CORROSION INHIBITION EFFICIENCY OF Zn(II), Cd(II) AND Hg(II) COMPLEXES OF MANNICH BASES OF BARBITURIC ACID

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ABSTRACT

Mannich base of Barbituric acid namely 1-[morpholin – 4-yl (phenyl) methyl] Pyrimidine 2,4,6- trione (BAMB) and 1-[aniline(phenyl)methyl]pyrimidine-2,4,6-trione (BAAB) were synthesized. Zn(II), Cd(II) and Hg(II) complexes of the above compounds were prepared and characterized using IR. In addition to this the above complexes were characterized by using analytical techniques such as conductance measurement. A preliminary corrosion inhibition efficiency of BAMB and BAAB were studied by weight loss method. The above studies proved that the ligands and their metal complexes can be applied for environmental related fields and aims at the inhibition towards corrosion of mild steel in hydrochloric acid medium at different concentration.

Keywords: *Corrosion, Inhibitors, Mannich base, Conductance.*

INTRODUCTION

Corrosion is a major problem caused by mineral acids, particularly Hydrochloric acid which is frequently used in industry during cleaning, acid picking, acid de-scaling and oil well acidizing [1-3]. Due to the aggressiveness of acids, inhibitors are often used to reduce the rate of dissolution of metals. Organic compounds containing hetero atoms, polar functional groups and π electrons as active centers have been reported as effective corrosion inhibitors [4-13]. An inhibitor is a substance which is added in small quantity in the electrolyte to reduce the rate of corrosion. The inhibitors may be organic or inorganic. But they should be able to dissolve in the corroding medium. Moreover, they should be able to form a protective layer. Several scientists work in the field of inhibition performance of corrosion in mild steel at different acid medium. Enormous losses occur due to corrosion every year in all countries of the world. According to literature, the cost of replacement of materials and equipment lost through corrosion has been currently estimated to be nine billion dollars per year all over the world. In India, according to the rough estimate direct losses due to corrosion are estimated to be 250 crores per year. The money spent on its prevention is about 50-70 crores per year. Considering these factors, the present study aims at the inhibition performance of Mannich bases towards the corrosion of mild steel in hydrochloric acid medium at different concentrations.

Generally Barbituric acids and its derivatives exhibit a wide range of biological activities such as antibacterial and anti-hypertensive agents [14]. In continuation of the work on the development of heterocyclic compounds as corrosion inhibitors in acidic environment[8], we synthesis, characterize and report the corrosion inhibiting effect of Zn(II), Cd(II) and Hg(II) complexes of BAMB and BAAB using weight loss measurements. The selection of these compounds as corrosion inhibitors is based on the fact that these compounds contain lone pair of electrons of N_2 and O_2 atoms through which they can co-ordinate readily on the metal surface. In addition they have low toxicity and are also used in pharmaceutical. The values of metal loss and inhibition efficiency of all the compounds were found to depend on their molecular structure.

Synthesis and characterization of 1-[morpholin-4-yl(phenyl)methyl]pyrimidine-2,4,6-trione (BAMB) and 1-[aniline4-yl(phenyl)methyl]pyrimidine-2,4,6-trione (BAAB):

BAMB was synthesized be employing the Mannich synthetic route. The three reactants barbituric acid, morpholine and benzaldehyde were taken in equimolar ratio. Barbituric acid (12.8g, 0.1mol) was dissolved in minimum amount of ethanol-water mixture. To this mixture morphloine (8.7ml, 0.1mol) was added and stirred well. Benzaldehyde (10.6 ml, 0.1mol) was added in drops to the above homogenous mixture and stirred well continuously for 30 minutes (**Fig-1(a)**). BAAB was synthesized in the same manner by taking barbituric acid, aniline (9.3 ml, 0.1mol) and benzaldehyde in 1:1:1 ratio. In both the cases a paste like semi-solid was observed. It was kept aside for about 10 days. A solid yellowish white powdery substance formed was washed with distilled water and filtered using the suction pump. The compound **(Fig-2(a))** was dried at 60^{o}C in an air oven and recrystallized from ethanol. The percentage yield of the compound BAMB was 85 and BAAB was 50. BAMB is a colorless solid and its melting point is 172-173^{o}C. BAAB is also a colorless solid with the melting point 162-163^{o}C. Both the compounds are insoluble in water, but partially soluble in ethanol, chloroform, carbon tetrachloride, and acetone and completely soluble in DMF and DMSO.

Complexes of ZN^{II}, Cd^{II} and Hg^{II} of BAMB **(Fig-1(b))** and BAAB **(Fig-2(b))** were synthesized by dissolving the metal chlorides and nitrates in ethanol, metal sulphates in methanol and the ligand solution in ethanol-DMF mixture. The hot solution of the metal was added to the hot solution of the ligand (1:1 ratio) with constant stirring. The insoluble colorless complex formed was filtered, washed with ethanol and DMF to remove the unreacted metal and ligand, dried in air and then in an air oven at 80^{o}C. All the complexes are stable in the solid state.

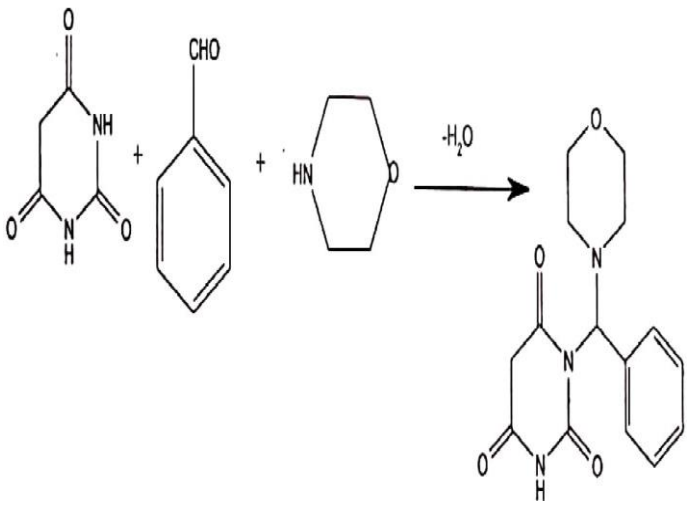
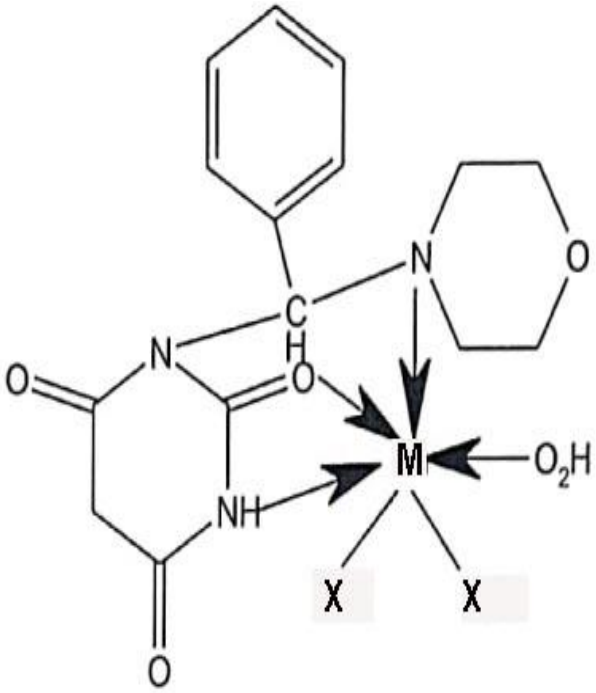


Fig-1 (a): Synthetic scheme of BAMB



M => Zn, Cd, Hg

Fig-1 (b): Structure of BAMB complex
X=> Cl_2, SO_4, $(NO_3)_2$

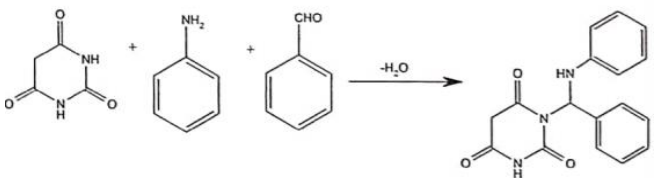
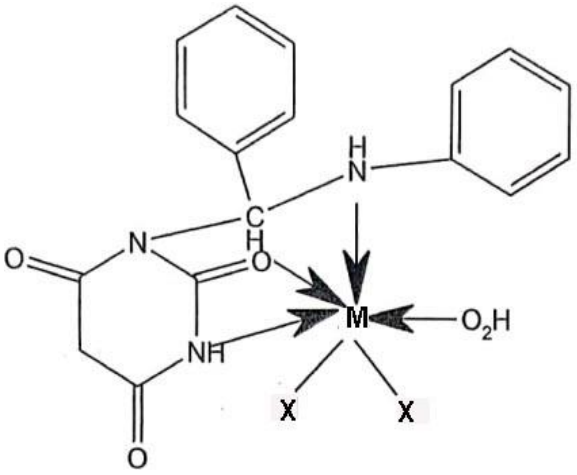


Fig-2 (a): Synthetic scheme of BAAB



M => Zn, Cd, Hg

Fig-2(b): Structure of BAAB complex
X => Cl_2, SO_4, $(NO_3)_2$

CHARACTERIZATION

1) IR

Zn^{II} complexes of BABM:

The IR frequencies are compared with that of the ligand. Upon complexation with Zn^{II} chloride, Zn^{II} Nitrate and Zn^{II} sulphate the ligand band due to $\upsilon_{C=O}$ at 1682 cm^{-1} experiences a positive shift, indicating the coordination of carbonyl oxygen to the metal atom. The complexes of Zn^{II} nitrate, Zn^{II} sulphate and Zn^{II} chloride (**Fig -3**) suffer a negative and positive shift for the υ_{NH} band compared to that of the free ligand, it occurs as a broad band in the complexes since it overlaps with the υ_{OH} of coordinated water in all the complexes of Zn^{II}.

The bands due to $\upsilon_{C\text{-}N\text{-}C}$ for the free ligand at 1141 cm^{-1}(amido) and 1107 cm^{-1} are shifted to higher and lower frequencies in all the complexes. This suggests that the carbonyl O and the amido N are coordinated to Zn^{II} in the chloro, nitrato and sulphato complexes. The structurally important absorption frequencies of Zn^{II} complexes have been presented in the **Table-1**.

Zn^{II} sulphate complex shows bands due to 'SO' stretching mode, υ_3 of sulphate group at 1232, 1170 and 1070 cm^{-1}. The 'OSO' bending mode, υ_4 appears at 666 and 617 cm^{-1}. The $\upsilon_1$and υ_2 modes of coordinated sulphato group occur at 879 and 548 cm^{-1}. These bands are consistent with those normally associated with the bidendate chelating sulphato group [14]. There are evidences for the presence of the coordinated water in the chloro, nitrato and sulphato complexes of Zn^{II}. These complexes show bands in the range from 3439-3443, 1655-1615, 883-851, 640-574, 536-466 cm^{-1} which are assigned as υ_{OH}, δ_{HOH}, ρr_{HOH}, ρw_{HOH} $\upsilon_{M\text{-}O}$ modes respectively of coordinated water.

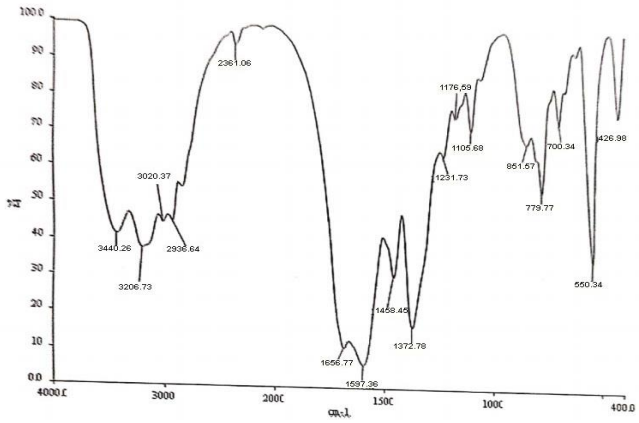


Fig – 3: IR spectrum of Zn(II) complex of BAMB

Cd^{II} complexes of BAMB

The structurally important absorption frequencies of Cd^{II} complexes have been presented in the **Table-1**. The IR frequencies are compared with that of the ligand. Upon complexation with Cd^{II} nitrate and Cd^{II} sulphate the ligand band due to $\upsilon_{C=O}$ at 1682 cm^{-1} experiences negative sift 1 and 9 cm^{-1} whereas Cd^{II} chloride experiences a positive shift of 2 cm^{-1} respectively, indicating the coordination of carbonyl oxygen to the metal atom. The complexes Cd^{II} chloride, Cd^{II} nitrate, Cd^{II} sulphate suffer a negative shift for the υ_{NH} band compared to that of the free ligand, it occurs as a broad band in the complexes since it overlaps with the υ_{OH} of coordinated water in all the complexes of Cd^{II}. The bands due to $\upsilon_{C\text{-}N\text{-}C}$ for the free ligand at 1141 cm^{-1} (amido) and 1107 cm^{-1} are shifted to higher and lower frequencies in all the complexes. This suggests that the carbonyl O and amido

N are coordinated to Cd^{II} in the chloro, nitrato and sulphato complexes.

Cd^{II} nitrate complex (**Fig -4**) exhibits υ_5, υ_1 and υ_2 for the nitrato group at 1493, 1389, 1070 cm^{-1} respectively. The difference between the υ_5 and υ_1 is 104 cm^{-1} suggesting unidentate coordination of the nitrate group. The 'OSO' bending, υ_4 in Cd^{II} sulphate appears at 699, 664 cm^{-1}. The υ_1 and υ_5, υ_2 modes of coordinated sulphato group occur at 887 and 548 cm^{-1}. These bands are consistent with those normally associated with the bidendate chelating sulphato group.

The Cd^{II} chloride complex exhibits IR absorption bands at 3441, 1607, 890, 661 and 547 cm^{-1} which are assigned to υ_{OH}, δ_{HOH}, ρr_{HOH}, ρw_{HOH} and υ_{M-O} modes respectively of coordinated water. The band at 430 cm^{-1} may be due to υ_{M-N} vibrations.

Hg^{II} chloride of BAMB

The structurally important absorption frequencies of Hg^{II} complexes have been presented in the **Table-1**. The IR frequencies are compared with that of the ligand. Upon complexation with Hg^{II} chloride (**Fig – 5**) the ligand band due to $\upsilon_{C=O}$ at1682 cm^{-1} experiences a negative shift of 19 cm^{-1} indicating the coordination of carbonyl oxygen to the metal atom. The complex suffer a positive shift for the υ_{NH} band compared to that of the free ligand and it occurs as a broad band with reduced intensity in the complex since it overlaps with the υ_{OH} of lattice water.

