xrfok; ka Hk l feefyr gA foHkku fo}kuka ds fopkja , oa vL; rF; ka l s ; g Hk Li'V gsrk gS fd LFku , oa ekgsy ; k ijflFkr ds ifjoru ds l kfk gh lk; kbj.k dh xqkoYkk ea Hk cnysr vk tkrk gA ; g Hk , d ; FkFz l R; gS fd tho dk LFku; lk; kbj.k l Ei wZ ikdfrd lk; kbj.k dk gh , d vâk gA bl fy, bl dk i Hko LFku; lk; kbj.k l Ei wZ ikdfrd lk; kbj.k dk gh , d vâk gA bl fy, bl dk i Hko LFku; lk; kbj.k ij i M& Hk LoHkkfod gA ; gh dkj.k gS fd lk; kbj.k dh xqkoYkk ea l dkj ds fy, lk; kbj.k l j [k.k dh utfr vkt oS"od epnk ; k v/ ; u dk fo'k; cu x; k gA

**lk; kbj.k l j [k.k %vto'; drk,a, oa oS mud ibo/ku**

i ; kbj.k leLr tho txr ds vLrRo dks cuk; s j [kus ds fy, vko'; d dkj d gA fodkl dsuke ij idfr ij fot; ikus dh ykl r Fkk mi Hkkrd kohn l dfr ds c<f s i Hko us vkt i ; kbj.k vl rgyu dh l Fkr mRi l u dh gA ftl ds dkj.k u dpy ekuo dls foHkku ikdfrd vki nk , oa fckjh dk l leuk djuk i M+ jgk gS cYd i M&i kks, oa tho tarvka dh izkfr; ka foylr gks pph gS vlg dbz foylr ds dxj ij gA vkt Hkjr ds dy Hkx dk egt 22&23 ifr'kr Hkx gh ou {s= gA bl ea Hk dpy 12 ifr'kr Hkx ij gh l ?ku ou ik, tksr gA bZ juskuy ; fu; u QW dltok ku vW upj , .M upjy fjl l d t %k bZ ; w l h- , u-½ ds vuæku ds vuØ kj 1900&1980 ds nks ku Hkjr ea 2-5 fey; u gdVs j ekko ou dk fouk'k gvrA Hkjr ea ftl xfr l s ftrh l d; k ea i M& dh dVkbZ dh x; h ml ds vuq i u, i M+ ugra yxk, x; A ; g ; gla ds i ; kbj.k dk , d cMk dkj.k ekuk tkrk gA i ; kbj.k dk , d vl; egRo iwz ?kVd ty gS ftl ds fcuk thou ds vLrRo dh dYi uk ugra dh tk l drh gA , d 'kSk ds vuØ kj i R; d o'kZ , d 0; fDr dks 1700 ?ku ehVj ty dh t: jr gsrh gA Lorærk ikfr ds l e; ifr 0; fDr ty dh miyC/krk 6000 ?ku ehVj Fkh tcd tcd 1997 ea ?kVdj ; g 2047 ?ku ehVj jg xbZ gA ; fn tyLrj ea deh dk ; g fl yf l yk ; gh tkjh jgk rks 2047 rd bl ds ifr 0; fDr 1000 ?ku ehVj rd i gpus dh l Hkkouk 0; Dr dh tk jgh gA vS l xhdj.k , oa uxjhdj.k dh ifØ; k us ty i nkk dh l eL; k dls c-kok fn; k gA i ; kbj.k



I j {k.k ds reke oSkkfud iko/kkua dks rkd ij j [kdj m |kskla l s fudyus okys dpM/s dks tehu ds uhps ; k ufn; ka ea i o k f r fd ; k tk jgk gA bl ds d k j .k v k l & i k l ds {ks= dk H k f e x r ty i n f ' k r g l s j g s g A bl ds v f r f j D r l p k j Ø k i r r f k k r d u d h ds c < f s i H k k o u s b z o k V i n t k .k d h l e l ; k d s t l e f n ; k g A b y D V M l u d d p j k j d E l ; W j , o a e k s k b y d c k M + d k c u r k i g M + f o ' o l e n k ; v k j [ k k l d j H k k j r t s s f o d k l ' k h y n s k d s f y , d x H k j l e l ; k c u x ; h g A b z o k V e a l h i k j d s M f e ; e j i k j k v k f n t s h g k f u d j d / k r r q d s l k f k & l k f k c k e h u , o a D y l g j h u ; Ø r i n k f z H k h ' k k f e y g l o r s g A v k t l k ; k b j .k i n t k .k d k c < f k L r j , o a t y o k ; q i f j o r u ds d k j .k m R i l u l e l ; k , W v k t f t l : i e a c < h g s o g f o ' o l e n k ; d s f y , x H k j f o r k d k f o ' k ; c u x ; k g A 18 o h a , o a 19 o h a l n h l s v k s k s c h d j .k , o a u x j h d j .k d h g l M + r f k k f o d k l ds e k u o e a i f j o r u s i k d f r d l a k k u a d k f t l Ø j r k d s l k f k n k g u f d ; k g s m l h d k i f j . k e v k t f o H k l u l k ; k b j .k h ; l o d V d s : i e a m H k j d j l e u s v k ; k g A l k ; k b j .k i n f k .k d h x H k j r k i j f o ' o l e n k ; d k / ; k u r c l o k / k d v k d f ' k r g y k j t c 5 t w 1972 d s L V k d g k e ' A o h M u 1/2 e a l a Ø r j k V ' l Ø k u s l k ; k b j .k i j f o ' o H k j ds n s k a d k i g y k l E e s y u v k ; k f t r f d ; k A b l h f n u d s o f ' o d L r j i j l k ; k b j .k f n o l d s : i e a e u k ; k t k r k g A b l l E e s y u e a l k ; k b j .k d h d h e r i j f o d k l i j f o d r k 0 ; D r d h x ; h A b l v o l j i j f o ' o l e n k ; l s i k ; k b j .k d s g k f u i g p k ; s o x s f o d k l d h u h r v i u k u s i j t k j f n ; k A b l e a d y 119 n s k a u s f g l l k f y ; k F k A b l l E e s y u l s g h l ; Ø r j k V ' l k ; k b j .k d k ; D e d h ' l q v k r g b A ; g h d k j .k g s f d b l l E e s y u d s e k u o h ; l k ; k b j .k d k i F k e v a r j k V h ; l E e s y u d g k t k r k g A H k k j r e a i ; k b j .k l j {k.k d h v k o ' ; d r k d s e g l ' d j r s g q l e ; & l e ; i j v u d o S k k f u d , o a l o S k k f u d i k o / k k u f d , x , g A b u i k o / k k u a d s v / ; ; u d h n f V l s e q ; : i l s n k s H k k o k l e a d k / k t l d r k g & i g y k L o r a r k l s i o d v f k r - f c v ' k d k y e a i ; k b j .k l j {k.k g r q f d , x , i k o / k k u r f k k n h j k L o r a H k k j r e a i ; k b j .k l j {k.k d s f y , f d , x , i k o / k k u A f c v ' k d k y e a c u s H k k j r h ; n . M l i g r k 1860 d h / k j k 268] 290] 291] 426] 430] 431 r f k k 432 e a i ; k b j .k l s t M s e p n k a ; k l e l ; k v k a i j n M d k i k o / k k u f d ; k x ; k g A b l l i g r k d h / k j k 277 t y i n t k .k r f k k 278 o k ; q i n t k .k l s l o k / r g A b a M ; u O k j o V , D V 1927 r f k k e k s j o k u , D V 1938 e a o u k a d s o x i d r d j u s r f k k o u ; t h o k a d s l j {k.k i j f o ' k k c y f n ; k x ; k g A i f y l v f / k u ; e 1861 r f k k H k k j r h ; n . M l i g r k 1898 d h f o H k l u / k j k v k a d s e k ; e l s i n t k .k f u ; a . k r f k k v i j k / k ; k a d s f y , n . M d k i k o / k k u f d ; k x ; k g A i ; k b j .k l j {k.k d h v k o ' ; d r k d s e g l ' d j r s g q L o r a r k i f t r d s i ' p k r l e ; & l e ; i j b l s t M s v u d o S k k f u d , o a l o S k k f u d i k o / k k u f d , x , g A v k t o f ' o d L r j i j H k k j r m u f x u s p u s n s k a e a ' k k f e y g s f t l d s l i o / k k u e a o u ; l E i n k d k l i ' V f o o j .k f d ; k x ; k g s r f k k m u d s l j {k.k d s f y , v u d i k o / k k u f d , x , g A l i o / k k u d s v u Ø N n 47 e a i ; k b j .k l j {k.k d s l o d k e a f y [ k k g s & ' j k T ; v i u s y k s k l a d s i k s k g k j L r j v k j t h o u L r j d s A p k d j u s v k j y k d L o k L F ; e a l H k j d s v i u s i k f k f e d d y o ; k a e a e k u s k v k j j k T ; f o f ' K V r ; k e k n d i s k a v k j L o k L F ; d s f y , g k f u d j d v k s k f / k ; k a d s v k s k / h ; i z k s t u k a l s f H k l u m i H k k s c d k i f r ' k k d j u s d k i z k l d j s k A ' c k n d s o ' k k a e a c n y r h i f j l F k r v k j l e ; d h e k a d s v u q i i ; k b j .k l j {k.k , o a l o } d s f y , 1976 e a 42 o a l i o / k k u l a k k s k u v f / k u ; e } k j k 48 1/2 d 1/2 r f k k 51 1/2 d 1/2 1/2 t k M k x ; k A 48 1/2 d 1/2 e a d g k x ; k g s f d & ' j k T ; n s k d s i ; k b j .k l j {k.k , o a l o } r f k k o u , o a o u ; t h o k a d h j {k.k d k i z k l d j s k A 51 1/2 d 1/2 1/2 & ' H k k j r d s i R ; d u k x f j d d k ; g d r o ; g l o s k f d o g i k d f r d i ; k b j .k d h f t l d s v r x r o u ] u n h ] > h y v k j o u ; t h o g s d h j {k.k d j a v k j m l d s l o } d d k m i k ; d j a r f k k i k f .k e k = d s i f r n ; k d k H k k o j [ k a H k k j r d s m P p r e U ; k ; k y ; u s f o H k l u U ; k f ; d f u . k z k a d s e k ; e l s b l v k k R e d m i c l u / k k a d s f o f o / k e k u ; r k i n k u d h g A ; f n j k T ; l j d k j v i u s m i ; Ø r d y o ; k a d k i k y u d j u s e a f o Q y j g r h g s r l s m l i f j l F k r e a U ; k ; k y ; m l s / k j k 32 d s v r x r f u n s k j v k n s k ; k f j v t k j h d j l d r k g A v f k r l i o / k k u e a ; g i k o / k k u f d ; k x ; k g s f d ; f n j k T ; l j d k j i ; k b j .k d s m i c a k k a d k m Y y a k u d j r h g s r l s U ; k ; k y ; m l e a g l r { k i d j l d r h g A J h l P p n k u l l i k . M s c u k e i f ' p e c a k y l j d k j d s e k e y s e a l q o k b z d j r s g q m P p r e U ; k ; k y ; u s ; g H k h f u / k k j r f d ; k f d t c H k h U ; k ; k y ; d s l e k i f j l F k r d h l s l o k / r d k b z l e l ; k y k ; h t k , x h r l s U ; k ; k y ; l i o / k k u d s v u Ø N n 48 1/2 d 1/2 r f k k 51 1/2 d 1/2 1/2 d s / ; k u e a j [ k d j l e i p r v k n s k n s l d r k g A , d v U ; e k e y s c M k c k t k j O k ; j o d l Z M h y l Z , l k e l , ' k u c u k e d f e ' u j v M d i f y l ] d y d y k , o a v U ; e a m P p U ; k ; k y ; u s ; g e r 0 ; D r f d ; k f d H k k j r h ; l i o / k k u d s v u Ø N n 19 d s v u Ø N n 21 d s l k f k i < e u s i j u k x f j d k a d s L o P N i ; k b j .k j ' k k a r i o d z j g u s j k r d s l k e u s , o a b r e h u k u l s j g u s v u Ø N n 21 } k j k i k i t r t h u s d k v f / k d j d s v k o ' ; d r r o g s i k l r g A v u Ø N n 19 , d s d k ; Z d s i f r c l / r d j r k g s f t l l s f d l h i z k j



dk inik.k gærk gÅ ohjbnz xlg cuke gfj;k.kk l jdkj ds ekeys ea mPpre U;k; ky; us fu/kkZjr fd;k fd i ; kbj.kh; i kdjdLFkrdih; j ok; q, oa ty inik.k vkfn dks vuqPNn 21 dk vfrØe.k ekuk tkuk pkfg, A Lorærk ikfir dsi'pkr fodkl dh vdkh nkm+rFkk izdfr vfu; kftr ?kVukvla ea of) dks ns[krs gq l jdkj us, d vkj tglai jkus vf/kfu; eka dks ledkyhu vuq i cukus ds fy, ml ea vko'; d l fkkj dh ifØ; k ikjkk dh ogta i ; kbj.k l j (k.k, oa l Ø) Û ds fy, vusl uohu dne mBk, x; } ftuea lk; kbj.k ¼ j (k.k½ vf/kfu; e] 1986 dks djkxj dne ekuk x; k gÅ bl ds vaxZ i ; kbj.k ds l elr ?kVdha ea (kj.k dks jksdus ds fy, dne mBkus dk iko/kku fd; k x; k gÅ bl ds vfrfjDr i ; kbj.k ds ?kVdha dks vvx&vyx : i ka ea l j (k.k inku djus rFkk ml ds l Ø) Û ds fy, Hkh vusl oBkfud iko/kku fd, x, gÅ ftuea dñ egroiwk oBkfud iko/kku bl izdkj g&

- ty inik.k l ækh dkum &
- jhoj chMI Z, DV] 1956
- ty ¼ inik.k fuokj.k , oafu; æ.k½ vf/kfu; e] 1974
- ty midkj ¼ inik.k fuokj.k , oafu; æ.k½ vf/kfu; e] 1977
- ok; q inik.k l ækh dkum
- ODVht , DV] 1948
- buñyæYI l clVk l st , DV] 1952
- ok; q ¼ inik.k fuokj.k , oafu; æ.k ½ vf/kfu; e] 1981
- Hñe inik.k l ækh dkum
- ODVht , DV] 1948
- b.MLVht WlcyieM , M jxys'ku½ vf/kfu; e] 1951
- bul DVht kbMI , DV] 1968
- vcÙ ySM ¼ hfyx , .M jx; y's'ku½ , DV] 1976
- ou rFkk ol; tho l ækh dkum
- Qkj k VI dtjosku , DV] 1960
- okbYM ykbQ ikvD"ku , DV] 1972
- Qkj k V ¼ dutjosku½ , DV] 1980
- okbYM ykbQ ¼ ikvD"ku½ , DV] 1995
- tØ & fofo/krk vf/kfu; e ] 2002

**i ; kbj.k l j (k.k dh pñf; k &**

i ; kbj.k (kj.k ; k vl rgyu dh voLFkk ledkyhu l ekt ea xdkhj pñf;h cuk gvrk gÅ bl voLFkk us l ekt ea i ; kbj.k inik.k ds fofo/k Lo: i ka dks tÙe fn; k gÅ bl ds nñi Hkko vR; Ur ?kkrd l kfcR gks jgs gÅ ; g u døy ekuo cfYd l elr tØ l epk; ds vflRrRo ds fy, xdkhj [krjk cu x; k gÅ ; gh djk.k gsfod os'od Lrj ij i ; kbj.k l j (k.k dks fo'kSk egRo fn; k tk jgk gÅ yfdu l jdkjh , oa xj l jdkjh Lrj ij fd, tk jgs reke iz kl ka ds ctoim i ; kbj.kh; l el; k fnu&ifrfnu c<fH tk jgh gÅ fi Nys dñ o"wa dh flFkr dk vkdyu fd; k tk, rls nsk dh jkt/kkuh fnYyh ea ok; q inik.k ds Lrj dks ns[kk tk l drk gÅ tglal ka yauk Hkh nñkj gærk jgk gS rFkk fnu&ifrfnu ok; q inik.k ds f'kdj Ø; fDr; ka dh l f; k Hkh c<fH tk jgh gÅ ; g fopkjuh; rF; gsfod vkr [kjdkj l jdkj } kjk pyk, tk jgs reke iz kl vius vi{kavla ij [kMk mrjus l soapr D; ka jg tk jgh gÅ bl ij fopkj djus l s i wZ ykñMlmu dh flFkr ea 'kgjka , oa ufn; ka dh flFkr dk vkdyu fd; k tkuk vko'; d izhr gærk gÅ vkt fnYyh l er nsk ds l Hkh egkuxjka vlg [kk dj ft l egkuxjka ea ok; q inik.k dk Lrj vR; Ur xdkhj : i /kkj.k djrk tk jgk Fkk] dh flFkr l rksktud gks x; h gÅ vkt ; gla dsk; q dh



xqkoRrk ekud ds vuq i gA fi Nys dN o"ka ea xak dls inlk.k ePr djus ds fy, djka/ka dk ctV 0; Fz l fcr gya ykkaMkmu ds bl nls eafcu fdl h [kpl ds xak l er nsk dh ykbQykb l fcr gkus okh fofhku ufn; ka dk ty Lo; a fuey vls LopN gls x; k gA ; s rF; gea bl ckr ij fopkj djus ij etoj djrh gsf d; k ekuo Lo; avius vLrRo dls feVkus ds fy, l a"kr gA ; gh dlj.k gsf d vkt ds bl nls ea i; kbj.k l j {k.k ftruk vf/kd egRo iwk emnk gS mruk gh egRo iwk bl rF; dls idk'k ea yuk Hh gsf d bl dsekZ ea dks & dks l h paks; ka gA

Hkjr , d xte izku jkV gA ; g foMEcuk gh gsf d nsk dh vf/kd l k vcknh dls viuh Nk; k ea j [kus oksy xka dh l kkr nj vi fkr vkt Hh fuEu gA bl ds dlj.k bl ea i; kbj.k l a dkh tlx: drk dk Hh vHko ik; k tkrk gA d'k dk; Z budk e; ; 0; ol k; gkus ds dlj.k bl svi us ifjokja dh vko'; drkva dls ij k djus ds fy, d'k mRi kn , oa bl l s t l s y?kq , oa d h j m l s ka ij vkf Jr jguk i mRk gA tlx: drk ds vHko ea ; s [ka ea ijkyh ; k d'k vi f'kV dls fofhku rjhka l s u"V djs gA l fkr gh buds jkj [kn , oa tgjyh nokva dk iz kx dju; taxy dkVus vkn f; kva ds : i ea iR; {k , oa ij k : i ea i; kbj.k {k.k dls c<kok nrs gA bl fy, ; fn i; kbj.k dls l mfy r j [kuk gS rks ml ds fy, ; g vko'; d gsf d buds chp i; kbj.k inlk.k l s t l s fofhku igya ka ds ckjs ea tkudjh dk ipk&i l j fd; k tk, A vkt reke oSkfud iko/kku ds oktm 'kj dk xnk ikuh dy&dkj [kuka dk rjy vi f'kV inlk.k vkn dls l h/s unh ea iokfr fd; k tkrk gS ftl ds dlj.k ufn; ka dk ikuh fo"kr gls tkrk gS rFk tyh; tho u"V gls tkrk gA bl l s Hh i; kbj.k l j {k.k ea iR; {k , oa ij k : i ea ck/k [kMh gsrh gA

vkt l i i wZ fo'o vkrf d fodkl dh , d vkh nM+ ea i frHkx dj jgk gA bl i frHkx ds dlj.k vf u; k tr , oa Oj rjhds l idfr dk ngu fd; k tk jgk gA Hkjr t s fodkl 'khy nsk ds fy, bl ij fopkj djuk vls Hh egRo iwk gls tkrk gA vkt nsk dh rhoz xfr l s c<f h tul ; k ds fy, ekyd vko'; drkva [kktu] ol= , oa vkokl 1/2 dh i frZ , d xkhj paks; cu pph gA fo'o ds dy {s=Qy dk egt 24 i fr'kr Hkx ij fo'o dh dy vcknh dk yxHx 18 i fr'kr vcknh fuokl djrh gA bl l s; g Li"V gsrk gsf d ; gka ds i k d frd l a k/kuk d'k dk; ka , oa Hka ij fdruk nko gA ; g i; kbj.k l j {k.k dsekZ ea xkhj paks; l fcr gls jgh gA ; g l eL; k iR; {k , oa ij k : i l s fofhku i; kbj.kh; l eL; kva ds mnHko dk dlj.k l fcr gls jgh gA fodkl dh cnryh vo/kj.kk , oa l pj Ofr us vkt l ekt ea mi HkRrkoknh l dfr dls c<kok fn; k gA ftl dh i frZ ds fy, vls ksdj.k , oa uxhdj.k dh xfr ea viR; k'kr of) g pZ gA ; s l eLr dkjd orku le; ea i; kbj.k l j {k.k ds ekZ ea fdl h u fdl h : i ea ck/kd kuh g pZ gA bl ds vfrjDr Hkjr; l ekt ea HZVkpj , oa HkRrHkrtokn dk vLrRo , d , s nkuo ds l eku gS ftl us l ekt ds vl; {s=ka ds l eku gh i; kbj.k l j {k.k l s t l s ; kstukva dls Hh vi uk vkgj cuk fy; k gA ; g vkt ds l mHk ea l okZ/d fprk dk fo"; gA bl ea l kky yk, fcuk fdl h Hh ; kstukva dh l Qyrk dh dYuk , d dkjh dYuk gh jgkx og dHh l kdj : i /kj.k ugha dj l drh gA

fu" d"Z

i; kbj.k l j {k.k dk l keku; rRi ; Z i; kbj.k ds ?kVd rRoa ea vk; h vl rgyu dh l fkr dls nj djus l s gA bl ds fy, oSkfud , oa l oSkfud Lrj ij vud iko/kku fd, x, gA mi HkRrkoknh l dfr ds c<f s iHko ds dlj.k vkt ekuoh; vko'; drkva dh cnryh idfr us vls ksdj.k uxhdj.k , oa rdudh fodkl dls c<kok fn; k gA bl us i; kbj.k l s t l s fofhku l eL; kva dls tle fn; k gA ftl ds dlj.k vkt ekuo fofhku l eL; kva l s xfl r gsrk tk jgk gA i s ty l dV] Xlycy okfak] tyok; qifjorZ vkn ds l fkr d d j l er vud ?krd fceljh; ka ds mnHko dk dlj.k i; kbj.k vl rgyu dh l fkr cu jgh gA , s ea ekuo ds LoLFk vLrRo dls dk; e j [kus ds fy, i; kbj.k l j {k.k vr; ur vko'; d gA foMEcuk ; g gsf d buds fy, vkt dxth Lrj ij l jdkjh , oa xj l jdkjh l fkrva jkj vud iz kl fd, tk jsgs ydu okLrfodr dh /jkry ij ; g dne ukdQh l fcr gls jgs gA bl ds iHns fdl h , d dkj.k dls fteokj Bgjuk mfr irh ugh gsrk gA rhoz xfr l s c<f h tul ; k bu tul ; k ds fy, vko'; d Hkktu] ol= , oa vkokl dh vko'; drkva dh i frZ



djuk , d pultsh l kcr gls jgk gA bl ds fy, iR; {k , oa ijkk : i l s i k d f r d l d k / k u k a d k n k s u  
f d ; k t k j g k g A b l d s v f r j D r f o d k l , o a m i H k k D r k o k n h l d f r d s c < f s i H k k o d s d k j . k f u r u ,  
v k r o " d k j r F k k H k V k p k j H k h i ; k b j . k l j { k . k d s e k z e a , d c M h c k / k k g A , d h l e L ; k i j f u ; æ . k i k ,  
f c u k i ; k b j . k l j { k . k d h d Y i u k l k d k j : i u g h a y s l d r h g A y f d u g e ; g H h u g h a d g l d r s g s f d  
i f j o r z u d s b l n k s e a f o d k l v k s m i H k k D r k o k n h l d f r l s e g e k M e k m f p r g A v k t t : j r b l  
c k r d h g s f d i t d f r d l E i n k l i ; k b j . k h ; ? k V d , o a f o d k l , o a m i H k k D r k o k n h e k a k d s c h p l a n y u d h  
f l F k f r d i s c u k , j [ k t k , A ; g v k t d h i f j l F k f r e a u d o y e g R o i w k z g s c f Y d ; g l e ; d h e k a k H h  
c u x ; h g A

#### **l m k z x k**

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- 4- , l d s i j k s g r i ; k b j . k i n k k d k j . k v k s f u o k j . k l , l - d s i f t y ' k l j k t l F k k u j 2005
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## APPLICATION OF FLAME RETARDANT FINISH ON COTTON/POLYESTER BLENDED UPHOLSTERY FABRIC

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### Abstract:

After the end of MFA from January 2005, some of the hurdles the textile industry facing are Technical Barrier to Trade (TBT) and Non Tariff Barrier (NTB). Flammability properties of fabric like shirting, suiting, upholstery, etc. is looked as TBT in WTO. Major importing countries like U.S.A., Europe etc. have imposed a stringent specifications and test methods for evaluation of textiles goods to be exported.

Various types of flame retardant chemicals (finishes) are commercially available in market. The concentration of flame retardant chemicals and duration of curing time are critical parameters in enhancement of flame retardancy of fabric. Sets of experiments were designed to evaluate the efficiency of flame retardant chemicals on textile fabrics.

In the present study, cotton/polyester blend fabric was selected for flammability analysis. Suitable flame retardant chemical was procured from one of the reputed manufacturer. The chemical was applied on to the fabric using padding mangle. The concentrations of solution used were 200gpl, 300gpl, 400gpl and 500gpl. The duration of curing of treated fabric was 4 minutes, 5 minutes, and 6 minutes. After the treatment, the cotton/polyester samples were subjected to 3 cycles of washing.

Standard test methods viz. Vertical flammability test was adopted for analyzing the flammability characteristics of treated sample. From the study, it can be inferred that the flammability characteristics-time (sec) for flame spread is increasing with the increasing FR concentration.

**Keywords:** Chemical, Concentration, Flame Retardant.

### 1. Introduction:

Textiles are indispensable part of human life. They are mainly to cover the human body for protection against all the adversities. Textiles are also being used from kitchen to automobile and occupy majority of human household articles.

Safety features in textile material are one of the important quality requirements in textile industry. Textile products can provide protection from sunlight, fire, chemical or biological hazards. They are main ingredients in Personal-Protective Equipments (PPE). Fire fighters, health care personnel, and agricultural workers spraying pesticides all get benefit/protection from clothing designed to protect them in specific situation. Increased usage of textiles coupled with human recklessness towards its use has posed

threats to his life. Burning of wearable and other textile articles due to their affinity towards fire is the main reason for most of the fire related accidents. To avoid the flame related accidents, many categories of textiles have been subjected to chemical finishing.

Every year thousands of people die of burns and often it is said that the victim's garment contributed to the severity. Approximately 80 (%) of all fire accidents are home fires and about 90 (%) of fire fatalities occur in home fires. Appropriate technologies have been developed in recent times to reduce the loss of human life and property due to flame related accidents.

Considering the loss of lives, according to federal register (USA), USA introduced flammable fabric act (FFA) in 1953. All apparels sold in USA must possess Flame Retardance and these should pass a  $45^{\circ}$  angle test as described in consumer product safety commission (16 CFR parts 1610).

Cotton and Polyester are both prone to catch fire when brought under/near the flame. The fabrics made out of it are therefore highly sustainable to flame. This brings the need of certain types of chemicals, which can suppress these disadvantageous characteristics of the fabric/textiles and enable it to resist fire/flame for certain period of time. At the same time the fabric treated with FR finishes should be durable i.e. it should sustain certain cycles of washings, which in turn can make it economic solution.

## 2. Aims and Objectives:

- To study flame retardant behavior of Cotton/Polyester upholstery fabrics.
- To optimize the application of FR finish and assess the durability of the optimized recipe using commercially available FR finishes.
- To test Cotton/Polyester fabrics for some of the important properties in order to assess the efficacy of the finish.
- To study the FR characteristics using vertical flame test method.

## 3. Methodology:

The methodology adapted to carry out the study is explained in brief with the help of the following flowchart.

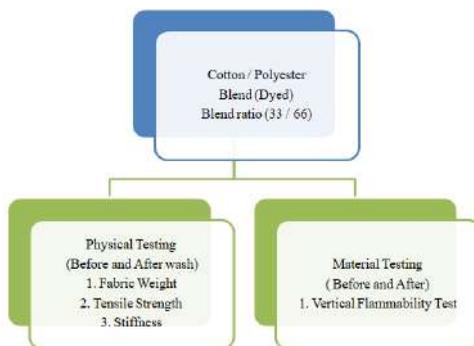


Fig 3.1

- Sample of Cotton / Polyester blend (cotton rich) fabric was procured from the commercial source.
- FR finish and chemicals used for the flame retarding finishing of fabrics were received from M/s Clariant Chemicals India Ltd.
- Physical and chemical testing of fabrics was carried out in the laboratory of Textiles Committee, Mumbai.

#### 4. Result and Discussions:

4.1 Data on fabric weight of fabric treated with various concentrations of FR chemical (Before wash and after wash).

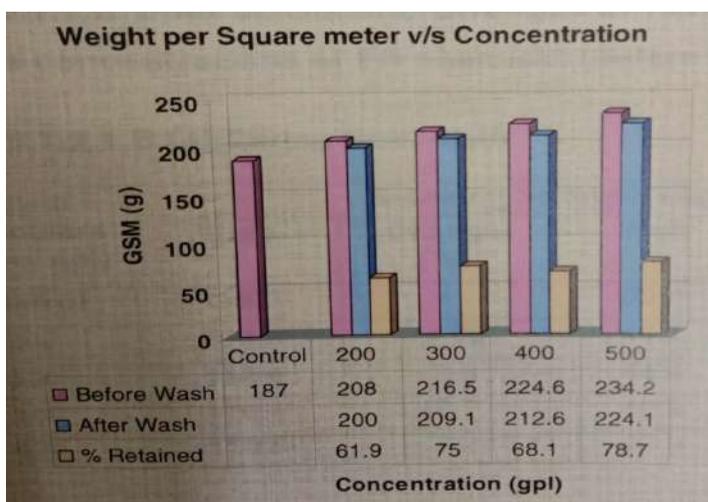


Fig 4.1 Weight per Square meter v/s Concentration

The above figure represents the data on Fabric Weight (GSM) at different concentration levels of FR chemical which show that the finish has been chemically bonded with the fabric. It can be seen that there is significant increase in the weight of the treated fabric when compared to the control fabric. The GSM of the fabric is directly proportional to the concentration, high weight at high concentration.

However, due to washing of the fabric the unfixed finish was leached out of the fabric as seen in Fig 4.1.

4.2 (A) Data on Tensile strength of fabric treated with various concentrations of FR chemical (Before wash)



Table 4.2.A (a) Curing time: 4 min

Fabric particulars (Conc. gpl)	Breaking Strength (Kgf)			
	Warp	Change (%)	Weft	Change (%)
Control	113.3	-	80.6	-
200	118.6	+ 4.68	49.1	- 39.6
300	112.4	- 0.8	44.4	- 45.4
400	116.4	+ 2.7	40.9	- 49.8
500	110.8	- 2.2	40.9	- 49.8

Table 4.2.A (b) Curing time: 5 min

Fabric particulars (Conc. gpl)	Breaking Strength (Kgf)			
	Warp	Change (%)	Weft	Change (%)
Control	113.3	-	80.6	-
200	122.4	+ 8.07	63.3	- 22.1
300	122.5	+ 8.2	60.7	- 25.3
400	113.9	+ 0.6	46.9	- 42.3
500	113.3	+ 0.02	43.0	- 47.2

Table 4.2.A (c) Curing time: 6 min

Fabric particulars (Conc. gpl)	Breaking Strength (Kgf)			
	Warp	Change (%)	Weft	Change (%)
Control	113.3	-	80.6	-
200	115.8	+ 2.2	45.5	- 44.0
300	117.1	+ 3.4	45.8	- 43.6
400	116.2	+ 2.6	60.7	- 25.4
500	110.3	- 2.7	74.4	- 8.6



In case of cotton / polyester blended fabric, the thread density is high compared to the warp direction. When the fabric is subjected to high temperature for curing there is some amount of shrinkage in the warp direction which leads to increase in the picks per inch. However, as the pick density is already high, further increase generates stress in the yarns in the form of lateral and longitudinal stress. This results in the decrease in the tensile strength in the weft direction.

4.3 (B) Data on Tensile strength of fabric treated with various concentrations of FR chemical (After wash)

Table 4.2.B (a) Curing time: 4 min

Fabric particulars (Conc. gpl)	Breaking Strength (Kgf)			
	Warp	Change (%)	Weft	Change (%)
Control	113.3	-	80.62	-
200	113.9	+ 0.51	35.1	- 56.9
300	113.2	+ 0.08	41.5	- 49.0
400	113.6	+ 0.23	44.4	- 45.4
500	114.4	+ 0.93	64.4	- 20.8

Table 4.2.B (b) Curing time: 5 min

Fabric particulars (Conc. gpl)	Breaking Strength (Kgf)			
	Warp	Change (%)	Weft	Change (%)
Control	113.3	-	80.6	-
200	114.5	+ 1.1	43.2	- 47.0
300	108.9	- 3.9	35.1	- 56.8
400	114.2	+ 0.8	44.9	- 44.8
500	113.0	- 0.3	66.4	- 18.4

Table 4.2.B (c) Curing time: 6 min

Fabric particulars (Conc. gpl)	Breaking Strength (Kgf)			
	Warp	Change (%)	Weft	Change (%)
Control	113.3	-	80.6	-

<b>200</b>	115.7	+ 2.1	42.3	- 43.1
<b>300</b>	113.4	+ 0.11	54.5	- 33.0
<b>400</b>	111.6	- 1.5	69.5	- 14.6
<b>500</b>	97.7	- 13.8	46.9	- 42.3

The table no 4.2.B (a), (b), and (c) gives the data on Tensile strength of the fabric at different concentrations of FR chemicals after 3 cycles of washing. It is seen that the Tensile strength decreases after wash more than before wash in the weft direction. There may be variation in the fabric quality or there may be differential shrinkage taking place in both latitudinal and longitudinal direction leading to decrease in the strength of the fabric.

4.3 Data on Stiffness of fabric treated with various concentrations of FR chemical (Before and After wash)

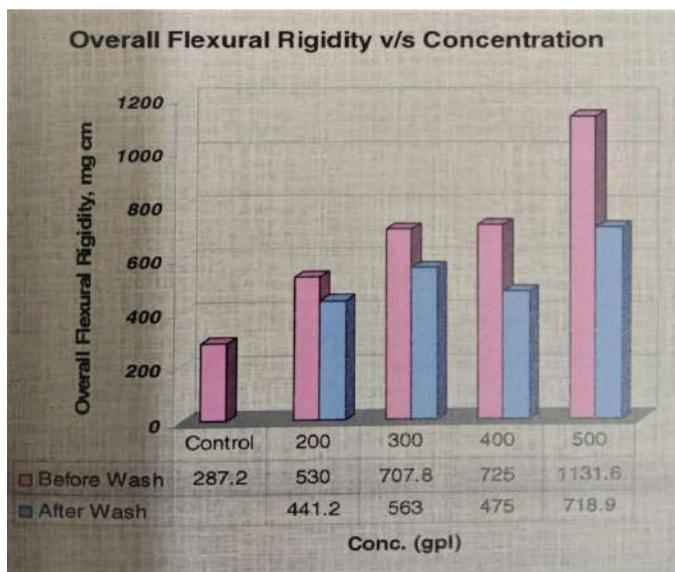


Fig 4.3.1 Fabric Stiffness with 4 min curing time

Figure No. 4.3.1 shows the data on fabric stiffness at different levels of concentrations of FR chemical. It is observed that there is increase in stiffness with the increase in concentration. This is due to the fact that deposition of the FR chemical on the fabric increases with the increase in concentration.