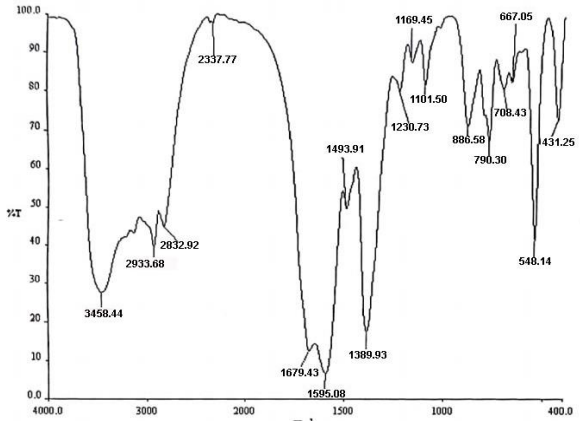


Fig – 4: IR Spectrum of Cd(II) BAMB complex

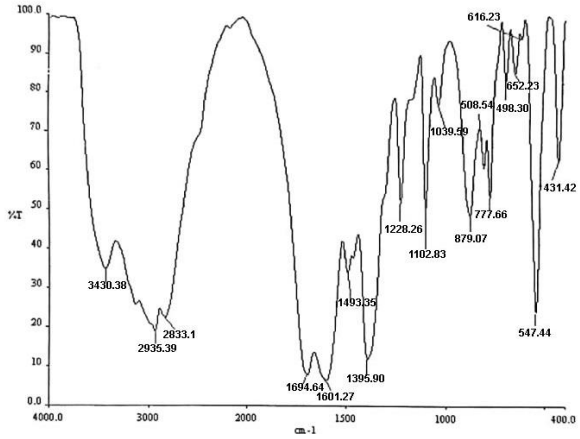


Fig – 5: IR Spectrum of Hg(II) BAMB complex

Zn complexes of BAAB

The IR frequencies are compared with that of the ligand. Upon complexation with Zn^{II} chloride, Zn^{II} Nitrate and Zn^{II} sulphate the ligand band due to $\upsilon_{C=O}$ at 1686cm^{-1} experiences a negative shift, indicating the coordination of carbonyl oxygen to the metal atom. The complexes of Zn^{II} nitrate, Zn^{II} sulphate and Zn^{II} chloride (**Fig – 6**) suffer a positive shift for the υ_{NH} band compared to that of the free ligand, it occurs as a broad band in the complexes since it overlaps with the υ_{OH} of coordinated water in all the complexes of Zn^{II}.

The bands due to υ_{C-N-C} for the free ligand at 1121 cm^{-1}(amido) and 1107 cm^{-1} are shifted to higher and lower frequencies in all the complexes. This suggests that the carbonyl O and the amido N are coordinated to Zn^{II} in the chloro, nitrato and sulphato complexes.

Zn^{II} sulphate complex shows bands due to 'SO' stretching mode, υ_3 of sulphate group at 1241, 1108 and 1070 cm^{-1}. The 'OSO' bending mode, υ_4 appears at 701and 620cm^{-1}. The $\upsilon_1$and υ_2 modes of coordinated sulphato group occur at 769 and 524cm-1. These bands are consistent with those normally associated with the bidendate chelating sulphato group [14]. There are evidences for the presence of the coordinated water in the chloro, nitrato and sulphato complexes of Zn^{II}.

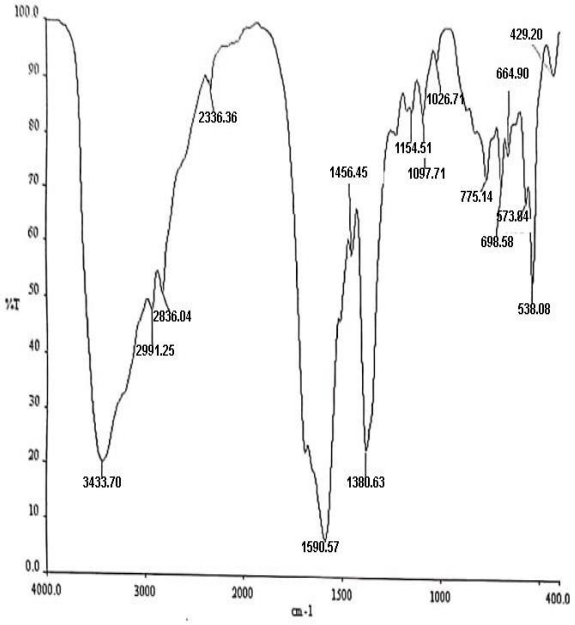


Fig – 6: IR Spectrum of Zn(II) BAAB complex

Cd^{II} complexes of BAAB

The structurally important absorption frequencies of Cd^{II} complexes have been presented in the **Table-1**. The IR frequencies are compared with that of the ligand. Upon complexation with Cd^{II} nitrate and Cd^{II} sulphate the ligand band due to $\upsilon_{C=O}$ at 1686 cm^{-1} experiences positive sift 8,2 and 10 cm^{-1} respectively, indicating the coordination of carbonyl oxygen to the metal atom. The complexes Cd^{II} chloride, Cd^{II} nitrate, Cd^{II} sulphate suffer a positive shift for the υ_{NH} band compared to that of the free ligand, it occurs as a broad band in the complexes since it overlaps with the υ_{OH} of coordinated water in all the complexes of Cd^{II}. The bands due to $\upsilon_{C\text{-}N\text{-}C}$ for the free ligand at 1121 cm^{-1} (amido) and 1029 cm^{-1} are shifted to higher and lower frequencies in all the complexes. This suggests that the carbonyl O and amido N are coordinated to Cd^{II} in the hloro, nitrato and sulphato complexes.

Cd^{II} nitrate complex exhibits υ_5, υ_1 and υ_2 for the nitrato group at 1502, 1386, 1098 cm^{-1} respectively. The difference between the υ_5 and υ_1 is 116 cm^{-1} suggesting unidentate coordination of the nitrate group. The 'OSO' bending, υ_4 in Cd^{II} sulphate (**Fig–7**) appears at 729, 694 cm^{-1}. The υ_1 and υ_5, υ_2 modes of coordinated sulphato group occur at 864 and 534 cm^{-1}. These bands are consistent with those normally associated with the bidendate chelating sulphato group.

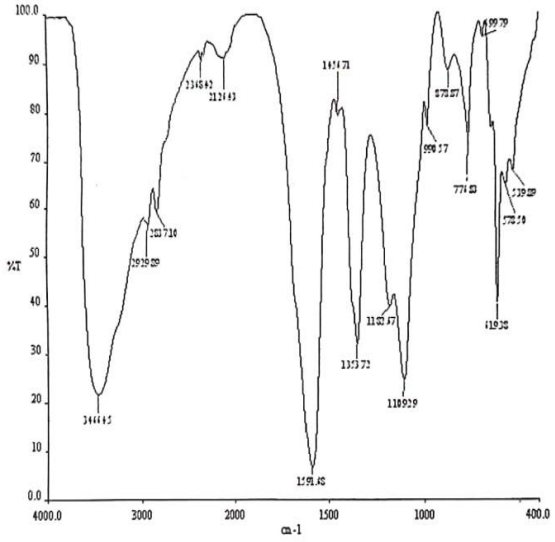


Fig – 7: IR Spectrum of Cd(II) BAAB complex

The Cd^{II} chloride complex exhibits IR absorption bands at 3429, 1587, 864, 694 and 534 cm^{-1} which are assigned to υ_{OH}, δ_{HOH}, ρr_{HOH}, ρw_{HOH} and $\upsilon_{M\text{-}O}$ modes respectively of coordinated water. The band at 422 cm^{-1} may be due to $\upsilon_{M\text{-}N}$ vibrations.

Hg^{II} chloride of BAAB

The structurally important absorption frequencies of Hg^{II} complexes (**Fig – 8**) have been presented in the **Table-1**. The IR frequencies are compared with that of the ligand. Upon complexation with Hg^{II} chloride the ligand band due to $\upsilon_{C=O}$ at1686 cm^{-1} experiences a positive shift of 4 cm^{-1} indicating the coordination of carbonyl oxygen to the metal atom. The complex suffer a positive shift for the υ_{NH} band compared to that of the free ligand and it occurs as a broad band with reduced intensity in the complex since it overlaps with the υ_{OH} of lattice water.

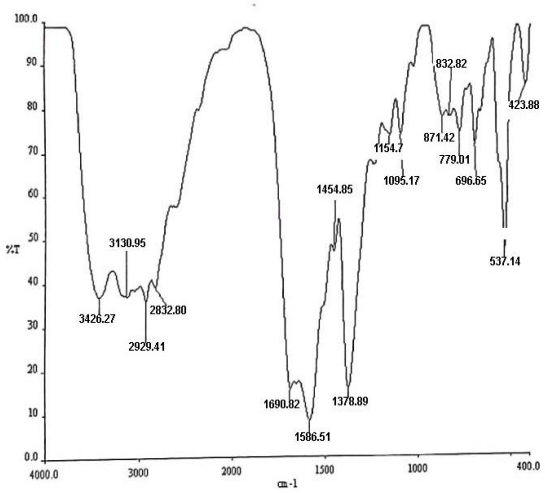


Fig – 8: IR Spectrum of Hg(II) BAAB complex

Bonding Atoms and Stereochemistry

The ligands BAMB and BAAB have two potential coordinating sites, secondary amido N atom and carbonyl O atom. Comparison of IR spectra of the metal complexes with that of their free ligands suggests the coordination sites of the ligand, the mode of coordination of nitrate and sulphate groups to the metal centre.

Table – 1: Important IR absorption bands (cm^{-1}) of BAMB and BAAB metal complexes:

Compound	**υ_{NH}**	**$\upsilon_{C=O}$**	**υ_{CNC}**	**υ_3**	**υ_4**	**υ_1**	**υ_2**	**υ_5**
BAMB / BAAB	3137 / 3420	1682 / 1686	1107 / 1121					
$ZnCl_2$ BAMB / BAAB	3206 / 3433	1686 /1590	1106 / 1154					
$Zn(NO_3)_2$ BAMB / BAAB	3135 / 3433	1682 / 1691	1103 / 1152					
$Zn(SO_4)$ BAMB / BAAB	3132 / 3437	1682 / 1594	1108 / 1107	1232/1241,1170/1108 & 1070	666 / 701 & 617 / 620	879/ 769	548/ 524	
$CdCl_2$ BAMB / BAAB	3135 / 3429	1684 / 1694	1149 / 1101					
$Cd(NO_3)_2$ BAMB / BAAB	2933 / 3444	1679 / 1688	1101 / 1155			1389 /1386	1070 /1098	1493/ 1502
$Cd(SO_4)$ BAMB / BAAB	2933 / 3466	1663 / 1591	1100 / 1182		699/729 & 664/694	887/ 864	548/ 534	

$HgCl_2$ BAMB / BAAB	2935 / 3426	1694 / 1690	1102 / 1154					

whether the anion is within or outside the co-ordination sphere of the complex.

(2) Electrical Conductance Measurements

The electrical conductance measurements of the ~10^{-3}M DMF solutions at room temperature were done in order to ascertain

Table – 2: Conductance Data for Zn(II), Cd(II) and Hg(II) Complexes of BAMB / BAAB

S.No	Complex	Decomposition temperature	Molar conductance Ohm^{-1} cm^2 mol^{-1}	Nature of the complex
1.	$ZnCl_2$ BAMB / BAAB	260°C / 260°C	0.000 / 0.001	Non-electrolyte
2.	$Zn(NO_3)_2$ BAMB / BAAB	240°C / 240°C	0.001 / 0.001	Non-electrolyte
3.	$Zn(SO_4)$ BAMB / BAAB	250°C / 268°C	0.000 / 0.000	Non-electrolyte
4.	$CdCl_2$ BAMB / BAAB	260°C / 210°C	0.002 / 0.002	Non-electrolyte
5.	$Cd(NO_3)_2$ BAMB / BAAB	240°C / 170°C	0.001 / 0.001	Non-electrolyte
6.	$Cd(SO_4)$ BAMB / BAAB	256°C / 258°C	0.000 / 0.001	Non-electrolyte
7.	$HgCl_2$ BAMB / BAAB	195°C / 192°C	0.003 / 0.001	Non-electrolyte

EXPERIMENTAL TECHNIQUES

The practical oriented features include preparation of specimen, preparation of surface, making specimen for identification, duration of exposure and removal of corrosion product. Mild steel specimen is used in all experiments with pretreatments such as cleaning, polishing, and degreasing. Surface cleaning done by immersing the specimen in Clerk's solution (5g of $SnCl_2$ and 2g of Sb_2O_3 in 100 mL HCl), polishing by using emery paper of various grade 0/0 to 0/5 and then finally degreasing by trichloroethylene or acetone.

The specimen is stored in a desicator. The initial weight of the specimen is noted using single pan balance and then immersed into the corrosive medium. The duration of the experiment is 30 minutes. After 30 minutes the weight of the specimen is noted. The loss of weight is calculated from the initial weight. From this the corrosion rate and the inhibitor efficiency are calculated. For the present investigation 500, 1000 and 1500 ppm concentrations of inhibitor solutions are prepared. Analytical reagent grade HCl and double distilled water were used for preparing test solutions of 5% and 10% HCl for all experiments.

Corrosion rate and efficiency of the inhibitor are calculated using the formula

Corrosion rate = 87.6 x w_1 –w_2 (mg) / area x time x density

Inhibitor efficiency = W_0 – W/ W_0 x 100

Where, w_1 = weight of specimen before treatment; w_2 = weight of specimen after treatment

W_0 = weight loss without inhibitor;

W = weight loss with inhibitor

The values of percentage inhibition efficiency (%IE) and corrosion rate (CR) of mild steel obtained by the weight loss method at 500,

1000 abd 1500 ppm concentration of the two ligands in 5% and 10% HCl under room temperature (**Table -3**) and for 60°C (**Table - 4**) for 30 minutes are given.

RESULTS AND DISCUSSION

PREVENTION AND CONTROL OF CORROSION

The methods generally adopted to prevent or control corrosion of metals are, suitable design and fabrication procedure, use of inhibitors, modification of the corrosive environment, use of protective coating (metallic and non-metallic), use of cathodic protection and alloying of metals.

A survey of literature reveals that only a few inhibitors are available that can withstand higher acid concentration and temperature. The effective acidizing inhibitors, which are usually found in commercial formulations, are acetylene alcohols, alkenyl phenones, aromatic aldehydes, nitrogen containing heterocyclic and their quaternary salts, and condensation products of carbonyls.

Among these acetylene alcohols are widely used because of their commercial viability. However, they suffer from the following drawbacks. They are effective only in high concentration and produce toxic vapours under acidizing process.

In view of the above there exist a need for development of new acidizing corrosion inhibitors. These two mannich bases namely, 1-[morpholin – 4-yl (phenyl) methyl] Pyrimidine 2,4,6- trione (BAMB) and 1-[aniline(phenyl)methyl]pyrimidine-2,4,6-trione (BAAB) are used for studying their inhibiting properties on corrosion of mild steel in 5% and 10% HCl solution. The selection of these compounds as corrosion inhibitors is based on the fact these compounds contain lone pair of electrons on nitrogen and oxygen atoms through which they can coordinate readily on the metal surface. In addition to this they are readily soluble in acid solution and have low toxicity and are also used in pharmaceuticals.

Table – 3: Corrosion parameters obtained from weight loss measurements in 5% and 10% HCl of the two inhibitors at room temperature.

HCl%	Inhibitor concentration (mgs)	Inhibitor	Imersion time (Mins)	Wt. Loss (gms)	IE	Corrosion rate
5%	500 ppm	Blank	30	0.1126		0.0015
		L1	30	0.1045	7.19	0.00139
		L2	30	0.0904	19.71	0.00120
	1000 ppm	Blank	30	0.2069		0.00275
		L1	30	0.1181	42.91	0.00157
		L2	30	0.1226	40.74	0.00163
	1500 ppm	Blank	30	0.1503		0.00200
		L1	30	0.1494	2.59	0.00199
		L2	30	0.1488	0.99	0.00198
10%	500 ppm	Blank	30	0,2165		0.00288

		L1	30	0.2017	6.83	0.00268
		L2	30	0.1790	17.32	0.00238
	1000 ppm	Blank	30	0.1769		0.00235
		L1	30	0.1725	2.48	0.00229
		L2	30	0.1618	8.53	0.00215
	1500 ppm	Blank	30	0.2848		0.00379
		L1	30	0.2241	21.31	0.00298
		L2	30	0.1865	34.51	0.00278

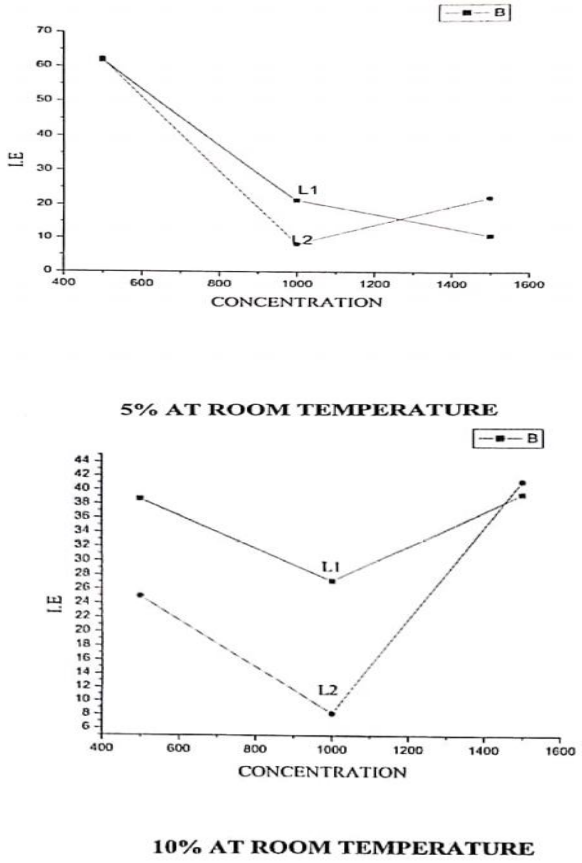


Fig-9: Plot of Inhibition Efficiency Vs Concentration of 5% and 10% HCl at Room Temperature

Inhibition of mild steel corrosion in acidic solutions by ligands can be explained on the basis of adsorption. These compounds inhibit the corrosion by controlling both the anodic and cathodic reactions. In acidic solutions the compounds exist as protonated species. These protonated species adsorb on the cathodic sites occurring through the π electrons of aromatic ring and lone pair of electrons of nitrogen and oxygen atoms, which decreases anodic dissolution of mild steel.

The values of metal loss and inhibition efficiencies of all the compounds were found to depend on their molecular structure. The inhibition efficiencies at room temperature have been found to be higher for BAAB at 5% for both 500 and 1500 ppm and for ligand BAMB at 1000 ppm. At 10% the ligand BAMB showed a higher IE at 1000 and 1500 ppm for 5%. At 10% the ligand BAAB showed a much higher IE at all three concentrations.

Table -4 : Corrosion parameters obtained from weight loss measurements in 5% and 10% HCl of the two inhibitors at 60ºC temperature.

HCl%	Inhibitor concentration (mgs)	Inhibitor	Imersion time (Mins)	Wt. Loss (gms)	IE	Corrosion rate
5%	500 ppm	Blank	30	0.2632		0.00356

		L1	30	0.1005	61.81	0.00135
		L2	30	0.0993	62.27	0.00132
	1000 ppm	Blank	30	0.1318		0,00175
		L1	30	1.1045	20.71	0.00139
		L2	30	0.1214	7.89	0.00161
	1500 ppm	Blank	30	0.1083		0.00144
		L1	30	0.0970	10.43	0.00129
		L2	30	0.0848	21.69	0.00113
10%	500 ppm	Blank	30	0.0897		0.00119
		L1	30	0.0551	38.57	0.00073
		L2	30	0.0674	24.86	0.00089
	1000 ppm	Blank	30	0.0782		0.00104
		L1	30	0.0572	26.85	0.00076
		L2	30	0.0719	8.06	0.00095
	1500 ppm	Blank	30	0.0920		0.00122
		L1	30	0.0554	39.78	0.00073
		L2	30	0.0537	41.63	0.00071

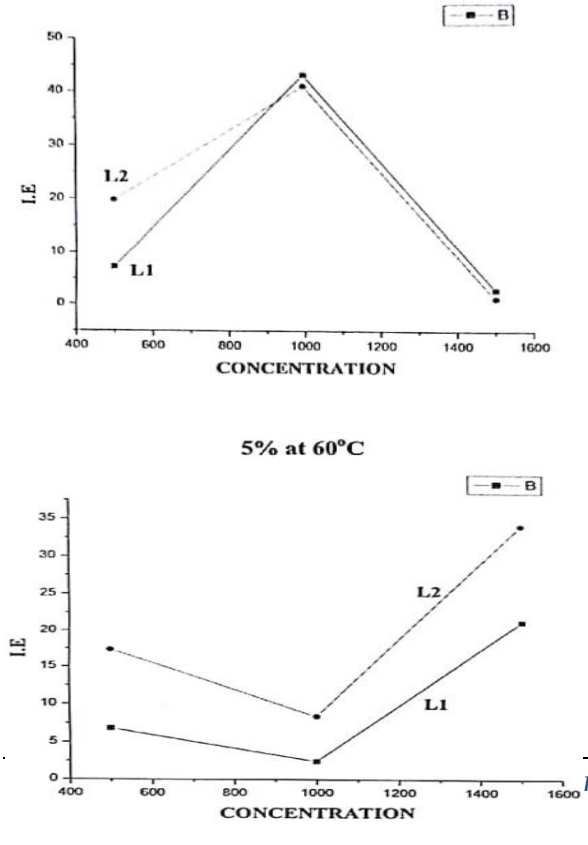


Fig-10: Plot of Inhibition Efficiency Vs Concentration of 5% and 10% HCl at 60°C

CONCLUSION

Isolation and structural elucidation of the complex of amino benzyl substituted barbituric acid namely BAMB and BAAB with Zn(II), Cd(II) and Hg(II) ions sulphato, chloro and nitrato complexes were reported. Non-aqueous medium was used for the isolation of the Zn(II), Cd(II) and Hg(II) complexes of both the ligands –BAMB and BAAB. All the complexes were non electrolyte and hydrated. In all the complexes the ligand was bonded to the metal in a tridentate fashion through amino and amido N atom and carbonyl O atom. IR data confirms the six-coordinate geometry of Zn(II), Cd(II) and Hg(II) complexes of BAMB and BAAB.

The values of metal loss and inhibition efficiencies of all the complexes were found to depend on their molecular structure. The corrosion rate showed a marked decrease which makes evident for the inhibiting action of the complexes of both the ligands.

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STATUS OF WOMEN DURING THE PERIOD OF SANGAM AGE

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ABSTRACT

Women constitute half the nation's population and their status in the society is an index of its civilization. Women's contribution to the development of the country depends on their active involvement and participation in development efforts. The status of women is a barometer of the democracy of any state, an indicator of how human rights are respected in it. Hence the status of women has become an important issue in national endeavours. All efforts should be made to recognise and benefit from the significant role women can play in the upliftraent of the society

Key Words: *Women, Education, Society, Opportunities, Status*

Introduction

The Sangam Age, is regarded as the "Golden Age" in the history of Tamil literature. The age of the Sangam is the age to which the Sangam literature belongs. Different scholars have expressed different views about the period of the Sangam Age. From the data culled out so far, the period of the Sangam Age is computed as second century. The literature of the Sangam Age are Tolkappiyam, Ettuthogai and Pathuppattu, and the twin epics, Silappathikaram and Manimegalai belong to the succeeding period, namely, the 'Post-Sangam' period.

Education

The Sangam literature extols the women of Tamil Nadu, for distinguishing themselves by their cultural attainments and virtuous living. A study of the literature of those days proves amply that women enjoyed a good deal of esteem and respect in the family and community circles. Describing the rights of women during the
Sangam Age that men and women had the same kind of freedom to get educated.
Thus women belonging to different social states and communities had received education.

The well known women poets of the Sangam Age were: Avvaiyar, Adiraandiyar , Vellividiyar, Kakkaippadiniyar , Nachchellaiyar , Kuraraakal Ilaveyini, Veripadiya Kamakkanniyar , Okkur Masathiyar, Kavarpendu, Ponmudiyar, Nakkannaiyar , Nanmullaiyar , Pukanuthiraiyar ,Bhudappandiyan Devi, Perunkoppendu and Pari Makalir. These women poets were of high calibre, although there were differences in individual capacities and inherent talents. Some even belonged to royal families.

In the Sangam Age,men and women poets and masters of learning trained their disciples in literature and communication. For example, Marokkathu Nappasalaiyar makes a respectful mention of her revered teacher, Kapilar , who himself had received sound training under a distinguished master. Thus from the earliest period, Tamil society has had eminent women poets. Much of their poetry is available even now.

Avvaiyar was one of the outstanding poetesses of the Sangam Age. The poetesses in Sangam Age were familiar with the arts and history of their times. For example, Vennikuyathiar explained the history of the war between Karikalvalavan and Cheraraan-Peruncheralathar in the following verse.

Kali iyal yanaik karikalvalavaI • •
Cenru, amark katanta nin arral tonra
Venroyl ninninum nallan anre
Kali kol yanar vennip parantalai, • • • • •
Mikap pukal ulakara eyti,
Purap pun nani, vatakkiruntone? • • • •
(Puram 66)

Art

In the Sangam Age music and dance were integral and inseparable parts of education of women. Art in any country, reflects the culture and civilisation of its people. Art is a field of human activity used to communicate to fellow beings, the meaning of experiences through which the artists had lived. Special mention needs to be made of Mutatthamakkanni who sang Porunararruppadai in praise of king Karikalan, Kakkai Padiniyar Nac-Cellaiyar sang ten verses on prince Adukotpattu Cheralathan who in turn, presented her with

nine weights of gold for making trinkets, besides 1,00,000 gold coins. From time immemorial, dance has been an art, in which participants express emotions which surge through the hearts by physical signs. A dancer who knows the art of expressing her emotions was called,'Virali*. The Viralies were dancing rhythmically, with full exressions depicting the meaning of the poems and made the people happy. The Sangam literature has ample evidence for the fact that many women had distinguished themselves in the art of music.

Women, by nature, were tender with sweet voices. Even the beasts of the forests were charmed by the music of women. Kurinchi was the hilly and mountainous region where hunting was the main occupation of the people. 'Kodichi' was the name for the woman of Kurinchi region. She was also called 'Kurathi'. A Kurava girl sang the "Kurinci-P-Pan", a melody native to the Kurinchi track, so sweetly, that an elephant which came to forage the ripened ears of Tinai corn, was fascinated by the music and fell into slumber.

Regardless of the region, girls who were engaged in plucking flowers, used to sing songs. Ainkurununru describes

Venkai Koyyunar Panchuram vilippinum
Ar itaic celvor aru nani verrum

(Ain 311)

When pounding rice and millet corn the women resorted to a particular variety of songs, namely, Vallaippattu to forget the fatigue, during the course of their strenuous work.

In Malaipadukadam,

Tinai kuru makalir icai patu vallaiyum, • • • • « (Malai, 342)

The dance mentioned in Sangam literature is Thunangai. This dance,Thunangai was the special feature of the rural festivals, and was often associated with the numerous mock fights that were under taken by sturdy warriors during the festival occasions.

A National Committee on Women's Education was appointed by the

Government of India in 1958 to go into the difficulties that hindered the progress of girl's education and to make recommendations in order to bring girls' education at par with that of boys. In essence, the measures this Committee suggested were top priority for the expansion of girls' education at the elementary stage; campaign against the traditional prejudices against girls' education; appointment of women teachers; on demand separate schools for girls at higher secondary stage; incentives; special central assistance to all stages till 80 per cent of girls in the age group 6-11 are enrolled, earmarking special fund by UGC for higher education of women; and establishment of a National Council for Women's Education.

To expedite education among the girls of the Scheduled Castes and Scheduled Tribes, additional facilities will continue to be provided under the "Development of Backward Classes" sector. Girls above the matriculation stage will get higher scholarships/stipends than boy students. Financial assistance is envisaged for construction of hostel buildings for girls at the district level and for purchase of equipment, furniture, utensils, books and periodicals in these hostels.

Between 1951 and 1981 the percentage of literacy among women had improved from 7.93 per cent to 24.82 per cent

Occupation

Women in the Sangam Age, engaged themselves in many occupations, earned their living and thereby improved the economic standards of their families. In the hill regions, women helped to guard the 'Tinai corn' and harvested, the sweet potato. In the pastoral regions, women prepared curds and ghee and sold them. In the coastal regions, women dried fish and marketed them. They drove away the birds from the fish which were spread out for sun drying. They were experts also in selling salt. While the common occupation for women in the Sangam Age was home making, combined often with agriculture and animal husbandry. The duties of the housewives included running the home, cooking and other chores, spinning, weaving and bearing and rearing children. Some women with special talents and inclinations, became dancers, songstresses and players on the harp. A

majority employed themselves In less rewarding occupations such as mat-weaving using palmyra leaves; washing and laundering clothes and as care takers for children, namely, governess and nannies. The part of the country fit for agricultural operations was called 'Marudam'. Agriculturists were the 'Uzhavar* and their women were the 'Uzhatthiyar'. Several poets of the Sangam Age have sung in praise of the nobility of Agriculture as profession. Another important participation of women in the Sangara period, particularly, by those belonging to the Yadava Community was to carry prepared milk products like curds, butter and ghee, on their heads to different places for sale. They were the vendors of milk and milk products. Women in the coastal regions of Neytal, engaged themselves in salt making, drying and selling the salt.

Weaving was a prominent occupation for women next to Agriculture and cattle breeding. A remarkable measure of skill had been developed in the Sangam Age in the art of weaving cotton and silk cloths. Dresses of different colours were made in Tamilaham as evident from the classics, Purananuru, Pattinappalai and Madurai Kanchi . Embroidery work was employed often to embelish the clothing. In Porunararruppadai a reference has been made to the fine dress made of silk. Well designed borders were provided for the silk sarees. Spinning of cotton yarn was undertaken with care. Women, particularly widows, were engaged in spinning on a large scale. women were expert in grinding the sandal paste and other fragrant pastes. Some women were engaged in preparing, filtering and selling toddy and wine. They were called "Ariyar Pendir". Women were engaged in fine arts such as music and dance. They earned their living by singing and dancing at public places and at times in the royal courts. By singing songs, the Padiniar received gifts from the kings and chieftains.