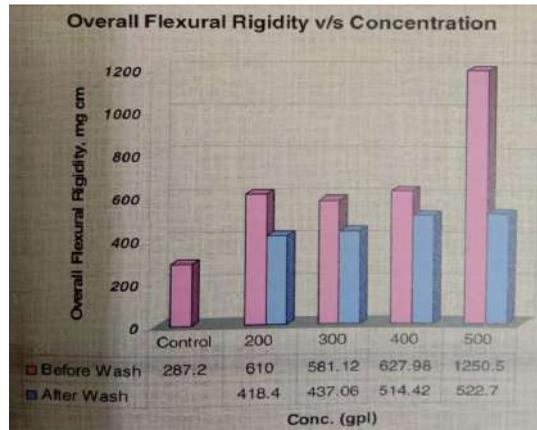


Fig 4.3.2 Fabric Stiffness with 5 min curing time

Figure No. 4.3.2 presents the data on fabric stiffness at different levels of concentrations of FR chemical. Stiffness indicates that the yarn has become more rigid than that of the control. This may be due to the impregnation of the finish associated to the cross linking of the finish. As the chemical add on increased, stiffness increased. Cross linking takes place at a higher pace at curing time of 5 min. however the effect of shrinkage in contributing to the increase in stiffness cannot be ruled out.

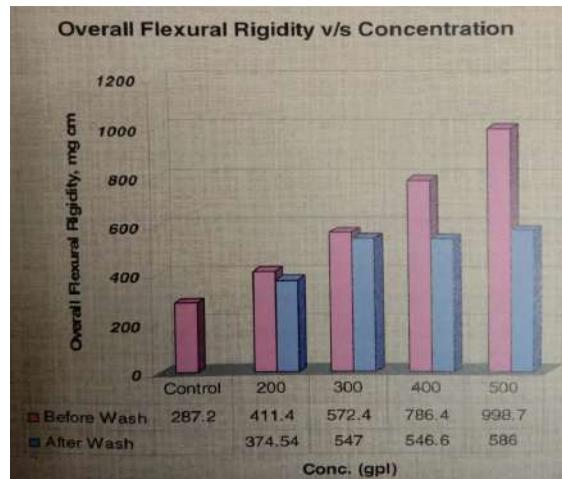


Fig 4.3.3 Fabric Stiffness with 6 min curing time

The above figure shows the impact of 6 minutes curing time on the fabric stiffness at different levels of concentrations of FR chemical. It could be seen that there is an increase in stiffness with the increase in the concentration. This is because the deposition of the FR chemical on the fabric increases with the increase in concentration.

4.4. A Data on vertical flammability test of the fabric treated with various concentrations of FR chemical

Table 4.4.A (a) Curing time: 4 min

Fabric particulars (Conc. gpl)	After flame time, sec.	
	Before wash	After wash
200	43.0	24.5
300	47.9	32.9
400	45.6	31.9

Table 4.4.A (b) Curing time: 5 min

Fabric particulars (Conc. gpl)	After flame time, sec.	
	Before wash	After wash
200	40.3	24.8
300	44.5	24.9
400	43.9	33.3

Table 4.4.A (c) Curing time: 6 min

Fabric particulars (Conc. gpl)	After flame time, sec.	
	Before wash	After wash
200	39.9	24.8
300	43.6	27.9
400	41.9	30.1

The tables 4.4 (a), (b), and (c) gives the data on FR characteristic-VFT for treated cotton / polyester fabric at 150<sup>0</sup>C for duration of various concentrations of FR chemical and cured at 4 min, 5 min, and 6 min.

It has been observed that the desired flame retardant characteristic (i.e. extinguishing of the fire after removal of flame) has not been achieved by application of the FR chemical up to the limit of 400gpl.

4.4. B Data on vertical flammability test of the fabric treated with 500gpl of FR chemical.

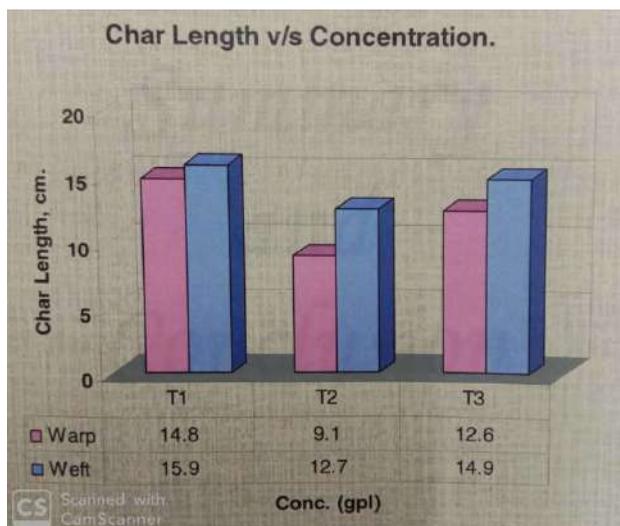


Fig 4.4.1

The above figure represents the FR characteristics – VFT of treated cotton / polyester fabrics after 3 cycles of washing.

All the sample specimens with FR concentration level of 500gpl did not ignite after the removal of flame. The char length was found to be minimum at the curing time of 5 min.

These result values are not for commercial purpose, they are only for the educational academic interests.

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## ARGUMENTATION OF RATIONALITY OF THE CIRCUMSTANCES OF ABHIJNANASHAKUNTALAM DRAMA

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### **INTRODUCTION**

Avijnanasakuntalam is the outstanding seven act play written by the great poet Kalidasa . By adding the incident of curse with the story of Mahabharata, the poet has turned his play into seven acts. Although the author has taken great care for the materialization of the curse in this drama, the rationality of those incidents can be questioned. For this reason, some incidents are presented here about the inevitability, originality and rationality of the incidents in this play.

#### Incidents from the First Act

- a) *The relevance of sacrifice for more than one fortnight after the return of the sage Kanva from the pilgrimage*

Some other issues need to be analyzed before discussing this issue. First of all, during any sacrificial ceremony, long term preparation would be done regarding collection of ingredients, invitation of sages etc. The security of the sacrifice was also required and confirmed thereof. It is also notable that, sages could not summon up any daily necessities for the next day. For this reason, they had to store sacrificial ingredients for longer days and as such it had become like a festival to the young and old inmates of the monastery.

The question may be raised that,, did the other sages complete the preparation for the sacrifice before the return of Maharshi Konva's pilgrimage? Or this is to be judged that, did the playwright inadvertently describes the sacrifice to give Dushyanta a chance to stay in the monastery? If the sage Kanva realized the necessity of the sacrifice, he would have taken his pilgrimage after the sacrifice or make prior arrangements for the safety of the sacrifice in his absence. Since he did not do any of these, we can say that, the sage Kanva did not feel the need for sacrifice.

Secondly, at the outskirts of the monastery, two disciples of the hermitage meet with King Dushyanta and he asks the disciples if the sacrifice of the hermitage is going on smoothly? Hearing the king the scholars invited him to the hermitage and also told him that Kanva had gone to Somatirtha this morning. So it cannot be said that Kanva did not feel the need for sacrifice or could not prepare for sacrifice as he had gone to Tirtha a long time ago.

Again, an ascetic of the hermitage told the king that, the sacrifice was going on unharmed and so he did not make any request for protection of the sacrifice. So we can say that, before the first day there was no preparation of sacrifice in the hermitage or fear of demons.



Again, it is noteworthy that, the next morning the king was asked to guard the sacrifice. So after about 12 hours the need of or preparation for security for the sacrifice was felt. Because the duration of time between the previous day's noon hour, when the disciples met the king, and the dawn hour of the next day, was about 12 hours.

It is notable that, the king suspended the hunt that day because of the clown's effort, otherwise the king would have gone for hunting before the sages' request. It cannot be said that, there is no need for any preparation for the sacrifice for more than 15 days and that can be held at any time. Because, to the sages, the fear of the safety of this sacrifice is so important that it is not possible to defend this sacrifice with only a few soldiers without king. But Dushyanta did not know how long this sacrifice would last? Hence, he did not send any instruction to his kingdom for his stay in the hermitage for indefinite days. It is noteworthy that, in the sixth Act of this play, the king who did not forget to give the responsibility of defending the kingdom to Pishun while going to heaven for one day, how did he not instruct to lead the kingdom for the sacrifice indefinitely? Are not these two sequences self-contradictory? If it is thought that the arrival of the king in the hermitage is accidental and this sacrifice is a common sacrifice, then it may be argued that shouldn't the patriarch have thought about the safety of that sacrifice in which the king's presence is not desirable? But the patriarch has gone to Somatirtha without doing this. Again, if it is thought that, the presence of a king is required here, then how many kings will be required for the common sacrifices like this that are being performed every day in all the hermitages in the whole kingdom of Dushyanta? Could the king visit everywhere? It is a matter of thought.

Again, in the absence of Kanva, the management of the hermitage was entrusted to whom? It is only mention in this play that, Dushyanta was requested by the scholars to protect the sacrifice. There were 10 thousand scholars in the hermitage. Was this a request of 10 thousand scholars? There is no answer in the play. So we can say that, the story of sacrifice is mainly planned to bring the king to the hermitage so that he could fall in love with Shakuntala, but no attention has been paid to the coherence and consistency of the events.

*b) The rationale for delegating hospitality to Shakuntala*

Although Shakuntala is reared in the hermitage, the heroine of Kalidasa is a very beautiful and gentle woman. At that time, just as ordinary guests used to come to the hermitage, so did the glorious sages. Sage Kanva knew this very well.

It is known from the Mahabharata that the sage Kanva was also a cause of fear to the kings. So without thinking that such a sage could come, how did Kanva put the responsibility of hospitality on Shakuntala? From the first, second and third Act of the play, it is known that, among the three companions, Anasuya's reciprocity, stability, restraint and depth of thought were much greater. So Anasuya was suitable for this job. Although Shakuntala's behaviour, quality etc. are unquestionable and it is one of the merits of hospitality but it can be said that, Shakuntala did not have the mental determination to present herself fluently to the great temperamental sages. This is why Shakuntala's creator Kalidasa did not dare to bring her on stage except with her friends. It should not be thought that Shakuntala was not hospitable, but her guests were ducks, peacocks, etc., not angry sages.

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- c) *The opportunity to listen to the conversations of three girlfriends from behind the tree and the reality of the hero-heroine reunion bed in cane bushes.*

Before discussing this matter, it is necessary to know some of the identities of the hermitage which will prove that it was impossible for those two events to happen. Firstly though Kanva was not worldly but from the mention of sages in the second and third chapters of the play, it is known that, this hermitage was habitable for both householders and sages. It is clear from all the practical advice given by Kanva when Shakuntala was going to her husband's house, that he had enough experience about the family. So we can say that, the population of Kanva hermitage including sages is more than 10 thousand.

Secondly, there was no separate and secluded place for women in this hermitage, but the entire hermitage was an open place for the sages and their child for bathing, picking fruits and flowers and for playing. Besides, due to the conservatism of the Hindu society at that time, it was also forbidden for young women to go to the edge of the hermitage.

For this reason, Kanva did not allow her friends to go with her despite Shakuntala's wishes.

So it can be concluded that this hermitage held more than 10,000 people where the movement of women was controlled but the movement of men was unimpeded. So, in such an hermitage, how could Dushayanta listen to the secret conversations of young women from recess and observe their youth where no one could see it, isn't it very inappropriate to think? Again, this scene is as inappropriate as it is unrealistic for the king. Since this scene is not of the first love-struck new lover, neither is the place secluded, so how was it possible to create a bed for a man and a woman in such a crowded place where it is impossible to find a secluded place? This is also a matter of cognizability. This is why in the Mahabharata this coalescence is shown inside the cottage in secret.

#### Incidents from the second Act

- 1) *Dushyanta just joked about his romance, should it be credible to the clown?*

The clown is the companion of the king's comic distributor. If Shakuntala's love story had been accepted as true by the clown, it would have been impossible for the king to reject Shakuntala and the playwright's intention would have failed. For this reason, before returning to the capital at the end of the second Act, the king said to the clown –

–“वयस्य, ऋषिगौरवादाश्रमं गच्छामि । न खलु सत्यमेव तापसकन्यकायाम् ममाभिलाषः । पश्य –

क्व वयं क्व परोक्षन्मथो मृगशावैः सममेधितो जनः ।

परिहासविजल्पितं सखे परमार्थेन न गृह्यतां वचः ॥” ( २/१८ )

It means, O dear friend, I am going to the hermitage because of the sages calling. It is not true that, I have love for the sage's daughter. Where are we and where are these hermitage's girl who had grown up with deer babies etc.? All that you have heard about this is just a joke.



In the fifth act, when the king rejects Shakuntala, the playwright sends the clown to the zenana to comfort the Hamsapadika. After 6 years, when the ring was found, the clown replied to the repentant king's question that, "You told me that love story was not true, just a joke."

–“न विस्मरामि ।किन्तु सर्वं कथयित्वा अवसाने पुनः त्वया परिहासविजल्पः एषः न भूतार्थः इति आख्यातम् ।मया अपि मृत्पिण्डवृद्धिना तथा एव गृहीतम् ।” (षष्ठाङ्कः )

First of all, it should be analyzed whether the clown was really a blunt person. Did the clown believe the incident that the king called a joke? This can be cleared by discussing the details.

In the second act, the clown's hunger for hunting was felt. In this context, it was also a cause of concern to the clown that the king did not want to leave the hermitage for love with Shakuntala. If the king does not leave the hermitage, then everyone's misery will not be removed. So the clown has pointed to Shakuntala as the cause of his misfortune. So I can say that, the clown knew, what was unknown to others, the love story of king and Shakuntala. Was this not a hard proof of the clown's keen intellect?

Again the king, in order to satisfy his lust for love, outwardly said that he was forbidding hunting at the request of the sages. Then when he raised the issue of Shakuntala with the clown, the cunning joke of the clown was noticeable. The clown says that the king's addiction to the sage's daughter is like eating tamarind after eating sweet dates. So can a clown who could make such a meaningful joke ever be stupid? Then, when the king agreed to go to the hermitage at the request of the sages, the wit of the clown was revealed by his ridiculous remarks -- ‘एषा इदानीम् अनुकूला ते अभ्यर्थना.-(

द्वितीयाङ्कः ) So the reader should think about whether such a wise clown can think the romance is a joke which the king described?

The role of the clown should also be considered at the beginning of the fifth Act. At first, on return from the hermitage, clown did not ask the king about Shakuntala. Is it reasonable for a friend with whom the king would discuss everything about Shakuntala? In front of the spectators and the king's priest in front of the palace, in broad daylight, Shakuntala was taken away with a luminous idol but no one saw it. It is also incredible and miraculous. Again it cannot be admitted that the story of Shakuntala's abandonment by the king was not spread among the subjects. If the people knew, then why didn't the clown hear this news after returning from the zenana? If he had heard the news, he would not have joked about leaving Shukuntala? It could not be that he forgot this because this incident had happened only six months ago. Again, with that clown with whom the king used to share everything, why didn't the king share the incident of abandoning Shakuntala that had tarnished his character? It should be taken into consideration.

So is the silence of the king and the clown is reasonable in such a stigmatized royal character?

2) *Was it the duty of the king to go to the hermitage for the second time?*

The king had protected the hermitage as a part of his duty. Therefore, to observe all the religious ceremonies here, to pay homage to the old sages and acquiring virtue by



visiting the hermitage, all these are essential duties of the king. But despite being invited by the sages the day before, the king did not do any of these things and requested the clown to find an excuse to go to the hermitage again the next day. So it can be said that finding an excuse to go like this is not for those works but to settle the matter of love . So was it the king's duty? Any one can say that just as Anasuya has said that the hermitage has prospered with the arrival of distinguished guests, so the king has also taken the all news of the hermitage from those three friends, so it is unnecessary to collect news from the sages.

The answer is that, first of all, Anasuya's statement is very courteous. It has no relation with fulfilment of royal duties. Secondly, Shakuntala was responsible for the hospitality, not the management of the hermitage. So it is ridiculous for the king to inquire about the religious activities of the hermitage to the friends of Shakuntala. So it should be considered whether the desire to visit the hermitage again is a part of the king's essential duty or not?

#### Incidents from the third Act

##### *1) A review of the playwright's remarks about the king's might for subduing demons.*

In the first part of the third act, host's disciple declares that, at the beginning of the sacrifice, Dushyanta did not have to use his arrows to drive away the disturbing monsters, only by the sound of the strings of his bow was enough to drive away the monsters. By this announcement, the spectators will know that, the demons are so frightened of Dushyanta that, he did not feel any difficulty in overcoming the obstacles during sacrifice.

But this is not the real picture. As we see at the end of this act, in the evening the monsters re-appeared around the altar ignoring the presence of this hero. So how can the monsters who run away only hearing the sound of the king's bow, ignored him even though the king himself was present there? It is up to the reader to decide whether there is a contradiction between the two.

In the fifth act also, when the king wants to know whether the austerities are being hindered, the disciples of Kanva reply that, there is no possibility of austerities in the reign of the religious guardian Dushyanta. It is pertinent to note that, in the reign of Dushyanta, we see in the second act that, there was no permanent system for the protection of religious activities in hermitages. It is notable that in spite of the presence of the king, where the demons had tried to create disturbances, is it believable that the demons would refrain from creating disturbances by merely remembering king's name in the absence of the king while he was engaged in royal affairs in the capital? So this statement is also inconsistent. Even if this royal compliment of the two disciples is accepted only out of courtesy, it is surprising that the king commented proudly on the false praise of the two disciples –“ सार्थकः तस्य राजमहिमा ”.

##### *2) Intimacy of Goutami etc. with the king during his stay in the hermitage and the king's behave of them in the fifth act when they arrived in the palace with Shakuntala.*



In the second act it is seen that, the king was in the monastery only with his jehu for more than 15 days. According to Manu's instructions, the king is not the guest here, he is the patron of the Vedic sacrifice, because the permanence of the guest does not last more than one night. Manu says about this –

“एकरान्तु निवसन्नतिथिर्वाहणः स्मृतः ।

अनित्यं हि स्थितो यस्मात्तस्मादतिथिरुच्यते ॥ (मनुसंहिता -३/१०२)

Since the sage Kanva was not in the hermitage, it was normal for the disciples like Sharangarab or the senior most Gautami to serve the king for more days. So we can say that, they formed an alliance with the king in the monastery. But in the fifth chapter, when Shakuntala was unable to prove the evidence of her marriage to the king, some of the king's remarks with these former acquaintances are noticeable –

गौतमी =नूनं ते शक्रावताराभ्यन्तरे शचीतीर्थसलिलं वन्दमानायः प्रभ्रष्टम्  
अङ्गुलीयकम् ।

राजा =( सस्मितम् ) इदं तत् प्रत्युत्पन्नमति स्त्रैणमिति यदुच्यते ।

गौतमी = महभाग, न अर्हसि एवं मन्त्रयितुम् । तपोवनसंवर्धितः अनभिज्ञः अयं जनः कैतवस्य ।

राजा = तापसवृद्धे ,

स्त्रीणामशिक्षितपटुत्वमानुषीषु

संदृश्यते किमुत याः प्रतिबोधवत्यः ।

प्रागन्तरिक्षगमनात् स्वमपत्यजात –

मन्यैद्विजैः परभृताः खलु पोषयन्ति ॥ ( श्लोकः -५म -२२ )

It is to be noted here that Gautami, who had been in service for more than 15 days in the hermitage and in whose care the king was pleased, was rebuked with undesirable words by the king in rage only at an interval of six months. The king also mocked and disrespected the venerable Gautami with this sentence - “इदं तत् प्रत्युत्पन्नमति स्त्रैणमिति यदुच्यते ”(पञ्चमाङ्कः ). Not only that the disciples of the ashram who accompanied Shakuntala were also disrespected by the king through jeer. So from this incident could we say that, the king's strange behaviour with his special acquaintances was reasonable? It is also known from Srangarab's conversation that, the king was his former acquaintance or not? He told the king that he was proud in wealth and was depraved. It should also be considered, why the king did not instruct to seek authenticity of the information after hearing such words.

### 3) Did Gandharva marriage take place in the absence of Shakuntala's girlfriends?

To get the answer to this question, it is necessary to know the scene of rejection of Shakuntala. Those who accompanied Shakuntala on her way to her husband's home was not present at the marriage ritual of Dushyanta-Shakuntala and did not know about the



curse of Durbasa. Shakuntala also lost the commemorative ring given by the king. So she has been reprimanded by the words like deceiver, unchaste etc. She also accused the king of deception because of her unexpected rejection. It is noteworthy that, in the future Shakuntala will be crowned -queen of the king - this promise was fulfilled by Ansuya from the king.

The question may arise here why the friends who were Shakuntala's constant companions, through whom the copulation of King and Shakuntala took place in secrecy and were always trying to maintain tight lipped regarding this meeting, were not called as witnesses? Or why after 3 days, without receiving any news from the king, to whom Shakuntala expressed her heart's desire, Shakuntala didn't raise the issue of eyewitness account of his friends even during such a catastrophe? Is it not amazing?

One can say that, the presence of the friends of Shakuntala was not observed in the play during the Gandharva marriage. If we admit this, we have to admit that the sense of propriety of both was very low. But that is not acceptable. While admitting that, the marriage took place in the absence of friends, it is also undeniably admitted that the first reunion of Dushyanta and Shakuntala took place at noon with the help of her friends, since there was no one present except her friends. Therefore it can be proved that both of them were eyewitnesses of Shakuntala-Dushyant's antecedent and affection.

It is also noteworthy that just as Shakuntala did not raise the issue of eyewitness accounts of friends, similarly, two friends also did not show up them in the great misfortune of their best friend. It is to be judged whether all the events required their direct observation or not.

Again, when questions are being raised about the dignity of a woman, and when similar question was being raised about the character of the king, why did the king remained abstain from going to the hermitage to find out the real truth? What was the need to take such a hard decision instantly? Is it the duty and judicial aptitude of the king to give such verdict? The reader should be judgemental in this case.

#### Incidents from the fourth Act

*Six months later, at first of the fourth act the reaction of the two friends was justified or not?*

Before this discussion it is important to know the reaction of the two friends. So their quoted statement is given below. Leaving bed in the morning , Ansuya says –

“न मे उचितेषु अपि निजकरणीयेषु हस्तपादं प्रसरति ।काम इदानीं सकामो भवतु येन असत्यस्न्धे जने शून्यहृदया सखी पदं कारिता ।अथवा दुर्वाससः शापः एषः विकारयति ।अन्यथा कथं स राजर्षिः तादृशानि मन्त्रयित्वा एतावत्कालस्य लेखमात्रमपि न विसृजति ।त् इतः अभिज्ञानम् अङ्गुलीयकम् अस्मै विसृजामः ।दुःखशीले तपस्विजने कः अभ्यर्थ्यताम् ।ननु सखीगामी दोषः इति व्यवसिता अपि न पारयामि प्रवासप्रतिनिवृत्तस्य तातकाश्यपस्य दुष्यन्तपरिणिताम् आपन्नसत्त्वां शकुन्तलां निवेदयितुम् ”(चतुर्थाङ्कः )



At this time, Priyambada said that, Kanva knew everything about Shakuntala by prophecy and promised to send to her husband on the same day. The prophecy was as follows:

“दुष्यन्तेनाहितं तेजो दधानां भूतये भुवः ।  
अवेहि तनयां ब्रह्मन्नग्निगर्भां शमीमिव” ॥ (४/४)

Incidentally, the question may arise, how did Gautami know nothing about Shakuntala's pregnancy despite being 6 months of her pregnancy? How did Gautami remain in dark of knowing the details of marriage and curse even from Shakuntala's friends? Although the friends were afraid to tell Kanva about Shakuntala's negligence in hospitality, why didn't they tell Gautami? With a few words, the friends comforted the pregnant, anxious Shakuntala for a long time. Because Dushyanta was an unexpectedly worthy groom, was said by Ansuya, the evidence of marriage was also seized by Shakuntala. Again, they knew that the curse of misfortune was infallible. They knew that the curse of misery was infallible. Even after 3 days, when no news of the king came, the thought that the king forgot because of the curse should be normal. But after much thought Anasuya realized that the fact was unbelievable.

After 6 months, why didn't the friends think about sending the sages to the palace? Seeing Shakuntala's miserable condition, why Ansuya was acting as usual without telling Kanva everything? Here one should be critical in analysis. It should also be noted that day after day, when Shakuntala was on the verge of death from obsession and preoccupation with her husband, Priyambada went frequently to her, asking whether she had a sound and peaceful sleep at night. Is it reasonable to ask this ridiculous question by Priyambada when she knew very well about the mental stress Sakuntala was going through and as her friend she and others failed to arrange any worthwhile arrangement for her solace and peace.

### CONCLUSION

So in the end, I can conclude that, even though this play of Kalidasa has many such unreasonable incidents, it is universal in nature, since what in reality is inconsistent, has a complete and reasonable meaning in the dramatic perspective. Here, we have judged the events of the drama from the point of view of reality, not from the point of view of drama. So even though the success of the writer comes through criticism, it is not desirable for people like us to criticize Kalidasa, one of the greatest poets and dramatists of all time. This is only an ostensible discussion of some great dramatic events, not a critique.

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- 11- ufn; ka ea Hkjh ek=k ea xkn teko l sty l ek; kfr djus dh {kerk ea deA
- 12- cny dk QVukA
- 13- pØokrA
- 14- i kdfnd rVclks dh {kfrA

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ogn viokg {ks= ck<+dk ied[k dlj.k g\$ xakk ds mUkj ehku ea ck< dk dlj.k fgeky; l s cguokyh vud ufn; k; gA ied[k ufn; k; l j; @/kk/kj] cxerh] x.Mcl] dkl h] dey] egulnk ce[k g\$, oa xakk ds nf{k.k ehku ea cjl krh ufn; k; ck<+dk ed; dlj.k g& l ku] i q i q] deZk"kk] vt; vkfn gA xakk ds ehku ea ufn; ka dk nls/c {ks= ufn; ka l s Apk gA unh ry ea xkn fu{ks ds dlj.k unh dh tyL=ko {kerk ea deh vk tkrh gA cjl kr ds fnu ka ea tc xakk unh Hkj tkrh g\$ rls og l gk; d ufn; ka ds ikuh dks vius ea l ekgr djus ds ctk; i hNs dh vlg <dsyus yxrh g\$ D; khd xakk dk tyLrj l gk; d ufn; ka l s Aij gkrk gA ck<+vkus dk , d vlg dlj.k j {kk rVcl/ka dk VVuk Hk gA

pØokr Hk ck<+dk , d ied[k dlj.k g\$ bl ds njsku rst rQku ds l kfk&l kfk Hkjh o"kkz Hk gsrh gA enk vijnu Hk ck<+dk , d ied[k dlj.k gA enk vijnu ds dlj.k ufn; ka ea vol kn tek gsrk g\$ ftl dlj.k ufn; ka dh cgko {kerk i Hkfor gsrh gA fcgkj dh dkl h unh vol kn teko ds dlj.k gh Hk; dlj ck<+fy, d; kr@fo]; kr gA vLekr vr; kf/kd rst o"kkz dks gh cnyka dk QVuk dgrs gA bl ds dlj.k Hk ck<+vkrh gA ; fn ty l dlnzk dk l e; de gsrks ck<+dh ip.Mrk vlg vf/kd c<+tkrh gA

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fcgkj , d dfrk c/kku jkT; gA; gk; dh vFk; oLFk dh jh<+Nfrk gh gA bl ds 38 ftys ea l s 28 ftys ck<+ i Hkfor gA fcgkj ds dy {ks=Qy 94]163 oxZ fd{eNE ea l s 68 yk[k oxZ gDVs j {ks= ck<+l s xfl r g\$ ts ijs fcgkj ds {ks=Qy dk 60% g\$ bl ea l s 45 yk[k gDVs j {ks= Aukj fcgkj ds ehku ea vlg 23 yk[k gDVs j {ks= e/; fcgkj ea lFkr gA nsk eack<+l s ftruk upl ku cfro'kz gsrk g\$ ml dk 20% l s 30% Hkx fl QZ fcgkj ea gsrk gA yxHkx 8 djM+ tul ; k okyk ; g jkT; ck<+ dh vkor'k vlg 0; ki drk l syxkrkj l k'k'z dj jgk gA ck<+l s fcgkj ea vki kj {kfr gsrh g\$ gtkj la ylx c\$kj gsrk gA o'kz 1987 dh iy; dlj



ck+ea yxHkx 1-90 djKM+ ylx iHkfor gg Fl\$ 104 LFkyka ij rVcl/k Vm's Fls , oa Hkou] jy ykbu] l Med] df'k mri knu vkfn l s 132 djKM+ : i ; s dh {kfr ghpZ Fkha bl l s Hkh iy; dkjh fLFkr o'kz 2008 ds ckn fn [k; h nh Fkha bl ds vfrfjDr nks vlc {s= ea ufn; ka ds plj vj\$ eu ea ty teko dh l el; k LFkk; h gis tkrh g\$ ft l l s [kjh Ql Ql ya ugha gis i krh A xack unh dk nf{k.kh dxkj Apk gkus ds dkj .k cjl kr ea Qr gk l s yD [khl jk; rd Vky {s= fodfl r gis tkrh g\$ fcgkj ea ck+ cHkfor {s= ka ds plj Hkx% ea foHkfr r fd; k tk l drk g\$

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 1- f'kogj2- l hrke<k3- i mh'z pEi kj .k4- e/kp;uh5- l q kSy  
 6- eaf'Qj i g7- njHkxk8- l gj l k9- i- pEi kj .k10- e/k'g'k mUkj {s=

bl Hkx& xM] ckt xM] ckerh vj\$ dkd h ufn; ka l sck+dh fLFkr i nk gis tkrh g\$  
 1/2 nf{k.kh Hkx& bl ds varx' fuEu ftys g\$&  
 1- Hkxyij 4- cxd jk; 7- oSkkyh  
 2- [kx'fM+k 5- yD [khl jk; 8- l eLrhij  
 3- e'kj 6- "k'ki jk 9- ukylnk

fcgkj ds e'kuh {s= xack dkd h] ckerh] ckt xM] xM] vkfn ufn; ka ds M'V'kbl {s= ka ea ck+ l s gkfu i gprh g\$

1/2 i mh'z Hkx& bl ds varx' fuEu ftys vkrs g\$&  
 1- vjff; k 3- i n. k'z k 5- e/k'g'k nf{k.kh {s=  
 2- fd"kuaxat 4- dfVgkj 6- Hkxyij i mh'z {s=

fcgkj ea ck+i Hkfor i mh'z Hkx& dkd h , oam l dh vl; l gk; d ufn; ka rFkk xack unh l sck+vkrrh g\$

1/2 i f'peh Hkx& bl ds varx' fuEu ftys g\$&  
 1- cDl j 4- t'gkukcln 7- xkd kyxat  
 2- Hkxst i j 5- l kju  
 3- i Vuk 6- l hoku

i f'peh Hkx ea l ku unh] xack l j; @?k'k'k ufn; ka ck+ l s gkfu i gprh g\$





- fl g] nhi ukjk; .k 2010½ fcgkj fnxn"ku-eg B %vfjglr i fcyds kll
- fl g] vkjñ i hñ , oa dækj] vfuy 1970½ e"u"xtQ vkkD fcgkj- i Vuk %Hkkjrh Hkou
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## Position of Women: A Study of ‘Abdelḥamīd Ben Bādīs and Moḥammed Arkoun of Algeria

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### Abstract

The issue of women has always remained for decades in the intellectual and debatable limelight. The arrival of the modern period gave birth to novel and foreign rituals which marked their entry in the teachings of the Muslim Faith thus bringing immense cultural tremors. The religion of Islam pays huge respect to both sexes, exclusively to women who are supposed to be given an equal treatment in the society. Focusing on the women’s role in the Muslim community, this paper will be an effort to accentuate the perceptions of two reputed scholars of the 20<sup>th</sup> century, hailing from Algeria, namely, ‘Abdelḥamīd Ben Bādīs (1889-1940) and Moḥammed Arkoun (1928-2010), on the position of women in the Muslim societies. As Algeria was under the French occupation (French Algeria) in those days, Ben Bādīs opted for the implementation of traditional approaches to the contemporary conditions so as to fight against the colonizers. He believed that women could play a pivotal role in realizing this resistance. According to him, the progress of women could be attained via the provision of an enlivening education thus enabling them to identify their efficacious role and position in the society and to boost them up to participate in the war of independence. As far as Moḥammed Arkoun is concerned, being a modernist, he believed that changes should be made in accordance to the pre-requisites of time. He opposed those traditional scholars who merely considered women to be the pillar of the house. However, the visions of Arkoun will portray how women’s role is indispensable both within the house as well as in the public domains.

**Keywords:** *Position of Women, French Algeria, ‘Abdelḥamīd Ben Bādīs, Moḥammed Arkoun*

### Introduction

The role and status of women in Islam is of great importance to be studied. It is a subject which provides an insight of the grandeur that women acquired with the advent of Islam compared to the pre-Islamic period where their position was horrible. Several debates and discussions have taken place throughout the centuries to depict the role of women in the Muslim community. Among so many scholars, two famous scholars of the 20<sup>th</sup> century belonging to the land Algeria, namely, ‘Abdelḥamīd Ben Bādīs<sup>i</sup> and Moḥammed Arkoun<sup>ii</sup>, advanced their thoughts regarding the role, identity and functioning of the Muslim women. Their intellectual insights had a great impact on the Algerian community which helped to eradicate various misconceptions regarding the status of women



### **Women under French Colonialism**

To begin with, it must be noted that the land of Algeria was colonized by the French. Every imperializing process was accompanied by exploitations. The French occupiers aimed at dismantling the Islamic institutions as well as the Islamic cultural networks. However, the Algerians were never interested to adopt the alien cultures. They considered the French cultures to be disrespectful and firmly believed that Islam and the Muslim family law are the only guided solution to the French imperialism.

The imperializing period was tough and required intelligent strategies to get rid of their occupancy. This harsh situation had a deep impact on gender relations among the Algerians. Men were not included by the French in the public life thus leading them to develop a more despotic role at home. The occupiers wanted to westernize the Algerian community, but the people reacted with hostility because they were not ready to compromise their cultures with the French one.

The women in Algeria, on their part, played their role effectively and truly safeguarded their authentic traditions and identity. They remained far from the eyesight of the French occupiers as far as possible. The wearing of veils and residing behind the high walls gave birth to an aura of mystery which the French impatiently wanted to unveil. In a way, it can be said that the instinctive motive towards the emancipation of women emerged mainly from the French. They were so eager to find out the real jewel behind the veiling of the Algerian Muslim women. Therefore, they started to work out on strategies that could bring down the status of the Algerian women.

The presence of the French had undoubtedly an impact on the status of women in the Algerian community. It gradually started to become prevalent in various areas of the society. The occupiers imposed legal structure, such as girls were not allowed to get married before the age 16 and that divorce cases were to be decided by the judge. Moreover, the Church initiated missionary efforts, comprising of the Sister's schools. Hence, many women got in touch with the French men and started to work out as servants in factories as well as migrants to France.

The Algerian women knew that the French were bent upon annihilating their cultural identity and the only way to escape it was to stand firm on the teachings of Islam. The occupiers were in a way resisting against the veiling of the women. However, as far as the Algerians were concerned, they said that unveiled women represented the submission to the colonialists and their disrespectful cultures. Therefore, the preservation and seclusion of women in Algeria were regarded as a defense against the colonial cultures.