Women in the Sangam Age were reputed to have fostered lofty ideals of military valour and heroism. Young women from the Mullai tract preferred to marry only those heroes who came out successfully in the bull fighting game. Girls with long beautiful tresses could be won only by heroes who had mastered the bull.

Patriotism

In the Sangam Age, women were brave and patriotic. For example, a brave woman had the misfortune of losing her elder brother and husband in battle. Her elder brother was killed by an elephant and her husband died fighting yesterday's battle; she had only a young male child left in the family. She dressed him in white, arranged his tuft, put a lance in his hand and directed him towards the battle field. Women in Tamil Nadu, who once had such a glorious position in the Sangam era, lost it gradually degrading into deplorable poverty and ignorance because of the ravages of the times.' Invasions and alien rule had deprived them of their status and freedom.

Ponmudiar, the women poetess, referring to the warrior child said, "It is ray prime duty to bear and bring him up, it is his father's duty to make him a virtuous man, it is the duty of the black smith to provide him with a lance; it is the duty of the King to teach him how to conduct himself (in war). It is the son's duty to destroy the elephants and win the battle of the shining swords and return victoriously. This is a fair apportionment of duties, quite in keeping with the military traditions. When Pari died, his daughters sang a song which showed their immense patriotism.

Arrait tinkal av ven nilavin, • • • •
Entaiyum utaiyera; em kunrura pirar kolar; • • • •
Irrait tinkal iv ven nilavin,
Venru eri muracin ventar em ” • • —
Kunrum kontar ; yam entaiyum ilame!
(Puram, 112)

Political Participation

There are many references in Sangam literature about Avvaiyar who went as an Ambassador to Thondaiman. Avvaiyar went to the Chieftain Thondaiman, who showed her, the room where he kept the array articles. After seeing the display of arras, Avvaiyar told him that the articles were so

sharp and new, while her king Athiyaraan's were blunted and broken. This meant that the articles were not in use in Thondaiman's palace, but her Chieftain Athiyaman used them for war which showed his bravery and valour. By her shrewd and intelligent arguments , she was able to avoid a war between these two kings.

As the first step in involving women in the national struggle, Mahatma Gandhi encouraged his wife to participate in the political activities in South Africa. Along with her, a host of women participated in the struggle, were arrested and sentenced to three imprisonment. Mahatma Gandhi sought the cooperation of women in his non violent struggle for the freedom of the country.

The Civil Disobedience Movement came as a golden opportunity for the women of India, who were waiting for the call to join the Dandi march. Gandhi nominated Sarojini Naidu to lead the raid on the Darshana Sat Field, she was followed by Kamala Devi Chattopadhyay, Hansa Mehta and many others. At Allahabad, Swarup

Rani Nehru, mother of Jawaharlal Nehru received a severe lathi blow from the hands of the police.

The Government of India set up in 1986 a Standing Committee at the national level to make recommendations to the government on various policies and programmes required for supporting women entrepreneurs and tapping their talents for the growth of the economy. At the state level, the 'Tamil Nadu Corporation for Development of Women (TNCDW)' was set up in 1983 with the main objective of promoting employment opportunities for women and to take steps for improving the educational status of women. The State's Social Welfare Department also implements various new welfare programmes such as: Aid for widow remarriage, Aid for widow's daughter's marriage, Free school uniform, Helping financially backward women to get loan from nationalised banks, Muthulakshmi Reddi maternity finance assistance scheme, Free education for poor girls and Reservation of 30 per cent of jobs for women.

A notable characteristic of Tamil Nadu is the high rate of female work

participation, particularly, in the unorganised sector. The factors responsible for the female work participation are poverty and socio-cultural reasons in conjunction with the divisions of labour within the house hold for domestic work and child care. Today, earning is a primary necessity for millions of women. Under the compulsion of economic conditions, women have even bypassed all the traditional and familial antogonisms towards work. Participation of women in economic development and social progress, is indispensable for the eradication of poverty and the management of resources in the farms, homes and factories.

Conclusion

The most significant event in the movement for women's political rights in India was the demand of equal political rights made by a delegation of distinguished women led by Sarojini Naidu to the British Parliament in 1917. The 'Self-Respect Movement' started by Periyar, E.V.R. Naicke in Madras created an intellectual awakening in the society, which favoured the uplift of women among other salutory efforts. Periyar policies for women are being faithfully followed by successive governments

Despite all the limitations that a working woman faces, every woman wants to be a worker, contributing to the society in a large or small measure. Women have to prepare themselves psychologically to be more effective members of the society. 'Every woman who has the privilege of education must be willing to rough it out, if necessary to share with man, the task of shaping the society. This alone will remove the stigma of dependency attached to women and ensure respect and dignity and ultimately enhance the 'Status of women'.

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SHOCKING INCIDENTS OF COLLISIONS IN THE HIGH SEAS

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ABSTRACT

The incidents of High sea collisions have resulted in the creation of great panic among the families of both traditional and mechanized fishing community. This research study high lights the major incidents occurred in Indian Ocean and Arabian Sea in the recent past. The sufferings of the victims of these accidents have led us to conduct this study. This would bring to the fore the prime causes of the accidents and the solutions to avert them. Through the citing of various accidents information is passed on to the stakeholders about the circumstances that lead to the accidents. Information on preventive measures to be adopted by the fishermen forms part and parcel of this discussion. Accidents occur due to the negligence of both the fishing boat drivers and the duty in charge of the ship. This study is based on the interview conducted among a few drivers of mechanized boats, Engineers and Captains of cargo and supply vessels. The news about the recent accidents has drawn the attention of the concerned state governments, Government of India and International organizations and Governments that deal with marine activities. Our research findings indicate that the laws governing the maritime activities are in a confused state. So, the study would pave the way for the International Maritime authorities to make new rules and regulations so as to regulate the movements of the boats and ships in the High Seas.

Words highlight: *Exclusive Economic zone, High Seas, International Waters, Maritime Activities, Traditional fishermen, Mechanized boats, Fishing boats, Cargo ships, Collision*

Introduction

In the present days, number of accidents in the High Seas or International Waters is on the rise at an alarming rate. Accidents pertaining to the collision between ships and fishing boats are highlighted in this article. The victims are usually fishermen. As a result, the dependents of them do suffer enormously. It is apt to have a close look at the causes of such accidents. It is no secret that a world map can give a vivid picture about the boundary of each and every country. Where one country's border ends, another country's begins. In case of oceans and seas, don't we have demarcated boundaries? Do any laws govern the waters? In this article, we will analyze and answer some of the pivotal queries. It is sad that as many as 9 major incidents took place from 2012 to 2021 in International waters. Since this issue assumes importance in the fishermen's life, let us analyze a slew of facts connected with this. It is also worth to remember the incidents happened between 2017 and 2018.

Incidents

2017 January: Seven injured after a ship collided with a fishing boat 65 nm off Kochi
2017 June: Three dead, 11 injured when Panama-flagged merchant vessel Amber L hit a fishing boat Carmel Matha 14 nautical miles off Kochi coast
2017 August: A Hong Kong-flagged ship collided with a fishing boat Arockia Annai, 39 nm off Kollam coast
2017 October: Unidentified ship rammed a fishing vessel, 19 nm off Colachel
2017 October: Unidentified merchant ship rammed fishing boat Immanuel, 50 nm off Beypore
2018 January: Unidentified ship hit fishing vessel Nelson off Kanyakumari coast

International waters

The term, "**International waters**" is most often refers to waters beyond the "**territorial sea**" of any state. International waters (high seas) do not belong to any state's jurisdiction. These waters are common for all where a state cannot claim but is disputed by the neighboring countries. The high seas – the area outside any country's national waters – cover nearly two-thirds of the oceans and are largely ungoverned. The high seas make up 50% of the surface area of the planet. States have the right to fishing there. Upon analysis, it is noticed that if states have the right to

fishing, then why can't their fishers do so in high seas? Our fishers in mechanized boats venture in to these open international waters. If high seas areas were closed to fishing, some countries would benefit directly and others indirectly through the protection of some fish stocks. The high seas are a headache for the people who manage fisheries. These fisheries are common resources, accessible by anyone. That's why, some could view the high seas as a global "**fish bank**".

Territorial waters

What does the law of the sea say about territorial waters? What is meant by the term "territorial waters"? The 1982 United Nations Convention on the Law of the Sea defines that the **Territorial Sea** is a belt of coastal waters extending 12 nautical miles (22 km14 mi) from the base line. It is abundantly clear that in the event of an accident, a law of that country will apply only within this area. It is the exclusive right of that country to build, extract natural resources and either encourage or forbid sea passage through it. Ominously, there is a growing apprehension among the fishermen whether they are permitted to fishing beyond this zone. Fundamental changes have to be made in the maritime laws that give conflicting signals to the fishermen. No doubt, they can fish but not in the territorial waters of other countries. Since the availability of fish is scanty within this zone, they go for fishing in the High Seas and the water column of Exclusive Economic Zone.

Exclusive Economic Zone (EEZ)

Maritime countries are also entitled to an exclusive economic zone (EEZ) which is made up of the water column and the seabed out to a distance of 200 miles (about 322 km). This is about 60% of the 364 million square kilometers of global oceans. It is also said that the maritime country that owns the EEZ also owns the sea life and mineral resources found within it. However, it cannot prevent ships, aircraft and other vessels from foreign countries from passing through it and over it.

International crimes

No doubt, water bodies do not end with these. There are still a lot of ocean beyond the EEZs and 12 mile limits. Which laws will be in force when crimes such as piracy, human trafficking and crimes against humanity are committed in this part of the ocean? Are the laws of the country owning the vessel applied? In this connection, there arises the question of jurisdiction. The concerned country can bring to the limelight the laws that are in force in that particular country. These laws are very often challenged by any other country. Obviously, it takes time for the International courts to recognize such laws. Similarly, the verdicts of the International courts are not accepted by the affected nations. It is due to these reasons the crimes committed in such circumstances are dragged on for so many years. ***Enrica Lexie* case** is the shining example of this.

Collision at Mid Sea

Incidents of collision at mid sea are on the rise time and again. This necessitated the stakeholders to take the matters very seriously. Although the Government of India, the fisheries departments of the concerned states and the coast guards are concerned about these matters, the fishermen are in trouble very often. Normally the fishing boats do not collide with the ships. It is the ships that collide with the boats. Gone are the days when many such incidents took place. At the same time, one cannot expect of these in the present scenario when technology has developed to a greater extent. However, it has to be observed that technological development has got its own repercussions too. Before the emergence of industrial revolution and technological advancement, a duty in-charge used to stay in captain's cabin to steer the ship very promptly. Now, the mechanized world is not bothered about the course of the ship. It is believed that the technology is in upper hand and therefore the steering part of the ship is no more a matter.

"The ships, during the course of their journey, would move to a certain direction and this is possible because of the setting of the steering for a considerable amount of time", said Antony Jayaraj, an engineer in a

ship. His words aptly describes about the existing condition of modern shipping industries. He continued to say that most of the accidents occur due to the negligence of the duty in charge. There would be none on duty for a certain hours. It is observed that at the time of the occurrence of accidents, none in the ship might notice it. As the size of the ship is much bigger than the fishing boat and the height of the ship is more than that of the boat, the noise produced by the collision is unheard of in the captain's cabin to make them alert about the accident. Something they are insensitive to or unaware of. In the event of a major collision also feeble noise would be heard to the crews in the ship. As usual, the ship would move with the same pace as if they have not damaged the boats. In this regard, it is suggested that the crews of the ship should undertake their duties routinely so that they might notice the boats if they were on their path. Many of the ships give scant regard to this particular aspect.

Collision between "IB Rabbal" and "APL Le Havre"

The newspaper, **The New Indian Express** dated, 13th April 2021 expressed that three fishermen were killed when **APL Le Havre**, a container ship with Singapore registration collided with a fishing boat, **IB Rabbal** owned by Mamantakkathu Jaffer of Beypore. It occurred around 60 nautical miles off the Mangaluru coast on 12th April night. According to sources, the crew of the ship launched a rescue operation and saved five workers of whom three died. The survived ones were Vel Murugan of Colachel and Sunil Das of West Bengal. According to Kerala Fishing Boat Operators Association Vice president, Haneefa Haji, there were 14 workers in the boat of which 7 were from Colachel and the other 7 from Odisha and West Bengal.

Incident of "Mercedes"

In the recent incident in which the boat, **Mercedes** belonging to Franklin of Vallavilai met with an accident at mid sea on 23d April 2021 about 600 nautical miles away from Goa coast, the ship that brought about the accident has not been caught so far. Initially, on witnessing the floating of the wheel house of the boat by another boat by name, **Periyanayahi**, it was speculated that the boat might have been damaged fully and as a result, it might have sunk in to the sea. But, to their fortune and luck, it was found subsequently that it wasn't damaged fully and all the 11 crews managed to get in to the damaged boat and could reach the Thenkapattnam harbour on 1st May 2021 after a long voyage of 8 days. Who is held responsible for this accident? The ship is largely to be blamed for this. She has to be charged with this grave crime. Normally, the culprits are hardly accounted for. Had all the 11 crews been lost to the sea, the condition of the 11 family members would have been moribund and pathetic. The mental agony suffered by the family members of the crew until the receipt of the good news is unimaginable. It is the responsibility of the Government of India to ensure the safety and security of the fishermen. The ship that caused the damage has to be tracked and identified at once. There should be a proper mechanism so as to do this promptly. Laws should be enacted so that necessary compensation shall be provided to the innocent victims.

Kerala Matsiya Thozhilali Aikyavedi President, Charles George, on an earlier occasion said that a certain merchant vessels, instead of going through High Seas, came to the territorial waters in order to receive signals to their mobile phones to contact with the family members. However, in the case of 'Mercedes', it did not happen so.

Accidents at dusk

At times, accidents occurred at dusk too when light in the boat is not visible. The gillnet boats of 1970s did not have such facilities including proper lighting as we have today. There was every room for major collisions in those days. The fishermen would be in dilemma as to find out the direction of the moving ship. Everyone in the boat must be aware of the approaching ship and so they would be in panic so much that the ship might dash against the boat from any direction. In

order to move away from the path of the ship, the driver of the boat would steer it frantically to a safer side. It so happened in 1978 when a merchant vessel was about to hit a gillnet boat. I, (A. Sajeen, one of the authors of this article) was also one among the 5 crews in the boat which was fishing about 20 nautical miles away from the Kochi coast. Luckily, we were saved solely due to the courage and tactics employed by our fellow driver. Intelligently, he drove the boat so fast towards the right direction so that the one on duty in the cabin of the ship could see the boat. When the crew in the captain's cabin noticed our boat's dangerous situation, he changed the direction of the ship. Thus, another major accident was averted.

Further, it is noticed that many a ships have the habit of escaping from the accident spot after hitting the traditional fishermen. They fail to give sufficient warning to fishermen when they are resting at sea. To their surprise, they would not find out the black sheep. After reporting to the government authorities, it would be difficult for them to detect the crime makers. Why does it happen? Advanced technology and modern communication system would make it easy to find out the ship that causes the damage. How much would they get as compensation? Does any law stipulate any fixed amount for the damage? They might sometimes lose their fishing gear too. Has any fisherman got any amount as compensation so far? There are numerous ways such as blowing the fog horn, use of water cannon and fire warning shots for the captain or the one on duty to give alert to the fishing boats. It is uncertain that they do the precautionary measures to avert the mishaps.

Incident of shooting

It is equally shocking that there occur shooting in the high seas. It so happened on 15th February 2012 when two Indian fishermen were killed off the coast of Kerala by two Italian marines aboard the Italian-flagged commercial oil tanker, **MB Enrica Lexie.** The ship continued to move, but was intercepted by the Indian Navy and the marines were detained. Here, in this case, the marines, during interrogation, said that they had suspected the fishermen of sea pirates. Nevertheless, it was a lame excuse. It was very clear that the fishermen had every reason to substantiate that they were fishermen. Here too, the question of jurisdiction arose. This has been the cause of friction between India and Italy for so many years. More worryingly, the case has not been settled so far. What is the need for this heightened tension? Powerful International Organizations with strong international laws can help ease the tension among maritime countries.

Conclusion

In all the above-mentioned cases the victims are poor fishermen. As usual our leaders would express deep concern over such incidents and reiterate the need for reforms in the existing laws. The political parties would make visit to the spot and give a lot of promises. Of course, they will take actions. Most of the efforts would end in futile. A mature and timely response is the need of the hour. Truly, there would be an unacceptable delay on the part of the government authorities in acting on it. In the aftermath of accidents, with the help of floating materials, the victims could swim in the water for long hours in spite of the tough weather. Before they would go missing, the rescue workers should reach the spot. They have to act swiftly and efficiently so that they can save lives. The presence of dedicated, strong, courageous and industrious sons and daughters of fishermen as workers or officers in the Fisheries department and coast guard can help save hundreds of lives. There would be peaceful public outcry for some time after the incident. It will go for a little more time. In due course, it will be forgotten forever. The concerned governments and departments should realize that this is a matter of serious concern and so it has to be looked in to its totality. The issue has to be approached with a human touch. A safe and dignified environment has to be assured to the fishermen. There is an imminent need to review the International law that governs the maritime countries. Sooner the governments realize this, the better for our fishermen.

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3. Patrick, Executive member, Thoothoor St.Thomas Deep Sea Boat Owners and Workers Welfare Union - 25.02.2021
4. Marythasan, President, Jesus Boat Union Thoothoor---27.02.2021
5. Charles George, President, Kerala Matsiya Thozhilali Aikyavedi, Kochi-18.03.2021
6. Soosai Antony, Captain of Cargo ship, Chinnathurai- 21.03.2021.
7. Antony Jayaraj, Engineer of Supply vessel, Thoothoor-5.05.2021

DESIGN OF MULTIPHASE BOOST CONVERTER FOR ELECTRIC VEHICLE APPLICATIONS

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ABSTRACT

In this paper, the design and development of multiphase coupled interleaved boost converter with reduced ripple is presented. The principle of interleaving of converters is to produce low ripple content in output voltage and input current. Different topologies such as conventional boost converters, uncoupled interleaved boost converter and coupled interleaved boost converter are studied. Using MATLAB/ SIMULINK, the simulation study of the above-mentioned topologies are carried out. Based on the simulation results obtained, the converters are compared with each other in terms of input current ripple and output voltage ripple. Also, the estimation of switching loss for interleaved boost converter is done using neural networks in MATLAB/SIMULINK.

Keywords*—boost converter, interleaved converters, ripple, switching loss, neural network*

Introduction

Electric vehicles are an emerging technology as they reduce the pollution and help in protecting the environment. Moreover, they reduce energy consumption and greenhouse gas emissions which offer advantages over the existing vehicle. Converters are used to interface the motors with the storage devices[1]. In this paper, the different of DC – DC converter topologies are discussed. DC – DC Converter is s used either to increase or decrease the DC voltage level. The Boost converter, also known as Step-up converter is a DC-DC converter that produces output voltage greater than input voltage. To achieve high voltage gain, the duty cycle (δ) of the converter has to be increased which results in increased stress across the switches. Due to this, the semiconductor device suffers from high switching loss thereby reducing the efficiency and, increasing the output voltage ripple and input current ripple. For high power applications, the increase in voltage and current stress cannot be tolerated by one device. This can be overcome by connecting multiple power devices in series or parallel. But this leads to voltage or current imbalance. Therefore, instead of connecting the devices in or parallel series, the converter stages can be utilized for two or more phases and this concept is known as interleaving of converters[2]-[5].

The Interleaved Boost Converter (IBC) has many advantages over conventional boost converters such as minimum switch voltage stress, improved reliability, faster transient response and higher efficiency[6]-[9]. It also produces continuous input current due to ripple cancellation. A two-phase IBC topology is simulated using MATLAB/ SIMULINK and is compared with Boost and Uncoupled DC-DC converters. The switching loss estimation for coupled inductor IBC is calculated by using neural networks by varying duty cycle and switching frequency of the converter.

Analysis Of DC-DC Converter Topologies

Conventional Boost Converter (BC)

BC are used to step up voltage and step-down current depending on the duty cycle. The circuit consists of a switching device, inductor, capacitor and a diode. The main purpose of inductor is to reduce input current ripple. The diode is connected in series with the capacitor across the load. Fig.1 shows the circuit diagram of a BC.

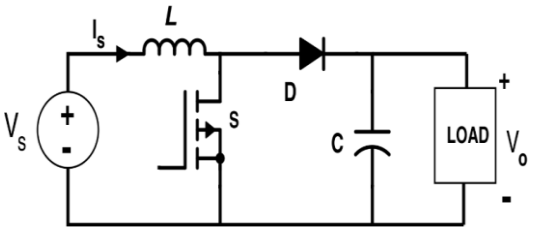

Fig.1.Conventional Boost Converter

There are two operating modes in BC namely charging and discharging mode. When switch(S) is ON as shown in Fig. 2, the input current flows through the inductor (L), which stores energy in the form of magnetic energy. As the diode (D) is reverse biased, during this mode the current does not flow through the load and, the output voltage is equal to the capacitor voltage.

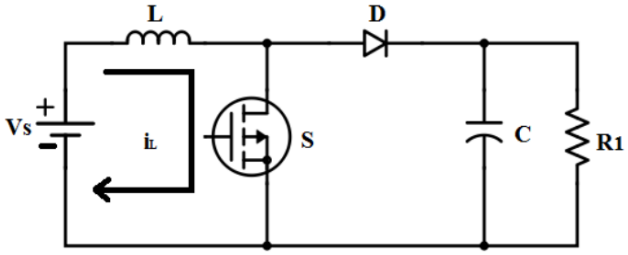

Fig. 2. Mode 1 Operation of BC

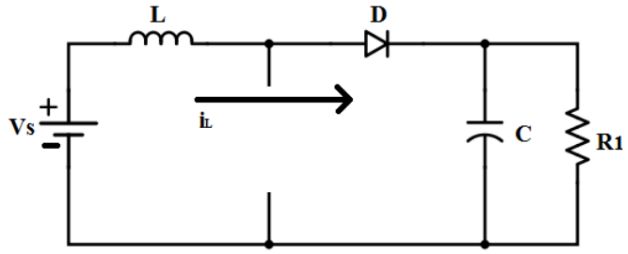

Fig. 3.Mode 2 Operation of BC

During mode 2 operation, S is turned OFF as in Fig.3. and diode D is forward biased. Thus, the current flows towards the load and the energy stored in inductor L is also transferred to the load. This leads to increase in output voltage greater than the input voltage. The capacitor is used to reduce the voltage ripple.

Uncoupled Interleaved Boost Converter (UIBC)

Interleaved control of this topology with n number of phases has phase shifting by 2π/n or T/n where T is the switching time period. The number of inductors and switch is same as the number of phases. The output current is divided by 1/n times separately[10]. This reduces the current stress in IBC. The switching sequence depends on the duty ratio. The advantages over conventional BC are:

- reduced ripple factor
- improved power factor
- reduced ripple with increase in number of phases

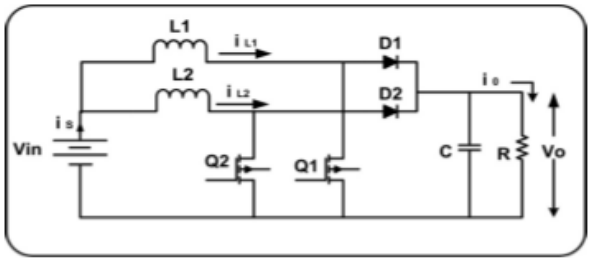

Fig.4.Circuit Diagram of UIBC

In Fig.4. L_1, Q_1, D_1 and, L_2, Q_2 and D_2 represents inductor, switch, diode for first and second phase respectively.It consists of four modes of operation. Fig. 5 shows the mode 1 operation of UIBC when Q_1 and Q_2 is ON. The input supply current charges both L_1 and L_2 and, D_1 and D_2 are reverse biased.

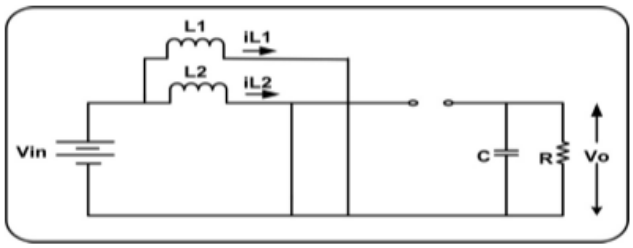

Fig.5.Mode 1 Operation for UIBC

Fig.6. shows the mode 2 operation where Q_1 is ON and Q_2 is OFF. The input supply current energies L_2 and L_1 and D_1 is forward biased. The current across L_2 rises to i_{L_2} . D_2 is reverse biased as Q_1 is closed and the current falls to zero at the instant before

switching on Q_1. There is a fall in L_1 current i_{L_1} as it supplies the energy to the load.

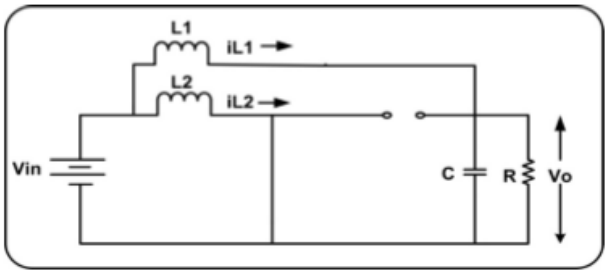

Fig.6.Mode 2 Operation for Uncoupled Interleaved Boost Converter

Fig.7 shows the mode 3 operation when Q_1 is OFF and switch Q_2 is ON. During this mode, D_1 is reverse biased as the Q_2 is closed. L_2 starts discharging and supplies the energy to the load resulting in decrease in current i_{L_2}. As L_1 starts charging the i_{L_1} increases. This produces greater output voltage than the input voltage with reduced input current ripple as a result of current sharing technique.

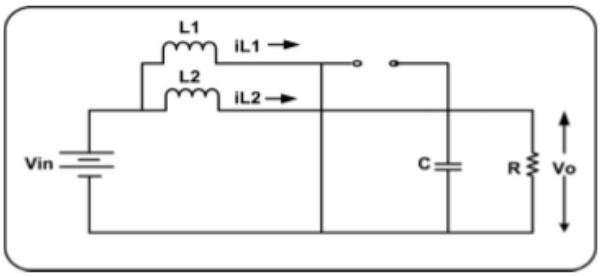

Fig.7. Mode 3 Operation for UIBC

Coupled Interleaved Boost Converter (CIBC)

CIBC consists of a magnetically coupled inductor made of two windings for two phases installed in EE or EI core. Each of the inductors will have equal number of windings to ensure the symmetry between the phases[11]. The input current ripple is reduced with coupled inductor topology as compared to the uncoupled inductor. But phase current ripple increases in directly CIBC with increase in Coupling Coefficient (CC). Hence, CC and δ should be carefully chosen to reduce overall input current ripple.

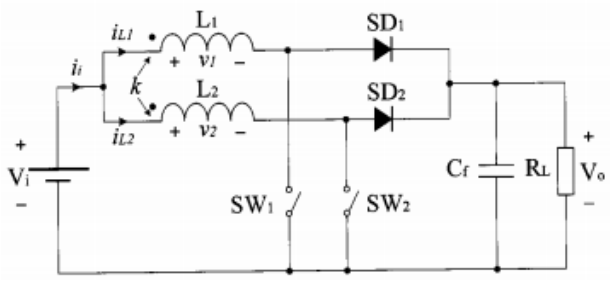

Fig. 8.CIBC

In Fig.8 L_1 and L_2 represent inductance of two inductors, L'_1 ,L'_2 represents leakage inductances of the two inductors and L_m represents the mutual inductance of CIBC. Fig. 9 shows the mode 1, when SW_1 is ON, the current in the inductor L'_1 starts to rise and L'_2 continues to discharge as the current in it was acquired in the previous switching cycle and is given by (1).

$$\frac{di_{L2}}{dt} = \frac{-V_0}{L'_1 + L'_2} \quad (1)$$

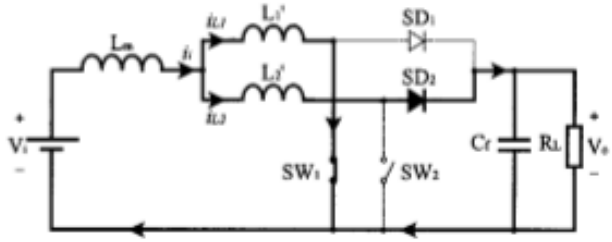

Fig. 9.Mode 1 Operation for CIBC

During the mode 2 shown in Fig. 10, Switch SW_1 is OFF, the energy stored in the L_1 is transferred to the load through SD_1 and is given by (2).

$$\frac{di_{L1}}{dt} = \frac{-(V_0 - V_i)}{L_1} \quad (2)$$

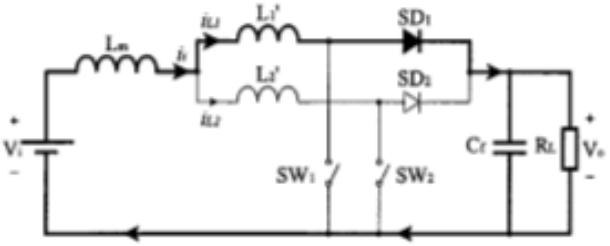

Fig.10.Mode 2 Operation for CIBC

Fig. 11 depicts mode 3, where SW_2 is ON and the current in the L'_2 starts to rise as in (3) while L'_1 continues to discharge.

$$\frac{di_{L1}}{dt} = \frac{-V_0}{L'_1 + L'_2} \quad (3)$$

Fig.12 represents mode 4. SW_2 is OFF and

$$\frac{di_{L2}}{dt} = \frac{-(V_0 - V_i)}{L_2} \quad (4)$$

the energy stored in the L_2 is transferred to the load through D_2 as in (4)

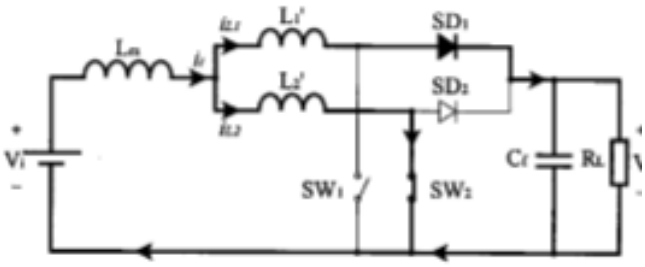

Fig. 11. Mode 3 Operation for CIBC

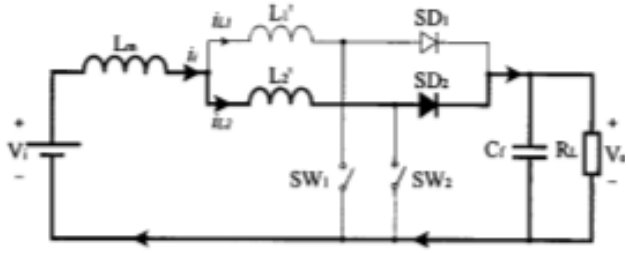

Fig. 12. Mode 4 Operation for CIBC

Performance Comparison of Topologies

A. Simulation results

The above discussed topologies are simulated using MATLAB/SIMULINK and the parameters used for simulation are given in TABLE I. Based on the given parameters, the converters are designed using the design equations.