The colonialists realized and understood the fact that the Algerian women held a very significant position because they were considered as the protectors of the traditional values and showed no interest to adopt their cultures. Therefore, they embarked on a mission to eradicate the Algerian culture by emancipating the women "à la Française." Had they been successful in doing so, this would have paved the way for the French occupiers to penetrate the houses of the Algerians. If the Algerian women accepted to emancipate in the French style, this would have depicted the fact that they had approved the French presence in the country. But they chose to do the contrary. They maintained that their culture and that of the French are dissimilar. Their individuality was not in



existence due to the French presence, that is, they both held a separate identity. Throughout the colonization, they maintained that *there is them and there is us*<sup>iii</sup>. This kind of reaction really bothered the imperialists. They were not ready to accept the fact that Algerian women held a pivotal stand in securing themselves from alien cultures. However, the imperialists were not to sit idle. They could not think of bowing down in front of the Algerian women's exceptional cultural fame. They continued their process of searching for shrewd measures in order to belittle the status of women. Their aim was to make the Algerian women realize that Islam meant oppression. Veiling was to hinder their participation in public life. Seclusion within the high walls was a mean to restrict their right to freedom. The imperialists purposely wanted to instill in their minds that success lies in unveiling. It would unlock doors of opportunities to explore different segments of the society. Unveiling meant securing high post in jobs and being a successful product of modern life. In short, the motive of the French occupiers was assimilation. This refers to discard one's culture, religion, language, beliefs and sense of belonging.

Moreover, the colonizers were not to accept defeat so easily. Therefore, they could find only one way to execute their objective; education. They decided to provide free education for girls. The imperialists saw that the education of women could prove to be a very powerful tool to undermine the cultures of Algeria. However, they had to encounter hostilities from many Algerian families who were hesitant to send their girls to French schools and if they did, they would get them wedded at an early age so that the girls were not able to complete their studies.

### **The Uncompromising Approach**

In the first half of the 20<sup>th</sup> century, there emerged a scholar in the land of Algeria, popularly known as 'Abdelhamid Ben Badis (1889/1307 A.H – 1940/1359 A.H), who set out to confront against the atrocities inflicted by the French upon his people. He became a pivotal figure who came up with a reformative program that efficaciously envisioned an ongoing practice of Islam in the modern world and highlighted the prerequisites for religiously-based ethics in any modern system. He believed more in pragmatism rather than theory.

'Abdelhamid Ben Badis was fully aware of the alien cultural dangers wandering around in his society. He was of the viewpoint that the Algerians are not supposed to become at any cost a prey of the colonialists. They should keep their distance from those European cultures which were not in accordance to Islam. A slight slip could make them lose their cultural identity. Therefore, they had no choice except to stay firm to their religious and cultural beliefs as these would act as powerful instruments of resistance to the French acculturation.

Besides, 'Abdelhamid Ben Badis was very much concerned about the roles of women in the Algerian Muslim society. Regarding their status in Algeria, he, unquestionably and profoundly, chose to implement the teachings of Islam over the liberal voices and thoughts of his period. An Algerian nationalist group called "Young Algerians" (Jeunes Algériens/ *Évolués*)<sup>iv</sup> who were traditionally Arab and educationally Frenchmen, deplored the traditional teachings of Islam regarding women. The society and its Islamic



elucidations imposed on Muslim women were regarded as degradable in nature by the Young Algerians.

Discussions about the status of women represented an explicit division that existed between modernity, in its crucial character, and not merely Islam but most major religions of the world. 'Abdelḥamīd Ben Bādīs believed that Islam was impartial truth, unaffected by any challenge. He considered it to be his incumbent duty to refute all the allegations to dissipate criticism that women solely experienced a depressed position in the society. He responded by stating that it was the whole Algerian Muslim community who fell into the state of depression. Therefore, it makes no sense, he says, to expect women enjoying any other position under these circumstances.

The *Évolués* also indulged in the discussion regarding the rights of women in Islam, polygamy, divorce, veil and the inheritance system. 'Abdelḥamīd Ben Bādīs set out to defend his insight of women's rights under the banner of Islam. He was against the liberals on this issue and regarded tradition as a shelter against the French cultural colonialism. 'Abdelḥamīd Ben Bādīs was of the viewpoint that questioning the status of women was actually a strategy to undermine the religion of Islam. It was another attempt from the part of the French imperialists to obliterate the cultures of Islam and hence pave the way for the French political domination and economic exploitations. These questions were also taken as another effort from them to sabotage the family traditions in Algeria.

'Abdelḥamīd Ben Bādīs' responses clearly show that he was a true defender of Islam. He never wanted to compromise the Islamic cultures with the European ones. He witnessed that the debate concerning the roles of women illustrated the fact that the French imperialists had failed in their policy of assimilation. Their efforts headed towards the unsuccessful lanes. They were unable to swallow the fact that Islam raised the status of women and accorded them their roles without any partiality.

It is important to note that Islam is a religion which does not approve any kind of violence. However, the status of women before the advent of Islam was extremely terrible. They were victims of various male injustices. According to 'Abdelḥamīd Ben Bādīs, the teachings of Prophet Muḥammad ﷺ led to the liberation of women from the cruelties of men. Ben Bādīs maintained that no matter what status a woman holds, single or married, she is an individual of her own right. She has the right to own and dispose of property and earnings. This view was held by almost all the Islamic reformists.

The Qurān makes people aware of the fact that Allah does not make distinctions between human beings, whether men or women, except between those who execute good deed and those who do bad deed. [An-Nisā4:124] The position that women occupy in Islam is on the basis of the Sharī'ah chosen by Allah, and this is unfortunately not understood by all people. 'Abdelḥamīd Ben Bādīs says that the Divine Laws affirm the everlasting principle of equality before Allah. The Qurān mentions that both men and women were created from a single soul.<sup>v</sup>

They both have a dignified equality but differ only in their functioning. Ben Bādīs believes that men and women complement each other. However, he opposed the *Évolués* who suggested that the Islamic laws regarding women should be replaced by



the European laws. ‘Abdelḥamīd Ben Bādīs, through *Ach-Chehāb*, demonstrated that women were liberated from the shackles of injustices faced in the patriarchal society with the advent of Islam, on the view of Islam regarding polygamy, and on the usage of the veil.<sup>vi</sup> Veiling did not come into existence with the advent of Islam as it was already a pre-Islamic tradition that emerged in various regions of the world. The Qurān has emphasized on this tradition in many verses.<sup>vii</sup>

‘Abdelḥamīd Ben Bādīsexpounded that women should not display their natural beauty (face, figures, breasts, legs, artificial embellishments) to seduce the males thus distracting them from fulfilling their duties. These principles, he says, depict a general moral code, not associated with any specific region or people. Ben Bādīs believes that women’s face should be veiled. They can only unveil their faces if there is no temptation (*Fitna*) that pushes towards sexual intercourse. According to him, temptation changes from time to time, region to region and from one person to another in accordance to the circumstances. ‘Abdelḥamīd Ben Bādīs categorically warned his audiences not to imitate the European women by displaying their natural beauty. He also cautions them not to follow the footsteps of Muslim political rulers in the East (Egypt, Iran and Turkey) because their women were roaming unveiled in public. Therefore, according to Frantz Fanon, veiling represents an Islamic value and not a cultural tradition from the Algerian community.<sup>viii</sup>

### **Opposed to the Feminists**

The *Évolués* hailed the feminist movements of Turkey and Egypt. In 1925, Turkey annihilated the system of polygamy and favored civil marriage. In 1934, Turkish women were given the right to vote, something not present in the French governance. The Arab women movement debuted in Egypt with the removal of the veil by HudāSha’rāwī (1882-1947). She initiated the first feminist union in Egypt, dramatically unveiled her face in 1923 after coming back from an international women’s conference in Italy. Ṭahir Ḥaddād (1899-1935), a Tunisian author, elucidated some Qurānic verses regarding women in a very liberalistic way. However, ‘Abdelḥamīd Ben Bādīs lambasted Ḥaddād because he urged the women to adopt the western civilization ultimately deviating from the Islamic tenets. According to him, Haddad had dared to change various Qurānic guidelines and verses and the consensus of several scholars thus entailing disbelief in Islam.<sup>ix</sup> To depict how Ḥaddād had gone astray, ‘Abdelḥamīd Ben Bādīs confirmed that anybody who rejects a single Qurānic verse lands in a state of disbelief. Therefore, trying to compromise on the well-settled legal status of women is not acceptable. Revelations have given a clear picture regarding the common dissimilarities between both men and women.

The feminist movements, in the eyes of ‘Abdelḥamīd Ben Bādīs, were to make women neglect their responsibilities towards their homes, especially socialization of children. This was what the *Évolués* hoped for and those feminist movements were to fulfill their objective. However, ‘Abdelḥamīd Ben Bādīs opposed their ideas and found education as the most powerful tool to counteract the liberal thoughts. In his view, both sexes complement each other, and the religious laws are to maintain their complementary roles. According to him, those talking about the emancipation of women lacked proper



knowledge of Islam regarding the role and status of women. These campaigns were nothing but to divide the community. He says that these attempts would be resisted by both men and women who were the true followers of the religion. 'Abdelḥamīd Ben Bādīs referred to al-Shifa' Bint 'Abdullah as the virtuous Muslim woman. She converted to Islam during the early years of propagation and followed Prophet Muḥammad ﷺ in his journey to Medina. She was a literate woman and taught the language of Qurān to other women on the recommendation of Prophet Muḥammad ﷺ. She was a woman of great intellect and of various other talents as well. 'Abdelḥamīd Ben Bādīs believed that her example could prove to be an effective inspiration for the women of his period.<sup>x</sup>

Regarding the rights and duties of women, 'Abdelḥamīd Ben Bādīs said that they were equal to men as per the Islamic laws. The function of both genders, he said, could be for the time being different. He agreed to the fact that this would be mirrored in the women education. 'Abdelḥamīd Ben Bādīs was of the viewpoint that boys and girls should study separately. As for the girls' education, he said, it would fundamentally prepare them to have a proper understating of their religion and to adhere to its laws. He believed that girls must be trained to be the queens of the house and perform their wifely and motherly duties for which they had been created. 'Abdelḥamīd Ben Bādīs stated that the first teacher of the children is their mothers and to achieve to this quality, he said, a proper training was required. 'Abdelḥamīd Ben Bādīs opinionated that to choose a husband of her choice was indeed a fundamental right of the wife.<sup>xi</sup>

### **The Modernist Approach**

Moḥammed d Arkoun (1928/1346 A.H – 2010/1431 A.H), a contemporary Islamic thinker of the 20<sup>th</sup> century Algeria, says that Islam has given women equal status to men in spiritual spheres, but less in Islamic legal matters. This point is to be taken into consideration as equality is a very significant concept in Islam. It is true that Islam acknowledges equality of both men and women, but at the same time strongly lays emphasis on the fact that the roles and duties of the two genders are not equal and are therefore dissimilar. There exists no physical equality between male and female except that they both are the creatures of Allah. The dissimilarities between physical and chemical structures are outstanding and exceptional. There exists certain womanly aspects which are exceptional, and men cannot execute these functions which women can do such as bearing of children. Furthermore, in the zone of parenting, the care and affection that women can give to their children, most of the males are incapable of doing so. Likewise, the thinking method of women is much more emotional in nature than men, who hold a different thinking process.

Apart from spirituality, the Qurān also emphasizes that both male and female will have an equal reward in the Hereafter for their deeds in the universe. Also, women have the equivalent political and social rights that men possess. For example, both males and females are given an appropriate inheritance from both parents and close relatives. However, it is only in the role and function of both genders that there is diversity, but this does not refer that they are not equal.

Furthermore, Moḥammed Arkoun argues that conservatism has hindered the participation of women in public spheres. Orthodox interpretations of the Scripture have



as if sealed their fate. Arkoun opines that just like men are involved in all public domains, similarly, women should also be given the right to excel in them. Though having proposed that, Arkoun is still doubtful whether women's participation in the public domains will be potentially possible or not. There exists such societies, he mentions, where female students and workers belonging to different social backgrounds are involved in public affairs. However, Arkoun regrets one thing. Their number is small in quantity and thus cannot form a movement to help women acquire a modern intellectual capability and political realization to voice out their opposition to the status quo successfully.

Regarding elementary kinship structure, Arkoun opines that the Qurān was unsuccessful to modify it.<sup>xiii</sup> In other words, he is perhaps trying to state that the relationships in the family structure is not due to the influence of the Qurānic verses, but rather the impact of modernity and European renaissance. However, it is to be noted that there contains no such concept in the Qurān. In fact, the Qurān rather emphasizes on maintaining good family ties (Al-Nisā, 4:1). Regarding sexuality, the Qurān labels females as sources of tranquility for men (Al-A'rāf, 7:189). Simultaneously, it also views men and women as mutually dependent and refers to them as vestments for one another (Al-Baqarah, 2:187).

Arkoun says that the position of women in Islam has always been one of the most debatable zones of Islamic construal, partially because few interpreters over the 14 centuries of Islamic history have been women. He argues:

In its essence, the problem of women in Islam is an interpretative problem, because of women interpreters in our age, as is the case in every age constitutes a basic obstacle in the way of the Muslim woman's ability to liberate herself as other women in the world do.<sup>xiii</sup>

Arkoun says that women's emancipation in a contemporary context rests on a philosophical redefinition of human beings beyond conservative status or religious law predating modern times. Therefore, he also proposes that the legislators should develop new attitudes regarding women and innovative approaches in regard to the legal issues concerning women. Arkoun believes that the legislators should evolve their outlooks and introduce audacious transformations that will have educational effects on all social classes and all stage of cultures, but also a revolutionary philosophy of law.<sup>xiv</sup>

### **Conclusion**

Based on the arguments put forward by the two renowned scholars of their respective period, it can be said that they embarked on the mission to depict certain measures that are to be implemented to maintain the status of women, which was on the verge on getting distorted by the European influences. 'Abdelḥamīd Ben Bādīs opted for the traditional approach to maintain the high standard of women given to them by Islam through the educational methods while Moḥammed Arkoun was highly critical towards the orthodox interpretations of the Scripture that were still being implemented to rectify modern issues (dogmatic closure), including the affairs regarding women. He was of the viewpoint that there is no place for orthodoxy in modernity. Hence, his suggestion was



that the rational modernism separates with dogmatic realities of traditional faith and dogmatic claims of a locked system.<sup>xv</sup>

## Notes and References

<sup>i</sup> Abdelhamid Ben Badi was one of the heroic figures of the modern history of Algeria and initiator of the Arab and Muslim revival movement in Algeria at the beginning of the 20<sup>th</sup> century. He was born on December 4<sup>th</sup>, 1889 in Constantine, a city in northeastern Algeria. Abdelhamid Ben Badi was the son of a family of the urban bourgeoisie, whose Berber origins dating back to the Zirids, a Muslim dynasty founded in the 10<sup>th</sup> century by Bologhine Ibn Ziri, were claimed. Ben Badi founded in 1931 the Association of Algerian Muslim Scholars. It was in the monthly, *al-Shihab*, that he published, from 1925 until his death, his reformist ideas that concerned both the religious and political zones. He fought to enliven the Sunnah of Prophet Muhammad ﷺ in the Algerian society of the time and fought innovation and idolatry, which were encouraged by colonialist France. He died on April 16th, 1940 in the same city.

<sup>ii</sup> Mohammed Arkoun was one of the great Islamic Algerian scholars in the second half of the twentieth century. He was born in Taourirt-Mimoun in Algeria on February 1<sup>st</sup>, 1928. He was a student at the Faculty of Literature at the University of Algiers, then at the Sorbonne in Paris. He was also an associate in Arabic language and literature in 1956 and obtained his Doctor of Philosophy in 1968. He gained fame in academia in 1969 with his work on the Persian historian and philosopher of the first millennium, Ibn Miskawayh, particularly, by translating his *Tahdhib al-Akhlāq wa-Taḥrīr al-A'rāq* (Refinement of Morals and Cleansing of Ethics) into *Traité d'éthique*. He taught at the Faculty of Arts and Humanities in Strasbourg (1956-1959), at the Lycée Voltaire in Paris (1959-1961), as a master assistant at the Sorbonne (1961-1969), associate professor at the University of Lyon II (1969-1972), and then as a professor at University of Paris VIII and Paris III-Sorbonne nouvelle (1972-1992). He was professor emeritus of the history of Islamic thought in Paris III. Scientific director of the magazine, *Arabica*, which he has contributed since 1980 to the great reputation, Mohammed Arkoun has played a significant role in the progress of the knowledge of Islam in the west. Mohammed Arkoun is located in the critical branch of Muslim reformism. Advocating modernism and Islamic humanism, he developed a critique of modernity in Islamic thought, and pleads for a "rethinking of Islam" in the contemporary world. He has devoted many works including *La Pensée arabe* (Paris, 1975), *Lectures du Coran* (Paris, 1982), *Penser l'islam aujourd'hui* (Alger, 1993), or *The Unthought in Contemporary Islamic Thought* (London, 2002). He died on September 14<sup>th</sup>, 2010 in Paris.

<sup>iii</sup> Khedi, Tribal Custom, the Quran and Revolution: The Changing Role of Women in Algerian Society (A Journal for Lovers of Middle Eastern Dance and Arts, Habibi Publications 1992-2002, Shareen El Safy, Publisher)

<sup>iv</sup> <https://www.britannica.com/topic/Association-of-Algerian-Muslim-Ulama>

<sup>v</sup> *An-Nisā* 4:1

<sup>vi</sup> *Al-Shihāb*, September 1930): p.485 and (October 1930): p.557

<sup>vii</sup> *An-Nūr* 24:30, *Al-Ahḏāb* 33:59

<sup>viii</sup> Fanon, Frantz, *A Dying Colonialism*, trans. Haakon Chevalier, Grove Press, 1965, p. 36

<sup>ix</sup> *Al-Shihāb* (December 1930): p. 714. And *Athar*, Vol. 3, p. 475

<sup>x</sup> *Al-Shihāb* (April 1931): pp. 164-65.

<sup>xi</sup> *Al-Shihāb* (May 1931): p. 314.

<sup>xii</sup> Arkoun, Mohammed, *Rethinking Islam: Common Questions, Uncommon Answers*, Translated by Robert D. Lee. Boulder, Co.: Westview Press, 1994, p.60

<sup>xiii</sup> Arkoun, Mohammed, "Women in Islam," *Al-Safir* (Beirut), October 21<sup>st</sup>, 1994

<sup>xiv</sup> Arkoun, Mohammed, *Rethinking Islam: Common Questions, Uncommon Answers*, Translated by Robert D. Lee. Boulder, Co.: Westview Press, 1994, p.63

<sup>xv</sup> Arkoun, Mohammed, *Al-'Ilmāniyawa ad-Dīn: al-Islam, al-Maṣīhiyya, al-Gharb [Secularism and Religion: Islam, Christianity and the West]*, Saqi Books, London, 1996, p.43. *Dogmatic closure* refers to the discontinuity in the elucidations of the Sharī'ah with the changing of time. Mohammed Arkoun lambasted the orthodox theologians for failing to provide a fresh re-interpretation of the Scripture which can help to solve contemporary issues in the Muslim societies. He opined that orthodox interpretations of Islamic laws cannot be applied for the elimination of modern issues and thus it is the duty of the theologians to develop a modern approach to interpret the Shariah.



## AN ANALYSIS ON THE IMPACT OF PLASTIC BAN BY KERALA GOVERNMENT WITH SPECIAL REFERENCE TO KOLLAM DISTRICT

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### Abstract

Our way of life depends on lot things, one of them being plastics. They do so much for us that it's not possible for us to shun them entirely from our lives. It is found in consumer goods that are a part of our daily life and industrial goods that help manufacture them. Its uses are undeniable and to balance the scale, there exists different problems to its usage. Plastics have been around for quite a while and during the times when it was first introduced, it was not considered to be much of a problem but with time, the population increased causing a rise in demand and usage of plastics. This rise in use and its constant littering resulted in several different environmental issues that had an impact on the present generations and could very well have an impact on future generations. This led to several different countries banning plastics. India was one such country where most of the states have banned the use of plastics. Our study focuses on one such state i.e. Kerala which recently banned single-use plastics on January 1, 2020. As with any initiative of a government, it's important to ensure that the initiative has been effective. We focus our study on the overall impact of the plastic ban, to see whether it has had a positive impact or not. To understand the impact, we measure the awareness of people about plastics and substitutes, their preference between plastics and substitutes and also the overall opinion and support from the public regarding the ban.

**Keywords:** Plastic Ban, Single use Plastics, Consumers, Shopkeepers.

### 1.Introduction

The first plastic based on a synthetic polymer was made from phenol and formaldehyde invented in 1907 and now in 2020 it's not an exaggeration when we say that it has become a crucial part of our lives. We use plastics for so many purposes as it's convenient and cheap. We find plastics everywhere; our carry bags, packets, disposable cups, spoons, forks, cell phones, televisions and even in bicycle helmets, airbags etc. Since it has been used for so many purposes, it has become an indispensable part of our lives.

Granted Plastic does have its uses, it also poses different problems for the environment. Plastics are non-biodegradable i.e. they can't be broken down by bacteria like other naturally occurring products. Plastics can lead to soil pollution, blockage of rain water



from seeping through the ground to reach the ground water, the death of animals when they consume it, water pollution etc. Because of all the various problems that can arise from the use of plastics it has become important to ensure a restriction on Plastic.

One of the first countries to ban plastic bags was Bangladesh in 2002 while the decision to ban plastic bags in India was taken up by different states at different times and on 1<sup>st</sup> January, 2020, the government of Kerala banned single use plastics under the Swatch Bharat Mission and Haritha Kerala Mission making it the latest state to issue the plastic ban. The decision to ban single use plastics was taken by the Kerala government on Thursday due to the environmental and health issues caused by mounting plastic waste. The plastic ban covers ban on the manufacture, sale and storage of single use plastic products. Plastic carry bags of all thickness are also banned. The fines that have been announced include Rs. 10,000 for the first violation, Rs. 25,000 the next time and then it would be Rs. 50,000 and cancellation of license, as per **Section 23** of the **Environment Protection Act 1986**, the Central government has delegated its powers to the State Government to invoke the provisions of **Section 5** of the **Environment Protection Act 1986**, whereby State Government is empowered to issue direction for the closure, prohibition or regulation of any industry.

As comes with every plastic ban, there may not actually be the expected impact. It is important to know whether the right kind of impact has been produced. Whether the plastic ban has caused more problems than solutions or not.

Also, people may be aware of the fact that plastics are harmful to the environment but they may not know about the reasons for this, the possible alternatives, the good and bad effects of these alternatives etc. and therefore through this report we would like to see whether the plastic ban has brought out a good impact and to also raise awareness amongst those about the bad and good aspects of plastics, the bad and good aspects of alternatives.

## 2. Literature review

[1] According to **LegesseAdane, DiribaMuleta (2011)**: A study was conducted in Ethiopia to assess the usage of plastic bags and their environmental impacts. It was found that the trend of using plastic bags has been increasing from time to time despite having good awareness of the adverse effects of plastic products. It was suggested by the authors to educate the public regarding this matter. It was also recommended that the government take the initiative to restrict the use of Plastic products.

[2] According to **KanupriyaGupta, RohiniSomanathan (2011)** : A study was conducted to analyse the customer incentives to reduce Plastic Ban appropriate policies that could help control the use of plastic bags in Delhi. According to their findings it was found that 94% of the consumers continue to use plastic bags in violation of rules, dilution in the efficacy of the ban within a year, with widespread lack of enforcement. It was concluded that a blanket ban may not be the best possible solution to curb the use of Plastics. Instead, availability of substitutes to plastic bags, and subsidies on the use of reusable bags (plastic bags) could constitute an important policy-mix as alternatives to Plastic ban for reducing pollution due to the usage of Plastics.

[3] According to **Md.AbdulJalil, N.Mian, Muhammad KhalilurRahman (2013)**: The objective of this article was to analyse the damaging impact of plastic bags on



agriculture and to suggest alternative shopping bags which are biodegradable and environmental friendly. It was found that people are not conscious to recycle plastic bags, as plastic bags do not decompose with soil consequently these bags become the very threat to food and life. The alternatives to plastic bags include jute bags, paper bags, bio degradable bags and reusable bags. The best alternative to plastic shopping bags is fully biodegradable bags which are nontoxic for soil.

[4] According to **Dr. Roy Scaria (2013)**: The research study was conducted to understand the challenges posed by Plastic waste to eco- tourism in Kerala and to suggest suitable remedies for sustained growth of Eco-tourism. It was found that the excessive use of plastic is really threat to eco- tourism industry in Kerala. It was suggested that the state government should initiate a leading role in effectively managing plastics by establishing mechanisms for reusing and recycling and also to provide education regarding the awareness about plastics.

[5] According to **DhanyaBabu, Remya James(2016)**: A survey was done to analyse the usage of plastic among the teenagers of Alappuzha town. It was found that awareness given through education is not enough to equip students take actions that favour the conservation of the environment. It was concluded that stringent measures should be taken by the government to control the excessive use of Plastic Materials.

[6] According to **Bright BuzongYintii, Maxwell A.G, Manrice M. Braimah (2016)**: A study was conducted in Ghana to understand the state of waste management and willingness of households to sort plastic wastes. It was found that the use of plastic products have resulted in high waste generation in spite of having great awareness for the majority of the people. It was also found that the municipality had very little capacity to manage waste and it was concluded that the government should establish recycling plants to convert plastics into useful products for society.

[7] According to **Caroline Enge(2018)**: This research focuses on the Plastic Ban in Kenya wherein the main aim of the study was to describe and understand how the Kenyan plastic bag ban is implemented and how it was intended to change people's behaviour towards reducing the use of plastic bags, to learn more about their perceptions of the ban and how they have adapted with the Plastic Ban.

[8] According to **Mansuri G, PradeepManikandan P. (2019)** : This research focuses on plastics and their impacts socially, economically and health wise and the effects taken by the UN to control the usage of several kinds of plastics and a brief discussion about the 2019s single use plastic ban. It was found that toxic chemicals from plastics gets mixed in our bloodstream and disrupts the endocrine system which may cause cancer, infertility, impaired immunity and many other ailments.

[9] According to **BishalBharadwaraj, Jean Marie Baland, Mani Nepal (2020)**: A study was conducted to understand the effectiveness of Plastic Ban in Nepal. The extensive use of plastic bags in Nepal has led to growing concern in recent years. It was found that the effectiveness of the ban critically depends on its enforcement and sanctioning system. The nominal amount of the fine did not seem to play a key role. It was concluded that effective monitoring of the ban by the municipal authorities is critical for the success of the Plastic Ban.



### 3. Objectives of the Study

#### I. Primary Objective

- a) To understand the impact of the Kerala Plastic Ban in Kollam

#### II. Secondary Objectives

- a) To measure the preference of people between plastic and its substitutes
- b) To measure the awareness about plastics and its substitutes
- c) To understand and measure the overall opinion about the Plastic ban
- d) To understand the opinions of shopkeepers about plastic ban.

### 4. Research Methodology

#### i. Area of Investigation: Kollam District

#### ii. Respondents: Customers (College students, office employees, teachers, police officers etc.) and Shopkeepers

#### iii. Number of respondents:

- a) Customers: 132
- b) Shopkeepers: 15

#### iv. Method of data collection

- a) Customers:  
Primary data was collected through Questionnaire method (Google forms)
- b) Shopkeepers: Primary data was collected through interview method. Secondary data was also used.

#### v. Sampling Method

- a) Customers: Random Sampling
- b) Shopkeepers: Convenience sampling

### 5. Limitations of the Study

In our study, the respondents are both customers and shop keepers. Due to time constraints and rush hour, the numbers of responses from shopkeepers were less. On the whole we got about 132 responses, from Kollam. Due to the outbreak of corona virus, we couldn't travel anywhere so the direct responses from customers and shopkeepers were less. Most of the responses, we collected were through Google form. Random sampling was used in selecting the customers and convenient sampling was used in selecting the shop keepers. Primary data was mostly used in the case of customers and a mix of both types of data in case of shop keepers.

### 6. Data Analysis

**Question 1:** Based on your Convenience what type of bag (cover) do you prefer for shopping?



**Table 6.1: Table showing the number of respondents preferring different types of bags on the basis of convenience**

Particulars	Number of respondents	Percentage (%)
Cloth Bags	89	67.42
Paper Bags	27	20.46
Plastic Bags	16	12.12
<b>Total</b>	<b>132</b>	<b>100</b>

**Question 2: Do you prefer Plastic Bottles or Steel Bottles?**

**Table 6.2: Table showing the number of respondents who use Plastic bottles or Steel Bottles**

Particulars	Number of Respondents	Percentage (%)
Plastic Bottles	58	43.94
Steel Bottles	74	56.06
<b>Total</b>	<b>132</b>	<b>100</b>

**Question 3: Do you check the grade number of Plastic items before purchasing them?**

**Table 6.3: Number of respondents who check the grade number of Plastic items before purchasing them**

Particulars	Number of respondents	Percentage (%)
Often check the Code	28	21.21
Sometimes check	68	51.52
Never Check	36	27.27
<b>Total</b>	<b>132</b>	<b>100</b>

**Question 4: Do you think Bio-Degradable Plastic bags are safe?**

**Table 6.4: Number of respondents who think Bio-Degradable Plastic bags are safe**

Particulars	Number of Respondents	Percentage (%)
Yes	48	36.36
Maybe	71	53.79
No	13	9.85
<b>Total</b>	<b>132</b>	<b>100</b>



**Question 5: Are you aware about compostable bags?**

**Table 6.5: Table showing the number of respondents who are and are not aware**

Particulars	Number of Respondents	Percentage (%)
Yes	54	40.91
No	78	59.09
<b>Total</b>	<b>132</b>	<b>100</b>

**Question 6: Do you find it difficult to manage your expenses owing to the recent plastic ban?**

**Table 6.6: Table showing the number of respondents who find it difficult to manage their expenses owing to the recent plastic ban**

Particulars	Number of respondents	Percentage (%)
Agree	26	19.70
Neutral	77	58.33
Disagree	29	21.97
<b>Total</b>	<b>132</b>	<b>100</b>

**Question 7: Do you support Plastic Ban 2020?**

**Table 6.7: Table showing the number of respondents on their support of plastic ban**

Particulars	Number of respondents	Percentage (%)
Yes	113	85.61
Neutral	17	12.88
No	2	1.51
<b>Total</b>	<b>132</b>	<b>100</b>

**Question 8: Do you think the Government is taking appropriate measures to check whether 'Plastic Ban' is effectively implemented?**

**Table 6.8: Table showing the number of respondents who feel that the Government is taking appropriate measures to check whether 'Plastic Ban' is effectively implemented**

Particulars	Number of Respondents	Percentage (%)
Strongly Agree	24	18.18
Agree	49	37.12
Neutral	47	35.61
Disagree	10	7.58
Strongly Disagree	2	1.51
<b>Total</b>	<b>132</b>	<b>100</b>



## 7. Findings

The recent Plastic Ban in Kerala has indeed acted as a catalyst in making an effective awareness on the bad effects of Plastic on the environment; did that have a real impact? We would like to enumerate our findings on the basis of the data collected.

### 7.1 Consumer Perspective

- a) Talking about the number of respondents who use what kind of bottles, it was found that the number of people who use Steel Bottles is more than that of people who use Plastic Bottles (**Table 6.1**). This shows that majority of the people are inclined to use Steel products over plastic products i.e. preferring an eco-friendly option over the other.
- b) After looking on to the number of respondents who prefer different type of bags on the basis of convenience it was found that cloth bags turns out to be the most preferable (67.42%) and paper bags are preferred by only 20.46 % of the total respondents (**Table 6.2**) it could possibly be due to lack of convenience wherein people find it hard to pack vegetables in newspapers as they are time consuming and difficult.
- c) On interpreting the number of respondents who check the grade number of plastic items before purchasing them it was found that 27.27% of the total respondents never check the grade number, and it was also found that 51.52% of the total respondents check the grade number sometimes(**Table 6.3**) and these findings clearly indicate the ignorant attitude of people.
- d) A majority of the respondents (53.79%) are not sure whether Bio-degradable plastics are really safe and 36.36% of the total respondents feel that bio-degradable plastics are safe while only 9.85% of the total respondents are aware that bio-degradable plastics are not safe (**Table 6.4**). Lots of researches regarding this have proved that bio-degradable plastics are not safe and it takes more than 3 years to decompose and almost have the same effect of a normal plastic bag.
- e) On analysing the number of respondents who are aware about compostable bags, it turned out that more than half of the respondents i.e. 59.09% of the total respondents are not aware about compostable bags (**Table 6.5**). This unawareness indicates the ignorant attitude of people post the recent plastic ban.
- f) Talking about managing expenses owing to the recent plastic ban, it was found that 19.70% of the total respondents (**Table 6.6**) agree that they find it difficult to manage their expenses, it is especially due to the fact that the replacement of plastic carry bag which had a cost of not more than Rs. 5, by cloth bag which costs more than Rs. 15 had a profound impact mainly on the low income group people. 58.33% of the total respondents stand neutral in their opinion and 21.97% of the total respondents feel that they are able to manage their expenses.
- g) The Majority of the respondents supports plastic ban (85.61%) (**Table 6.7**) while only a minority does not support it. This indicates that most of the people are in favour of the plastic ban because they feel that it is their responsibility to safe guard our environment.
- h) On analysing the number of respondents who feel that the government is taking appropriate measures to check whether 'Plastic Ban' is effectively implemented, it



turned out that 18.18% of the total respondents strongly agree, 37.12% of the total respondents agree; so as per the above data more than half of the majority feel that the government is taking appropriate measures to effectively implement the Plastic Ban and 35.61% of the total respondents stand neutral in their opinion and only 7.58% of the total respondents disagree and only 1.51% strongly disagree (**Table 6.8**). So it can be understood that the recent plastic ban have been quite effective, even though there are some drawbacks, they can revise the rules strictly for having a profound impact on the awareness about Plastic and other eco-friendly alternatives in the minds of people.

## 7.2 Shopkeeper Perspective

Talking about the impact on small scale shopkeepers like grocery shops, vegetable shops, etc. the shopkeepers are finding it hard to pack the products in paper bags because it is time consuming and difficult. Since Cloth bags are more expensive than paper bags and plastic bags, small scale shopkeeper cannot stock large quantity of cloth bags. The purchase of a large number of cloth bags takes its toll on the shopkeeper's financial capability.

The emergence of bio- degradable plastic bags seemed to be a sigh of relief, but it did not last long as there were many reports that most of the carry bags coming in the market were fake. It was also difficult to distinguish between a real and a fake one. If the shopkeepers are caught with plastic materials then they will have to pay penalty according to the new law under section 23 of environment protection act, 1986.

## 8. Suggestions

### 8.1 For Government

- a) In Kerala, fine on making use of single use plastics is only levied on shopkeepers and not customers but in Karnataka, the fine is being levied on both. The same is to be implemented in Kerala. Customers are also to be charged with fines if they are found making use of single use plastics. If any customers do have single use plastics with them then they are to give it to the authorities who are responsible for handling plastics.
- b) In many urban areas, the rules regarding single use plastics have been implemented to some extent but the same rules and regulations are not properly implemented in rural areas. So, the rural areas are to be kept under close watch and ensure that the rules are followed.
- c) In market areas especially grey markets, some shopkeepers and customers can still be seen using plastic bags. So, focus has to be given to the markets, the authorities can catch hold of such people by having police officers dressed as the common man to keep an up close and personal watch in the markets and thus ensuring that the rules and regulations are followed.
- d) As an alternative for Single use plastics, the government provides bio-degradable plastic bags to the consumers but the fact is that they should know that bio-degradable plastic bags are not as environmentally safe as they may seem. An experiment regarding the environmental friendliness of bio-degradable plastic bags and compostable bags was tested when each of these bags were left in the marine



environment. The compostable bag disappeared completely after 3 months whereas even after 3 years the bio-degradable plastic bag was still in one piece and ready for use proving that Bio-degradable plastic bags are not as they seem. Instead of bio-degradable plastic bags, compostable bags are to be used and promoted.