TABLE I.Simulation Parameters

Parameters	**Ratings**
Output voltage	72V
Input voltage	32V
Switching frequency	25 kHz
Duty ratio	0.556
Output voltage ripple	200mV
Power rating	5kW

Fig.13 and 14 depicts the output voltage and input current ripple present in BC respectively.

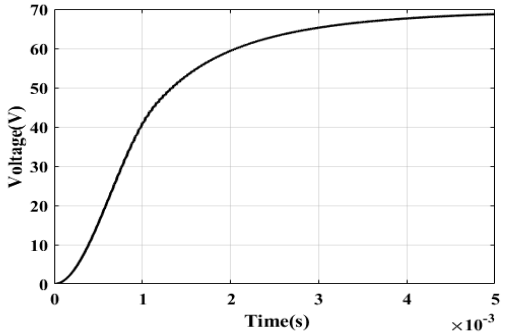

Fig.13.Output voltage waveform of BC

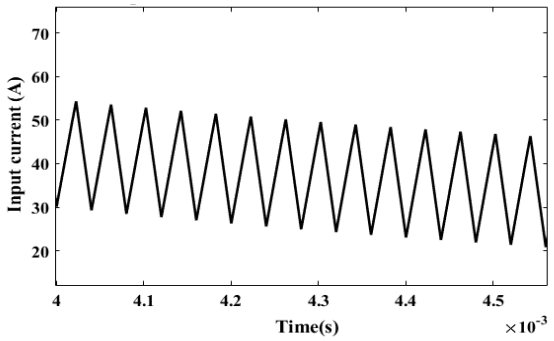

Fig.14 .Input current waveform of BC

Fig.15 and 16 depicts the output voltage and input current ripple present in UIBC respectively.

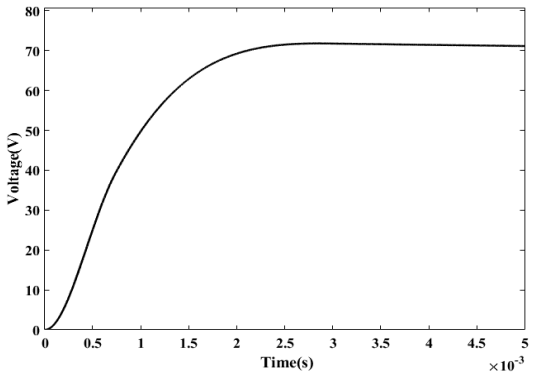

Fig.15.Output voltage waveform of UIBC

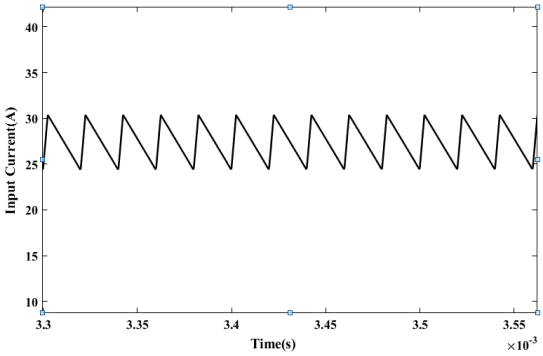

Fig.16.Input current waveform of UIBC

It can be seen from Fig.15 that the output voltage produced by UIBC is greater than the conventional BC.

Fig.17 and 18 represents the output voltage and input current ripple present in CIBC respectively. From Fig. 18 and Fig. 19, CIBC gives reduced input current ripple and produces higher voltage in comparison with other two topologies.

TABLE II shows the comparison of output voltage ripple and input current ripple for BC, UIBC and CIBC.

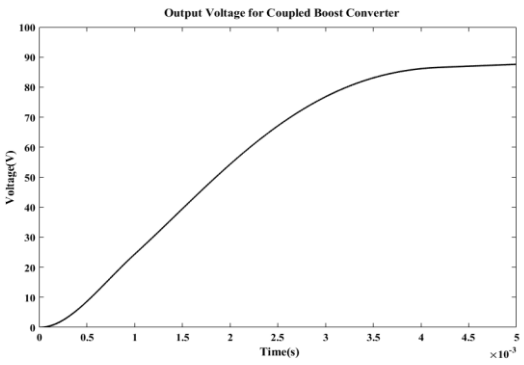

Fig.17. Output voltage waveform of CIBC

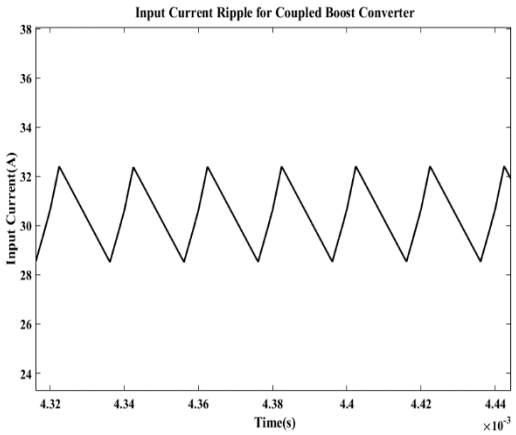

Fig.18 Input current waveform of CIBC

TABLE II. Comparison of Performance Parameters

Parameters	**BC**	**UIBC**	**CIBC**
Input Current Ripple(A)	0.57	0.22	0.02
Output Voltage Ripple(V)	0.02	0.013	0.0041

B. Effect of Coupling Co-efficient on Input Current Ripple

By increasing the value of coupling coefficient, the input current ripple can be reduced effectively but simultaneously the phase current ripple is increased. Fig. 19 represents the variation of input current ripple for varying coupling coefficient.

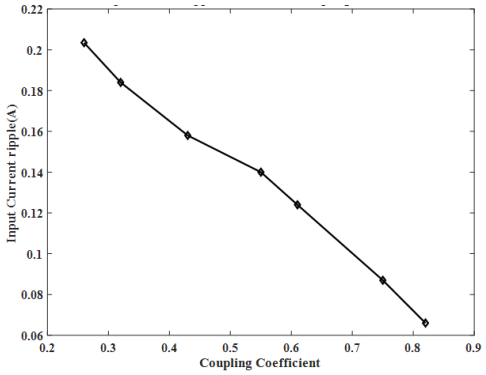

Fig.19.Variation of input current ripple for different coupling coefficient

Therefore, the value of coupling coefficient is carefully chosen as 0.61 such that the input current ripple is reduced and also, the phase current ripple is within the limits.

C. Effect of Duty ratio on Input Current Ripple

Fig.20. shows the variation of input current ripple for different duty cycle.

TABLE III gives the values chosen for data extraction.

TABLE III. .Range of Input parameters

Input Parameters	Range
Switching	10kHz – 40kHz
Duty ratio	0.1 – 0.9
Load resistance	5 Ω

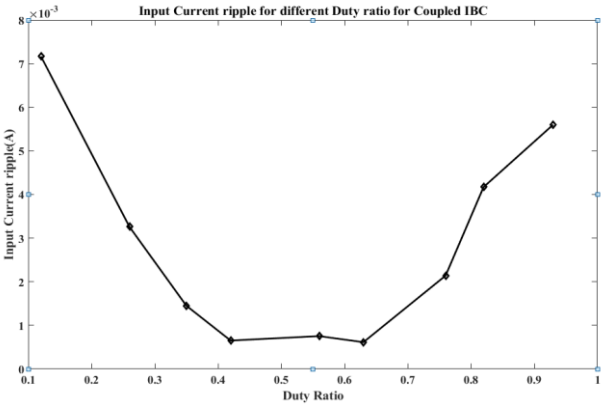

Fig.20. Input current ripple for different duty ratio

Lower input current ripple results in lowering the output capacitance requirements. Therefore, the duty ratio is chosen between 0.4 to 0.7 to get minimized amount of ripple content.

Estimation of Switching Loss Using Neural Network

The power loss analysis of the converter includes power loss of the MOSFETs, diodes and main inductor used in converter circuit[12]. Switching loss for the main power device is calculated as given in (5) and (6).

$$P_{sw} = 0.5 V_o I_{in} (t_r + t_f) \frac{1}{N} f_s \quad (5)$$

$$P_{sw} = 0.5 V_0 (t_r + t_f) f_s \frac{V_0}{1-D} \cdot \frac{1}{R} \cdot \frac{1}{N} \quad (6)$$

where P_{sw} represents the switching loss of main power semiconductor device, N represents the number of phases, f_s represents the switching frequency, I_{in} represents the current through the device, V_0 represents the voltage, t_r represents the current rise time and t_f represents the voltage fall time.

The data required for training and validation is obtained by using (5) and (6) in MATLAB. Feed Forward Backprop network type is used to train the set of values to obtain the switching loss. Fig.21. represents the neural network (NN) used to predict the switching loss using MATLAB.

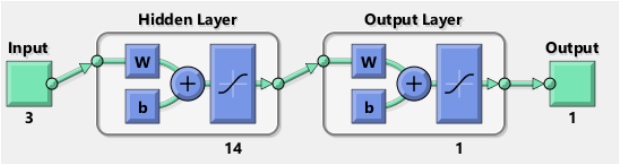

Fig.21.Implementation of the artificial neural network using MATLAB

On successful training of NN, the network is tested for accuracy. Fig. 22. shows the graph consisting of actual and predicted switching loss of the converter.

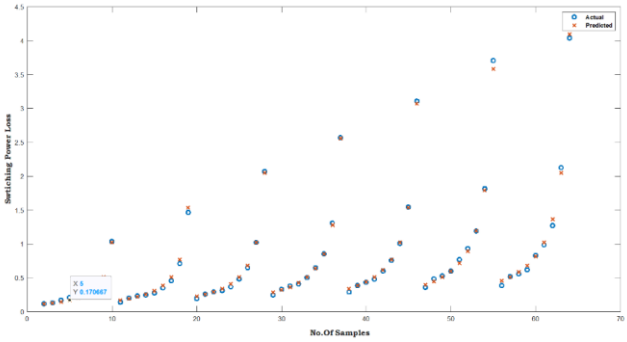

Fig.22. Actual Vs Predicted Switching Loss for MOSFET.

From the fig. 22. it is observed that the predicted values are in close agreement with the computed values. It is also observed that, with the increase in switching frequency, the switching loss also increases considerably. Hence, in order to minimize the switching loss, the choice of switching frequency is critical.

Conclusion

Based on the performance analysis for coupled, uncoupled interleaved boost converter and conventional boost converter, it is found that CIBC has a lower input current ripple of 0.02% and output voltage ripple of 0.0014% when compared to other two topologies. Also, the effect of coupling coefficient and duty cycle on the ripple was studied in order to achieve minimized ripple

content. Using NN, the switching loss for the semiconductor devices was predicted in order to find the optimum switching frequency. Hence, CIBC was designed to have minimal ripple for EV applications.

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ON POLYNOMIAL QUASI ORTHOGONAL OF TYPE I MATRICES

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ABSTRACT

This paper is concerned with a new type of polynomial matrix. The concept of polynomial quasi orthogonal of type I matrices are introduced. We define the index of quasi orthogonal of type I matrices and we extended some results of quasi orthogonal of type I matrix to polynomial quasi orthogonal of type I matrices

Keywords: *Quasi orthogonal matrix, orthogonal of type I matrix, quasi orthogonal of type I matrix, determinant, inverse, transpose.*

INTRODUCTION

In linear algebra, a matrix A is orthogonal if its transpose is equal to its inverse, which entails $AA^T=A^TA=I$, where I is the identity matrix. The term orthogonal matrix was used in 1854 by Charles Hermite (1822-1901) in the Cambridge and Dublin mathematical journal, although it was not until 1878 that the formal definition of an orthogonal matrix was published by Frobenius [6]. The orthogonal Matrix was defined by Sylvester in 1867 [5]. A polynomial matrix $A(\lambda)=A_0+A_1\lambda+A_2\lambda^2+.....+A_n\lambda^n$ is a polynomial orthogonal matrix whose coefficient matrix $A_i's$ are orthogonal matrices which was referred by [1] [2] [3] [4]. Polynomial matrices arise naturally as modeling tools in several areas of applied mathematics, systems theory, sciences and engineering.

Polynomial quasi orthogonal of type I matrices

DEFINITION: 2.1

A square matrix A is called an orthogonal of type I matrix if $A^k(A^T)^k=I_n$ *and* $(A^T)^k(A)^k=I_n$, for some $k\epsilon R$

Example: 2.2

Let $A=\begin{bmatrix} i & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & i \end{bmatrix}$ is orthogonal of type I matrices.

DEFINITION: 2.3

A real square matrix A of order n is called quasi orthogonal matrix if it satisfies $AA^T=A^TA=cI_n$ .Where, I_n is $n\times n$ identity matrix and c is a constant real number.

Example:

$\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ is quasi orthogonal matrix.

DEFINITION: 2.4

Let A be an quasi orthogonal of type I matrix and there exists positive integer k with $A^k(A^T)^k=c^kI_n$ is called the index of A. We say that A is quasi orthogonal of type I of period k .

EXAMPLE: 2.5

$A=\begin{bmatrix} 2i & 0 \\ 0 & 2i \end{bmatrix}$ is quasi orthogonal of type I matrix.

Solution:

Given that $A=\begin{bmatrix} 2i & 0 \\ 0 & 2i \end{bmatrix}$

If A is quasi orthogonal of type I matrix.

Thus, $A^k(A^T)^k=c^kI_n$

Put k=1,

$$AA^T=\begin{bmatrix} 2i & 0 \\ 0 & 2i \end{bmatrix}\begin{bmatrix} 2i & 0 \\ 0 & 2i \end{bmatrix}=4\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$$

Put k=2, $A^2(A^T)^2=4^2\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Put k=3,

$$A^3(A^T)^3=4^3\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$$

Put k=4, $A^4(A^T)^4=4^4\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Put$k$=5, $A^5(A^T)^5 = 4^5\begin{bmatrix}-1 & 0\\ 0 & -1\end{bmatrix}$

Put k=6, $A^6(A^T)^6 = 4^6\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

Put k=7, $A^7(A^T)^7 = 4^7\begin{bmatrix}-1 & 0\\ 0 & -1\end{bmatrix}$

Put k=8, $A^8(A^T)^8 = 4^8\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

The index of A is 2, then $A^k(A^T)^k=I_2$,k = 2,4,6,8,….. and A is of period 2.

DEFINITION: 2.6

Let

$A(\lambda) = A_0 + A_1\lambda + A_2\lambda^2 + ... + A_n\lambda^n$ be polynomial quasi orthogonal of type I matrix. Here coefficient matrices $A_i's$ are quasi orthogonal of type I matrices and there exists positive integer k with $A_i^k(A_i^T)^k = c^k I_n$ is called the index of $A_i's$. We say that $A_i's$ is quasi orthogonal of type I of period k .

THEOREM: 2.7

If $A(\lambda)$ is an polynomial quasi orthogonal of type I matrix is a polynomial quasi orthogonal of type I matrix whose coefficient matrices are quasi orthogonal of type I matrices. Then $\det(A_i^k) = \pm c^{kn/2}$

Proof:

Let

$A(\lambda) = A_0 + A_1\lambda + A_2\lambda^2 + ... + A_n\lambda^n$ be polynomial quasi orthogonal of type I matrix. Here coefficient matrices $A_i's$ are quasi orthogonal of type I matrices.

That is, $A_i^k(A_i^T)^k = c^k I_n$

Taking determinant on both sides

$\det(A_i^k(A_i^T)^k) = \det(c^k I_n)$

$(\because \det(cI) = c^n \det(I))$

$\det A_i^k . \det(A_i^T)^k = (c^k)^n \det(I_n)$

Since, $\det A_i^k = \det(A_i^T)^k$

ie) $\det A_i^k . \det A_i^k = c^{kn}1$

$(\det A_i^k)^2 = c^{kn}1$

$\det(A_i^k) = \pm c^{kn/2}$

Hence $\det(A_i^k) = \pm c^{kn/2}$

THEOREM: 2.8

If

$A(\lambda) = A_0 + A_1\lambda + A_2\lambda^2 + ... + A_n\lambda^n$ be polynomial quasi orthogonal of type I matrix. Here coefficient matrices $A_i's$ are quasi orthogonal of type I matrices.

The following statements are equivalent.

(i) $A(\lambda)$ is an polynomial quasi orthogonal of type I matrix.

(ii) $A(\lambda)^{-1}$is an polynomial quasi orthogonal of type I matrix.

(iii) $A(\lambda)^T$ is an polynomial quasi orthogonal of type I matrix.

(iv) $\overline{A(\lambda)}$ is an polynomial quasi orthogonal of type I matrix.

(v) $A(\lambda)^*$ is an polynomial quasi orthogonal of type I matrix.

Proof:

Let

$A(\lambda) = A_0 + A_1\lambda + A_2\lambda^2 + ... + A_n\lambda^n$ be polynomial quasi orthogonal of type I matrix. Here coefficient matrices $A_i's$ are quasi orthogonal of type I matrices. Where i = 1, 2, 3,.....n.

To prove (i) ⇒ (ii)

Suppose that $A_i's$ is an quasi orthogonal of type I matrix

To prove $A_i^{-1}$is an quasi orthogonal of type I matrix

Since , $A_i^k(A_i^T)^k = c^k I_n$, for some $k\epsilon\mathbb{N}$

So that, $A_i^k(A_i^T)^k = c^k I_n$

Taking inverse on both side

$(A^k(A^T)^k)^{-1} = (c^k I_n)^{-1}$

$(A_i^k)^{-1}((A_i^T)^k)^{-1} = (c^k)^{-1} I_n$

$(A_i^{-1})^k((A_i^{-1})^T)^k = (c^{-1})^k I_n$

Hence $A_i^{-1}$is an quasi orthogonal of type I matrix.

⇒ $A(\lambda)^{-1}$is an polynomial quasi orthogonal of type I matrix.

Hence all the coefficients of $A(\lambda)^{-1}$are quasi orthogonal of type I matrices.

Therefore $A(\lambda)^{-1}$ is a polynomial quasi orthogonal of type I matrix.

To prove (ii) ⇒ (iii).

Suppose A_i^{-1} is a quasi orthogonal of type I matrix.

To prove A_i^T is an quasi orthogonal of type I matrix.

Since , $(A_i^{-1})^k((A_i^{-1})^T)^k = (c^{-1})^k I_n$, for some $k\epsilon\mathbb{N}$

Taking inverse on both side

$$((A_i^{-1})^k((A_i^{-1})^T)^k)^{-1} = ((c^{-1})^k I_n)^{-1}$$

$$(((A_i^{-1})^T)^k)^{-1}((A_i^{-1})^k)^{-1} = ((c^{-1})^k)^{-1} I_n{}^{-1}$$

$$(((A_i^{-1})^{-1})^T)^k((A_i^{-1})^{-1})^k = ((c^{-1})^{-1})^k I_n$$

$$(A_i^T)^k A_i^k = c^k I_n$$

Taking transpose on both side

$$((A_i^T)^k A_i^k)^T = (c^k I_n)^T$$

$$(A_i^T)^k((A_i^T)^T)^k = (c^T)^k I_n$$

Hence A_i^T is an quasi orthogonal of type I matrix.

$\Rightarrow A(\lambda)^T$ is an polynomial quasi orthogonal of type I matrix.

To prove (iii) ⇒ (iv)

Suppose A_i^T is an quasi orthogonal of type I matrix.

To prove $\overline{A_i}$ is an quasi orthogonal of type I matrix.

Since, $(A_i^T)^k((A_i^T)^T)^k = (c^T)^k I_n$, for some $k\epsilon\mathbb{N}$

ie) $(A_i)^k(A_i^T)^k = c^k I_n$

Taking conjugate on both side

$$\overline{A_i^k(A_i^T)^k} = \overline{c^k I_n}$$

$$(\overline{A_i})^k(\overline{A_i^T})^k = (\overline{c})^k I_n$$

$$(\overline{A_i})^k((\overline{A_i})^T)^k = (\overline{c})^k I_n$$

Hence $\overline{A_i}$ is a quasi orthogonal of type I matrix.

To prove (iv) ⇒ (v)

Suppose $\overline{A_i}$ is an quasi orthogonal of type I matrix.

To prove A_i^* is an quasi orthogonal of type I matrix.

Since, $(\overline{A_i})^k((\overline{A_i})^T)^k = (\overline{c})^k I_n$,for some $k\epsilon\mathbb{N}$

ie) $(\overline{A_i})^k((\overline{A_i})^T)^k = (\overline{c})^k I_n$

Taking transpose on both side

$$((\overline{A_i})^k((\overline{A_i})^T)^k)^T = ((\overline{c})^k I_n)^T$$

$$(((\overline{A_i})^T)^k)^T((\overline{A_i})^k)^T = ((\overline{c})^k)^T I_n$$

$$(((\overline{A_i})^T)^T)^k(A_i^*)^k = (c^*)^k I_n$$

$$\because ((\overline{A_i}))^T = A_i^*)$$

$$((A_i^*)^T)^k(A_i^*)^k = (c^*)^k I_n$$

Hence A_i^* is an quasi orthogonal of type I matrix .

$\Rightarrow \overline{A(\lambda)}$ is an polynomial quasi orthogonal of type I matrix.

To prove (v) ⇒ (i)

Suppose A_i^* is an quasi orthogonal of type I matrix.

To prove A is an quasi orthogonal of type I matrix .

Since,

$((A_i^*)^T)^k(A_i^*)^k = (c^*)^k I_n$,for some $k\epsilon\mathbb{N}$

So that,

$$((A_i^*)^T)^k(A_i^*)^k = (c^*)^k I_n$$

Taking $*$ on both side

$$(((A_i^*)^T)^k(A_i^*)^k)^* = ((c^*)^k I_n)^*$$

$$(((A_i^*)^T)^k)^*((A_i^*)^k)^* = ((c^*)^k)^* I_n$$

$$(((A_i^*)^*)^T)^k A_i^k = c^k I_n \text{ s}$$

$$(A_i^T)^k A_i^k = c^k I_n$$

Hence A_i is a quasi orthogonal of type I matrix.

$\Rightarrow$ $A(\lambda)$ is an polynomial quasi orthogonal of type I matrix.

THEOREM: 2.9

Let

$A(\lambda) = A_0 + A_1\lambda + A_2\lambda^2 + \ldots\ldots\ldots + A_n\lambda^n$ be polynomial quasi orthogonal of type I matrix. Here coefficient matrices $A_i's$ are quasi orthogonal of type I matrices. Where i = 1, 2, 3,.....n.

The matrix $A_i's$ is quasi orthogonal of type I matrix of index k if and only if A_i^m is quasi

orthogonal of type I matrix of index k for each $m \epsilon R$

Proof:

Suppose that $A_i's$ is an quasi orthogonal of type I matrix.

To prove A_i^m is quasi orthogonal of type I matrix .

So that , $A_i^k (A_i^T)^k = c^k I_n$ for some $k \epsilon R$

Taking m on both side

$$(A_i^k (A_i^T)^k)^m = (c^k I_n)^m \quad \text{for } m \epsilon R$$

$$(A_i^k)^m ((A_i^T)^k)^m = (c^k)^m I_n$$

$$\text{ie)} (A_i^m)^k ((A_i^m)^T)^k = (c^m)^k I_n$$

Hence A_i^m is quasi orthogonal of type I matrix .

Conversely, suppose that A_i^m is quasi orthogonal of type I matrix for each $m \epsilon R$.

To prove $A_i's$ is an quasi orthogonal of type I matrix of index k.

Since $(A_i^m)^k ((A_i^m)^T)^k = (c^m)^k I_n$

Put m=1

$(A_i^1)^k ((A_i^1)^T)^k = (c^1)^k I_n$

For each $m \epsilon R$,

Each of A_i^2 and A_i^3 is quasi orthogonal of type I matrix of index k

So,

$(c^3)^k I_n = (A_i^3)^k ((A_i^3)^T)^k$

$(c^2)^k I_n = A_i^k (A_i^2)^k ((A_i^2)^T)^k (A_i^T)^k$, for A^2

$(c)^k I_n = A_i^k (A_i^T)^k$

is an quasi orthogonal of type I matrix

Hence $A_i's$ is an quasi orthogonal of type I matrix of index k.

THEOREM: 2.10

Let

$A(\lambda) = A_0 + A_1\lambda + A_2\lambda^2 + \ldots\ldots\ldots + A_n\lambda^n$ be polynomial quasi orthogonal of type I matrix. Here coefficient matrices $A_i's$ are quasi orthogonal of type I matrices. Where i = 1, 2, 3,.....n. If λ is an eigenvalue of an quasi orthogonal of type I matrix $A_i's$ with index k , then λ is modulus c^k.

Proof:

Let A be an quasi orthogonal of type I matrix with index k, then

$A_i^k (A_i^T)^k = c^k I_n$

$\Rightarrow (c^k)(A_i^k)^{-1} = (A_i^T)^k = (A_i^k)^T$

Since λ is an eigenvalue of A, the λ^k is an eigenvalue of A_i^k and $1/\lambda^k$ is an eigenvalue of

$(A_i^k)^{-1}$. A_i^k and $(A_i^k)^T$ have the same eigenvalues,

then $\lambda^k = c^k / \lambda^k$

So , $(\lambda^k)^2 = c^k$

Then $|(\lambda^k)^2| = |\lambda||\lambda|.....|\lambda| = c^k$

Since $|\lambda| > 0$ and real number, then we must have

$|\lambda| = c^k$

THEOREM: 2.11

Let

$A(\lambda) = A_0 + A_1\lambda + A_2\lambda^2 + \ldots\ldots\ldots + A_n\lambda^n$ be polynomial quasi orthogonal of type I matrix. Here coefficient matrices $A_i's$ are quasi orthogonal of type I matrices. Where i = 1, 2, 3,.....n.

The matrix $A_i's$ is quasi orthogonal of type I matrix. If A is an quasi orthogonal of type I matrix, then it preserves the inner product in the eigenvectors subspace .

Proof:

Let λ is an eigenvalue of A and x and y be eigenvectors corresponding to λ .

Then $Ax = \lambda x$ *and* $Ay = \lambda y$

So $\langle Ax, Ay \rangle = \langle \lambda x, \lambda y \rangle$

$= \lambda \bar{\lambda} \langle x, y \rangle$

$= |\lambda|^2 \langle x, y \rangle$

$\langle Ax, Ay \rangle = c^{k/2} \langle x, y \rangle$

EXAMPLE: 2.12

Let

$A(\lambda) = A_0 + A_1\lambda + A_2\lambda^2 + \ldots\ldots\ldots + A_n\lambda^n$ be polynomial quasi orthogonal of type I matrix. Here coefficient matrices $A_i's$ are quasi orthogonal of type I matrices. Where i = 1, 2, 3,.....n. If $A_1 = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ is quasi orthogonal of type I matrix , then $\det A_1 = \pm 4^{n/2}$.

Solution:

Given that A is quasi orthogonal of type I matrix

$$A_1 = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$$

Since $A_1 A_1^T = A_1^T A_1 = cI_n$

Thus , $A_1 A_1^T = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix} = 4I_n$

ie) $A_1 A_1^T = 4I_n$

$$A_1 A_1^T = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix} = 4I_n$$

ie) $A_1^T A_1 = 4I_n$

Hence $A_1 A_1^T = A_1^T A_1 = 4I_n$

So that , $A_1 A_1^T = 4I_n$

Taking determinant on both sides

$\det(A_1 A_1^T) = \det(4I_n)$ $(\because \det(aI) = a^n \det(I))$

$\det A_1 . \det A_1^T = 4^n \det(I_n)$ $(\because \det(I) = 1)$

Since, $\det A_1 = \det A_1^T$

That is $\det A_1 \det A_1 = \det(4I_n)$

$(\det A_1)^2 = 4^n$

$\det A_1 = \pm 4^{n/2}$

Hence $\det A_1 = \pm 4^{n/2}$

EXAMPLE: 2.13

Let

$A(\lambda) = A_0 + A_1\lambda + A_2\lambda^2 + \ldots\ldots\ldots + A_n\lambda^n$ be polynomial quasi orthogonal of type I matrix. Here coefficient matrices $A_i's$ are quasi orthogonal of type I matrices. Where i = 1, 2, 3,.....n. If coefficient matrix $A_1 = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$ is quasi orthogonal of type I matrix, then $-A_1, A_1^T$ *and* A_1^{-1} are quasi orthogonal of type I matrix.