- e) There is also another problem that shopkeepers face. It is the fact that there are real and fake bio-degradable plastic bags as well as compostable bags. The government should enforce a quality check which can help distinguish between the real and the fake which can help bring about strict actions against the production of fake bags.
- f) Government should provide strong support to those start-ups that help make alternatives to plastic product.
- g) Government should also look into the effectiveness and efficiency of plastic collection system from the households is to be channelized through the existing waste collection facilities set up by local bodies as per EPR (Extended Producer responsibility) plan.
- h) A very good concept has been introduced by Skipping Rocks Lab Ltd. It is basically a bubble than encircles drinking water within an edible membrane made from natural seaweed extract. These bubbles have been sold around London and the government should look into whether or not it could be brought to India.

### 8.2 For Shopkeepers

- a) In Thailand, a supermarket had its fruits and vegetables packed with banana leaves, the same could be implemented here. But, the main concern with using banana leaves instead of plastic and paper bags would be that the banana leaves do not last more than 3 days and to counteract this, TenithAdithyaa a 20 year old developed a technology known as **Cellular eco-friendly technology** that helps banana leaves to stop aging and therefore be used for packaging.
- b) Many juice shops and ice-cream parlours make use of plastic glasses; small and big plates etc to serve their juices and ice-creams in. Instead of this, we can use the technology developed by TenithAdithyaa for making cups, straws, spoons etc made out of banana leaves, thereby reducing plastic waste, cost of operation and protecting environment.
- c) There is another eco-friendly option specifically concerning straws. Steel straws was an option introduced by Mayank Jain as an alternative to plastic straws. This was developed by him through his company "MINIMO" when he got concerned with how people in Maharashtra would enjoy drinking coconut water without plastic straws, after the Maharashtra government banned single use plastics like straws, cups etc. This is an option that could be introduced into Kerala.

### 8.3 For General Public

- a) People should refrain from using plastic bags. If they have plastic bags with them, then it should be given to the authorities who deal with the plastic waste and instead of plastic bags use cloth bags or paper bags or other eco-friendly options like compostable bags.
- b) Instead of buying water in plastic bottles, they should rather buy steel bottles and fill them up with water from their homes which might refrain them from buying drinking water in plastic bottles initially.



- c) People can earn some money if they produce and sell cloth and paper bags from home.

## 9. Conclusion

The overall impact of Kerala's plastic ban has been positive but it has been effective only to some extent. The impact has been measured on the basis of the awareness of the people about plastics and substitutes, preference between the two, support of plastic ban and also the overall opinions of shopkeepers and customers. Most of the people favour for eco- friendly products over Plastic Products. Majority of the people are not sure as to whether bio degradable plastics are safe. They lack awareness when it comes to compostable bags. Most of the people have an ignorant attitude towards the changes that are happening in the current scenario. It is dangerous to proceed with little knowledge as things can turn out to be counterproductive. Majority of the people express their support towards the plastic ban because it could be possible because the people might have realised the importance of protecting our environment. Most of the people are aware about the Don'ts but not about the Do's. Both are two sides of the same coin both should do hand- in- hand. It is time to adopt the new 3R's- Reuse, Recycle, and Recover for the 'Greater good'.

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## IMPACT OF INDIAN STOCK MARKET DUE TO CRISIS IN MARCH 2020

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### Abstract

Indian stock market witnessed a series of major setbacks over the last two months triggered by the covid-19, followed by a spate of collapses most notably oil war, currency fluctuations. Yes banks moratorium-culminating in the present phase of gloom and doom occasioned by these scenarios in March 2020. The economic turmoil associated with the coronavirus pandemic in 2019-2020 has widespread and severe repercussions on financial markets, including equity, bond and commodity markets (including crude oil and gold). The main events were a described oil price war between Russia and Saudi Arabia after failing to reach an OPEC + deal that led to a collapse in crude oil prices and a stock market crash in March 2020. Market effects are part of the coronavirus recession and are among the many socioeconomic impacts of the pandemic. In this paper we are discussed some crisis and its impact in Indian stock market.

**Keywords:**Covid-19, Stock market, Oil war, Yes bank, Currency fluctuations

### Introduction

The Covid-19 pandemic has had a profound impact on the Indian stock market and members of the Indian industry. Almost 162 countries are gradually being blocked and companies around the world are operating out of fear of an impending collapse of global financial markets. This situation, marked by the slow economic growth of the previous year, especially in a developing country like India, leads to extremely volatile market conditions. The scale and speed of the economic collapse that India has experienced in recent weeks is unprecedented and there is great uncertainty about what the future holds for companies and businesses.

### Object of the study

1. Covid-19 and its impact on stock market
2. Oil war and its impact on stock market
3. Yes bank moratorium and its impact on stock market
4. Indian Currency plunged and its impact on stock market

### Statement of Problem

In just weeks, the Corona virus pandemic has shaved off nearly a third of the global market capitalization. After the World Health Organization (WHO) officially declared it a pandemic, global markets, including India, witnessed bloodbath. The Sensex registered its biggest one-day drop of nearly 3000 points on March 12 followed by an even bigger drop of nearly 4000 points on March 23 after the lockdown was announced.



The spread of the virus has triggered panic across the world and shaken the confidence of investors.

Due to the countrywide lockdown, most of the financial intermediaries including Depository Participants, stock brokers, Registrars and Transfer Agents, mutual fund houses and their distributors are working with lesser number of staff and resources. Reaching them in person has become quite difficult. This may result into delayed response to various requests from investors. However, most of the intermediaries have made available digital modes of transactions. Investors may visit their respective website and find out the details.

### **Limitation of the Study**

- The study confined particularly to the period between March and April 2020 only.
- It is based on the secondary data only.

### **Analysis**

#### **1. Covid-19 and its impact on stock market**

In just a few short weeks, the coronavirus pandemic has reduced global market capitalization by almost a third. The Indian stock market bounced back, but the Sensex still closed at 20% below the peak reached two months ago. Investors can get a bit of a cold comfort as other markets have fallen further. The spread of the virus has sparked worldwide panic and has shaken investor confidence.

The drop in indices like the Nifty 50 after the Covid-19 crisis has caught the attention of Indian retail investors, who are aware of updated valuations of blue chip stocks, and believe this period is a good time. to enter the markets. Cuts in interest rates also play an important role in making the stock market a more attractive option for investors to channel their investible surplus.

Zerodha has seen a significant increase in the number of new investors given the number of accounts opened. Growth for one month (M-o-M) was close to 100% in March. With the general trend towards digitization in recent years, the distinction between offline and online brokerage firms has become less and less relevant. Most brokers now have an online and offline presence to stay competitive. Considering the convenience of online integration processes and digital platforms, customers are likely to be more targeted towards brokers who are exploiting technology effectively.

Something and systematic trading are useful tools to mitigate and hedge risks in a bear market. Automated trading tools increase market efficiency while reducing impact costs. Currently, between 30 and 50% of trade in India is governed by something. In the US markets USA, Approximately 90% of futures capital transactions and approximately 80% of cash capital transactions are executed using algorithms without human intervention.

Obviously, compared to its global peers, the proportion of seaweed in Indian markets is lower. We see the percentage of commercial turnover that algos will contribute to increase in the coming year.



## **2. Oil war and its impact on stock market**

The oil and gas industry is experiencing its third price collapse in 12 years. After the first two shocks, the industry recovered and business continued as usual. This time is different. The current context combines a supply shock with an unprecedented drop in demand and a global humanitarian crisis.

To compound the global economic uncertainty, an ill-timed global crude oil war has begun. The demand by Organisation of Petroleum Exporting Countries (OPEC) to further restrict production from April was rejected by Russia, resulting in the scrapping of existing restrictions. Increasing production at a time when demand is low due to the Covid-19 pandemic is bad for the crude oil market.

US oil futures led losses after US crude inventories rose to 518.6 million barrels in the week to April 17, near an all-time record of 535 million barrels set in 2017, while floating crude oil storage has hit an all-time high of 160 million barrels.

US West Texas Intermediate futures fell \$1.22, or 7.2 per cent, to \$15.72 a barrel by 0122 GMT, while Brent crude was down 33 cents, or 1.5 per cent, at \$21.11 a barrel.

Oil futures marked their third straight week of losses last week - and have fallen for eight of the past nine - with Brent ending down 24 per cent and WTI off around 7 per cent.

The minimum price of 100 barrels of crude oil will be set at Rs. 1 by the Multi Commodity Exchange (MCX). After the crude oil price debacle last week, MCX is in talks with the SEBI market regulator to announce a rule to set the minimum price for crude oil and other contracts traded on its platform at 1 euro. sources told BusinessLine. A single crude oil contract at MCX consists of 100 barrels of crude oil.

One of the main reasons MCX set the minimum price at 1 euro is that the trading platform does not allow traders to offer "negative price quotes".

## **3. Yes bank moratorium and its impact on stock market**

The central bank also took over the bank's board after the Ravneet Gill-led administration failed to raise capital by hiring a strategic investor. The RBI said that the absence of a credible stimulus package and the availability of private capital led it to impose a moratorium to protect the interests of depositors.

From a directional point of view, development is negative for the stock, since the new capital should have a strong discount, said Nirmal Bang Institutional Equities.

"The reason for this decision was to restore depositors' confidence in the bank. For a long time, we have been of the opinion that RBI is highly unlikely to allow bank failure. This would have a negative impact on the perception of the security of bank deposits, which RBI cannot afford. We continue to monitor Yes Bank due to lack of clarity on the way forward," said Nirmal Bang Institutional Equities.

The decision of the Reserve Bank of India to place Yes Bank Ltd. under a moratorium was made in many ways. Depositors were unable to access their money, borrowers struggled to find funds, and investors struggled with momentum in the equity and debt markets. Most of this was planned. But there was another unintended consequence. This is financial technology companies and third-party mobile applications that require payment services. Many of these companies had built their services on private banking systems, which had become one of the most sophisticated



digital lenders in India. Around 21 of the 38 third-party over-the-air application providers used the infrastructure provided by Yes Bank for UPI transactions, according to archived information available on the website of the National Payments Corporation of India. . As Yes Bank's systems have been disconnected to comply with the terms and conditions of the moratorium, most of these fintech companies have also seen their systems disappear. Among them were large payment service providers like PhonePe.

The Association of National Exchange Members of India (ANMI) has asked the RBI to consider exempting on-going capital market transactions involving a Yes Bank account. The purpose of this decision is to prevent investors from defaulting on existing payment obligations.

#### **4. Indian Currency plunged and its impact on stock market**

PankajBobade, Head of Basic Research, and Axis Securities, said: "Indian markets are positively correlated with movements in the US market. Markets beat expectations for exiting the foreclosure and economic recovery program, which did not happen. The foreclosure was extended for another two weeks, but gradually, while the stimulus plan was unsuccessful. Disappointment on these fronts also added to negative feelings. In addition, mounting tensions between the United States and China are expected to worsen market sentiment in the near future, fueling future market movements. "

Manufacturing activity in India fell to a record low in April. The Nikkei Manufacturing Purchasing Managers (PMI) for India released, fell to 27.4 in April from 51.8 in March, the sharpest deterioration in trading conditions since data analyst firm IHS Markit began recording data 15 years ago. .

At the sector level, with the exception of healthcare, which has stagnated, all other indices closed with losses. Banks, automobiles, and metals were the weakest.

Among the main losers, ICICI Bank lost 10.96%, followed by Bajaj Finance (-10.21%), HDFC (-10.08%) and IndusInd Bank (-9.58%).

Fitch Ratings reduced the so-called Viability Rating (VR) of the State Bank of India, ICICI Bank, Bank of Baroda (BoB) and Axis Bank by one level, citing the impact of Covid-19 on the operating environment

Indian stock markets rebounded around 14% in April after a decline in March. "The risk-return balance for the Indian market has become less favorable after the sharp rise in share prices in the past three to four weeks. The price and value gap has narrowed in some stocks and is less clear in others due to high economic and earnings uncertainty, "Kotak Institutional Equities said in a May 3 report. Currently, Sensex and Nifty are at 16.59 and 15.81, respectively, the forward price of one-year earnings, while MSCI Emerging Markets is at 13.67.

#### **Conclusion**

The foundations of the industry have changed and the rules for the next normal will be difficult. But the good results, with robust portfolios, innovation and superior operating models, potentially very different from the current ones, can have superior performance. Here our market is much depends on Foreign Institutional Investors who are the net sellers from the beginning of the February due to this pandemic over the global markets. The time has come for visionary thinking and bold action. We expect the government to quickly introduce a series of measures to support demand and ensure business



continuity. India can consider a concerted package of fiscal, monetary and structural measures and explore forms of isolation that reflect its situation and respect the most important principle.

Moody rating agency said about India the rapid and widening spread of Corona virus, deteriorating global economy outlook, falling oil prices and financial markets

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**Women Empowerment through Self Help Groups: An Analytical Study of  
SGSY schemes in Jorhat District, Assam, India**

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**ABSTRACT**

*In the year 1999 The Government of India introduced Swarnajayanti Gram Swarozgar Yojana with an objectives to create employment opportunities among the poor people through Self Help Group. The study related with the analytical study in implementation of SGSY scheme and creation of SHG in Jorhat Dev,Block and North West Dev, Block of Jorhat District of Assam, The results shows that majority of the members of SHG in between 30 to 40 years and maximum were married. Income level of the member of SHG has also been changed. It reveals that the monthly income of the members of SHG before joining in SHGs. Majority of the beneficiaries income fall in between Rs. 3000-5000 while only 25.4% respondents income fall in between Rs. 5000-7000 but after joining in the SHG monthly income of the members increased to Rs. 5000-7000, majority of the respondent belong to the income group Rs. 7000-9000 and 6.8% beneficiaries income increased above Rs. 9000 .. After comparing the monthly income of the members before and after joining SHG it is found that the economic condition of the members, after joining SHG were improved compared to income before joining SHG.*

*Key Words: SGSY, SHG, Income level*

**Introduction:** The SGSY scheme played an important role in creating self employment among the rural people. Swarnajayanti Gram Swarozgar Yojana introduced by the Government of India in the year 1999. From the inception to 31<sup>st</sup> March 2015, the amount saved by the members of self Help Group with bank in North Eastern Region was Rs. 13022 lakhs. The total nos. of SHG in the North Eastern Region was 333981 as on 31<sup>st</sup> March 2015. The top 3 States in term of savings mobilized by Self Help Group with bank in the North Eastern Region were Assam, Tripura and Meghalaya.

Self Help Group (SHG) is a unique system of organization and finance management by its members in a democratic way through regular savings, flexible working system and pooling of resources. It also provides a forum for social interaction, which serves as an alternate peer level interactive social structure. The present study was carried out in two villages of Jorhat district, Assam (India); covering nine women SHGs. The purpose was to analyze the income, expenditure and savings of the members after joining SHGs; thereby generating comprehensive knowledge for the participation of women SHGs in various income-generating activities.



#### OBJECTIVE OF THE STUDY:

The main objectives of the study to analysis role of SGSY scheme in creating employment opportunities among the poor people of Assam specially women through Self Help Group

#### REVIEW OF LITERATURE

Few studies are available on income generating of women SHG and women empowerment. The researcher had tied to review the following:

National Commission for Women, (2004) revealed that 30% of the household reported increase in assets after joining SHG mainly in Rajasthan and Tamil Nadu. Wadiniale, 2004 reported empowerment of slum women by saving credit programme in Baroda city. The study also reported that SHG programme had led to increase in their monthly household income, 66% women converted their houses into permanent structure; apart from many other positive impacts on health, social and cultural values. Further studies revealed that there was a drastic change in social status of women after joining the programme and these researchers articulated SHG programme as a change agents for social and economic empowerment of rural poor particularly women (Wadiniale, 2004 and Singh, 2011). SHGs have the power to create a social- economic revolution in the rural areas of the country (Gurumoorthy, 2002) and can act as an important tool for socio-economic empowerment of the poor, particularly women (Roy, 2011). It is also reported that the members of SHGs are prepared to undertake entrepreneurial activities at a smaller level with minimum capital requirements (Kamaraj, 2005) and thus SHGs can promote self employment opportunities to the rural women (Manimekalai and Rajeswari, 2000). Women SHG members who took up their own enterprise were contributing more than 50% of their earnings to the households in Andhra Pradesh. Pati and Benjamin (2011) observed that micro finance through SHGs has had a positive impact on income, expenditure and savings of the women clients in Meghalaya.

Das (2012) observed that SHG have a positive impact on women members particularly in empowering them. In fine Self Help Groups is undoubtedly considered as an empowerment model. Das (2012), in his study of SHGs in the Lumding Development Block, Dhalpukuri Development Block and Udali development Block of the Nagaon districts of Assam reveals that impact of SHGs is appreciable in bringing confidence, courage, skill development and self worthiness in rural areas, particularly women. There is appreciable development in planning, coordination, decision making and financial skills among the leader respondents. However, Basumatary and Boro (2012) have observed that SHGs have contributed a lot to the social empowerment of the *Bodo* women; although they are lagging much behind with respect to economic and political empowerment. Moreover, financial inclusion is also not fully expanded to their needs.

Pattanaik (2003) in her study reveals that SHGs are continuously striving for a better future for tribal women as participants, decision-makers and beneficiaries in the domestic, economic, social and cultural spheres of life. Manimekalai (2004) commented that in order to run the income generating activities successfully the SHGs must get the help of NGOs. Besides, the bank officials should counsel and guide the women in selecting and implementing profitable income generating activities. He remarked that the formation of SHGs have boosted the self-image and confidence of rural women. Sahu and Tripathy (2005) articulated SHGs which have emerged as the most vital instrument in the process of participatory development and women empowerment. In addition, remarkable studies have been done by Ali-Akpajiak and Pyke (2000), Krishna



(2003), Panda (2005), Jerinabi (2006) and Chen, Jhabvala, Kanbur and Richard (2007) regarding role of SHGs in development of poor. APMAS (2009) reported that SHG programme in the state of Assam resulted significant social and economic benefits and categorically mentioned that 75% of the group members has experienced increase in saving habits and increase in income, increase in access to formal credit and decline in family debts etc.

#### METHODOLOGY

**Sampling Design:** The Sampling design of this study is based on Multistage sampling procedure. The stages are as follows,

**Stage-I :** Jorhat Development Block and North West Development Block were selected out of 8 blocks of Jorhat district

**Stage-II :** Jorhat Development Block is having 27 GP and North West Development Block with 18 GP out of 45 GPs, 4 GPs were selected by using PPS sampling technique. The selected Gaon Panchayats are Karanga Gaon Panchayat, Moidhya Thengal Khongiya Gaon Panchayat from Jorhat Development Block and Dhekargarah Gaon Panchayat and Pub Sarucharai Gaon Panchayat from North West Jorhat Development Block.

**Stage-III :** Two villages from each select Gaon Panchayat are selected by using Probability Proportional to size (PPS) sampling Technique, thus the total nos. of sample villages comes to 8. The selected villages are, Kamar Hajarika Gaon, Hejari Gaon, No.2 Mohbondha Gaon, No.1 Bhahukmara, Dhekargarah, Sarucharai Gharfalia, Sarbaibandha, Bohotia Gaon.

**Stage-IV :** The list of SHG of eight select villages have been collected from the office of the Gaon Panchayat and 10% of such beneficiaries have been selected from each village. Thus the total numbers of shg are selected for data collection comes to 59 SHG and data was collected from the beneficiaries by using personal interview and questionnaire method.

#### Data analysis:

Collected data were compiled and analyzed through frequency and percentage. To test the relationship between variables viz- age, education and loan taken with the income per month of the respondent after joining as the SHG member; Chi-square ( $r \times s$  manifold contingency table) was applied taking studied variables were independent as null hypothesis against the alternative variables were not independent from each other.

**Result and Discussion:** Total 59 Nos. of SHG were selected randomly from Jorhat development Block and North west Development Block of Jorhat District, Assam. The analysis and interpretation of collected data as given below:

The table 1.shows that beneficiaries

of SGSY from North West Development Block are 23.7% and from the Jorhat Development block is 76.3%. Jorhat development block is the largest block in the district. Therefore majority of the samples have been drawn from Jorhat Development Block.

Table1  
Block wise selection of beneficiary under SGSY scheme

Name of the Block	Frequency	Percent	Cumulative Percent
North West Dev. Block	14	23.7	23.7
Jorhat Dev. Block	45	76.3	100.0
Total	59	100.0	

Source: Field Survey

**Demographic Profile of Member of SHG :** During the time of study some important question was asked to the selected member regarding their age, education, gender, marital status etc. The table 2 shows the age wise classification of the member of SHG. Out of the total sample beneficiary of SGSY. 28.8% members of SHG fall under the age group of 20-30 years while majority of the beneficiary were of the age group of 30-40 years and only 23.7% beneficiaries fall in the age group of 40-50 years.

Table: 2  
Age group of member in SHG

Age Group	Frequency	Percent	Cumulative Percent
20—30	17	28.8	28.8
30—40	28	47.5	76.3
40—50	14	23.7	100.0
Total	59	100.0	

Source: Field Survey

Educational qualification of the members of SHG are shown in the table 3 The table reveals that out of the total respondents, 72.9% are school dropouts and 27.1% could pass their 10<sup>th</sup> level examination.

Table: 3  
Education level of the member of SHG

Levels of Education	Frequency	Percent	Cumulative Percent
Primary Standard	19	32.2	32.2
Up to class X	24	40.7	72.9
HSLC	16	27.1	100.0
Total	59	100.0	

Source: Field Survey



Women empowerment through self help group is the main objectives of the SGSY scheme. The selected beneficiaries under the scheme of SGSY are all female. The table :4 reveals the marital status of the beneficiaries. It has been observed that majority of the beneficiaries i.e. 74.6% are married, while only 18.6% were unmarried and 6.8% were widow.

Table:4  
 Marital status of the member of SHG

Marital Status	Frequency	Percent	Cumulative Percent
Married	44	74.6	74.6
Unmarried	11	18.6	93.2
Widow	4	6.8	100.0
Total	59	100.0	

Source: Field Survey

Another important question was asked to the respondent is the purpose of joining in the SHG. In response to the question they said to availing micro finance, self employment and to fulfill the future needs. Out of the total beneficiaries 35.6% beneficiaries joined in the SHG for getting microfinance while majority of the beneficiaries joined for self employment and only 22% joined with an objective of fulfilling their future needs. It is shown in the table: 5

Table : 5  
 Purpose of joining in SHG

Purpose of Joining	Frequency	Percent	Cumulative Percent
Micro Finance	21	35.6	35.6
Self employment	25	42.4	78.0
Fulfilling future needs	13	22.0	100.0
Total	59	100.0	

Source: Field Survey

After grading or receiving the revolving fund by SHG applies for loan from the financial institutions for taking up economic activities. Some of the block officials and bank officials help SHG in receiving loan from the financial institutions. The table: 6 reveals the number of member receiving the loan through SHG to perform their economic activity. It was seen that 22.0% beneficiaries took loan for agricultural activity, 16.9% for Piggery farming, 10.2% for goatery farming, 30.5% for handloom & textiles, 6.8% for fishery and 13.6% for other economic activity.

Table: 6  
 Purpose of loan taken by members of SHG



Economic Activity	Frequency	Percent	Cumulative Percent
Agriculture	13	22.0	22.0
Piggery	10	16.9	39.0
Goatery	6	10.2	49.2
Handloom	18	30.5	79.7
Fishery	4	6.8	86.4
Other	8	13.6	100.0
Total	59	100.0	

Source: Field Survey

Table : 7 shows the name of the banks from which they have got the loan. Majority of the respondents got their loan from Assam Gramin Vikash Bank i.e. 35.6%, followed by Kanaklata Mahila Urban Co-operative Bank 25.4%, 15.3% from Panjab National Bank, 13.6% from Allahabad Bank, 6.8% from other private financial institution and only 3.4% from State Bank of India. It is observed that borrowers are interested to take loan from Gramin banks than nationalized banks.

Table : 7  
Bankwise position of borrowers

Financial Institutions	Frequency	Percent	Cumulative Percent
Kanaklata Mahila U. Co. Bank	15	25.4	25.4
SBI	2	3.4	28.8
AGVB	21	35.6	64.4
PNB	9	15.3	79.7
Allahabad Bank	8	13.6	93.2
Other	4	6.8	100.0
Total	59	100.0	

Source: Field Survey

The table 8 shows the amount of loan taken by SHG member. It is seen that 25.4% of the borrowers took loan less than Rs 50000, 23.7% of the respondent took loan in between Rs. 50,000-1,00,000 and 44.1% of them took loan Rs.1,00,000-2,00,000 and only 6.8% have gone for loan in between Rs.2,00,000-3,00,000.

Table : 8  
 Borrowers positions based on quantum of loan

Range of Loan (Rs.)	Frequency	Percent	Cumulative Percent
Less than 50000	15	25.4	25.4
50000—100000	14	23.7	49.2
100000—200000	26	44.1	93.2
200000—300000	4	6.8	100.0
Total	59	100.0	

Source: Field Survey

The table 9 shows that 74.6% of the borrowers got subsidy whereas 25.4% of them yet to get their subsidy.

Table :9  
 Percentage of Loans with & without subsidy

Loans with Subsidy	Frequency	Percent	Cumulative Percent
Yes	44	74.6	74.6
No	15	25.4	100.0
Total	59	100.0	

Source: Field Survey

The table : 10 shows utilization of SHG fund for activities of SHG in the area of study 55.9% members of SHG were of the opinion that they generally utilize their fund for microfinance among the member or to finance for tiny and small business, 27.1% said that they utilized their fund in business while 16.9% used their money in agricultural activity.

Table : 10  
 Activitywise Utilization of SHG fund

Activities	Frequency	Percent	Cumulative Percent
Micro finance	33	55.9	55.9
Business	16	27.1	83.1
Agriculture	10	16.9	100.0
Total	59	100.0	

Source: Field Survey

Table : 11 reveals the monthly income of the members of SHG before joining in SHGs. Majority of the beneficiaries income fall in between Rs. 3000-5000 while only 25.4% respondents income fall in between Rs. 5000-7000 but after joining in the SHG monthly income



of the members increased to Rs.5000-7000, majority of the respondent belong to the income group Rs.7000-9000 and 6.8% beneficiaries income increased above Rs. 9000 as shown in table : 11. After comparing the monthly income of the members before and after joining SHG it is found that the economic condition of the members, after joining SHG were improved compared to income before joining SHG.

Table: 11  
Individual monthly income of members before joining SHG

Income Level (Rs.)	Frequency	Percent	Cumulative Percent
3000—5000	44	74.6	74.6
5000-7000	15	25.4	100.0
Total	59	100.0	

Source: Field Survey

Table: 12  
Individual monthly income of members after joining SHG

Income Levels (Rs.)	Frequency	Percent	Cumulative Percent
5000-7000	18	30.5	30.5
7000-9000	37	62.7	93.2
9000 & above	4	6.8	100.0
Total	59	100.0	

Source: Field Survey

An important question was asked to the respondent of SGSY scheme regarding their problem. In response to our question all the beneficiaries said that they have faced many problem in different stage of implementation of SGSY. The problems of beneficiaries are shown in the table 13 It is seen that 26.76% beneficiaries said about the family problem in performing economic activities with the SHG. Another problem faced by them in case of leadership which is said by 14.08% beneficiaries. Sometimes they faced the problems from block officials as said by 21.13% of respondents and majority of the beneficiaries i.e. 38.08% said that bank officials insisted on more documentation as a result taking longer time to get loan sanctioned. It is seen that the respondents are facing more than one problems in obtaining benefit under this scheme.



Table: 13  
Problemwise break up of SHG Members

Types of Problem	Frequency	Percent	Cumulative Percent
Family problem	19	26.76	26.76
leadership problem	10	14.08	40.84
Block official problem	15	21.13	61.97
Bank official problem	27	38.03	100.0
Total	71	100.0	

Source: Field Survey

Another question was asked to know about implementation of the scheme. it is seen that 14.29% beneficiary suggested to organize awareness programme among the rural poor to implement the RDPs. 17.86% beneficiaries suggested for timely and regular supervision of implementing authority after providing financial assistance under RDP. One of the most important problem faced by SHG is marketing their product. So majority of the beneficiaries i.e. 35.71% suggested for offering separate market facilities for self help group. 19.05% beneficiaries said about the minimization of documentation and procedure to be follow for getting bank loan and 13.10% beneficiary said about the organization of training programme after getting benefit from different RDPs.

Table : 14  
Suggestions for successful implementation of the programme

Suggestions	Frequency	Percent	Cumulative Percent
Organisation of awareness programme	12	14.29	14.29
Timely and regular supervision	15	17.86	32.15
Separate marketing facility	30	35.70	67.85
Bank loan procedure should minimized	16	19.05	86.90
Organisation of training programme	11	13.10	100.0
Total	84	100.0	



Source: Field Survey

**Findings of The S** Swarnajayanti Gram Swarozgar Yojana- a holistic self employment programme for the rural poor. This programme was introduced in India in the year 1999. The UPA government had launched the National Rural Livelihoods Mission (NRLM) or Aajeevika in 2011 by revamping the earlier Swarnajayanti Gram Swarozgar Yojana (SGSY). This scheme is currently implemented by the Ministry of Rural Development and has been renamed as Deen Dayal Antyodaya Yojana- National Rural Livelihood Mission (DAY-NRLM). Like other district of Assam, the administrative of Jorhat implemented this programme in study. After analysis of collected data, the study has been concluded with following findings :

1. Out of the total nos. of beneficiaries i.e. 59 of the selected blocks, the study covered 23.7% from the North West Development Block and 76.3% from the Jorhat Development Block.
2. The study revealed that the Majority of the beneficiaries i.e. 47.5% were the age group of 30-40 years, 28.8% members of the SHG fall under the age group of 20-30 years and 23.7% were under the age of 40-50 years.
3. It is observed that, out of the total sample member of SHG 72.9% are school dropouts and only 27.1% could pass their 10<sup>th</sup> level examination.
4. The study revealed that majority of the beneficiaries i.e. 74% were married 18.6% were unmarried and only 6.8% were widow member of SHG of study areas.
5. After getting loan or financial assistance from the member of SHG involved in economic activity. The study revealed the majority of the member of SHG, i.e. 30.5% . involved in Handloom and Textiles, 22% in agricultural activities and remaining 47.5% involved in other activity like piggery, goatery, Fishery etc.
6. It also observed that the majority of the member of SHG got their loan from the Assam Gramin Vikash Bank, i.e. 35.6%, followed by Kanaklata Mahila Urban Co-Operative Bank, i.e.25.4% and remaining from PNB, SBI, Allahabad Bank etc.
7. The study revealed that 23.7% of the respondent took loan in between Rs. 50,000-1,00,000 , 44.1% of them took loan Rs. 1,00,000-2,00,000 and only 6.8% have gone for loan in between Rs. 2,00,000-3,00,000.
8. The major findings of the study was that the changes of monthly income of the member in before and after joining in the SHG's. It was seen that a remarkable changes has been made in income level of the respondent. The income level of majority respondent was fall in the group of Rs.3000 to 5000 before joining but after joining in the SHG's it comes to the groups Rs. 7000 to 9000 and only 6.8% beneficiaries income increased above Rs. 9000. It is the good sign for rural economy and best way of self employment.
9. Another important finding of the study is the problems faced by beneficiaries. It observed that majority of the beneficiaries i.e. 38.03% faced the problem of bank officials. 26.76% respondent from family, followed by block officials problems and 21.13%
10. The study revealed that majority of the respondent i.e. 35.7% suggested for separate marketing facilities, 19.05% said for reducing the loan procedure, 17.9% pointed out the regular supervisions by implementing authority etc.



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## Unmanned Retail Store Based on Sensor fusion and Video Analytic Technology

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**Abstract:** - With the development of India's economy, people's living standard is improving day after day. Their life-related behavior like shopping is also gradually getting everyone's attention. In order to get more customers and to enhance selling of their household items, merchants make a great effort to the shopping experience design. This paper introduces a concept of unmanned retail stores with facilities like customer counting, tracking of customer inside the retail stores, tracking of goods inside the store, shelves management, self billing and self payment through RFID, large data, Sensor fusion, Video analytics, Barcode, Mobile Application and other technologies. Users can be provided with more personalized products services and experience, to achieve social operations and accurate marketing.

**Keywords:** - Unmanned, retail, RFID, large data, sensor fusion, Video analytics, Barcode.

**1. Introduction:** - At present unmanned store supported by Internet of Things (IoT), has become a new trend in the global retail industry either in online and offline complementary, such as Amazon Go and Bingo Box. However, through the practical operating in recent years, new problems arose. The proposed unmanned retail stores use electronics (embedded system), software, sensor fusion, video analytics etc, which enables their goods to connect and exchange data through online payment system, so that there is no need for a cashier or billing counter and security staff. Through this technology both online and offline retailers can be connected. However online is no longer just a sales channel, but interact with consumers and their social groups. On the other hand, offline retailers can keep consumers in their stores for longer, offering better customer experiences. This model is called New Retail.

Also the proposed unmanned retail stores pops-up by the retailing store owners to reduce the staff costs for small convenient stores.

Unmanned store based on above technology can be divided in three modes of operations.

### a) Pre-identification mode:-

In this mode of unmanned retail store, user need to be identified before shipping, first customers need to scan two-dimensional code (identity) before entering inside the store, the consumer cannot allow for shopping without completion of identification process. Inside the store all Goods are equipped with sensors like RFID tags or other digital tag, which will help in forming the corresponding electronic bills.

### b) Unrecognized (identity) mode:-

In this mode of unmanned retail store, users do not need to be identified for merchandise shopping. Generally, such unattended stores will be with an access control system, consumers can directly enter the store through the physical switch, after the consumer comes in, access control will be automatically locked. After consumers finished shipping and payment, the access control can be reopened. All Goods are equipped with sensors like RFID tags, which will help in, term the corresponding electronic bills.

### c) Fully open mode:-

In this mode of unmanned retail the user can enter and leave the store freely. Goods are with RFID tags/any other digital tag and two-dimensional code label. Consumers can leave the shop after selecting the Goods and scanning to complete payment. But if not completed payment and shop, the access control system will automatically detect and alarm.

The advantage of full open mode is that it can solve the problem of multi-point shopping settlement, while the store information is relatively controllable. In this mode, if equipped with a small number of service personnel and combined with the first two models of application equipment, will be particularly suitable for convenience stores, supermarkets to form the new model of personnel and unmanned combination.



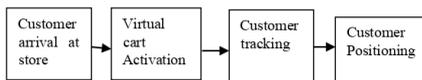
Our proposed system is based on the combination of fully open mode system and pre-identification mode system. RF ID enable identification can be done from a distance unlike earlier bar-code Technology; also line of sight communication is not required in case of RFID.

**2. Our Approach:** - While designing of our proposed unmanned store system care have been taken for customer security, store security, Goods security, and correct position of Goods in shelves and automatic billing of purchased Goods. Details of technologies used to perform above mentioned task is given in table 1.1

Requirement	Solution
Customer counting	People counting/Face reorganization Technology(FR)
Customer Profile Management	Face reorganization Technology (FR)/other image processing app
Customer Tracking inside store	Video analytics using deep learning
Product Tracking	Sensor fusion technology and video analytics
Shelves management	Sensor fusion
Self Product Billing	Barcode and Mobile Application
Self payment	Mobile Application
Customer Checkout	Video Analytics

Table 1.1 Technologies used to perform various task

**Total system may operates in four different steps:-**



**Customer Arrival at store:-**Process for entering inside the store for existing and new customer, will be displayed outside the entry gate, which can be achieved via image processing application.

**Customer Registration:-** Registration process will be linked with social media account/mobile number which is to be used for billing. For this purpose image with clear customer face is mandatory with age and gender.

**Customer Identification:-** After registration a welcome message on application will be displayed and user will be guided how to get access via FR camera. Customer needs to give details of number of people entering with him/her without registration. Any good quality of CCTV camera can work for FR (face recognition)

After successful identification of customer information, their name will be displayed on the monitor installed at entry gate. The information about number of people tagged with customer will also displayed. The gate will automatically opened for the registered customer for fix duration of time the timing will be displayed on the display board. The integration of customer identification module is to be done with access control. In no gate scenario one representative can be given with a handheld device for manual Identification.

**3. Verification of number of customer entering inside store:-**

The people counting analytics cross check the information by counting the people entering the store. The people counting analytics result will be matched with information entered by customer. In case of any difference in data alert will be send to registered customer and store manager. The registered customer ID will be linked with secondary virtual ID for the other entire not registered customer entering the store.

**4. CUSTOMER TRACKNIG**

**Virtual cart activation:-** Virtual art will be activated as soon as customer identification is done.

For all the group of customer visiting together virtual card be single.

**Customer Tracking:-** Will be achieved by CCTV cameras network installed inside the store. Human body and cloth detection video based analytics will be used to track the customer.

**Customer positioning:-**The customer location will be mapped with CCTV cameras. The shelves in





## GEOFFREY CHAUCER, THE FATHER OF ENGLISH POETRY: A CRITICAL ANALYSIS

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### Abstract

Geoffrey Chaucer known as the Father of English literature is widely considered the greatest English poet of the middle Ages and was the first poet to have been buried in Poet's Corner of Westminster Abbey. While he achieved fame during his lifetime as an author, philosopher He was born intellect at a time when the lights were obscure By the alembic of his genius he created something of lasting and permanent value in literature. After Chaucer followed a century of dry sterility, and the superiority and greatness of the poet become conspicuous when we view him in the light of his followers.

**Key Words:** As Father of English Poetry, His Narrative Art, His humour, His art of Characterisation, As a story Teller.

ENGLISH LITERATURE is often described as beginning with Chaucer This would give England six centuries of literature. Actually there were more than six centuries of literature before Chaucer was born. The modern reader can make out of the general meaning of a page of Chaucer without difficulty, but if he looks at our earliest literature he finds that it reads like a foreign tongue. This is the reason for the neglect of our early literature, thought today much of it can be obtained in translation.

We are accustomed to regard the fourteenth century as, on the whole, a dark epoch in the History of England", says J.M. Manly, in the Cambridge History of English Literature. "an epoch when the corruptions and injustice and ignorance of the middle Ages were piling themselves ever higher and higher; When the Black death ,having devoured half the population of city and hamlet was still hovering visibly like a gaunt and terrible vulture over the affrighted country; when Nobleman and gentry heard in indignant bewilderment the sullen murmur of peasants awakening into consciousness through pain ,with now and then a shriller cry for vengeance and a sort of blind injustice ;an epoch when intellectual life was dead or lying not only in the Universities ,but through the land.1 **J,M, Manly : Cambridge History of English Literature.**

The Fourteenth Century is a period of great Political, Social, religious and Literary Activity. Politically it was a period of the Hundred Years' War which released and strengthened the feeling of national consciousness and patriotism both in England and France.

The Age of Chaucer witnessed a rapid growth in trade and Commerce. The English People shed off their narrow-mindedness and showed their wider interest in this field.

Modern English Poetry begins with Geoffrey Chaucer (1340-1400), diplomat, soldier and scholar. He was a bourgeois who understood the court and had a keen eye for the



ordinary man, and he was a reader who had studied most of the literature available at this time.

The English Literature had so many masterpieces also have Chaucer's monumental work The Canterbury Tales. It is a long poem describing twenty nine Pilgrims including Chaucer himself meet at Tabard Inn . The twenty nine Pilgrims are chosen From all classes of people of both sexes and of all ranks.

In the Canterbury Tales Chaucer takes to the study of contemporary English society and turns poetry with tolerant curiosity and genial humour to the study of men and manners of his times. Chaucer presents realistically the life of fourteenth century through The Canterbury Tales.

Chaucer is the first great painter of character in English Literature. In fact, next to Shakespeare, he is the greatest master in this field. In the Canterbury Tales , Chaucer takes to the study of contemporary English Society and turns poetry with tolerant curiosity to the study of men and manners . In the Prologue he introduces thirty pilgrims representing all types and shades of Fourteenth Century Society except the highest and the lowest –the two extremes unlikely to meet the concourse.

It is said that ,”Chaucer’s characters are individuals as well as types, not mere phantoms of the brain but real human beings and types true to the likeness of whole classes of man and women”<sup>2</sup> A,C,Ward: Chaucer.

Chaucer’s art of characterisation is free from personal bias or animosity. He portrays characters objectively, impartially and disinterestedly without betraying his animosity against anyone of them.

There is an open air atmosphere about his characters. His people are always on the move. Never do they become shadowy or lifeless. They shout and swear, and laugh and weep, interrupt the story teller, pass compliments, and in general behave themselves as we might expect them to be in the dramatic circumstance of the narrative. <sup>3</sup> Compton – Rickett: A History of English Literature.

There is a universal touch in Chaucer’s characters. His pilgrims are types and individuals, true to their own age, but also representatives of humanity in general. They are timeless creations on a time –determined stage. The pilgrims are the epitome of mankind. “Their traits are universal, lineaments, as Blake put it, of universal human life, beyond which Nature never steps. They are all with us to-day, though some of them have changed their names. The Knight now commands a line regiment; the Squire is in guards. The shipman was a rum-runner while prohibition lasted and is active now in the black market, the friar is a jolly sporting publican, rends quack medicines, and the prioress is the headmistress of a fashionable girl’s school. Some of them have reappeared in later literature: poor Parson was reincarnated in the vicar of Wakefield, the Knight in Colonel Newcomer, and the Monk in Archdeacon Grantly”<sup>4</sup> Grierson-Smith: A Critical History of English Poetry

Chaucer is regarded as one of the best narrative poets in English Poetry. His Canterbury Tales is the best example in this context. No other writer is so great as Chaucer .According to some critics he is excellent in narration of verse.

Chaucer’s narrative art is well marked with dramatic touches. He paints old story into a new one and reveals the complexities of emotions in a dramatic sense to the fullest. His



description about the characters shows originality as well as his highest sense of artistic beauty and magnificence. Chaucer is a great narrator because he infuses humour in his stories and never allows them to become dull and dreary.

In context of style of storytelling in Chaucer's *Canterbury Tales*, it is appropriate as well as ranked high. It is grave, dignified and poetic.

Chaucer's method of portraying characters is a scientific manner by differentiating them by means of their obvious distinctions. It was for the first time in European literature that a writer proved himself clearly conscious of the relation between individuals and ideas. Moreover, Chaucer's characters are consistent and instead of being static, they grow and develop in the course of the tale, like living human beings. They give their opinions on the stories that have been told and these comments reveal their dominant thoughts, their feelings and the objects of their interests.

Chaucer's genial humour and spirit of comedy too are to be seen at their best in these tales. As the cavalcade pursues its course, a true comedy of life is being enacted. The Characters of the piece shout and swear, laugh and weep, pass compliments, and show disagreement, and thereby keep alive the spirit of life. A comedy of action goes through the whole poem and makes it dramatic in character. Chaucer lays the seeds of modern drama and modern novel in these tales, which are rich in dramatic activity and sound in characterisation. "Though all but two are written in verse and abound in exquisite poetical touches, they are stories as well as poems, and Chaucer is to be regarded as our first story teller as well as our first modern poet. The work end with a kindly farewell from the poet to his reader, and so "he taketh the makere of this book his leve."- \*5 W.J Long: English Literature.

Narrative poetry is a form of poetry that tells a story, often making the voices of a narrator and characters as well; the entire story is usually written in metered verse. Narrative poems do not need rhyme. The poems that make up this genre may be short or long, and the story it relates to may be complex. It is normally dramatic, with objectives, diverse and meter. Narrative poems include epics, ballads, idylls, and lays Chaucer's narrative art is most prominently displayed and praised in his epic poem *The Canterbury Tales*

Chaucer is regarded as one of the best narrative poets of his country. His *Canterbury Tales* is the supreme Example "Chaucer is known to everybody as the Prince of story tellers, as incomparably the greatest of our narrative poets. Indeed if we disregard the epic .which stands in a class by itself, I do not see why we should hesitate to call him the greatest of all narrative poets whatsoever making no reservation of era or of language.6 Grierson –Smith: A Critical History of English Poetry.

Like Shakespeare, Chaucer did not take the trouble of choosing a plot of his stories. His tales does not have originality of plot. He borrowed his plots from Latin, French and Italian sources. He always revealed his Sources like Shakespeare. Although he borrowed his plots yet his style is his own. He gave new clothes to an old body..Hence he is called as an original poet by thinkers like Root and Chesterton. *The Canterbury* is a collection of 24 stories by Geoffrey Chaucer. Chaucer primarily had to narrate number of tales but he narrated 24 stories divided according to subject matter. These are based on different themes viz romantic, religious and full of valour by soldiers in the



battlefield. All the tales of Chaucer have a number of varieties. Although Stories cannot claim to have any originality yet they are so artistically narrated as fresh tales.

Chaucer is a great narrator because of humour in his tales. Besides this the style is appropriate, grave and dignified. Chaucer was a conscious artist with a clear sense of the effect he wished to produce, and of how best he could produce it. The more we investigate Chaucer's work, the more clearly this establishes itself."7 H.S. Bennett: Chaucer And The Fifteenth Century.

The Prologue is Chaucer's most celebrated and established work in which he uses a narrative style to express his viewpoint. He uses several poetic devices to liven up his style. Chaucer followed the rhetorical principles laid down by Gaufred de Vinsauf in his "Nova Poetria. These principles are description and narration. His descriptive and narrative technique is nowhere so visible as in the Canterbury Tales. In the prologue, he uses mainly the descriptive style and in the Tales, he employs the narrative style. The most remarkable thing is that he consummates the his style as averred by Robert P. Miller, "Chaucer subtly adapted language and perspectives to his individual tellers and thus established a model for Shakespeare and the Elizabethan dramatists" Why Robert Miller or David Daiches credit Chaucer can be best understood by examining the salient characteristics of his style.

Chaucer's poetry is extremely musical and must be judged by the ear rather than by eye. In the field of versification, the English poets owe much to Chaucer. He was the first poet, who tried his hands on English poetry. During his time, poetry was in its raw shape. He made several experiments in versification and gave it a new shape. His contemporaries were sued to too much alliteration in their poetry. Chaucer could not withstand with it and brought about drastic changes in alliteration. In the old fashioned alliteration, the number of syllables was irregular. Chaucer discarded this method of alliteration and introduced a new one, which had regular number of syllables, end rhyme and absence of frequent repetition.

In Chaucer's poetry, we also find that he has used lines of ten syllables and the lines are in couplets. Every line in a couplet rhyme with each other. Chaucer is also famous for his new form of stanza, which is called Chaucerian stanza. He was the first poet, who introduced it into the English literature. It is a stanza of seven lines having octosyllabic meter. Its rhyme scheme is *aba bb cc..* Chaucer is also regarded as the originator of heroic couplet. Heroic couplet is widely used in *The Canterbury Tales by Chaucer* and later on by his successors like Pope and Dryden.

Satire in Chaucer is always gentle. His humour was not intermingled with fierce and biting satire. He was a humanitarian and he is a friend of humanity rather than a foe. For the pleasure of the people, Chaucer had the keenest sense of farcical, the incompatible and the humorous in life and manners. Alexander Pope and Ben Jonson were the bitter satirist but Chaucer was not a rabid castigatior of the evils that were running rampart in every nook and corner of his society.

.Satire had been always a place in literature as anger in society, but anger and satire are far removed from tranquil and fair irony of Chaucer. Irony is the strong point of



Chaucer. But Irony of humours so pervasive pervading in the prologue and Chaucer's work as a whole that without continual watchfulness and vigilance one is in the danger of missing its elusive flame.,

“The Chaucerian irony is sometimes so large that it is too large to be seen.” ‘The flame of Sir Tapas’ has been wrongly considered as a parody of certain bad romantic verse of Chaucer's Age. In reality the joke is not that Chaucer is joking at the expense of bad-balled-mongers, but the joke is too broad to be seen by jaded mind. Chaucer is making fun of not only bad poets but also of good poets. “But the parody,” says Chesterton, “is not the point. The point is in the admirable irony of the whole conception of the dumb or doggerel rhymers who is nevertheless the author of all the other rhymes; nay, even the author of their author.” Among all pilgrims the poet is the only man who knows no poetry.<sup>8</sup> **G.K. Chesterton.**

Chaucer had remarkable involvement to the English Language and versification. Chaucer reshaped and reformed the East Midland dialect and gave it the form of standard speech. In the field of versification, Chaucer made significant offerings. Chaucer makes the profoundest and innermost appeal to the readers of the modern times. The age of Chaucer was the prelude to modern age. The greatest quality of Chaucer's poetry is his freshness of outlook, his catholicity of temper and his joyous appreciation of the good things of life. Chaucer's conviviality, good humoured jest, lenience and compassion have won for him a wide appreciation.

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## GENERATION Y: THE LABOUR MARKET DILEMMA

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### Generation Y : The labour market dilemma

#### Abstract

Generation Y is the most recent in a sequence of demographic cohorts which have been given diminutive yet peculiar name in a bid to interpret them as a conjoint cultural group. Generation Y is collectively a more diverse and socially liberal grouping than those who were born earlier; Generation X and the Baby Boomers. Evolving effective work lay-out for Gen-Yers is pivotal for the future advancement and sustainability of firm competitive advantage. This paper provides valuable and at times unexpected results particularly for the new and thus far little-known Gen-Yers. Making use of theories of leadership, self-determination and creativity, this paper attempts to theoretically inculcate a model that merges empowering leadership with team creativity by simultaneously analysing the effects of team self-harmony and team creative efficacy. Empowering leadership comprises leading by example (to act such that it shows others how to behave by working hard) i.e. through effective coaching, participative decision making, showing concern to fellow colleagues and providing accurate details and facts. This paper also tries to look at how quality of work life (QWL) impact job satisfaction and to scrutinize if gender and type of organization has any role to play in this relationship for Generation Y (Gen-Y).

#### Keywords

team creativity, empowering leadership, team self-concordance, team creative efficacy

#### Introduction

Generation Y is the most recent in a sequence of demographic cohorts which have been given diminutive yet peculiar name in a bid to interpret them as a conjoint cultural group. Generation Y is collectively a more diverse and socially liberal grouping than those who were born earlier; Generation X and the Baby Boomers. Generation Y is seen to be unorthodox and less religious than the generations which preceded it. Evolving effective work lay-out for Gen-Yers is pivotal for the future advancement and sustainability of firm competitive advantage. Human resource (HR) managers are challenged with contributing to strategies and activities that increase their employees' job satisfaction. Numerous career related elements in the bounds of quality of work life (QWL) realm have been recognised as acceptable measures to sustain job satisfaction. These attributes include physical safety, payment, job security, appreciation of one's work, contribution to decisions affecting one's work area (i.e. having the right to say) and opportunities to realize one's own potential (Kim *et al.*, 2017; Nadler and Lawler, 1983; Rath and Lee, 2017; Robbins, 1998; Sirgy *et al.*, 2001). Today's workplaces include employees with a broad range of ages and generational membership. Consequently, HR managers are confronted with an interplay of Baby Boomers (frequently in upper management and executive positions), Generation X (constituting the largest share of the workforce) and Generation Y (Gen-Y) (entering the job market and striving toward mid-management) employees, creating an inventory of cohort-based differences and conflict. Most importantly, this variation in workforce raises questions about the nature, characteristics and outcomes of supposed generational difference. It remains furthermore unclear if gender differences exist for Gen-Y in this QWL-job satisfaction relationship. Despite the attempted changes toward more gender



equality in participation in work (Smith *et al.*, 2012), there is still debate around whether social roles of women and men have changed, and whether traditional social roles have been passed on from previous generations (Huang and Gamble, 2015; Powell, 2018). Studies posit that men and women differ in their underlying career attitudes, self-direction and organizational mobility preferences (Enache *et al.*, 2011; Maxwell and Broadbridge, 2014), but it is unknown whether these differences also exist for Gen-Y. Hence, a deeper understanding of gender in the context of job satisfaction is of great importance. Following person–environment (P–E) fit theory, employees choose a job environment that aligns with their interests, values and goals (Nye *et al.*, 2012). This job “environment” predominantly involves organizational type (e.g. structures and hierarchies) as the core determinant for working conditions.

## 2. Objectives

- To analyze the importance of empowering employees to enhance leadership and creativity boosting motivation among the labour force of Generation Y
- To study how gender and organizational type moderate job satisfaction in the quality of work life in the cohort of Generation Y:

### 2.1 Importance of empowering employees to enhance leadership and creativity boosting motivation among the labour force of Generation Y

The key to encouraging teamwork is team task interdependence, which refers to the extent to which members of a team must exchange information and resources and actually work together to complete their jobs (Wageman 1995). Following the notion that a high level of task interdependence requires team members to collaborate more, this paper proposes that when the level of task interdependence is high, then empowering leadership has a greater impact on team self-concordance and team creative efficacy. This study thus makes a contribution to both the literature that examines empowering leadership and that regarding creativity by considering the influence of empowering leadership on team self-concordance motivation, team creative efficacy, and team creativity.

#### 2.1 a. Empowering Leadership and Team Creativity

Creative teams work best when they have considerable autonomy and decision-making ability. Empowering leader behavior consists of the following five dimensions: *leading by example*, which reflects a leader’s commitment to his or her own work and the work of team members to achieve better performance; *coaching*, which refers to actions that educate team members and help them become more efficient and self-reliant; *participative decision making*, which encourages the sharing among team members of ideas and opinions on group decision making; *informing*, which promotes the company-wide dissemination of information, resulting in team members who are more likely to understand the compelling mission and expectations of their leader; and *showing concern*, which indicates the support and fair treatment of subordinates by a team leader (Arnold, Arad, Rhoades, and Drasgow 2000; Srivastava, Bartol, and Locke 2006).

Empowering leaders also show strong personal commitment to their work, which conveys its value and importance to their employees (Aheame, Mathieu, and Rapp 2005; Arnold *et al.* 2000). This leading-by-example style is likely to encourage subordinates to follow their leaders’ model by embracing and identifying with work goals, which in turn will likely lead to higher levels of team creativity. Empowering leaders also provide employees a great deal of



coaching and information designed to help them become more confident and proficient in their work (Amabile et al. 1996; Shalley, Zhou, and Oldham 2004). This combination of coaching and information sharing has both social and instrumental effects. It helps to build high-quality relationships, fosters trust among team members, and bolsters performance by providing important informational inputs necessary for team creativity (Mesmer-Mangus and DeChurch 2009).

Leaders must encourage employees' motivation to solve problems associated with creativity, and they must allow them considerable latitude. Research has indicated that the compelling visions crafted by empowering leaders create energy and excitement about work among their employees, in turn increasing the latter's intrinsic motivation (Bono and Judge 2003). This vision is also likely to enhance employees' sense of self-concordance by promoting and endorsing the goals they are pursuing as meaningful and important (Shalley, Zhou, and Oldham 2004; Shin and Zhou 2003). Empowering leaders also show their own commitment to, and identification with, their vision and the work goals and objectives derived from it (Arnold et al. 2000). This leading-by-example may compel subordinates to follow the model of their leaders by embracing and identifying with work goals, which is the essence of team self-concordance (Ahearne et al. 2005; Sheldon and Houser-Marko 2001; Sheldon et al. 2003).

Similarly, a high level of task interdependence can strengthen the positive influence of empowering leadership on team creative efficacy. Perceived task interdependence reflects the belief of a team that each member's contribution to the group product is required, which encourages the interpersonal helping and coordination that contributes to the attainment of team goals (Saavedra, Earley, and VanDyne 1993). In this situation, it is again important for empowering leaders to engage in behaviors such as coaching and leading by example that promote cooperation, cognitive complexity, and interpersonal relations.

**2.2 Job satisfaction and quality of work life (QWL)** Job satisfaction represents the "pleasurable or positive emotional state resulting from the appraisal of one's job or job experience" (Locke, 1976, p. 1304). It refers to a person's attitudinal state of readiness influencing one's response toward decisions, situations, subjects or objects in the workplace (Pacheco and Webber, 2016). Employees' QWL was first introduced by Nadler and Lawler (1983) and since then has been used to measure the extent to which employees are able to satisfy their personal needs through work and related experiences (Kim *et al.*, 2017; Robbins, 1998; Sirgy *et al.*, 2001). Employees were found to evaluate their QWL through specific organizational attributes, which are physical safety, payment, job security and career-related factors, comprising the appreciation of their work, the right to say, opportunities to realize their own potential and prospective promotion prospects (Sirgy *et al.*, 2001). Sharma *et al.* further discovered that QWL drives employee satisfaction – as well as their commitment and well-being, which in turn positively affects employee's performance. Kim *et al.* (2017) evaluated the relationship between work environment and job outcomes for Gen-Y, confirming that job characteristics act as important mediator. A specific investigation of how QWL factors impact upon Gen-Y's job satisfaction levels, however, is still lacking to date.

**Generational theory** Generational theory puts forward the idea that social changes and processes in the public sphere explains developments that come about over generations. Generations share similar "emotions, attitudes, preferences and dispositions", resulting from a commonly shared generational identity (Mannheim, 1952), which is socially constructed and refers to the consciousness of a generation (Biggs and Lowenstein, 2011). Generational



identities are created to distinguish generations from each other, enabling intergenerational comparison and forming generational and age-related social images (Biggs and Lowenstein, 2011). Generations can thus subsume multiple cohorts and smaller groups, although, “cohort” and “generation” are often used interchangeably. HR managers and leaders from every generations therefore should recognize how workplace conduct have changed over generations to develop their own cognizance, understanding and managerial practices according to these changes for effective team management. A number of studies have already highlighted generational changes in expectations and preferences of distinctive workplace behaviors and found that Gen-Y personal values and motivation are unique (e.g. Abubakar *et al.*, 2018; Deal *et al.*, 2010; Guillot-Soulez and Soulez, 2014; Kuron *et al.*, 2015; Parry and Urwin, 2011; Twenge *et al.*, 2010). It is known that, for example, Gen-Y employees have a higher appreciation for leisure (Guillot-Soulez and Soulez, 2014) and a higher overall need for self-actualization and satisfaction of intrinsic benefits (Davidson *et al.*, 2011). Recent studies moreover confirm that Gen-Y employees need a nurturing, positive and supportive work environment (Guillot-Soulez and Soulez, 2014). Yet, they lack long- term organizational commitment (Twenge *et al.*, 2010) whilst still wanting to have high levels of job security (Guillot-Soulez and Soulez, 2014).

**Gender, QWL and job satisfaction** With the same performance levels, women are less promoted and receive less payment (Joshi *et al.*, 2015), a situation often referred to as the “job satisfaction-gender paradox” (Westover, 2012). Studies report a number of underlying differences with respect to careers and motivation that could explain the underlying reasons for the occurrence of the “job-satisfaction-paradox” (Westover, 2012). Maxwell and Broadbridge (2014, p. 547), for example, found career differences, with recent female Gen-Y graduates “being more accepting to start in a non-graduate level job after graduation; and more women than men encountering gender discrimination in the workplace.”

Theoretically, the question, ‘Which organizational type fits better to an employee’s individual’s attitudes and values?’ can be approached by applying P-E fit theory to workplace environments. Here, the positive relationship between the person (P) and the environment (E) explains why positive work attitudes of some employees are lower. As employees choose work environments that align with their interests, higher satisfaction can be achieved (Nye *et al.*, 2012). In this study, we apply P-E fit to explain why particular people choose to work in a specific organizational structure. In their quest for the right P-E fit, we assume that job security, pay, and career prospects, provide greater job satisfaction for Gen-Y employees in larger, corporate structures. In contrast, the work environment of SMEs might be the right fit for Gen-Y employees with a higher appreciation for having the right to say, receiving individual appreciation and getting opportunities to realize own goals. We support this argument as SMEs might have flatter hierarchies, centralized decision making and, potentially, higher agility.

### Findings

**From objective 1 :** The aim of this objective was to enhance our understanding of how a leader’s behaviors can foster higher levels of team creativity in the industry through team self-concordance and team creative efficacy. When the level of team task interdependence is high, empowering leadership has a strong, positive relationship with team self-concordance and team creative efficacy, which in turn are both positively related to team creativity. Employee self-concordance has been characterized as one of the principal manifestations of intrinsic motivation (Bono and Judge 2003; Sheldon and Houser-Marko 2001; Sheldon *et al.* 2003), which scholars have long held to be a fundamental determinant of creative performance (Amabile *et al.* 1996; Ford 1996; George 2007; Oldham and Cumming 1996; Shalley, Zhou,



and Oldham 2004). This study investigated both relationships with an important intervening variable. Empowering leadership is associated with heightened levels of team self-concordance, which in turn is associated with higher levels of team creativity in organizations. By focusing on autonomous motivation at the team level (Sheldon et al. 2003), moreover, this study has thus provided more direct evidence of the relationship between team self-concordance and team creativity.

From objective 2: Social role theory is used to discuss gendered job expectation and the job satisfaction-gender paradox. QWL attributes of Generation Y workforce is found to have a positive influence on job satisfaction: physical safety, payment, appreciation of one's work within the organization, having a right to say in decisions affecting one's work area, realization of one's potential and promotion prospects within the organization and so on.

In terms of gendered effects, this study presents another significant and surprising observation. When men felt high levels of job security, their job satisfaction is found declining.. In contrast, job security do not change women's job satisfaction levels. The effect of receiving appreciation at work on job satisfaction is also different for men and women. Despite receiving less appreciation at work, women are more satisfied with their jobs. This supports the existence of the "job satisfaction-gender paradox" (Hauret and Williams, 2017; Kossek *et al.*, 2017; Westover, 2012) and extends prior studies of this paradox to Gen-Y (e.g. Clark, 1997; Eagly, 1987; Zhao *et al.*, 2017).

**Practical implications for HR managers** Implications of this study include a variety of valuable suggestions for HR managers relative to QWL, gender and Gen-Y. It is important to recognize that QWL attributes (including physical safety, payment, job security, appreciation, right to say, realization of one's potential and promotion prospects) have diverse effects on job satisfaction.

**Conclusion** The organizational type moderates the QWL–job satisfaction relationship. P–E fit theories are extended for Gen-Y, showing that employees who appreciate having the right to say, fit better into independent organizational types (and usually smaller structures), while employees who appreciate realizing their own potential tend to be more satisfied with their jobs in corporate structured organizations.

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## अथर्ववेदे संग्राम सैन्यव्यवस्था च

मिलन कुमार मिश्रः

अनुसन्धाता, विद्यावारिधिः

पुराणेतिहासविभागः

राष्ट्रीय-संस्कृतविद्यापीठम्, तिरुपति

पवित्रे भारतभुवि ज्ञानप्रदीपो वेदो व्यक्ताव्यक्ताविद्याधनानां सततमनुस्यूतानां रहस्यानां विद्योतितानां विवेचितानां विषयबाहुल्येन प्रसिद्धिमागतानां वस्तुजातानाश्च अनन्योऽनुपमश्च प्रकाशको विवधिविद्योन्मोचक इति कीर्तिः सर्वत्र निनादिता स्वीकृता विचारमुखेन समादृता चकाशते। आधुनिकजगति पदार्थविज्ञानम्, कृषिविज्ञानम्, युद्धविज्ञानम्, शिल्पविज्ञानम्, ज्योतिर्विज्ञानम्, गणितशास्त्रज्ञेत्यादिभावेन यद्यत् स्वरूपं यच्च प्रारूपं वाऽखिलक्षीकृतमाधुनिकजगति तत्सर्वं वेदसकाशात् लब्धवृत्तान्तं चेत्यसंशयम्। मम दिव्यास्त्रं बाणं च शत्रुणां विनाशं करोतु।

अथर्ववेदे अपि संग्रामस्य सैन्यप्रणालेश्च विस्तृत विवरणमुपलभ्यते। देवतानां सेनाध्यक्ष इन्द्रः वज्रधारी आसीत्।

इन्द्रस्य वज्रो अपहन्तु राक्षस आराद्,

विसृष्टा इषवः पतन्तु रक्षसाम्॥ अथर्व. ४/२

अथर्ववैदिककाले जपतपतपस्याभिः दिव्यास्त्राणां प्राप्तिः क्रीयते स्म। मम दिव्यास्त्रं बाणं च शत्रुणां विनाशं करोतु।

विश्वक्रो अस्मच्छरवः पतन्तु ये अस्ता ये चास्याः।

दैवीर्मनुष्येषवो ममामित्रान् विविध्यत॥ अथर्व. १/१९/१

शत्रुणां विनाशं कृत्वा स्वराष्ट्रस्य उपाधिधारणं कृतमासीत्।

सपत्नक्षयणो वृषाभिराष्ट्रो विषासहिः।

यथाहमेषां वीराणां विराजानि जनस्य च॥ अथर्व. १.२९/६



विजिगीषु इति राज्ञः भयेन शत्रुणां मनः चक्षुः हृदयं च कम्पते स्म। शत्रुणां विनाशाय  
अभिचारमन्त्राणां प्रयोगः आसीत्।

उद्वेपमाना मनसा चक्षुषा हृदयेन च।

धावन्तु विभ्यतोऽमित्राः प्रजासेनाज्ये हुते।। अथर्व. ५/ २१/ २

अभि त्वा देवः सविताभि सोमो अबीवृषत्।

अभि त्वा विश्वा भूतान्यभीवर्तो यथाससि।। १/ २९/ ३

सीमायां बाह्यसुरक्षायै सैनिकाः निरन्तरं सतर्काः आसन्। संग्रामे जीतवस्तुषु स्वस्य अधिकारः  
आसीत् तथा तानि वस्तुनि राष्ट्रियसम्पत्तिरूपेण सम्मिल्यते स्म।

जितमस्माकमुद्भिन्नमस्माकमभ्यष्टां विश्वाः पृतना अरातीः।। १६/ ९/ १

सैनिकानां नियुक्तिः शत्रोरक्षार्थं कृता आसीत्। विजिगीषु राज्ञा सैन्यव्यवस्था उत्तमशस्त्राणां  
व्यवस्था कृता आसीत्। तस्य सैनिकेषु अदम्यउत्साहः साहसः च आसीत्। ते युद्धकलायां  
निपुणाः आसन् अतः ते शत्रुदलानां प्रमुखपात्रान् चित्वा मारयन्ति स्म। एतस्य वर्णनाप्रसङ्गे एकं  
सूक्तमुपलभ्यते। काकयननामकऋषिणः शत्रुषु क्रियमाणं विजयकार्यम् अतीव प्रशंसनीयम्।  
यस्य वर्णनं तु एकस्मिन् सूक्ते उपलभ्यते। ऐतरेयब्राह्मणे कद्रुपुत्र अर्बुदं मन्त्रकृत सर्पऋषिरूपेण  
चित्रितम्। भृग्वद्विरा इत्यादि ऋषिणां सेना निलिम्पन-त्रिसन्धिः आदि मन्त्राः उल्लेखनीयाः आसन्।  
सायणेन त्रिसन्धि इत्यस्य बज्राभिमानी देवता इति उल्लिखितम्। अथर्ववेदे राजासेनयोर्मध्ये  
घनिष्ठसम्बन्धस्य उल्लेखः प्राप्यते। अतः राज्ञः विजयः भवति स्म। राजारूपेण इन्द्रः स्वयं  
सेनया सह आसीत्।

अथर्ववेदे विभिन्न संगठनानां वर्णनं मिलति। हे इन्द्रः! अस्माकं कृते संग्रामे शत्रुं तथा तस्य  
सैन्यान् मारयितव्यम्। तान् शत्रुन् अन्धकारं प्रति नेतव्यं यः अस्मान् पीडयन्ति।

वि न इन्द्र मृधो जहि नीचा यच्छ पृतन्यतः।

अधर्मं गमया तमो यो अस्मान् अभिदासति।। अथर्व. १/ २१/ २



“यस्त्वां मृत्युः” इत्यादीनां मन्त्र जपेन मृत्युभयस्य नाशः भवति। “इन्द्रेण दत्तो” इति मन्त्रस्य जपेन होमेन च विजयकामनायाः सिद्धिर्भवति।

इन्द्रेण दत्तो वरुणेन शिष्टो मरुद्भिरुग्रः प्रहितो न आगन्।

एष वां द्यावापृथिवी अघातां विश्वे देवा मरुत ऊर्जमापः।।२/२९/४

“ये मे पाशा” इत्यादीनां मन्त्राणां जपेन ब्रह्मास्त्रादे पाशानां बन्धनानां च छेदनं भवति। “बृहस्पतिर्नः परिपातु” अस्य मन्त्रस्य जपेन विजययात्रा मङ्गलमय भवति। विविधैः मन्त्रैः भिन्न भिन्न समिधानां हवनस्य विधानमस्ति। मुख्य हविष्यातिरिक्तं घृतं-धान्यं-श्वेतसर्षपः-अक्षतं-तिलं-दधिं-कुशं-दुर्वा-बिल्वं-कमलमादिनी द्रव्याणि शान्तिकारकाणि भवन्ति। एतेषां विशेषवर्णनं अथर्वणप्रयोगे वर्णितम्।

अस्माज्जायते यत् अथर्ववेदे संग्रामस्य तु महत्त्वं कौशलादिकं तु विद्यत एव तेन सह नानाविध शस्त्रास्त्राणां प्रयोगः, मन्त्रशक्त्या अभिचारमन्त्राणां प्रयोगः अपि दृश्यते। सीमायां बाह्यसुरक्षा निमित्तं विभिन्नानि उपायानि परिकल्पितानि आसन्। एतद् समस्त उपायान् परिलक्ष्य आधुनिककाले अपि संग्रामे कथं सीमायाः सुरक्षा कथं करणीयाः, कथं शत्रुणां विनाशाय कर्तव्या वयं ज्ञातुं सक्नुमः।

सन्दर्भग्रन्थसूची

- १-अथर्ववेदः - वेदमूर्ति तपोनिष्ठ पं श्रीराम शर्मा आचार्य
- २-पुराणविमर्श - बलदेव उपाध्यायः
- ३-वैदिक संहिता - आर.एल.मिश्रः
- ४-प्राचीन भारतीय युद्धकला - काशीप्साद जायसवाल



**Challenges in Engineering Education in India during the Time of Corona  
Virus Pandemic and the Consequent Total Lockdown**

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**Abstract:**

Corona virus pandemic has taken the world by storm. Its highly contagious nature has made social distancing a norm. To curb and control the pandemic, central and state governments have taken the path of complete lockdown, coupled with social distancing. Educational institutions have also been shut down as a precautionary measure. Though a well thought move, it's sudden implementation has shifted the emphasis from traditional face-to-face class room teaching to teaching using digital platforms. This shift has caused a major disruption in functioning and management of engineering educational institutions resulting in new challenges in engineering education. Various adversities faced in the teaching and learning process of engineering education during Corona virus pandemic lockdown are summarized and possible solutions to overcome the same are suggested in this paper.

**Keywords:** Engineering Education, Pandemic, Online Teaching, COVID 19

**Introduction:**

The World Health Organization (WHO) has declared a pandemic<sup>1</sup> over a highly contagious novel corona virus that causes an illness known as COVID 19. This has rapidly spread across the world. The disease has killed more than 414,588 people and infected some 7.36 million and counting, according to data compiled by Johns Hopkins University<sup>2</sup>. More than 3.63 million people have recovered. As per WHO recommendations, an effective way to fight COVID 19 pandemic is by maintaining social distance.<sup>3</sup>

The first case of COVID-19 pandemic in India was reported on 30 January 2020, originating from China<sup>4</sup>. On 10<sup>th</sup> June 2020, a total of 280,067 cases, 137,022 recoveries (including 1

1



migration) and 7,797 deaths were reported in the country<sup>5</sup>. The outbreak has been declared an epidemic in all states and union territories. On 24<sup>th</sup> March, the prime minister ordered a nationwide lockdown for 21 days, affecting the entire 1.3 billion population of India. On 14<sup>th</sup> April, the prime minister extended the ongoing nationwide lockdown till 3<sup>rd</sup> May, followed by further lockdown with certain relaxations till 18<sup>th</sup> May 2020<sup>6</sup>. But the educational institutes continue to remain closed and would continue doing so in the near future.

The complete lockdown is an unprecedented move and has disrupted the traditional teaching-learning process as we know it. The students were forced to return home, while the teachers were advised to stay at home.

We know of no previous instance where the entire country has been subjected to such dire circumstances, where one is locked down and apprehensive to venture out. Since this was an unparalleled event, never having been experienced or imagined by anyone, the magnitude of this event was not initially appreciated. General opinion was that the lockdown would blow away in a few days. As a result some students as well as faculty got caught in the lockdown, away from home. Those who managed to reach home had not prepared for an extended stay, leaving their books and laptops behind.

With the complete lockdown being implemented during active term, it has become necessary for the teaching to shift from traditional offline method to online platform. The lockdown also restricted physical movement and the availability of resources. As always, it brought out the best and the most innovative side in people. Let us evaluate the challenges being faced in these difficult times along with some possible solutions.

#### **Challenges:**

The lock down has brought its own set of problems. Distance learning has suddenly become the by word. The course teaching plan that was designed for face-to-face learning has to be redesigned to cater to the need of students who have become distant learners.

A large number of students join Engineering course due to parental pressure<sup>7-8</sup> and are not too keen. There are others who are low in confidence due to number of reasons including English



communication<sup>9</sup>. As these students are not self motivated, keeping them inspired is a big challenge. If this issue of keeping them involved and engaged is not addressed, the number of drop outs could increase.

Language becomes a bigger barrier on e-learning platform. The class room teaching is not language specific, though the principal mode of instruction is English. Teachers routinely revert to local language to help students understand better. In online communication, since the medium of instruction is English, students who are not fluent in English are at a disadvantage. The teachers have to take special cognizance to make the students understand and keep them interested.

The confusion caused by the lock down and unpredictable future has created stress in the students. They don't understand the logic of continuing with their studies without the university examination as the goal in view. Persuading them to continue with their studies requires a lot of patience and ingenuity. The students with low confidence are the worst sufferers of this lock down. They are trying to pass off sub standard assignments hiding behind the excuse of low connectivity.

The uncertainty has hit the BE students the most. They were ready to step out into the world with their offered job. Now there is an uncertainty whether they will get these coveted jobs. Also the economic downturn seems around the corner. The doomsday predictions of economic recession, loss of jobs and scenarios painting a bleak future are not helping.

A very important part of syllabus is the practical work. It gives hands on experience of the theory being taught in class. Though it is possible to write codes and submit them on e platform, the same cannot be said about practicals in other subjects. The practical work is not possible online. Since the lock down was declared in the middle of the semester, the practical work was not complete. There are virtual laboratories and 3D pictures and videos available, but they cannot replace actually setting up and performing an experiment and taking readings for the same.



Completion of Project and its demonstrations, especially group projects where the students live in physically different locations, is nearly impossible, particularly if it involves exercises like product development. The partially completed project has been left behind in the college. Some projects involve taking readings and performing experiments. Without the necessary infrastructure these projects cannot be completed. Some of the student groups have changed their projects after lock down, keeping in mind the restrictions imposed. This transformation/ change in project is easier for the first year students as their Projects only span one semester and the weightage is lesser.

Complete lock down also means no domestic help. A significant fraction of our teachers today are females/ladies. These teachers have had to take up the mantle of traditional household responsibilities in addition to those of teaching. Besides domestic work, it entails catering to the needs of their own children who are also undergoing home schooling. Along with these additional duties, teachers continue with the online teaching, but with a difference. Whereas during regular functional college, the teachers used to be available to students only during the college working hours, now the teachers are available to students 24 X 7, through online platforms.

A limited resource is another challenge. The numbers of laptops and tabs or the cell phone available in a household are limited. Not realizing / appreciating the nature and duration of the lock down the faculty / students did not carry their laptops with them when going back to their native villages. They have to find new ways of continuing to learn and teach on the e-platform.

Reliable Internet connection can be a challenge, especially in remote villages. Particularly during face-to-face interactions students and faculty face this issue. Uploading large assignment files is not possible on a slow and unreliable connection. A lot of times the students have to split their assignment into smaller files before they are able to upload them. This takes a long time and sometimes results in error besides delay in submission.

Another issue with online submission is plagiarism. A lot of times the students do not even make an effort to write the given assignment in their own handwriting, but submit their friends



assignment as their own. Due to lock down the shops are closed and the stationary is not available. So students type in their assignments and submit it in .doc format. Here the problem of copying becomes more pronounced as the students submit the same document.

Teachers have to adapt themselves to this new way of teaching. Teachers have already been using various (Information and Communication Technology) ICT tools (viz powerpoint presentations and videos), platforms (viz Moodle and Enterprise Resource Planning i.e ERP,) and modes (viz split class room) during their face-to-face interactions in class. But Moodle and ERP though adequate during normal functioning of college, where the assignments are submitted as hard copies, face the disk space crunch in these unforeseen circumstances. Further these above mentioned platforms may have a small upper limit to the size of files that can be uploaded on them.

Teachers have to investigate and experiment with newer means of communication and teaching, that are easily available but more resource intensive. They can share notes, give assignments and have interactive sessions, accept submissions, on platforms like WhatsApp, kiddom, microsoft teams, Cisco Webex, You Tube Streaming, OERs, SWAYAM Platform and Google class room. For doubt solving, teachers can have live sessions using apps like zoom and Google duo. Zoom, though an app preferred by many, has a number of security issues. Poor internet connection can make these apps difficult to use.

A big difficulty in these restricted times is the evaluation of students. Due to travel restrictions conducting offline or written examination may not be possible in near future. Same applies to online exams, as all the students do not have access to good speed internet connection or hardware. The electricity supply in remote areas can also be unpredictable. It is the need of the hour for august bodies like University Grants Commission (UGC) and All India Council for Technical Education (AICTE) to give directions keeping in mind these restrictions.

Students aspiring to be engineers, i.e. students wanting to take admission in the year 2020 do not know how to proceed with the admission process. It may not be possible to conduct examination; new criteria for admission will have to be formulated.



There is a dearth of government sponsored engineering colleges. This gap was filled by self financing or private engineering colleges. These colleges charge higher fees as compared to the government colleges. Hence scholarships or some other means of sponsorship become important. Due to the lockdown some of the schemes like Prime Minister's Special Scholarship Scheme (PMSSS) for the FY 20 -21 have been delayed, that has caused further apprehension.<sup>10</sup>

Management of the Self financing private colleges have to plan for the coming semester, and that includes hiring staff, arranging for hostels for students, messing and other infrastructural detail. This could be difficult to arrange if the duration of lockdown is not definite. The information about the admission criteria and an estimate of the number of new students taking admission is necessary to work out the details and finances for the upcoming semester.

**Possible Solutions:**

Thanks to modern technology and the use of ICT in teaching-learning process the transformation from traditional face-to-face offline study to remote, online teaching on e-platforms has not been very difficult. The teachers have used the online platforms like google class room, you tube, zoom and even WhatsApp to continue the teaching-learning process. Videos, powerpoint presentations and word documents have been changed to adapt the teaching to the new reality. Teachers are now available 24 X 7, instead of the limited college working hours.

Teachers have to be extra vigilant to ensure that students work on their assignments and not submit plagiarized ones. Teachers have to go through each and every assignment and give a feed back about the "lacunae" or the excellence of the work. After the due date, the solution of the assignment also needs to be put up. As an incentive the teacher could also share well written assignments on their virtual class room. This motivates students and makes them strive to give their best.

Quizzes and competitions can also be held where students can be given stars. The stars can also be given for timely submission or excellent work. At the end of lock down students with the maximum stars can be given some prize. This has to be done with prior cognizance from the management.



College management can ensure that the teaching-learning process continues without a hitch. It could do so by interacting with all the prominent stake holders, the students, their parents and of course the staff members. By conducting regular meetings, sending messages and taking feed back, the management could ensure that the teaching-learning process continues smoothly.

To keep the interest of students alive, beyond syllabus activities can be carried out. This is a golden opportunity for students and faculty alike to pursue online courses to further their interests. A large number of online courses are offered by Udemey, Coursera, National Programme on Technology Enhanced Learning (NPTEL), spoken tutorials by Indian Institute of Technology (IITs) amongst others. Faculty and students should carry out literature survey and maybe write projects. With the schedule becoming less hectic, due to absence of work related travel, teachers and students alike have more time to ponder and think of new ideas.

To keep students motivated Government and NGOs are conducting online hackathon competitions<sup>11</sup>. A month long online lecture series is being conducted by NPTEL<sup>12</sup>, to address multiple issues relevant in today's scenario.

Institutions with the help of alumni could conduct online sessions to keep the moral high. This is a good time for alumni to come to the aid of their alma mater. It is time to explore untraditional ways of creating jobs and becoming entrepreneurs. A small idea could go a long way, provided it gets right guidance and a nurturing environment. Ministry of Human Resource Development (MHRD) is funding development of incubation centers across the country to foster the spirit of entrepreneurship.

MHRD has offered a special collection called "Corona Outbreak: Study from Home" through the National Digital Library of India<sup>13</sup>. This collection has been developed and executed by IIT Kharagpur. It contains both academic and research materials to enable students and faculty to have continued access to content during the Pandemic lockdown.

AICTE has launched an e-learning portal Enhancement in Learning with Improvement In Skills (ELIS) with 49 free e-learning courses, to foster digital learning and support the student



community across the country.<sup>14</sup> These courses aim to prevent the loss of students and help students utilize the COVID – 19 lockdown period effectively for upgrading their skills.

UGC has announced a new academic calendar keeping in mind the possible extension of the lockdown.<sup>15</sup> This has taken away some of the uncertainty. The college management can now start working towards logistics related with work load and hiring of faculty for the coming semester. The uncertainty still remains about the number of admissions. In the worst case scenario the state government can step in to bail out the college/institution. The teachers need to start their preparation for the coming semester, keeping in mind that they may have to continue with the online teaching for a prolonged duration.

UGC and the state government have also announced criteria for grading and promotion of students. The finer points are still being worked on and will be released soon. Now the students are aware of the basis for their grading. They should now start working towards completing the requirements of the course.

Around the world the ranks of higher education have kept pace with the government in trying to find a solution to the challenges faced. Unfortunately India's strength lies in providing world class undergraduates. There is a dearth of research and postgraduate institutions. If nothing this lockdown has pointed towards the need for more funding by the government on higher education. Relying on private institutions that depend on the fees collected from the students for their survival, in long term may not be a good idea. The burden on the government could decrease if the industry takes up the challenge of getting involved with these private and self financed technical education institutions. Governments should explore the possibility of industry sponsored higher education and provide incentives for it.

**Conclusions:**

1. A lot of opportunities are being provided to students to continue with their learning process using e- platforms amidst lockdown due to COVID 19.
2. Teachers are making use of online platforms to continue with teaching-learning process. They are implementing innovative methods to sustain the interest of students.



3. Management is supporting the teaching-learning process by making available the necessary infrastructure and by acting as mentor and guide to teachers and students.
4. Alumni are conducting online workshops and seminars for their alma mater.
5. Government is helping the teaching community by ensuring that their job and salaries are protected.
6. Free online courses are being offered by the central bodies like AICTE for the development of students and staff.
7. Free study material is being made available through the National Digital Library.
8. The last date has been extended for Central scholarships like PMSS application
9. Government is trying to bring some clarity to the situation by publishing the revised academic calendar, formulating the amended grading criteria and conducting webinars.

In view of above it would not be incorrect to say that Corona virus Pandemic has resulted in innovative solutions, by adopting technology to bridge the gap and shift from conventional face-to-face teaching to modern online teaching. As a nation that has been mainly dependent on the traditional offline face-to-face teaching, comprising of far flung remote villages; we are doing a good job of online teaching on e platforms. There are challenges, but we are discovering that we are ingenious enough to come up with solutions using state of art technology to keep the torch of spreading knowledge burning bright.

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**THEORY OF SIX - DIMENSIONAL FINSLER SPACES IN TERMS OF SCALARS-I**

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**ABSTRACT.** This paper refers to the study of several properties of torsion tensors  $C_{ijk}$  and  $P_{ijk}$  Matsumoto [4], in a six-dimensional Finsler space, whose theory in terms of scalars has been studied and developed by the authors [1]. In this paper we have studied Finsler spaces of six-dimensions, which are C-reducible Finsler spaces Matsumoto [3] and P-reducible Finsler spaces Matsumoto [5] and Rastogi and Kawaguchi [7]. We have also studied P\*-Finsler spaces of six-dimensions, which for three-dimensional Finsler spaces were defined by Izumi [2] and Rastogi [6]. In the end we have obtained expression for the third curvature tensor in  $F^6$  and obtained some of its properties.

**KEY WORDS:** Curvature and torsion tensors in  $F^6$ , P\*-Finsler spaces.

1. INTRODUCTION. Let  $F^6$ , be the six-dimensional Finsler space equipped with the fundamental function  $L(x,y)$ . Let  $l^i, m^i, n_{(1)}^i, n_{(2)}^i, n_{(3)}^i$  and  $n_{(4)}^i$  be the six vectors of the orthonormal frame and let the metric tensor and angular metric tensor of  $F^6$  are given by [1]

$$g_{ij} = l_i l_j + m_i m_j + n_{(1)i} n_{(1)j} + n_{(2)i} n_{(2)j} + n_{(3)i} n_{(3)j} + n_{(4)i} n_{(4)j} \quad (1.1)$$

and

$$h_{ij} = m_i m_j + n_{(1)i} n_{(1)j} + n_{(2)i} n_{(2)j} + n_{(3)i} n_{(3)j} + n_{(4)i} n_{(4)j} \quad (1.2)$$

Let  $(j_i)$  represent the h-covariant derivative for a tensor then for unit vectors of the orthonormal frame, we have [1]

$$m^i_{/j} = n_{(1)}^i h_j - n_{(2)}^i r_j - n_{(3)}^i s_j - n_{(4)}^i v_j \quad (1.3) a$$

$$n_{(1)}^i_{/j} = -m^i h_j + n_{(2)}^i k_j - n_{(3)}^i t_j - n_{(4)}^i w_j \quad (1.3) b$$

$$n_{(2)}^i_{/j} = m^i r_j - n_{(1)}^i k_j - n_{(3)}^i u_j - n_{(4)}^i x_j \quad (1.3) c$$

$$n_{(3)}^i_{/j} = m^i s_j + n_{(1)}^i t_j + n_{(2)}^i u_j - n_{(4)}^i y_j \quad (1.3) d$$

$$n_{(4)j}^i = m^i v_j + n_{(1)}^i w_j + n_{(2)}^i x_j + n_{(3)}^i y_j \quad (1.3) e$$

where  $h_j, k_j, r_j, s_j, t_j, u_j, v_j, w_j, x_j$  and  $y_j$  are h-connection vectors in  $F^6$ .

In  $F^6$ , the torsion tensor  $C_{ijk}$  is expressed as [1]:

$$\begin{aligned} C_{ijk} = & C_{(1)} m_i m_j m_k + C_{(2)} n_{(1)i} n_{(1)j} n_{(1)k} + C_{(3)} n_{(2)i} n_{(2)j} n_{(2)k} + C_{(4)} n_{(3)i} n_{(3)j} n_{(3)k} \\ & + C_{(5)} n_{(4)i} n_{(4)j} n_{(4)k} + \sum_{(l,j,k)} [C_{(6)} m_i m_j n_{(1)k} + C_{(7)} m_i m_j n_{(2)k} \\ & + C_{(8)} m_i m_j n_{(3)k} + C_{(9)} m_i m_j n_{(4)k} + C_{(10)} n_{(1)i} n_{(1)j} m_k \\ & + C_{(11)} n_{(1)i} n_{(1)j} n_{(2)k} + C_{(12)} n_{(1)i} n_{(1)j} n_{(3)k} + C_{(13)} n_{(1)i} n_{(1)j} n_{(4)k} \\ & + C_{(14)} n_{(2)i} n_{(2)j} m_k + C_{(15)} n_{(2)i} n_{(2)j} n_{(1)k} + C_{(16)} n_{(2)i} n_{(2)j} n_{(3)k} \\ & + C_{(17)} n_{(2)i} n_{(2)j} n_{(4)k} + C_{(18)} n_{(3)i} n_{(3)j} m_k + C_{(19)} n_{(3)i} n_{(3)j} n_{(1)k} \\ & + C_{(20)} n_{(3)i} n_{(3)j} n_{(2)k} + C_{(21)} n_{(3)i} n_{(3)j} n_{(4)k} + C_{(22)} n_{(4)i} n_{(4)j} m_k \\ & + C_{(23)} n_{(4)i} n_{(4)j} n_{(1)k} + C_{(24)} n_{(4)i} n_{(4)j} n_{(2)k} + C_{(25)} n_{(4)i} n_{(4)j} n_{(3)k} \\ & + C_{(26)} m_i (n_{(1)j} n_{(2)k} + n_{(1)k} n_{(2)j}) + C_{(27)} m_i (n_{(1)j} n_{(3)k} + n_{(1)k} n_{(3)j}) \\ & + C_{(28)} m_i (n_{(1)j} n_{(4)k} + n_{(1)k} n_{(4)j}) + C_{(29)} m_i (n_{(2)j} n_{(3)k} + n_{(2)k} n_{(3)j}) \\ & + C_{(30)} m_i (n_{(2)j} n_{(4)k} + n_{(2)k} n_{(4)j}) + C_{(31)} m_i (n_{(3)j} n_{(4)k} + n_{(3)k} n_{(4)j}) \\ & + C_{(32)} n_{(1)i} (n_{(2)j} n_{(3)k} + n_{(2)k} n_{(3)j}) + C_{(33)} n_{(1)i} (n_{(2)j} n_{(4)k} + n_{(2)k} n_{(4)j}) \\ & + C_{(34)} n_{(1)i} (n_{(3)j} n_{(4)k} + n_{(3)k} n_{(4)j}) + C_{(35)} n_{(2)i} (n_{(3)j} n_{(4)k} + n_{(3)k} n_{(4)j}) \end{aligned} \quad (1.4)$$

where

$$C_{(1)} + C_{(10)} + C_{(14)} + C_{(18)} + C_{(22)} = C, \quad C_{(2)} + C_{(6)} + C_{(15)} + C_{(19)} + C_{(23)} = 0, \quad (1.5) a$$

$$C_{(3)} + C_{(7)} + C_{(11)} + C_{(20)} + C_{(24)} = 0, \quad C_{(4)} + C_{(8)} + C_{(12)} + C_{(16)} + C_{(25)} = 0, \quad (1.5) b$$

$$C_{(5)} + C_{(9)} + C_{(13)} + C_{(17)} + C_{(21)} = 0. \quad (1.5) c$$

## 2. C-REDUCIBLE FINSLER SPACES.

C-reducible Finsler spaces in an n-dimensional Finsler space have been defined and studied by Matsumoto [3] such that  $C_{ijk}$  is expressed as

$$C_{ijk} = (n+1)^{-1} (h_{jk} C_i + h_{ki} C_j + h_{ij} C_k) \quad (2.1)$$

In case of  $F^6$ , equation (2.1), will give

$$C_{ijk} = (1/7) (h_{jk} C_i + h_{ki} C_j + h_{ij} C_k) \quad (2.2)$$

Substituting the value of  $h_{jk}$  in (2.2) from equation (1.2) and using the value of  $C_{ijk}$  from equation (1.5), we shall get

$$\begin{aligned} C_{(1)} &= (3/7) C, C_{(2)} = C_{(3)} = C_{(4)} = C_{(5)} = C_{(6)} = C_{(7)} = C_{(8)} = C_{(9)} = C_{(11)} \\ &= C_{(12)} = C_{(13)} = C_{(15)} = C_{(16)} = C_{(17)} = C_{(19)} = C_{(20)} = C_{(21)} = C_{(23)} C_{(24)} \\ &= C_{(25)} = C_{(26)} = C_{(27)} = C_{(28)} = C_{(29)} = C_{(30)} = C_{(31)} = C_{(32)} = C_{(33)} = C_{(34)} \\ &= C_{(35)} = 0, C_{(10)} = C_{(14)} = C_{(18)} = C_{(22)} = C/7. \end{aligned} \quad (2.3)$$

Alternatively, equation (2.3) can also be expressed as in [1]:

$$\begin{aligned} C_{222} &= (3/7) C, C_{233} = C_{244} = C_{255} = C_{266} = C/7, C_{322} = C_{333} = C_{344} \\ &= C_{355} = C_{366} = C_{422} = C_{433} = C_{444} = C_{455} = C_{466} = C_{522} = C_{533} = C_{544} \\ &= C_{555} = C_{566} = C_{622} = C_{633} = C_{644} = C_{655} = C_{666} = 0, C_{(234)} = C_{235} \\ &= C_{236} = C_{245} = C_{246} = C_{256} = C_{345} = C_{346} = C_{356} = C_{456} = 0. \end{aligned} \quad (2.4)$$

Hence:

**Theorem 2.1.:** A six-dimensional Finsler space  $F^6$ , shall be C-reducible if and only if coefficients  $C_{(1)}$  to  $C_{(35)}$  satisfy set of equation (2.3) or alternatively equation (2.4).

Using  $C_{ijk} m^i = {}^1C_{jk}$ ,  $C_{ijk} n_{(1)}^i = {}^2C_{jk}$ ,  $C_{ijk} n_{(2)}^i = {}^3C_{jk}$ ,  $C_{ijk} n_{(3)}^i = {}^4C_{jk}$  and  $C_{ijk} n_{(4)}^i = {}^5C_{jk}$ , from equation (2.2), we can obtain Shimada [9]:

$${}^1C_{jk} = (1/7) C (h_{jk} + 2 m_j m_k), {}^2C_{jk} = (1/7) C (m_j n_{(1)k} + m_k n_{(1)j}), \quad (2.5) a$$

$${}^3C_{jk} = (1/7) C (m_j n_{(2)k} + m_k n_{(2)j}), {}^4C_{jk} = (1/7) C (m_j n_{(3)k} + m_k n_{(3)j}), \quad (2.5) b$$

and

$${}^5C_{jk} = (1/7) C (m_j n_{(4)k} + m_k n_{(4)j}) \quad (2.5) c$$

Hence:

**Theorem 2.2.:** In a six-dimensional C-reducible Finsler space  $F^6$ , we have five C-tensors which are symmetric and satisfy equations (2.5) a, b, c.

Further from equations (2.5) a, b, c, we can obtain

$${}^1C_{jk} m^j = (3/7) C_k, {}^2C_{jk} n_{(1)}^j = {}^3C_{jk} n_{(2)}^j = {}^4C_{jk} n_{(3)}^k = {}^5C_{jk} n_{(4)}^k = (1/7) C_k \quad (2.6)$$

and

$${}^1C_{jk} g^{jk} = C, {}^2C_{jk} g^{jk} = {}^3C_{jk} g^{jk} = {}^4C_{jk} g^{jk} = {}^5C_{jk} g^{jk} = 0 \quad (2.7)$$

Hence:

**Theorem 2.3.:** In a six-dimensional C-reducible Finsler space  $F^6$ , C-tensors satisfy equations (2.6) and (2.7).

### 3. P-REDUCIBLE FINSLER SPACES

Corresponding to the tensor  $C_{ijk}$  defined by equation (1.4), the tensor  $P_{ijk}$  is expressed as [1]

$$\begin{aligned}
 P_{ijk} = & L [A_{(1)} m_i m_j m_k + A_{(2)} n_{(1)j} n_{(1)k} + A_{(3)} n_{(2)j} n_{(2)k} \\
 & + A_{(4)} n_{(3)j} n_{(3)k} + A_{(5)} n_{(4)j} n_{(4)k} + \sum_{(l,j,k)} [A_{(6)} m_i m_j n_{(1)k} \\
 & + A_{(7)} m_i m_j n_{(2)k} + A_{(8)} m_i m_j n_{(3)k} + A_{(9)} m_i m_j n_{(4)k} \\
 & + A_{(10)} n_{(1)j} n_{(1)k} m_i + A_{(11)} n_{(1)j} n_{(1)k} n_{(2)k} + A_{(12)} n_{(1)j} n_{(1)k} n_{(3)k} \\
 & + A_{(13)} n_{(1)j} n_{(1)k} n_{(4)k} + A_{(14)} n_{(2)j} n_{(2)k} m_i + A_{(15)} n_{(2)j} n_{(2)k} n_{(1)k} \\
 & + A_{(16)} n_{(2)j} n_{(2)k} n_{(3)k} + A_{(17)} n_{(2)j} n_{(2)k} n_{(4)k} + A_{(18)} n_{(3)j} n_{(3)k} m_i \\
 & + A_{(19)} n_{(3)j} n_{(3)k} n_{(1)k} + A_{(20)} n_{(3)j} n_{(3)k} n_{(2)k} + A_{(21)} n_{(3)j} n_{(3)k} n_{(4)k} \\
 & + A_{(22)} n_{(4)j} n_{(4)k} m_i + A_{(23)} n_{(4)j} n_{(4)k} n_{(1)k} + A_{(24)} n_{(4)j} n_{(4)k} n_{(2)k} \\
 & + A_{(25)} n_{(4)j} n_{(4)k} n_{(3)k} + A_{(26)} m_i (n_{(1)j} n_{(2)k} + n_{(1)k} n_{(2)j}) \\
 & + A_{(27)} m_i (n_{(1)j} n_{(3)k} + n_{(1)k} n_{(3)j}) + A_{(28)} m_i (n_{(1)j} n_{(4)k} + n_{(1)k} n_{(4)j}) \\
 & + A_{(29)} m_i (n_{(2)j} n_{(3)k} + n_{(2)k} n_{(3)j}) + A_{(30)} m_i (n_{(2)j} n_{(4)k} + n_{(2)k} n_{(4)j}) \\
 & + A_{(31)} m_i (n_{(3)j} n_{(4)k} + n_{(3)k} n_{(4)j}) + A_{(32)} n_{(1)j} (n_{(2)j} n_{(3)k} + n_{(2)k} n_{(3)j}) \\
 & + A_{(33)} n_{(1)j} (n_{(2)j} n_{(4)k} + n_{(2)k} n_{(4)j}) + A_{(34)} n_{(1)j} (n_{(3)j} n_{(4)k} + n_{(3)k} n_{(4)j}) \\
 & + A_{(35)} n_{(2)j} (n_{(3)j} n_{(4)k} + n_{(3)k} n_{(4)j})] \tag{3.1}
 \end{aligned}$$

where

$$\begin{aligned}
 A_{(1)} &= C_{(1)/0} - 3 (C_{(6)} h_0 - C_{(7)} r_0 - C_{(8)} s_0 - C_{(9)} v_0), \\
 A_{(2)} &= C_{(2)/0} + 3 (C_{(10)} h_0 - C_{(11)} k_0 + C_{(12)} t_0 + C_{(13)} w_0), \\
 A_{(3)} &= C_{(3)/0} - 3 (C_{(14)} r_0 - C_{(15)} k_0 - C_{(16)} u_0 - C_{(17)} x_0),
 \end{aligned}$$



$$A_{(4)} = C_{(4)/0} - 3 (C_{(18)} s_0 + C_{(19)} t_0 + C_{(20)} u_0 - C_{(21)} y_0),$$

$$A_{(5)} = C_{(5)/0} - 3(C_{(22)} v_0 + C_{(23)} w_0 + C_{(24)} x_0 + C_{(25)} y_0),$$

$$A_{(6)} = C_{(6)/0} + (C_{(1)} - 2 C_{(10)}) h_0 - C_{(7)} k_0 + C_{(8)} t_0 + C_{(9)} w_0 \\ + 2(C_{(26)} r_0 + C_{(27)} s_0 + C_{(28)} v_0),$$

$$A_{(7)} = C_{(7)/0} - (C_{(1)} - 2 C_{(14)}) r_0 + C_{(6)} k_0 + C_{(8)} u_0 + C_{(9)} x_0 \\ - 2(C_{(26)} h_0 - C_{(29)} s_0 - C_{(30)} v_0),$$

$$A_{(8)} = C_{(8)/0} - (C_{(1)} - 2 C_{(18)}) s_0 - C_{(6)} t_0 - C_{(7)} u_0 + C_{(9)} y_0 \\ - 2(C_{(27)} h_0 - C_{(29)} r_0 - C_{(31)} v_0),$$

$$A_{(9)} = C_{(9)/0} - (C_{(1)} - 2 C_{(22)}) v_0 - C_{(6)} w_0 - C_{(7)} x_0 - C_{(8)} y_0 \\ - 2(C_{(28)} h_0 - C_{(30)} r_0 - C_{(31)} s_0),$$

$$A_{(10)} = C_{(10)/0} - (C_{(2)} - 2 C_{(6)}) h_0 + C_{(11)} r_0 + C_{(12)} s_0 + C_{(13)} v_0 \\ - 2(C_{(26)} k_0 - C_{(27)} t_0 - C_{(28)} w_0),$$

$$A_{(11)} = C_{(11)/0} + (C_{(2)} - 2 C_{(15)}) k_0 - C_{(10)} r_0 + C_{(12)} u_0 + C_{(13)} x_0 \\ + 2(C_{(26)} h_0 + C_{(32)} t_0 + C_{(33)} w_0),$$

$$A_{(12)} = C_{(12)/0} - (C_{(2)} - 2 C_{(19)}) t_0 - C_{(10)} s_0 - C_{(11)} u_0 + C_{(13)} y_0 \\ + 2(C_{(27)} h_0 - C_{(32)} k_0 + C_{(34)} w_0),$$

$$A_{(13)} = C_{(13)/0} - (C_{(2)} - 2 C_{(23)}) w_0 - C_{(10)} v_0 - C_{(11)} x_0 - C_{(12)} y_0 \\ + 2(C_{(28)} h_0 - C_{(33)} k_0 + C_{(34)} t_0),$$

$$A_{(14)} = C_{(14)/0} + (C_{(3)} - 2 C_{(7)}) r_0 - C_{(15)} h_0 + C_{(16)} s_0 + C_{(17)} v_0 \\ + 2(C_{(26)} k_0 + C_{(29)} u_0 + C_{(30)} x_0),$$

$$A_{(15)} = C_{(15)/0} - (C_{(3)} - 2 C_{(11)}) k_0 + C_{(14)} h_0 + C_{(16)} t_0 + C_{(17)} w_0 \\ - 2(C_{(26)} r_0 - C_{(32)} u_0 - C_{(33)} x_0),$$

$$A_{(16)} = C_{(16)/0} - (C_{(3)} - 2 C_{(20)}) u_0 - C_{(14)} s_0 - C_{(15)} t_0 + C_{(17)} y_0$$



$$-2(C_{(29)} r_0 - C_{(32)} k_0 - C_{(35)} x_0),$$

$$A_{(17)} = C_{(17)/0} - (C_{(3)} - 2 C_{(24)})x_0 - C_{(14)} v_0 - C_{(15)} w_0 - C_{(16)} y_0$$

$$-2(C_{(30)} r_0 - C_{(33)} k_0 - C_{(35)} u_0),$$

$$A_{(18)} = C_{(18)/0} + (C_{(4)} - 2 C_{(8)})s_0 - C_{(19)} h_0 + C_{(20)} r_0 + C_{(21)} v_0$$

$$-2(C_{(27)} t_0 + C_{(29)} u_0 - C_{(31)} y_0),$$

$$A_{(19)} = C_{(19)/0} + (C_{(4)} - 2 C_{(12)})t_0 + C_{(18)} h_0 - C_{(20)} k_0 + C_{(21)} w_0$$

$$-2(C_{(27)} s_0 + C_{(32)} u_0 - C_{(34)} y_0),$$

$$A_{(20)} = C_{(20)/0} + (C_{(4)} - 2 C_{(16)})u_0 - C_{(18)} r_0 + C_{(19)} k_0 + C_{(21)} x_0$$

$$-2(C_{(29)} s_0 + C_{(32)} t_0 - C_{(35)} y_0),$$

$$A_{(21)} = C_{(21)/0} - (C_{(4)} - 2 C_{(25)})y_0 - C_{(18)} v_0 - C_{(19)} w_0 - C_{(20)} x_0$$

$$-2(C_{(31)} s_0 + C_{(34)} t_0 + C_{(35)} u_0),$$

$$A_{(22)} = C_{(22)/0} + (C_{(5)} - 2 C_{(9)})v_0 - C_{(23)} h_0 + C_{(24)} r_0 + C_{(25)} s_0$$

$$-2(C_{(28)} w_0 + C_{(30)} x_0 + C_{(31)} y_0),$$

$$A_{(23)} = C_{(23)/0} + (C_{(5)} - 2 C_{(13)})w_0 + C_{(22)} h_0 - C_{(24)} k_0 + C_{(25)} t_0$$

$$-2(C_{(28)} v_0 + C_{(33)} x_0 + C_{(34)} y_0),$$

$$A_{(24)} = C_{(24)/0} + (C_{(5)} - 2 C_{(17)})x_0 - C_{(22)} r_0 + C_{(23)} k_0 + C_{(25)} u_0$$

$$-2(C_{(30)} v_0 + C_{(33)} w_0 + C_{(35)} y_0),$$

$$A_{(25)} = C_{(25)/0} + (C_{(5)} - 2 C_{(21)})y_0 - C_{(22)} s_0 - C_{(23)} t_0 - C_{(24)} u_0$$

$$-2(C_{(31)} v_0 + C_{(34)} w_0 + C_{(35)} x_0),$$

$$A_{(26)} = C_{(26)/0} + (C_{(7)} - C_{(11)})h_0 + (C_{(10)} - C_{(14)})k_0 - (C_{(6)} - C_{(15)})r_0 + C_{(32)} s_0$$

$$+ C_{(29)} t_0 + C_{(27)} u_0 + C_{(33)} v_0 + C_{(30)} w_0 + C_{(28)} x_0,$$

$$A_{(27)} = C_{(27)/0} + (C_{(8)} - C_{(12)})h_0 - C_{(29)} k_0 + C_{(32)} r_0 - (C_{(6)} - C_{(19)}) s_0$$

$$- (C_{(10)} - C_{(18)})t_0 - C_{(26)} u_0 - C_{(34)} v_0 + C_{(31)} w_0 + C_{(28)} y_0,$$

$$\begin{aligned}
 A_{(28)} &= C_{(28)/0} + (C_{(9)} - C_{(13)})h_0 - C_{(30)}k_0 + C_{(33)}r_0 + C_{(34)}s_0 + C_{(31)}t_0 \\
 &\quad - (C_{(6)} - C_{(23)})v_0 - (C_{(10)} - C_{(22)})w_0 - C_{(26)}x_0 - C_{(27)}y_0, \\
 A_{(29)} &= C_{(29)/0} - C_{(32)}h_0 + C_{(27)}k_0 - (C_{(8)} - C_{(16)})r_0 - (C_{(7)} - C_{(20)})s_0 \\
 &\quad - C_{(26)}t_0 - (C_{(14)} - C_{(18)})u_0 + C_{(35)}v_0 + C_{(31)}x_0 + C_{(30)}y_0, \\
 A_{(30)} &= C_{(30)/0} - C_{(33)}h_0 + C_{(28)}k_0 - (C_{(9)} - C_{(17)})r_0 + C_{(35)}s_0 + C_{(31)}u_0 \\
 &\quad - (C_{(7)} - C_{(24)})v_0 - C_{(26)}w_0 - (C_{(14)} - C_{(22)})x_0 - C_{(29)}y_0, \\
 A_{(31)} &= C_{(31)/0} - C_{(34)}h_0 + C_{(35)}r_0 - (C_{(9)} - C_{(21)})s_0 - C_{(28)}t_0 - C_{(30)}u_0 \\
 &\quad - (C_{(8)} - C_{(25)})v_0 - C_{(27)}w_0 - C_{(29)}x_0 - (C_{(18)} - C_{(22)})y_0, \\
 A_{(32)} &= C_{(32)/0} + C_{(29)}h_0 + (C_{(12)} - C_{(16)})k_0 - C_{(27)}r_0 - C_{(26)}s_0 - (C_{(11)} \\
 &\quad - C_{(20)})t_0 - (C_{(15)} - C_{(19)})u_0 + C_{(35)}v_0 + C_{(34)}x_0 + C_{(33)}y_0, \\
 A_{(33)} &= C_{(33)/0} + C_{(30)}h_0 + (C_{(13)} - C_{(17)})k_0 - C_{(28)}r_0 + C_{(35)}t_0 + C_{(34)}u_0 \\
 &\quad - C_{(26)}v_0 - (C_{(11)} - C_{(24)})w_0 - (C_{(15)} - C_{(23)})x_0 - C_{(32)}y_0, \\
 A_{(34)} &= C_{(34)/0} + C_{(31)}h_0 - C_{(35)}k_0 - C_{(28)}s_0 - (C_{(13)} - C_{(21)})t_0 - C_{(33)}u_0 \\
 &\quad - C_{(27)}v_0 - (C_{(12)} - C_{(25)})w_0 - C_{(32)}x_0 - (C_{(19)} - C_{(23)})y_0, \\
 A_{(35)} &= C_{(35)/0} + C_{(34)}k_0 - C_{(31)}r_0 - C_{(30)}s_0 - C_{(33)}t_0 - (C_{(17)} - C_{(21)})u_0 \\
 &\quad - C_{(29)}v_0 - C_{(32)}w_0 - (C_{(16)} - C_{(25)})x_0 - (C_{(20)} - C_{(24)})y_0. \tag{3.2}
 \end{aligned}$$

**Def. 3.1.:** A six-dimensional Finsler space  $F^6$ , shall be called P-reducible if the tensor  $P_{ijk}$  can be expressed as

$$P_{ijk} = (1/7) (h_{jk} A_{i/0} + h_{ki} A_{j/0} + h_{ij} A_{k/0}) \tag{3.3}$$

Comparing values of  $P_{ijk}$  in equations (3.1) and (3.3), we can obtain

$$\begin{aligned}
 A_{(1)} &= c C_{/0}, A_{(2)} = 3 C h_0, A_{(3)} = -3 C r_0, A_{(4)} = -3 C s_0, A_{(5)} = -3 C v_0, \\
 A_{(6)} &= A_{(15)} = A_{(19)} = A_{(23)} = C h_0, A_{(7)} = A_{(11)} = A_{(20)} = A_{(24)} = -C r_0, \\
 A_{(8)} &= A_{(12)} = A_{(16)} = A_{(25)} = -C s_0, A_{(9)} = A_{(13)} = A_{(17)} = A_{(21)} = -C v_0, \\
 A_{(10)} &= A_{(14)} = A_{(18)} = A_{(22)} = C_{/0}. \tag{3.4}
 \end{aligned}$$

From equations (3.2) and (3.4), we can obtain following independent relations

$$\begin{aligned}
 C_{(1)/0} &= 3 (C_{(0)} + C_{(6)} h_0 - C_{(7)} r_0 - C_{(8)} s_0 - C_{(9)} v_0), \\
 C_{(2)/0} &= 3\{(C - C_{(10)}) h_0 + C_{(11)} k_0 - C_{(12)} t_0 - C_{(13)} w_0\}, \\
 C_{(3)/0} &= 3\{(C_{(14)} - C) r_0 - C_{(15)} k_0 - C_{(16)} u_0 - C_{(17)} x_0\}, \\
 C_{(4)/0} &= 3\{(C_{(18)} - C) s_0 + C_{(19)} t_0 + C_{(20)} u_0 - C_{(21)} y_0\}, \\
 C_{(5)/0} &= 3\{(C_{(22)} - C) v_0 + C_{(23)} w_0 + C_{(24)} x_0 + C_{(25)} y_0\}, \\
 C_{(6)/0} &= (C - C_{(1)} + 2 C_{(10)}) h_0 + C_{(7)} k_0 - C_{(8)} t_0 - C_{(9)} w_0 \\
 &\quad - 2(C_{(26)} r_0 + C_{(27)} s_0 + C_{(28)} v_0), \\
 C_{(7)/0} &= (C_{(1)} - C - 2 C_{(14)}) r_0 - C_{(6)} k_0 - C_{(8)} u_0 - C_{(9)} x_0 \\
 &\quad + 2(C_{(26)} h_0 - C_{(29)} s_0 - C_{(30)} v_0), \\
 C_{(8)/0} &= (C_{(1)} - C - 2 C_{(18)}) s_0 + C_{(6)} t_0 + C_{(7)} u_0 - C_{(9)} y_0 \\
 &\quad + 2(C_{(27)} h_0 - C_{(29)} r_0 - C_{(31)} v_0), \\
 C_{(9)/0} &= (C_{(1)} - C - 2 C_{(22)}) v_0 + C_{(6)} w_0 + C_{(7)} x_0 + C_{(8)} y_0 \\
 &\quad + 2(C_{(28)} h_0 - C_{(30)} r_0 - C_{(31)} s_0), \\
 C_{(10)/0} &= C_{(0)} + (C_{(2)} - 2 C_{(6)}) h_0 - C_{(11)} r_0 - C_{(12)} s_0 - C_{(13)} v_0 \\
 &\quad + 2(C_{(26)} k_0 - C_{(27)} t_0 - C_{(28)} w_0). \tag{3.5}
 \end{aligned}$$

Hence:

**Theorem 3.1.:** The P-reducible six-dimensional Finsler space  $F^6$ , satisfies above ten independent relations given by equation (3.5).

Using  ${}^1P_{jk} = P_{ijk} m^i$ ,  ${}^2P_{jk} = P_{ijk} n_{(1)}^i$ ,  ${}^3P_{jk} = P_{ijk} n_{(2)}^i$ ,  ${}^4P_{jk} = P_{ijk} n_{(3)}^i$  and  ${}^5P_{jk} = P_{ijk} n_{(4)}^i$ , from equation (3.3), by virtue of definitions given in (1.3) a, b, c, d, e, we shall obtain

$$\begin{aligned}
 {}^1P_{jk} &= (1/7) LC [(m_j n_{(1)k} + m_k n_{(1)j}) h_0 - (m_j n_{(2)k} + m_k n_{(2)j}) r_0 \\
 &\quad - (m_j n_{(3)k} + m_k n_{(3)j}) s_0 - (m_j n_{(4)k} + m_k n_{(4)j}) v_0], \tag{3.6a}
 \end{aligned}$$

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$${}^2P_{jlk} = (1/7) LC [(h_{jk} + 2 n_{(1)j} n_{(1)k}) h_0 - (n_{(1)j} n_{(2)k} + n_{(1)k} n_{(2)j}) r_0 - (n_{(1)j} n_{(3)k} + n_{(1)k} n_{(3)j}) s_0 - (n_{(1)j} n_{(4)k} + n_{(1)k} n_{(4)j}) v_0], \quad (3.6)b$$

$${}^3P_{jlk} = (1/7) LC [-(h_{jk} + 2 n_{(2)j} n_{(2)k}) r_0 + (n_{(1)j} n_{(2)k} + n_{(1)k} n_{(2)j}) h_0 - (n_{(2)j} n_{(3)k} + n_{(2)k} n_{(3)j}) s_0 - (n_{(2)j} n_{(4)k} + n_{(2)k} n_{(4)j}) v_0], \quad (3.6)c$$

$${}^4P_{jlk} = (1/7) LC [-(h_{jk} + 2 n_{(3)j} n_{(3)k}) s_0 + (n_{(1)j} n_{(3)k} + n_{(1)k} n_{(3)j}) h_0 - (n_{(3)j} n_{(4)k} + n_{(3)k} n_{(4)j}) v_0], \quad (3.6)d$$

$${}^5P_{jlk} = (1/7) LC [-(h_{jk} + 2 n_{(4)j} n_{(4)k}) v_0 + (n_{(1)j} n_{(4)k} + n_{(1)k} n_{(4)j}) h_0 - (n_{(2)j} n_{(4)k} + n_{(2)k} n_{(4)j}) r_0 - (n_{(3)j} n_{(4)k} + n_{(3)k} n_{(4)j}) s_0] \quad (3.6)e$$

Hence:

**Theorem 3.2.:** In a six-dimensional P-reducible Finsler space  $F^6$ , five P-tensors satisfy equations (3.6) a, b, c, d, e.

From equations (3.6) a, b, c, d, e, we can further obtain

$${}^1P_{jk} m^j = (1/7) LC [n_{(1)k} h_0 - n_{(2)k} r_0 - n_{(3)k} s_0 - n_{(4)k} v_0], \quad (3.7)a$$

$${}^2P_{jk} n_{(1)}^j = (1/7) LC [3 n_{(1)k} h_0 - n_{(2)k} r_0 - n_{(3)k} s_0 - n_{(4)k} v_0], \quad (3.7)b$$

$${}^3P_{jk} n_{(2)}^j = (1/7) LC [n_{(1)k} h_0 - 3 n_{(2)k} r_0 - n_{(3)k} s_0 - n_{(4)k} v_0], \quad (3.7)c$$

$${}^4P_{jk} n_{(3)}^j = (1/7) LC [n_{(1)k} h_0 - n_{(2)k} r_0 - 3 n_{(3)k} s_0 - n_{(4)k} v_0], \quad (3.7)d$$

$${}^5P_{jk} n_{(4)}^j = (1/7) LC [n_{(1)k} h_0 - n_{(2)k} r_0 - n_{(3)k} s_0 - 3 n_{(4)k} v_0] \quad (3.7)e$$

which lead to

$${}^1P_{jk} m^j + {}^2P_{jk} n_{(1)}^j + {}^3P_{jk} n_{(2)}^j + {}^4P_{jk} n_{(3)}^j + {}^5P_{jk} n_{(4)}^j = LC [n_{(1)k} h_0 - n_{(2)k} r_0 - n_{(3)k} s_0 - n_{(4)k} v_0] \quad (3.8)$$

Hence:

**Theorem 3.3.:** In a six-dimensional P-reducible Finsler space  $F^6$ , P-tensors satisfy equation (3.8).

#### 4.P\*-FINSLER SPACES

A Finsler space is said to be a P\*-Finsler space Izumi [2], when for a non-zero constant  $\lambda$ , the tensor  $P_{ijk}$  is related with  $C_{ijk}$  as follows:

$$P_{ijk} = \lambda C_{ijk} \quad (4.1)$$



Now using the values of  $P_{ijk}$  and  $C_{ijk}$  from equations (1.4) and (3.1), we get on simplification

$$\begin{aligned}C_{(1)/0} &= L^{-1} \lambda C_{(1)} + 3 (C_{(6)} h_0 - C_{(7)} r_0 - C_{(8)} s_0 - C_{(9)} v_0), \\C_{(2)/0} &= L^{-1} \lambda C_{(2)} - 3 (C_{(10)} h_0 - C_{(11)} k_0 + C_{(12)} t_0 + C_{(13)} w_0), \\C_{(3)/0} &= L^{-1} \lambda C_{(3)} + 3 (C_{(14)} r_0 - C_{(15)} k_0 - C_{(16)} u_0 - C_{(17)} y_0), \\C_{(4)/0} &= L^{-1} \lambda C_{(4)} + 3 (C_{(18)} s_0 + C_{(19)} t_0 + C_{(20)} u_0 - C_{(21)} y_0), \\C_{(5)/0} &= L^{-1} \lambda C_{(5)} + 3(C_{(22)} v_0 + C_{(23)} w_0 + C_{(24)} x_0 + C_{(25)} y_0), \\C_{(6)/0} &= L^{-1} \lambda C_{(6)} - (C_{(1)} - 2 C_{(10)}) h_0 + C_{(7)} k_0 - C_{(8)} t_0 - C_{(9)} w_0 \\&\quad - 2(C_{(26)} r_0 + C_{(27)} s_0 + C_{(28)} v_0), \\C_{(7)/0} &= L^{-1} \lambda C_{(7)} + (C_{(1)} - 2 C_{(14)}) r_0 - C_{(6)} k_0 - C_{(8)} u_0 - C_{(9)} x_0 \\&\quad + 2(C_{(26)} h_0 - C_{(29)} s_0 - C_{(30)} v_0), \\C_{(8)/0} &= L^{-1} \lambda C_{(8)} + (C_{(1)} - 2 C_{(18)}) s_0 + C_{(6)} t_0 + C_{(7)} u_0 - C_{(9)} y_0 \\&\quad + 2(C_{(27)} h_0 - C_{(29)} r_0 - C_{(31)} v_0), \\C_{(9)/0} &= L^{-1} \lambda C_{(9)} + (C_{(1)} - 2 C_{(22)}) v_0 + C_{(6)} w_0 + C_{(7)} x_0 + C_{(8)} y_0 \\&\quad + 2(C_{(28)} h_0 - C_{(30)} r_0 - C_{(31)} s_0), \\C_{(10)/0} &= L^{-1} \lambda C_{(10)} + (C_{(2)} - 2 C_{(6)}) h_0 - C_{(11)} r_0 - C_{(12)} s_0 - C_{(13)} v_0 \\&\quad + 2(C_{(26)} k_0 - C_{(27)} t_0 - C_{(28)} w_0), \\C_{(11)/0} &= L^{-1} \lambda C_{(11)} - (C_{(2)} - 2 C_{(15)}) k_0 + C_{(10)} r_0 - C_{(12)} u_0 - C_{(13)} x_0 \\&\quad - 2(C_{(26)} h_0 + C_{(32)} t_0 + C_{(33)} w_0), \\C_{(12)/0} &= L^{-1} \lambda C_{(12)} + (C_{(2)} - 2 C_{(19)}) t_0 + C_{(10)} s_0 + C_{(11)} u_0 - C_{(13)} y_0 \\&\quad - 2(C_{(27)} h_0 - C_{(32)} k_0 + C_{(34)} w_0), \\C_{(13)/0} &= L^{-1} \lambda C_{(13)} + (C_{(2)} - 2 C_{(23)}) w_0 + C_{(10)} v_0 + C_{(11)} x_0 + C_{(12)} y_0 \\&\quad - 2(C_{(28)} h_0 - C_{(33)} k_0 + C_{(34)} t_0),\end{aligned}$$



$$\begin{aligned}C_{(14)/0} &= L^{-1} \lambda C_{(14)} - (C_{(3)} - 2 C_{(7)}) r_0 + C_{(15)} h_0 - C_{(16)} s_0 - C_{(17)} v_0 \\ &\quad - 2(C_{(26)} k_0 + C_{(29)} u_0 + C_{(30)} x_0), \\ C_{(15)/0} &= L^{-1} \lambda C_{(15)} + (C_{(3)} - 2 C_{(11)}) k_0 - C_{(14)} h_0 - C_{(16)} t_0 - C_{(17)} w_0 \\ &\quad + 2(C_{(26)} r_0 - C_{(32)} u_0 - C_{(33)} x_0), \\ C_{(16)/0} &= L^{-1} \lambda C_{(16)} + (C_{(3)} - 2 C_{(20)}) u_0 + C_{(14)} s_0 + C_{(15)} t_0 - C_{(17)} y_0 \\ &\quad + 2(C_{(29)} r_0 - C_{(32)} k_0 - C_{(35)} x_0), \\ C_{(17)/0} &= L^{-1} \lambda C_{(17)} + (C_{(3)} - 2 C_{(24)}) x_0 + C_{(14)} v_0 + C_{(15)} w_0 + C_{(16)} y_0 \\ &\quad + 2(C_{(30)} r_0 - C_{(33)} k_0 - C_{(35)} u_0), \\ C_{(18)/0} &= L^{-1} \lambda C_{(18)} - (C_{(4)} - 2 C_{(8)}) s_0 + C_{(19)} h_0 - C_{(20)} r_0 - C_{(21)} v_0 \\ &\quad + 2(C_{(27)} t_0 + C_{(29)} u_0 - C_{(31)} y_0), \\ C_{(19)/0} &= L^{-1} \lambda C_{(19)} - (C_{(4)} - 2 C_{(12)}) t_0 - C_{(18)} h_0 + C_{(20)} k_0 - C_{(21)} w_0 \\ &\quad + 2(C_{(27)} s_0 + C_{(32)} u_0 - C_{(34)} y_0), \\ C_{(20)/0} &= L^{-1} \lambda C_{(20)} - (C_{(4)} - 2 C_{(16)}) u_0 + C_{(18)} r_0 - C_{(19)} k_0 - C_{(21)} x_0 \\ &\quad + 2(C_{(29)} s_0 + C_{(32)} t_0 - C_{(35)} y_0), \\ C_{(21)/0} &= L^{-1} \lambda C_{(21)} + (C_{(4)} - 2 C_{(25)}) y_0 + C_{(18)} v_0 + C_{(19)} w_0 + C_{(20)} x_0 \\ &\quad + 2(C_{(31)} s_0 + C_{(34)} t_0 + C_{(35)} u_0), \\ C_{(22)/0} &= L^{-1} \lambda C_{(22)} - (C_{(5)} - 2 C_{(9)}) v_0 + C_{(23)} h_0 - C_{(24)} r_0 - C_{(25)} s_0 \\ &\quad + 2(C_{(28)} w_0 + C_{(30)} x_0 + C_{(31)} y_0), \\ C_{(23)/0} &= L^{-1} \lambda C_{(23)} - (C_{(5)} - 2 C_{(13)}) w_0 - C_{(22)} h_0 + C_{(24)} k_0 - C_{(25)} t_0 \\ &\quad + 2(C_{(28)} v_0 + C_{(33)} x_0 + C_{(34)} y_0), \\ C_{(24)/0} &= L^{-1} \lambda C_{(24)} - (C_{(5)} - 2 C_{(17)}) x_0 + C_{(22)} r_0 - C_{(23)} k_0 - C_{(25)} u_0 \\ &\quad + 2(C_{(30)} v_0 + C_{(33)} w_0 + C_{(35)} y_0), \\ C_{(25)/0} &= L^{-1} \lambda C_{(25)} - (C_{(5)} - 2 C_{(21)}) y_0 + C_{(22)} s_0 + C_{(23)} t_0 + C_{(24)} u_0\end{aligned}$$



$$\begin{aligned} & + 2(C_{31} v_0 + C_{34} w_0 + C_{35} x_0), \\ C_{(26)/0} &= L^{-1} \lambda C_{(26)} - (C_{(7)} - C_{(11)})h_0 - (C_{(10)} - C_{(14)})k_0 + (C_{(6)} - C_{(15)})r_0 \\ & - C_{(32)} s_0 - C_{(29)} t_0 - C_{(27)} u_0 - C_{(33)} v_0 - C_{(30)} w_0 - C_{(28)} x_0, \\ C_{(27)/0} &= L^{-1} \lambda C_{(27)} - (C_{(8)} - C_{(12)})h_0 + C_{(29)} k_0 - C_{(32)} r_0 + (C_{(6)} - C_{(19)})s_0 \\ & + (C_{(10)} - C_{(18)})t_0 + C_{(26)} u_0 + C_{(34)} v_0 - C_{(31)} w_0 - C_{(28)} y_0, \\ C_{(28)/0} &= L^{-1} \lambda C_{(28)} - (C_{(9)} - C_{(13)})h_0 + C_{(30)} k_0 - C_{(33)} r_0 - C_{(34)} s_0 - C_{(31)} t_0 \\ & + (C_{(6)} - C_{(23)})v_0 + (C_{(10)} - C_{(22)})w_0 + C_{(26)} x_0 + C_{(27)} y_0, \\ C_{(29)/0} &= L^{-1} \lambda C_{(29)} + C_{(32)} h_0 - C_{(27)} k_0 + (C_{(8)} - C_{(16)})r_0 + (C_{(7)} - C_{(20)})s_0 \\ & + C_{(26)} t_0 + (C_{(14)} - C_{(18)})u_0 - C_{(35)} v_0 - C_{(31)} x_0 - C_{(30)} y_0, \\ C_{(30)/0} &= L^{-1} \lambda C_{(30)} + C_{(33)} h_0 - C_{(28)} k_0 + (C_{(9)} - C_{(17)})r_0 - C_{(35)} s_0 - C_{(31)} t_0 \\ & + (C_{(7)} - C_{(24)})v_0 + C_{(26)} w_0 + (C_{(14)} - C_{(22)})x_0 + C_{(29)} y_0, \\ C_{(31)/0} &= L^{-1} \lambda C_{(31)} + C_{(34)} h_0 - C_{(35)} r_0 + (C_{(9)} - C_{(21)})s_0 + C_{(28)} t_0 + C_{(30)} u_0 \\ & + (C_{(8)} - C_{(25)})v_0 + C_{(27)} w_0 + C_{(29)} x_0 + (C_{(18)} - C_{(22)})y_0, \\ C_{(32)/0} &= L^{-1} \lambda C_{(32)} - C_{(29)} h_0 - (C_{(12)} - C_{(16)})k_0 + C_{(27)} r_0 + C_{(26)} s_0 + (C_{(11)} \\ & - C_{(20)})t_0 + (C_{(15)} - C_{(19)})u_0 - C_{(35)} w_0 - C_{(34)} x_0 - C_{(33)} y_0, \\ C_{(33)/0} &= L^{-1} \lambda C_{(33)} - C_{(30)} h_0 - (C_{(13)} - C_{(17)})k_0 + C_{(28)} r_0 - C_{(35)} t_0 - C_{(34)} u_0 \\ & + C_{(26)} v_0 + (C_{(11)} - C_{(24)})w_0 + (C_{(15)} - C_{(23)})x_0 + C_{(32)} y_0, \\ C_{(34)/0} &= L^{-1} \lambda C_{(34)} - C_{(31)} h_0 + C_{(35)} k_0 + C_{(28)} s_0 + (C_{(13)} - C_{(21)})t_0 + C_{(33)} u_0 \\ & + C_{(27)} v_0 + (C_{(12)} - C_{(25)})w_0 + C_{(32)} x_0 + (C_{(19)} - C_{(23)})y_0, \\ C_{(35)/0} &= L^{-1} \lambda C_{(35)} - C_{(34)} k_0 + C_{(31)} r_0 + C_{(30)} s_0 + C_{(33)} t_0 + (C_{(17)} - C_{(21)})u_0 \\ & + C_{(29)} v_0 + C_{(32)} w_0 + (C_{(16)} - C_{(25)})x_0 + (C_{(20)} - C_{(24)})y_0. \end{aligned} \quad (4.2)$$

Hence:

**Theorem 4.1.:** In a P\*- Finsler space of six-dimensions  $F^6$ , coefficients  $C_{(1)/0}$  to  $C_{(35)/0}$  satisfy set of equations given by (4.2).

Multiplying equation (4.1) by  $g^{jk}$  and using equations (1.4) and (3.1), for a P\*-Finsler space  $F^6$ , we get  $P_i = \lambda C_i$ , which gives  $C_{i/0} = L^{-1}\lambda C_i$  or  $m_{i/0} = 0$ . This by virtue of equation (1.3) a, easily gives  $h_0 = 0$ ,  $r_0 = 0$ ,  $s_0 = 0$  and  $v_0 = 0$ . Hence:

**Theorem 4.2.:** In a P\*-Finsler space of six-dimensions  $F^6$ , vector  $m_i$  satisfies  $m_{i/0} = 0$  or  $h_0 = 0$ ,  $r_0 = 0$ ,  $s_0 = 0$  and  $v_0 = 0$ .

From equations (1.3) b, c, d, e, we can easily obtain

$$n_{(1)/0} = n_{(2)} k_0 - n_{(3)} t_0 - n_{(4)} w_0, \quad n_{(2)/0} = -n_{(1)} k_0 - n_{(3)} u_0 - n_{(4)} x_0, \quad (4.3)a$$

$$n_{(3)/0} = n_{(1)} t_0 + n_{(2)} u_0 - n_{(4)} y_0, \quad n_{(4)/0} = n_{(1)} w_0 + n_{(2)} x_0 + n_{(3)} y_0 \quad (4.3)b$$

which give

$$n_{(1)/0} n_{(2)}^i = k_0, \quad n_{(3)/0} n_{(1)}^i = t_0, \quad n_{(4)/0} n_{(1)}^i = w_0, \quad (4.4)a$$

$$n_{(3)/0} n_{(2)}^i = u_0, \quad n_{(4)/0} n_{(2)}^i = x_0, \quad n_{(4)/0} n_{(3)}^i = y_0 \quad (4.4)b$$

Hence:

**Theorem 4.3.:** In a P\*-Finsler space of six-dimensions  $F^6$ , unit vectors  $n_{(1)}$ ,  $n_{(2)}$ ,  $n_{(3)}$  and  $n_{(4)}$  satisfy equations (4.3)a and (4.3)b, while the scalars  $k_0$ ,  $t_0$ ,  $w_0$ ,  $u_0$ ,  $x_0$  and  $y_0$  satisfy equations (4.4)a and (4.4)b.

## 5. V-CURVATURE TENSOR IN $F^6$

Corresponding to proposition (29.2) of Matsumoto [5] for three-dimensions, we here give, the following proposition for  $F^6$ :

**Proposition 5.1.:** Let  $T_{ij}$  be the skew-symmetric tensor of a six-dimensional Finsler space  $F^6$ , then for tensor

i)  $T^{*ijkl} = (1/2) \epsilon^{ijklmn} T_{mn}$ , we shall have

$$T_{ij} = \epsilon_{ijklmn} T^{*klmn}, \quad (5.1)$$

ii) For  $T_{i0} = T_{ij} h^j = 0$ , there will exist scalars  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ ,  $\Theta$ ,  $\Phi$ ,  $\psi$ ,  $\omega$ ,  $\rho$ ,  $\sigma$  such that

$$T_{ij} = \alpha(m_i n_{(1)j} - m_j n_{(1)i}) + \beta(m_i n_{(2)j} - m_j n_{(2)i}) + \gamma(m_i n_{(3)j} - m_j n_{(3)i}) \\ + \delta(m_i n_{(4)j} - m_j n_{(4)i}) + \Theta(n_{(1)i} n_{(2)j} - n_{(1)j} n_{(2)i}) + \Phi(n_{(1)i} n_{(3)j} - n_{(1)j} n_{(3)i})$$

$$\begin{aligned}
 & + \psi(n_{(1)l} n_{(4)j} - n_{(1)j} n_{(4)l}) + \omega(n_{(2)l} n_{(3)j} - n_{(2)j} n_{(3)l}) + \rho(n_{(2)l} n_{(4)j} - n_{(2)j} n_{(4)l}) \\
 & + \sigma(n_{(3)l} n_{(4)j} - n_{(3)j} n_{(4)l}) \tag{5.2}
 \end{aligned}$$

Proof. It is known that  $\epsilon_{\alpha\beta\gamma\delta\Theta\Phi}$  are scalar components of  $\epsilon_{ijklmnp}$ , therefore i) is obvious. The surviving scalar components of  $T_{\alpha\beta}$  are  $T_{23} = -T_{32}$ ,  $T_{24} = -T_{42}$ ,  $T_{25} = -T_{52}$ ,  $T_{26} = -T_{62}$ ,  $T_{34} = -T_{43}$ ,  $T_{35} = -T_{53}$ ,  $T_{36} = -T_{63}$ ,  $T_{45} = -T_{54}$ ,  $T_{46} = -T_{64}$ ,  $T_{56} = -T_{65}$ .

Thus, putting  $\alpha = 2 T_{23}$ ,  $\beta = 2 T_{24}$ ,  $\gamma = 2 T_{25}$ ,  $\delta = 2 T_{26}$ ,  $\Theta = 2 T_{34}$ ,  $\Phi = 2 T_{35}$ ,  $\psi = 2 T_{36}$ ,  $\omega = 2 T_{45}$ ,  $\rho = 2 T_{46}$ ,  $\sigma = 2 T_{56}$ , the proof of ii) will be completed.

To obtain V-curvature tensor of  $F^6$ , we observe that  $S_{hijk}$  is skew-symmetric in both h and i and j and k and  $S_{0ijk} = S_{hiok} = 0$ , therefore by above proposition, we get

$$\begin{aligned}
 L^2 S_{hijk} = & [\alpha(m_h n_{(1)j} - m_j n_{(1)h}) + \beta(m_h n_{(2)j} - m_j n_{(2)h}) + \gamma(m_h n_{(3)j} - m_j n_{(3)h}) \\
 & + \delta(m_h n_{(4)j} - m_j n_{(4)h}) + \Theta(n_{(1)h} n_{(2)j} - n_{(1)j} n_{(2)h}) + \Phi(n_{(1)h} n_{(3)j} - n_{(1)j} n_{(3)h}) \\
 & + \psi(n_{(1)h} n_{(4)j} - n_{(1)j} n_{(4)h}) + \omega(n_{(2)h} n_{(3)j} - n_{(2)j} n_{(3)h}) + \rho(n_{(2)h} n_{(4)j} - n_{(2)j} n_{(4)h}) \\
 & + \sigma(n_{(3)h} n_{(4)j} - n_{(3)j} n_{(4)h})]. [\alpha'(m_h n_{(1)j} - m_j n_{(1)h}) + \beta'(m_h n_{(2)j} - m_j n_{(2)h}) \\
 & + \gamma'(m_h n_{(3)j} - m_j n_{(3)h}) + \delta'(m_h n_{(4)j} - m_j n_{(4)h}) + \Theta'(n_{(1)h} n_{(2)j} - n_{(1)j} n_{(2)h}) \\
 & + \Phi'(n_{(1)h} n_{(3)j} - n_{(1)j} n_{(3)h}) + \psi'(n_{(1)h} n_{(4)j} - n_{(1)j} n_{(4)h}) + \omega'(n_{(2)h} n_{(3)j} \\
 & - n_{(2)j} n_{(3)h}) + \rho'(n_{(2)h} n_{(4)j} - n_{(2)j} n_{(4)h}) + \sigma'(n_{(3)h} n_{(4)j} - n_{(3)j} n_{(4)h})], \tag{5.3}
 \end{aligned}$$

where  $\alpha, \beta, \gamma, \delta, \Theta, \Phi, \psi, \omega, \rho, \sigma$  and  $\alpha', \beta', \gamma', \delta', \Theta', \Phi', \psi', \omega', \rho', \sigma'$  are (0)-p homogeneous scalars.

It is known Rund [8] that

$$S_{hijk} = C^r_{hk} C_{jir} - C_{rhi} C_{ikr}, \tag{5.4}$$

therefore, the scalar components of  $L^2 S_{hijk}$  can also be expressed as

$$L^2 S_{hijk} = S_{\alpha\beta\gamma\delta} e_{\alpha} e_{\beta} e_{\gamma} e_{\delta}, \tag{5.5}$$

where we have

$$S_{\alpha\beta\gamma\delta} = C_{\alpha\delta\Theta} C_{\Theta\beta\gamma} - C_{\alpha\gamma\Theta} C_{\Theta\beta\delta} \tag{5.6}$$

Now using the skew-symmetry property of curvature tensor  $S_{\alpha\beta\gamma\delta}$ , the surviving 54, independent components of  $S_{\alpha\beta\gamma\delta}$  of six-dimensional Finsler space  $F^6$ , can be expressed as

$$S_{2323} = C_{23\Theta} C_{\Theta32} - C_{22\Theta} C_{\Theta33}, S_{2324} = C_{24\Theta} C_{\Theta32} - C_{22\Theta} C_{\Theta34},$$



$$\begin{aligned} S_{2325} &= C_{25\theta} C_{\theta32} - C_{22\theta} C_{\theta35}, S_{2326} = C_{26\theta} C_{\theta32} - C_{22\theta} C_{\theta36}, \\ S_{2334} &= C_{24\theta} C_{\theta33} - C_{23\theta} C_{\theta34}, S_{2335} = C_{25\theta} C_{\theta33} - C_{23\theta} C_{\theta35}, \\ S_{2336} &= C_{26\theta} C_{\theta33} - C_{23\theta} C_{\theta36}, S_{2345} = C_{25\theta} C_{\theta34} - C_{24\theta} C_{\theta35}, \\ S_{2346} &= C_{26\theta} C_{\theta33} - C_{24\theta} C_{\theta36}, S_{2424} = C_{24\theta} C_{\theta42} - C_{22\theta} C_{\theta44}, \\ S_{2425} &= C_{25\theta} C_{\theta42} - C_{22\theta} C_{\theta45}, S_{2426} = C_{26\theta} C_{\theta42} - C_{22\theta} C_{\theta46}, \\ S_{2525} &= C_{25\theta} C_{\theta52} - C_{22\theta} C_{\theta55}, S_{2526} = C_{26\theta} C_{\theta52} - C_{22\theta} C_{\theta56}, \\ S_{2434} &= C_{24\theta} C_{\theta43} - C_{23\theta} C_{\theta44}, S_{2435} = C_{25\theta} C_{\theta43} - C_{23\theta} C_{\theta45}, \\ S_{2436} &= C_{26\theta} C_{\theta43} - C_{23\theta} C_{\theta46}, S_{2445} = C_{25\theta} C_{\theta44} - C_{24\theta} C_{\theta45}, \\ S_{2446} &= C_{26\theta} C_{\theta44} - C_{24\theta} C_{\theta46}, S_{2456} = C_{26\theta} C_{\theta45} - C_{25\theta} C_{\theta46}, \\ S_{2534} &= C_{24\theta} C_{\theta53} - C_{23\theta} C_{\theta54}, S_{2535} = C_{25\theta} C_{\theta53} - C_{23\theta} C_{\theta55}, \\ S_{2536} &= C_{26\theta} C_{\theta53} - C_{23\theta} C_{\theta56}, S_{2545} = C_{25\theta} C_{\theta54} - C_{24\theta} C_{\theta55}, \\ S_{2546} &= C_{26\theta} C_{\theta54} - C_{24\theta} C_{\theta56}, S_{2556} = C_{26\theta} C_{\theta55} - C_{25\theta} C_{\theta56}, \\ S_{2626} &= C_{26\theta} C_{\theta62} - C_{22\theta} C_{\theta66}, S_{2634} = C_{24\theta} C_{\theta63} - C_{23\theta} C_{\theta64}, \\ S_{2635} &= C_{25\theta} C_{\theta63} - C_{23\theta} C_{\theta65}, S_{2636} = C_{26\theta} C_{\theta63} - C_{23\theta} C_{\theta66}, \\ S_{2645} &= C_{25\theta} C_{\theta64} - C_{24\theta} C_{\theta65}, S_{2646} = C_{26\theta} C_{\theta64} - C_{24\theta} C_{\theta66}, \\ S_{2656} &= C_{26\theta} C_{\theta65} - C_{25\theta} C_{\theta66}, S_{3434} = C_{34\theta} C_{\theta43} - C_{33\theta} C_{\theta44}, \\ S_{3435} &= C_{25\theta} C_{\theta43} - C_{33\theta} C_{\theta45}, S_{3436} = C_{36\theta} C_{\theta43} - C_{33\theta} C_{\theta46}, \\ S_{3445} &= C_{35\theta} C_{\theta44} - C_{34\theta} C_{\theta45}, S_{3446} = C_{36\theta} C_{\theta44} - C_{34\theta} C_{\theta46}, \\ S_{3456} &= C_{36\theta} C_{\theta45} - C_{35\theta} C_{\theta46}, S_{3535} = C_{35\theta} C_{\theta53} - C_{33\theta} C_{\theta55}, \\ S_{3536} &= C_{36\theta} C_{\theta53} - C_{33\theta} C_{\theta56}, S_{3545} = C_{35\theta} C_{\theta54} - C_{34\theta} C_{\theta55}, \\ S_{3546} &= C_{36\theta} C_{\theta54} - C_{34\theta} C_{\theta56}, S_{3556} = C_{36\theta} C_{\theta55} - C_{35\theta} C_{\theta56}, \\ S_{3636} &= C_{36\theta} C_{\theta63} - C_{33\theta} C_{\theta66}, S_{3645} = C_{35\theta} C_{\theta64} - C_{34\theta} C_{\theta65}, \\ S_{3646} &= C_{36\theta} C_{\theta64} - C_{34\theta} C_{\theta66}, S_{3656} = C_{36\theta} C_{\theta65} - C_{35\theta} C_{\theta66}, \\ S_{4545} &= C_{45\theta} C_{\theta54} - C_{44\theta} C_{\theta55}, S_{4546} = C_{46\theta} C_{\theta54} - C_{44\theta} C_{\theta56}, \\ S_{4556} &= C_{46\theta} C_{\theta55} - C_{45\theta} C_{\theta56}, S_{4646} = C_{46\theta} C_{\theta64} - C_{44\theta} C_{\theta66}, \\ S_{4656} &= C_{46\theta} C_{\theta65} - C_{45\theta} C_{\theta66}, S_{5656} = C_{56\theta} C_{\theta65} - C_{55\theta} C_{\theta66} \end{aligned} \quad (5.7)$$



Alternatively, from equation (5.3), for an indicatory tensor  $M_{ij}$ , one can obtain the value of  $L^2 S_{hijk}$  in a stand form represented by Matsumoto [4]:

$$L^2 S_{hijk} = (h_{hj} M_{ik} + h_{ik} M_{hj} - h_{hk} M_{ij} - h_{ij} M_{hk}) \quad (5.8)$$

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## Aquaponics System: IoT Based Innovative Plant Cultivation and Fish Feeding System

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**Abstract**— Aquaponics is a system which amalgamates the aquaculture & hydroponics that grows fish and plants together in one system. It utilizes fish wastes to provide essential nutrients to the plants and in reciprocation the plants will purify the water and gives it back to the fishes. The purport of this paper is to build an efficient system by implementing aquaponics system by utilizing the technology of IOT (Internet of Things). By engendering an automated System with the avail of sensors interfaced with the Arduino board, it possible to automate fish victualing and water supply to the plants at the conventional interval of time. Subsisting system that coalesces these technologies must overcome the fundamental issues like cost, victuals quality control and circumscribed grow. In this paper we intend to propose a kit which contains all these features mentioned above, and that is auxiliary to provide the rudimental organic vegetation for the abode along with Aquaculture farmers and exporters conventionally face concerns cognate to data of their farm, while utilizing digital apps (Mobile Applications).

**Keywords**—aquaponics; hydroponics; aquaculture; IOT;

### I. INTRODUCTION

There is immense need to grow organic vegetation due to the prime injunctive authorization of people around the world to get the chemical free aliment; hence the current buzz word in agriculture has become organic. There are lots of researches going on to find out the ways to achieve this goal, and one such technique is aquaponics. The word "Aquaponic" is referred to the integration of hydroponic and aquaculture. Soil-less gardening is called hydroponics, it rudimental involvement of growing salubrious plants without utilizing the traditional medium such as soil, instead it utilizes nutrients in water. A plant just needs nutrients, water, and sunlight to grow, but it can additionally grow without soil, they often grow a lot better with their roots in water instead.

One of the major issue in the world is providing the aliment, because there is an immensely colossal incrementation in the population where as other side there is very congested place for farming. Most of the consumer wants to ascertain that the aliment they are consuming is salubrious, hence this can be assured utilizing aquaponics system that avails in growing chemical free vegetation.

The climatical transmutations in the environment will not have any impact on this system and hence it can grow any kind of vegetation. This system provides minimal risk and high profit farming method as expected by the consumers or people around the world. Moreover, this aquaponics farming requires little upkeep and investment once it is plenary setup, giving a chemical free, feasible, weed free, less cost, reliable solution to farming [2]. Traditional farming requires customary monitoring, whereas

aquaponics system is an automated system which requires less monitoring. Survey verbalizes that aquaponics requires less than 10 percent of fresh water as the system itself recycles the water. In this paper, main goal is to propose an automated aquaponics system, that demands nominal requisites providing best results with the avail of the technologies also informing the farmer on issues with the system and any slight fluctuations in the ideal environment required. The necessity of an automated and smart system comes from this for aquaponics.

### II. RELATED STUDY

N Hari Kumar *et al* [1] proposed a system which initiated the concept of hydroponics and aquaculture to bring about a interrelated system which is in the controlled system and minimal human intervention. Internet of Things (IoT) application for aquaponics in order to engender an autonomous, self-regulating system with the avail of Wireless Sensor Network (WSN). An open standard of WSN called 6LoWPAN is utilized in this system which avails us to construct an ecumenical infrastructure.

Megumi U *et al* [2], says that in diminutive place we can grow the plants adapting the conception of aquaponics. VEGILAB is mainly an indoor system which grows vegetables such as lettuce and tomatoes to surmount the fundamental issues such as extravagant manufacturing cost, inhibited grow and pabulum quality. The need for this system was the reduction of farm lands globally and with the help of artificial environment cultivating the crops as well as maintaining the quality of food production as well.

M.F. Saaid *et al* [3] tried implementing a model of Aquaponics such that a selection of particular type of fish (comet goldfish) and a particular hydrophilic plant type which is Ipomoea aquatic (water spinach), Spinacia oleracea (spinach) type of leafy vegetable was considered, so that it could perform recirculation of water from the aquaculture and back to the same. Feeds containing 30% crude protein were provided for plants as required for growth and auto fish feeder to note the growth and survival rates of fishes were given importance. Filter systems to filter wastes from water. The brain of the system is Aurdino UNO board which receives the signals and performs the required functions via actuators. The factors such as temperature, water level in both plants and aquaculture was maintained resulting in good statistics of growth in both the plant and fishes.

Analene Montesines Nagyo *et al* [4] an automated solar powered. The aquaponics system is cost efficient and more ideal for the farmers. The system designed consists of four modules: 1) water recirculation system that is required to

circulate water from aqua medium to plants 2) aquaponics control and monitoring system utilizing Arduino microcontroller interfaced with sensors, actuators, GSM shield and NI LabVIEW that sanctions plants and fish associate and a form a interrelated chain in a controlled environment 3) solar energy is utilized to power the entire system using the renewable resources 4) cooling and heating system that maintain air and water temperature, so it will be auxiliary for the plants and magnification of the fishes. This is required as the breeding is dependent on temperature as a major factor.

N.R Mohammed *et al* [5] verbally expresses aquaponics system can be done as self-regulating system with the avail of wireless sensor network with an open standard of WSN called 6LOWPAN. The system which is designed utilizing this sensor contrivance can be acclimated to sense and accumulate the information of the water quality involved and the corresponding data can be stored in the cloud database. This system requires very less human interaction when compared to the traditional technique

M.N Mamatha *et al* [6] studied that in Aquaponics Cultivation Technique, 30% crude protein engendered by fish waste can provide virtually all nutrients required for the plant magnification. Auto feeder is utilized in the system to provide aliment for the fish that avails to maintain the magnification and survival rates of the fishes. Filter system that is available in the system will abstract the waste material & the breakdown things from the water. To provide sustainability due to climatologically vicissitudes in the system, set point is utilized to monitor the temperature in the tank utilizing a temperature sensor. The sensed values will be received by the Arduino which replications by regulating the water temperature utilizing a heater. Hence this setup works impervious to the climatological issues.

Matti Satish Kumar [7] aimed at building a low cost moisture sensor such that using the information about moisture, the yield could be increased and only required amount of water could be used for cultivation. The major focus was on the simplicity and the cost efficiency of the system where previously the soil moisture was measured via techniques such as gravimetric sampling; electromagnetic radiations emitted by soil at different temperatures, these processes are expensive and time consuming. One of the most commonly used technologies in soil moisture sensors is based on electrical resistance of the soil. Using this as the key point a low cost and simple model was brought out using an Arduino board, LED on the PCB and 2 copper rods so that it can measure the moisture, as the conductivity of soil changes by changing the amount of water in it. All the values of the soil having enough moisture is collected by the resistor which determines zones and soil and tries to predict acute value of the soil. This setup is extremely useful in aquaponics as well as the plant moisture level is important.

B O'Flynn *et al* [8] aimed at mimicking the Water Framework Directive (WFD) to develop a low cost water monitoring system that was capable of monitoring temperature, phosphate, dissolved oxygen, conductivity, pH, turbidity and water level. The previous procedures were tedious to measure the water quality. This system consists of 2 major sensors out of which key component of the wireless sensor system is the adding or implementing of "smart" sensors incorporating (Transducer Electronic datasheet)TEDS and COTS. Basically TEDS obeys IEEE 1451 standards and allows determining sensor modularity, aggregation, fault tolerance, inter-operability & dynamic calibration. Whereas COTS was used to determine temperature, pH, conductivity,

depth and turbidity covering major requirements to note the water quality monitoring efficient and the additional point included along with these factors were customized sensors (Phosphate & Dissolved Oxygen) being developed in the project.

Elena V.Platonova *et al* [9] explained the evaluation techniques for vitality provided to the outside of sunlight based boards. The need of increment in exactness of figuring of the sunlight based vitality entering on the board is demonstrated because of the bookkeeping of extra impacting factors. A method for evaluating sunlight based vitality to the outside of boards is created. The level of shadiness effect on the sunlight based vitality contribution for the territory viable is recognized. The correlation of the consequences of displaying with the utilization of the created strategy and specific PC programs is completed. It demonstrated acceptable outcomes. The ideal edge of tendency of the sun based board is determined and the decrease of the approaching vitality is broke down when the point goes amiss from the ideal worth. This is achieved by following 3 steps that is 1)To build up a strategy for estimation of approaching sun oriented vitality on a slanted surface.2) To appraise impact of darkness on size of the vitality approaching on the sunlight based board 3) To contrast demonstrating results and aftereffects of the current PC programs and with genuine information.

Zeenat shareef *et al* [10] studied regarding network analysis of aquaculture in the region of Godavari. This is to understand the range of data transfer improvement required in these systems and provide data security.

### III. SYSTEM ARCHITECTURE

The primary objective of this paper is to comprehend the current aquaponics frameworks actualized utilizing different strategies and to propose a novel mechanized aquaponics framework with all the essential prerequisites with exceptionally less human mediation with the framework. The primary innovation utilized is IOT by which the creators have mechanized fish taking care of utilizing a servo engine, computerized water supply to the plants and provided supplements naturally at customary interim of time. The proposed system is basically a simple, cost effective and easy to understand system which could be used by farmers.

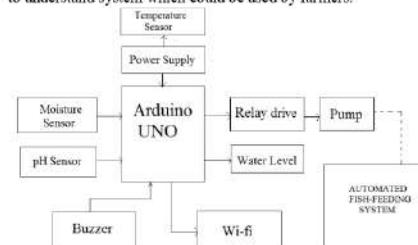


Figure 1 block diagram of the Aquaponics system.

The above figure 1 is the Block diagram of the proposed system which is connected to the plants. As shown in the figure moisture sensor, ph. sensor, power supply and buzzer is connected to Arduino which controls the relay. The moisture sensor is used to determine soil moisture. One end of water level sensor is connected to Arduino board and its other 3 ends

are dipped in aquarium. Temperature is connected to power supply. One end of the relay is connected to Aurdino board and other end to the pump. We can control the whole system through telegram app in mobile by using Wi-Fi. The ph. sensor is dipped in aquarium. When pH is less than or equal to 7, reading will be 'healthy' in telegram else the reading shows 'unhealthy'. When the pH of the water is greater than 7, automatically pump will be on for Filtration. When the water level in the aquarium is high "HIGH LEVEL" is displayed in the telegram. When the water level in the aquarium is low "LOW LEVEL" is displayed in the telegram. When the water level in the aquarium is appropriate "MIDDLE LEVEL" is displayed in the telegram. Moisture sensor is attached to aquarium plants. When the moisture content is too low 'LOW MOISTURE' is displayed and 'MORE MOISTURE' is displayed when it is too high with respect to the plants being grown. When the temperature in the aquarium is too high "MORE TEMPERATURE" is displayed and 'LOW TEMPERATURE' when temperature is low. POWER SUPPLY has 7805 IC which provides +5 volts. It is used to maintain the electromagnetic switch operated by a relatively small current that can turn on or off a much larger electric current in the system. When all the conditions are false, the buzzer buzzes accordingly. Meanwhile, the automatic fish feeder is not the integral part of the this system and is attached separately to the aquaculture medium.

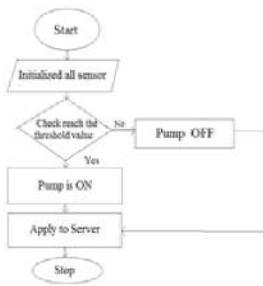


Figure 2 Working of sensor integrated system.

As shown in the figure 2, the flow chart describes the sensor actions. The approach in this is the pump isn't triggered unless the threshold value of the any of the sensor be it temperature, pH, moisture, water level is considerably low or inefficient resulting in loss of efficiency of the system. If the sensor has reached its threshold value, it does not trigger the pump and send its value to server. If the Sensor does not reach its threshold value, it triggers the pump and sends its value to server. Where the water pump provides filtrations and water circulation. The C (close pin) of the relay is connected to the positive terminals of the pump and the negative terminal of the pump is connected to the ground of the power supply. The power supply is the most important factor of consideration. This has a 7805 IC which is used to note and maintain fluctuations. This has 3 pins: 12V representing output pin, 5V representing input pin and GND represents ground pin respectively. This IC provides +5 volts regulated power supply. 7805 IC divides 5V to whole system. The circuit diagram of the entire system works on the power supply and connections that each of the sensor shares with the Aurdino UNO board. The amount of power consumption and technical working of the entire system is clear. The main parts are the sensors, Wi-Fi module, power supply, buzzer and most importantly the Aurdino UNO. The Arduino Uno is a

microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. A DC servo motor is a revolving actuator or engine that takes into consideration an exact control as far as precise position, speeding up and speed, abilities that a normal engine doesn't have. It utilizes an ordinary engine and sets it with a sensor for position criticism. These are usually accurate and the requirement to run the Aquaponics system accordingly. The ESP8266 Wi-Fi Module is used in the system which is an independent SOC with coordinated TCP/IP convention stack that can give any microcontroller access to your Wi-Fi arrange. The ESP8266 is prepared to do either facilitating an application or offloading all Wi-Fi organizing capacities from another application processor. It has range from 350 meters to 490 meters respectively. Sensor-Buzzer is a passive buzzer. Like a magnetic speaker, it needs voltage with different frequency so that it can make sound accordingly. The pitch becomes louder when the frequency gets higher, where the frequency depends on other sensors signal.

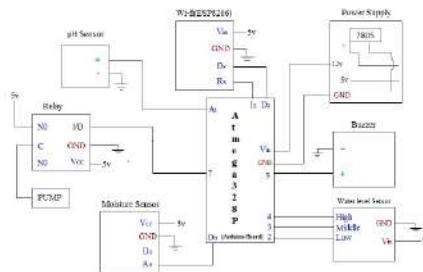


Figure 3 Circuit representation of sensor integrated system.

As shown in the figure 3, this represents the pin connections to the Aurdino board of various sensors. The positive terminal of the pH sensor is connected to the A<sub>1</sub> pin of the Aurdino board and the negative terminal is grounded. The relay is connected to the pump and the input terminal is connected to the 7<sup>th</sup> pin of the board. The V<sub>cc</sub> pin accepts the input of 5V respectively in both moisture sensor and relay. The A<sub>0</sub> pin of moisture sensor is connected to the D<sub>0</sub> pin of the board. In case of water level sensors the 'high' is connected to the 4<sup>th</sup> pin, 'middle' is connected to the 5<sup>th</sup> pin, 'low' is connected to the 6<sup>th</sup> pin of the board respectively. The V<sub>in</sub> accepts the power supply of 5V. The positive terminal of the buzzer is connected to the 9<sup>th</sup> pin of the Aurdino board and the negative terminal is grounded. The 2 pins of the Wi-Fi module are connected to the 2 pins of the Aurdino board. The V<sub>in</sub> of the Wi-Fi module is supplied with power of 5V. In the case of power supply board, it accepts the input of 5V and the output pin of the same is connected to the V<sub>in</sub> pin of the Aurdino board which represents the power supply being provided to the board. The GND pin of the power supply is connected to the GND pin of the power supply. The GND pin in circuits represent the grounding, is the reference point for all signals or a common path in an electrical circuit where all of the voltages can be measured from. This is also called the common drain since the voltage

measurement along it is zero.

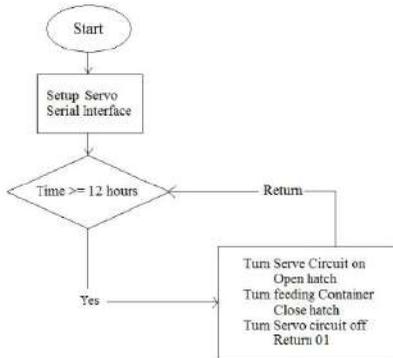


Figure 4 Flow chart of Fish feeder.

The automatic fish feeder is essential because it monitors the fish feeding process without human interventions. The farmer could forget to feed the fishes in regular interval resulting in fishes being growth deficient and even death. The fish feeder, in this case is a simple one. When it starts, the servo motor is setup such that in every 12 hours the system feeds the fishes and depending on what type of fishes are being bred, the time slot could be changed. Once the feeding is done, the system waits until the next cycle.

#### IV. COST ANALYSIS

Table 1: Cost estimation of the proposed system

Component	Number of component	Cost
Arduino	2	380
Adapter	1	75
USB Cable	2	35+35=70
Servo motor	2	150+150=300
Relay	2	90+90=180
Water Level Sensor	1	120
Jumper Wires	80	120
Ph sensor	1	1900
Moisture sensor	1	115
Temperature sensor	1	285
Model setup	1	100
Real-time clock	1	59
		Total :4604

Considering the statistical data points given in the above table we can tell that aquaponics technique is financially savvy as far as the parts utilized and their particular rates. It is likewise more affordable when contrast with the current aquaponics model.

#### V. RESULT AND DISCUSSION

Primer arrangement and portrayal of the sensors and sensor frameworks in the proposed framework have been done. In the proposed system as it is known that the system sensitivity is increased to obtain an efficient system that detects minute issues

as well and informs the farmer about it. Hence, the clarity and simplicity in data is essential. So that it is convenient for the farmer to understand and act accordingly. The snapshots justify the working of the proposed system and the efficient prediction in real time.



Figure 5. snapshot of the sensors reporting its status via an application.

The above figure 5 illustrates the working of the aquaponics system, when the system begins and if the monitoring has to be done then a secured Wi-Fi connection with the system and application is required as the data needs to be transmitted regarding the status. It asks the user to begin by typing "START" and informs about the current situation of the system. The sensors used inform about the working in the system like pH sensors indicate if the pH is normal it states "HEALTHY" or else if it requires any improvisations it states as "UNHEALTHY". The water level sensors are such that if the level of water in the aquaculture medium is less than it displays as "LOW LEVEL" and if its above normal range it sends the signal and the application displays "HIGH LEVEL". In the condition of optimum condition, it displays "MIDDLE LEVEL". Maintaining moderate room temperature is required for both fishes as well as the plants. Hence, if the temperature exceeds the normal level, then the application displays "MORE TEMPERATURE".



Figure 6. snapshot of the sensors reporting its status via an application.

The above figure 6, represents the snapshot of the received



outputs from the sensors regarding the system respectively. Moisture required to the plants is also indicated by the moisture sensors and that is displayed as "LOW MOISTURE" in case of low moisture in plants and "HIGH MOISTURE" if the normal level is exceeded.

#### VI. CONCLUSION

The traditional strategies for providing water to the plants and fish taking care of frameworks incorporate disservices, for example, Increase in labor costs, Dependence on place, by and large significant expenses and reliance on climate. Aquaponics framework beats these drawbacks by giving a viable framework to supply water to the plants and feed nourishment to the fishes. Initially, the yields developed by utilizing this framework are exceptionally wealthy in the necessary supplements and are liberated from synthetic substances. This framework turns out to be exceptionally valuable as it requires less measure of room for the development and furthermore creates a financially savvy item in the end. According to the above proposed paper, the framework utilizes a computerized fish nourishment feeder and a water purging framework which makes the whole procedure practical and liberated from synthetic substances. Plants are become naturally disposing of the considerable number of harms and misfortunes brought about by the vermin and diseases. The atmosphere has least or no obstruction in the aquaponic framework which is another value of the framework. Any types of harvests can be developed at a specific season or climate condition though then again atmosphere turns into a significant factor influencing the development and result if there should be an occurrence of conventional methods. Considering all the above benefits, we can infer that aquaponics is the best strategy to develop plants and yields naturally.

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## Design and Implementation of Floating-point Vedic multiplier

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**Abstract**— Critical role of any digital system is played by the multiplier. In mathematics, Veda provides one line, fastest processor along with fast cross-checking method. It is most important to implement faster multiplier occupying less area and consuming less power. VEDIC Mathematics is mathematical detail of 'Sixteen Simple Mathematical formula from the Vedas' as release by Sri Bharati Krishna Tirtha. The implementation of the Floating-point multiplier by use of Vedic multiplication methods. For mantissa multiplication we are using Urdhvatiryakbhyam formula. The cases of underflow and overflow would be solved. The multiplier's input in 32bit IEEE 754 outlay. We appliances these multipliers using VHDL. For simulation of our work Xilinx ISE tool i.e. amenable for synthesis tool is used and Modelism 10.2a is also used.

**Keywords:** Mathematics of Vedic, a formula of UrdhvaTiryakbhyam, Floating-Point multiplier, precision.

### I. INTRODUCTION

This Floating-point operation is very important for computation involves huge dynamic areas, but they are demand especially more estate the whole numbers operation. The speedy promoted in area programmable gate array (FPGA) technic made like device progressively absorbing for implementing arithmetic of floating-point. This multiplier has moderate working in both speed and field. The basic function of binary floating-point numbers application applied in digital signal processing (DSP) application. IEEE 754 norm confers of outlay for characterization of Binary Floating-point numbers in computers.

The Binary Floating-Point is into two formats i.e.

- i) Single-Precision
- ii) Double Precision



Single Precision Representation -(32 bit)

Double Precision Representation- (64 bit)

### II. RELATED WORK

The format of the IEEE floating-point was a norm layout used in the whole technology essence since Binary floating-point numbers. Multiplication is a general gathering used in digital signal processing (DSP) petition. The floating-point multiplier's VHDL implementation using ancient Vedic. Urdhva Tiryakbhyam formula (system) was elected for execution so this is valid to whole matters of multiplication mathematics is offered. The representation of floating-point numbers in a binary sequence. The idea for tracing of multiplier unit is conditioned from the old Indian mathematics " Urdhva Tiryakbhyam formula (system) was elected for execution since this is eligible for whole cases of multiplication. Two number's multiplication by using Urdhva



Tiryakbhyam formula is worked by vertically and crosswise, crosswise appliance diagonal multiplication, and vertically appliance outright above multiplication and taking their sums. A multiplier is one of the execution hardware in most digital signal processing method better execution of any digital signal manipulation stop upon the better execution of the multiplier. The high-performance digital signal processor is the design of multiplier. It is also known as mathematical tools. The post floating pint is derivative from the meaning there is no switched number and digital after and before the decimal point that is decimal point can floating. There was representation too in which the digital number before and after the decimal point is a grouped called switched point representation generally floating-point representation is slow and short actual then switch point representation but they can maintain the larger range's number. The floating-point number as display as a fractional portion. Modified of the Booth algorithm is one of the major plausible algorithms. Rounding the resulted number confer a calibration number's multiplication by manners IEEE rounding system.

### III. LITERATURE REVIEW

**Sushma S. Mahakalkar et al**, they operated on the primeval and the cores of whole the DSPs are its multipliers and the DSPs speed is mainly composed by the fast of its multiplier. The IEEE floating-point format was a norm outlay applied in whole processing elements so Binary floating-point numbers multiplication is one of the general gatherings applied in DSP petition. In that work VHDL execution of Floating-Point Multiplier applying old Vedic mathematics is presented. The designing of the multiplier system is adoptive from ancient Indian mathematics "Vedas". The Urdhva Tiryakbhyam formula (system) is elected for execution so this is eligible to the whole concern of multiplication. Two no's multiplication using Urdhva Tiryakbhyam formula is operated by vertically and crosswise, crosswise means diagonal multiplication and vertically appliance outright above multiplication and taking their addition. A trait is any multi-bit multiplication can be diminished down to single bit multiplication and sum applying this system. On account of these methods, the carry propagation from LSB to MSB is less due to one step descent of fractional product [1].

They get that the effective application of the Vedic multiplication technique to produce two floating-point numbers. This function represents the execution of a floating-point multiplier that helps the IEEE 754-2008 binary interchange outlay. The discussion-based made above it is clear that a multiplier is a most crucial element in any processor design and a processor past satiety amount of time in functioning multiplication and simply the most field reducing. Therefore, improving the fast and field of the multiplier is a large outlay design mark. A reform in multiplication fast by using a recent method can greatly reform system working. This project can be forwarded for the reconfigurable tectonics [1].

**Aritra Mitra et al** proposed a Vedic Multiplication technique that applied to the executive Floating-point multiplier. The Urdhvatriyakbhyam formula will be applied as a multiplication of Mantissa. The overflow and underflow matters would be handled. The multiplier's input in 32bit format. The multiplier is constructed in VHDL or VERILOG and simulated using Modalism.

They reduce that the multiplier system has been constructed. The design of the project in the forward stage would be constructed using VHDL or VERILOG and will be perceptible using Modalism Simulator. The construction would be synthesized applying Xilinx ISE 12.1 tool. A bench of the test would be used to produce the stimulus and the multiplier gathering is to be tested. Over-flow and milder flow flags are to incorporate in the construction to display the overflow and underflow concern. This theory said that the effective use of the



Vedic multiplication technique to multiply two floating-point numbers. That hardware needed is shattered, thereby shattering the power decrease. The power decrease upon shattering effectively may not deal with a delay so much [3].

**BHAGYASHREE HARDIYA et al** operated on floating-point number's multiplication stated in IEEE 754 single-precision recognized. The floating-point multiplier is done by applying VHDL. Implementation in VHDL (VHSIC Hardware Description Language) is applied because it free of making apparent execution on the hardware while in other languages they have to change them into HDL then only can be implementation on the hardware. In floating-point multiplication, two number's adding is done with the need for different types of adders but for production with some advance shifting is needed. This floating-point multiplication solved different situations such as underflow normalization, overflow, rounding. In this function, they use the IEEE rounding technique for the execution of the rounding of the resulted number. This work scrutiny the execution of an IEEE 754 single-precision floating-point multiplier solved with the help of a lot of investigations. Finally they have viewed that the multipliers play a crucial preface in today's DSP and different other petition. With promoted in technique, a lot of investigations have tried and slapping to design multipliers which offer either of the following creation targets – fast speed, consumption of less power, layout regularity and hence low field or even conjunction of them in one multiplier thus making them appropriate for different fast speed, less power and firm VLSI execution. By applying serial to parallel Booth multiplier they view that in parallel multipliers partial product number to be added is the chief parameter that judges multiplier performs. To reduce partial product numbers to be added, the Modified of the Booth algorithm is one of the majority of plausible algorithms. Resulted in rounding number confers calibration production numbers by applying the IEEE rounding technique [4].

**Remadevi** proposed an algorithm for multiplying floating-point numbers which were a delicate need for DSP petition including a huge dynamic range. This work focuses only on single accuracy normalized binary interchange outlay targeted for Xilinx Spartan-3 FPGA based on VHDL. The multiplier was tested against Xilinx floating-point multiplier core. It maintains underflow and overflow cases. Rounding is not execution give more calibrated when using the multiplier in a Multiply and Accumulate (MAC) ace. They receive that the current function design and simulation of a floating-point multiplier that adherence the IEEE 754-2008 binary interchange sequence, proposed of multiplier doesn't execution rounding and extant the significant multiplication result like is (48 bits), this gives better accurate if all 48 bits are used of in another ace; i.e. With a floating-point adder to aspect a MAC unit. But the generated of floating-point multiplier core by Xilinx core generator doesn't imply the entire 48 bits of mantissa proper to rounding and is not beneficial in DSP application case of big dynamic particularly when using it in another high calibrated floating-point units such as Multiply and Accumulate (MAC) unit[6].

**Dinesh Kumar et al** operated on floating-point numbers they are successive used for numerical computation in a reputed method for better calibrate, but floating-point functions are complicated and hard to design on FPGAs. This work tries to create like -the architecture of hardware for single-precision calibration floating-point multiplication that is simply implementable with advanced efficiency. The multiplier unit is optimal on the old Vedic mathematics system. The introduced design is developed using VHDL which is seeming using Modalism SE 5.7f and especially using ISE Xilinx 10.1i on FPGA device Vertex -XC4VSX25-12FF668. Logic use shows



that the use of slices is 1% and of 4-input LUTs is 21%. Also logic divided hint that many occupied portions are 2358 which are completely respective e[7].

They execution single precision floating point multiplier is formation using the old Vedic mathematics system. The algorithm is executed using ISE Xilinx 10.1i on FPGA device Vertex -XC4V SX25-12FF668 and pretense are entire by using Modalism SE 5.7f. The agglutination results present that number of portions applied is 154 out of 20480 with the use of 1%. Logic divided present occupied utilization portion is 23% and the overall number of 4input LUTs applied is 4470 out of 20480. The timing essence implies overall time contracted for the procedure is 32.730 ns (11.651ns for calculation, and 21.079 ns for communication) and several components applied are also present. The double calibration multiplier must be formed as an explication of this work. Also they can apply the Nikhlam formula (another method of Vedic mathematics) and weigh the results. They could also creation matrix multiplier and weigh speed and operations area [7]. decimal floating-point sequence. Execution results are associated with a broad spectrum of manipulation, presenting promise that our approach is practicable for a petition that needs decimal floating-point calculations. This work fills sooner publicity [19].

They incidental few mathematical talent and algorithms used in the first execution in the software of the IEEE 754R decimal arithmetic of floating-point rooted on the BID encoding. These concentrated on the issue of rounding properly decimal values that are contained in binary sequence while using binary manipulation effectively and also shown briefly other important or interesting algorithms applied in the library implementation. Finally, these handy a broad performance's sample numbers that demonstrate that the eventual exacerbation of hardware execution over software may not be as salutatory as beforehand ejective. The execution was condensing via testing against context magnificence implemented freely, which applied, in little concern, existing multiprocessing arithmetic magnificence. As they aspect by the future, they need ahead reformation in execution via algorithm and code optimizations, like good as increased functionality, for example, via the addition of transcendental execution help. Furthermore, they presume that hardware help can be added incrementally to renovate decimal floating-point execution as a request for its increase.

#### IV. PROBLEM FORMULATION

IEEE 754 task confer the sequence for characterization of Binary Floating point. The represented binary floating-point number in Single and Double sequences. Single has 32 bits and double has 64 bits. They are sequences &3 fields composed: Exponent, Sign, and Mantissa presenting the fabrication of Single and Double sequences of the IEEE 754 task. In the content of Single, the represented of Mantissa is in 23 bits and MSB added 1-bit standardization, represented of an exponent is in 8 bits which are inclined to 127, in fact the Exponent is represented in spare 127-bit sequences and MSB of Single is darn for the Sign bit. When sign bit is 1 that appliance the number is negative (-) and when the sign bit is 0 that appliance the number is positive (+). In 64 bits sequence the represented of Mantissa is in 52 bits, represented of Exponent is 11 bits which are inclined to 1023 and Double MSB is contained for the sign bit.

#### V. OBJECTIVES

In this paper we worked on the sublimate speed deign Vedic Multiplier applying the method of old Indian Vedic Mathematics that has been improved for renovating execution. Vedic Multiplication method is applied to implement IEEE 754 Floating point multiplier for mantissa multiplication we are applying Urdhvatriyakbhyam



formula for the over-flow and underflow regard are maintained. Inputs of multipliers are provided in IEEE 754, 32-bit sequences. Vedic Mathematics is the old system of mathematics technique that has a masterly method of enumeration rooted in 16 Sutras Urdhva Triyagbhya. This technique is a classical technique for solving of floating-point multiplier and object the accurate value.

## VI. METHODOLOGY

The mantissa performance calculation unit dominates all execution of the floating-point multiplier. Require of malformed multiplier for multiplication of 24\*24 bit. The technique for multiplication of twos,3 Bit. This technique provides a hopeful result in speed terms and energy. This multiplier is structured in VHDL or VERILOG and simulated using Modellism. The techniques for multiplication of two, the number of 3 bits is represented figure 2.0 regard the number X and Y where  $X=a_2a_1a_0$ ,  $Y=b_2b_1b_0$ . The A LSB is multiplied with LSB of

$$B; s_0 = a_0 b_0;$$

The multiplied of  $a_0$  with  $b_1$  and multiplied of  $b_0$  with  $a_1$  and then result are added in concert a

$$c_1 s_1 = a_1 b_0 + a_0 b_1;$$

So carry is  $c_1$  and the sum is  $s_1$ . Sum  $c_1$  is the next step with the multiplication  $a_0$  result with  $b_2$  with  $b_2$ ,  $a_1$  with  $b_1$  and  $a_2$  with  $b_0$ .

$$C_2 s_2 = c_1 + a_2 b_0 + a_1 b_1 + a_0 b_2;$$

Add  $c_3$  is the next step with the multiplication results of  $a_1$  with  $b_2$  and  $a_2$  with  $b_1$ .

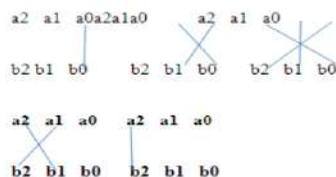
$$C_3 s_3 = c_2 + a_1 b_2 + a_2 b_1;$$

Similarly last step

$$c_4 s_4 = c_3 + a_2 b_2;$$

Now the multiplication final result of X & Y

is  $c_4s_4s_3s_2s_1s_0$ .



## VII. CONCLUSION

Vedic word is made from the word 'Veda' i.e. the store-house of the whole knowing. Mathematics, derive from the Veda confers one line, mental and super-fast technique along with fast crosses checking technique. Mathematic of Vedic was rediscovered in the soon twentieth century from old Indian sculptures (Vedas). What we invoke VEDIC MATHEMATICS is a function of the mathematical spread of 'Sixteen Simple Mathematical sutras from the Vedas' as release by Sri Bharati Krishna Tirthaji. The Vedic Multiplication method would be applied to an appliance for a floating-point multiplier. To multiplication of mantissa, we are applying



Urdhvatriyakbhyam formula. The overflow and underflow concern would be solved. Inputs to the multiplier is in the 32-bit IEEE 754 sequence.

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