Solution:

Given that A is quasi orthogonal of type I matrix.

$$A_1 = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$$

i) To prove $-A_1$ is quasi orthogonal of type I matrix.

$$A_1 = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$$

That is $-A_1 = \begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$

$$(-A_1^T) = \begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$$

$$-A_1(-A_1^T) = \begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}\begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix} = \begin{bmatrix} 9 & 0 \\ 0 & 9 \end{bmatrix}$$

$$-A_1(-A_1^T) = 9\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$=3^2 I_n(-A)(-A)^T = 3^2 I_n$

Similarly $(-A_1^T) - A_1 = 3^2 I_n$

Hence $-A_1$ is quasi orthogonal of type I matrix.

ii)To prove A_1^T is quasi orthogonal of type I matrix

$$A_1^T = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$$

That is $\left(A_1^T\right)^T = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$

$$A_1^T\left(A_1^T\right)^T = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix} = \begin{bmatrix} 9 & 0 \\ 0 & 9 \end{bmatrix} = 9\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$A_1^T\left(A_1^T\right)^T = 3^2 I_n$

Similarly, $\left(A_1^T\right)^T A_1^T = 3^2 I_n$

Hence A_1^T is quasi orthogonal of type I matrix.

iii) To prove A_1^{-1} is quasi orthogonal of type I matrix

$$A_1 = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$$

To find: A_1^{-1}

$$A_1^{-1} = \frac{1}{|A_1|} adjA_1$$

$$adjA_1 = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$$

$$|A_1| = \begin{vmatrix} 3 & 0 \\ 0 & 3 \end{vmatrix}$$

$|A_1| = 9 - 0 = 9$

$$A_1^{-1} = \frac{1}{9}\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$$

$$A_1^{-1} = \frac{1}{3}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\Rightarrow (A_1^{-1})^T = \frac{1}{3}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$A_1^{-1}(A_1^{-1})^T = \frac{1}{3}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\frac{1}{3}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \frac{1}{9}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} =$$

$$(9)^{-1}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$A_1^{-1}(A_1^{-1})^T = (3^2)^{-1} I_n = (3^{-1})^2 I_n$$

$$A_1^{-1}(A_1^{-1})^T = (3^{-1})^2 I_n$$

Similarly, $(A_1^{-1})^T A_1^{-1} = (3^{-1})^2 I_n$

Hence A_1^{-1} is quasi orthogonal of type I matrix.

Here, k = 1 proved. Similarly we have to prove k = 2, 3, 4…….

CONCLUSION

In this paper some properties of polynomial quasi orthogonal of type I matrices are derived and also we extended to some results of polynomial quasi orthogonal of type I matrices.

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ROLE OF COOPERATIVE PRIMARY AGRICULTURAL CREDITSOCIETY AND ORGANIZATION STRUCTURE IN INDIA

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ABSTRACT

Primary Agricultural Credit Societies (PACS) are the Kernel of the Cooperatives movement in India. They are the very foundation stone of the cooperative credit structure and constitute the largest number, of cooperative institution in India. The organization of Primary Agricultural Credit Societies (PACS) dates back to 1904, when the first Cooperative Credit Societies Act was passed. These societies function at the village level the short-term the cooperative agricultural credit structure. In this unit, you can learn the functions and the resources of primary agricultural credit societies.

INTRODUCTION

Agriculture is the backbone of India's economy and the improvement in agricultural productivity is of paramount importance today. Agriculture like any other industry requires credit. For accelerated development of the agricultural sector, it is essential that the farmers should be provided with the pre-requisites like fertilizers, improved seeds, irrigation facilities, modern implements, organized marketing facilities etc. Without adequate and timely credit farmers cannot make use of essential inputs.

IMPORTANCE OF COOPERATIVE CREDIT

The cooperative movement started in the pre-independence period in order to develop rural areas. Cooperation itself is a rural concept. In most of the countries of the world, an attempt has been made to develop institutional credit for agriculture in cooperative lines. The cooperative form of organization is considered best for providing credit to the farmers. Importance of cooperatives in rural credit had been highlighted by Reserve Bank of India in its statutory reports in 1937. The report observes that, "an agency which satisfies the requisite conditions for agricultural finance is the cooperative society and it has so recognized in almost all agricultural countries.

In 1945, the Agricultural Finance sub-committee was of the view that the spread of cooperation would provide the best and the most lasting situation for the problems and of the rural economy in particular.

Grow More Food Enquiry Committee, 1952 emphasized the need for cooperatives in the following terms. "It would be useful at this stage to stress the great part of cooperative movement can and should play an improving rural life. The cooperative principle, in its infinitely varying forms, is capable of adoption for finding a solution to all problem of rural life. In fact, it is only in the cooperative principle that such a solution can be found.

Thus cooperative credit institutions have an important role in providing not merely a facility of credit but a safe and productive credit. In fact, every act and effort of obtaining cooperative credit educates and guides the borrower; it teaches the borrower the lesson of mutual and self help. Besides, the cooperative institutions develop strong feeling of responsibility amongst the members for prompt repayment loans and interests. It also provides incentives to thrift and savings.

Classification of Cooperative Loans

Financial requirements of the farmers can be classified into three types based on duration and purpose. There are:

i. Short term (S.T) Loans: The period of this loan is less than 15months. The purpose of this loan is to buy various agricultural inputs such as seeds, fertilizers etc.

ii. Medium term (M.T) Loans: The period of this loan is ranging from 15 months to 5 years for making some improvements on land, buying cattle, implements etc.

iii. Long term (L.T) Loans: Period of this is more than 5 years to 15 years. Purpose of this loan is buy costly agricultural implements such as tractors etc., and for making permanent improvement on land.

ORGANIZATION STRUCTURE OF COOPERATIVE CREDIT

The cooperative movement in India began with the setting up of cooperative credit of, institutions. Gradually, the movement spread to embrace other fields of agricultural activities: such as marketing, processing, etc. The various credit cooperatives in India can be broadly grouped into two categories such as credit societies and non-credit societies.

From the above chart it is clear that there are two separate cooperative agencies for the provision of agricultural credit one for shout and medium term credit, and the other for long term credit.

S.T and M.T Credit structure has a three tier institutions consisting of state co-operative bank at the state level. Central cooperative bank at the district level and the primary agricultural credit societies at the village level.

The long term cooperative credit is provided by the Land Development Banks (LDBs). It consists of two tiers only viz; Central Land Development Banks (CLDBs) at state level and Primary Land Development Banks (PLDBs) at taluk level. At present the primary Land Development Banks are renamed as Primary Agricultural and Rural Development Banks and the Central Land Development Banks are called as State Agricultural and Rural Development Banks.

Three Tier Cooperative Structures

The short and medium term cooperative credit structure is federal in character. These institutions are constituted an integrated system for mobilizing resources and an effective means of supplying credit.

The constitution of a cooperative banking institution at the apex was considered essential as early as in 1915. The Maclagan Committee emphasized the need for having an apex bank in each major provides to coordinate and regulate the working of central cooperative banks. The apex bank at the state level operates as a balancing centre for the resources of the movement in the entire state. At the top of the federal structure it derives its strength from its affiliated institutions. In return it helps by way if its contracts with Reserve Bank of India. It is the federal character which ensures smooth running of all the affiliated institution. The apex bank provides the link between the Reserve Bank of India and the money market on the one hand and the entire cooperative credit structure on the other. Thus, the state cooperative bank occupies a key position in the entire structure of short term and medium term cooperative credit.

The position Central Cooperative Bank is of crucial importance in the cooperative credit structure. They form an important link between the state cooperative bank at the apex and the primary agricultural credit societies at the base. The Maclagan Committee suggested that the term “Central Bank” should be applied to all local financing institutions directly financing the primary societies. The Standing Advisory Committee on Agricultural Credit Constituted by the Reserve Bank of India recommended that as a general proposition. These should be one central cooperative bank for one district. This view was also expressed by the All India Rural Credit Survey Committee. A programme of rationalization of the Central Cooperative banking Structure was taken up in various states during the Second Five Year plan period. This was carried on by merger or amalgamation of uneconomic or weaker units with a view to have one strong viable central bank in each district.

Organization Structure of PACS

The credit societies are registered under the provisions of cooperative societies Act of respective state. In Tamil Nadu societies were registered under 1904, 1912, 1961 Acts. Now, the Tamil Nadu cooperative societies Act 1983 is in force. The power of Registration vests with the Registrar of cooperative societies. 25 members are minimum members required to register a society. A society is registered along with the Bye laws on the society. It contains all the rules and regulations relating to the working of the society, minimum requirement of membership and the area under cultivation. After considering the scope for successful the Registrar registers the society.

1. **Area of operation:** It is difficult to demarcate definite area of operation of a society for its functioning as it involves certain factors such as population of the village, lands available for cultivation, nature of the crops raised, irrigation sources, requirements of the people existing arrangement etc. MACLAGAN advocated one society for one village within a radius 3 or 4 miles. In the year 1958 N.D.C also adopted a resolution favouring the same pattern. The council advocated the following reasons.

1) The members should have mutual knowledge among themselves Raiffeisen too believed.
2) They should have easy access to the society.
3) Involvement or participation of members in the affairs of society becomes easy
4) Proper conduct of the affairs of society in a democratic way.
5) Proper utilization of the loans for the purposes for which they were meant.
6) Provision of credit and other inputs, services to its members.
7) There should not be any difficulty in collection of the dues (outstanding). However later, it was observed by All India credit survey committee that the pattern of one society for one village has failed and recommended large sized society for viability and further progress. Small societies were reorganized so as to make them viable consisting of a few villages.

2. Membership:

By laws of each society provides qualifications for membership. A person who resides or owns lands in the area of operation of the society can become a member if they had attained the age of majority (that is 18) Lunatic, insolvents, minors, are not qualified for membership. Those who do not own land are admitted only as 'B' class members for receiving Jewel Loans and other services. The societies have to point out the reasons for non-admission. By collecting share capital and entrance fees and after necessary resolution passed by the Board, the society admits fresh applicants. The present Act 1983 provides effect to the membership on the data of Remittance of required share capital and entrance or admission fee without the Resolution of the society.

3. Liability

During initial years, societies were registered under unlimited liability. In the event of loss and liquidation of the society the deficit to the assets of the society will be made good from the members of the society. The members may have to lose their property. This was a main hurdle in organizing more number of societies at the beginning. As the members are jointly and severally responsible in respects of all its obligations and to contribute to any deficit in the assets of the society. It created a sense of insecurity among the people. Therefore, later committees recommended the organization of credit societies with limited liability. This means the liability of member is limited up to the extent of share capital subscribed by him.

4. Management:

In the management of society, its general body consisting all of its members, is the supreme authority. The general body elects a Managing Committee of 7 to 15 members on the principle of "one member, one vote". Representation should be given to women (30%) and scheduled caste and scheduled tribes (18%) on the managing committee. The president, Vice-President and Treasure

are elected among the board of directors. The committee is nested with the powers to appoint a Secretary and other staff required to run the administration of the society.

Resources of PACS

PACs require adequate resources in order to discharge their functions. They are raised both internally and externally. The internal resources consist of share capital, entrance fee, reserves created, and various deposits from members. Loan from central cooperative banks and loans, grants and subsidies from the Government belong to the second category.

1) Share Capital:

Primary Agricultural credit societies raise their own funds mainly by way of share capital. The value of share capital is kept very low Rs.10/- as to facilitate farming community to become members. As maximum borrowing power is dependent on its owned funds, the societies have to raise their share capital and this is being done by linking share of the members to their borrowings. Government holds large amount of shares in large sized societies. As per the recommendation of survey committee 1954 state participation in share capital has become a by word. Owned funds enable the societies to undertake non-credit activities like distribution of essential commodities under public distribution system, village shop scheme. Further the central cooperative banks do not have such provisions for finance for such purposes. The hall mark of a good society is its viability – that is a self-reliant society which can stand on its own legs – namely managing the affairs of society with its own sources of funds.

Borrowing of Share Capital: MEHTA Committee suggested raising share capital to link the borrowings with the share capital of the members. Through such measures the credit societies can raise the needed share capital resources. The borrowings of an individual may not exceed & to 10 times his paid up capital in the society. The Bye-laws of the societies should contain specific provisions to secure this linkage.

2) Reserves:

Reserves are created to meet unforeseen losses and debs of the societies. Reserves of Primary credit societies composed of statutory reserve. Special bad debt reserve, risk fund and other reserves. They serve as security for borrowings from higher financing agencies. The Reserve fund wholly belongs to tile society and it can be utilized. To help the marginal farmers a special bad debt Reserve was credited and the National cooperative Development Corporation and the state Government agreed to share on 50-50basis. The total reserves of the primaries stood at Rs.8.86 crores in 1950-51 which increased to Rs.13.80 crores in 60-61 and further to 56-57crore in 70-71, in 80-81, it stood at Rs.166.59 crores. This was just 5 percent of the total working capital.

3) Deposits:

It is one of the important components of working capital. Mobilization of deposits locally by the Primary Agricultural credit societies is an ideal method of raising sufficient capital for lending it is second line of weapon to strength the armory of capital structure of a primary.

4) Borrowings:

It is a major source of the working capital of primary. Society mobilizes adequate funds internally by inculcating the habit of thrift and saving among members. To meet the credit needs of its members, the borrow from central cooperative banks. Government and commercial banks. Government borrowings including Loans. Grants Subsidies etc. Borrowings from central banks include Loans. Cash credits and overdrafts.

Individual and Society Maximum Borrowing Power

Ceiling on borrow 1% for individual is fixed. Under the crop system though, the members are eligible to get credit on the basis of per acre credit limit fixed by the central bank a member cannot get credit over and above a particular limit which varies from state to state. The ceiling is fixed irrespective of the maximum acre-age of lands held by an individual. The ceiling is fixed by taking into

account the following factors (1) To provide credit to a maximum number of farmers. It a few monopolizes the resources, other weaker section may be deprived of credit (2) Such ceiling is fixed to stop misuse of loans or Diversion of loans for unproductive purposes (3) The farmers who need large amount of loans are affluent farmers and they may have necessary resources of their own (4) When the concentration is focused forwards small farmers to meet the full credit needs ceiling is essential NABARD has directed the central banks to issue 25 percent of the loans to weaker sections.

Maximum Borrowing Power of a Society

In case of a liability society, it can borrow only up to a multiple (usually 8 times) of their owned funds. Unlimited liability societies can borrow usually 1/8 of their net asset. This maximum Borrowing power includes the borrowings from C.C.B. and others and borrowing by way of deposits. To increase its Maximum Borrowing power, a society must increase its owned funds. NABARD has relaxed this limit in case where banks finance small farmers in areas where special agricultural schemes are launched.

Functions of Primary Credit Societies

The following are the important functions of primary credit societies.

1. Raising of adequate resources and supply of adequate and timely short and medium term credit.
2. Supply of necessary inputs required by members.
3. Undertake marketing of agricultural products.
4. Supply of certain consumer goods.
5. Inculcate thrift and self help among the members.

The committee on cooperative credit chaired by MEHTA V.L 1960 enlisted the following function discharged by a credit society.

1. To associate itself with programmes of production.
2. To lend adequate loans to all producers particularly agricultural producers and increasing to small farmers.
3. To provide to a limited extent loans for consumption purpose to small farmers and agricultural laborers depending on their repaying capacity.
4. To raise adequate funds internally or from the financing agencies for the above purposes.
5. To supply inputs like seeds, fertilizer, implements, and insecticides either on its own behalf of as agent.
6. To supervise the utilization of loans.
7. To supply certain consumer goods in common demand such as rice, wheat, kerosene, sugar etc.
8. To store members produce, to sell at advantageous prices.
9. To recover the loans promptly.
10. To collect or purchase produce, where necessary on behalf of a consumer society, marketing society or Government.
11. To attract local savings as deposits and
12. To undertake certain social welfare activities for the benefit of members.

Characteristic Features of a Sound Loan Policy

An important aspect of cooperatives finance lies in it sounds loan policy and it must ensure. (a) Simplicity in procedure (b) Adequate of loans (c) timely disbursement of loan (d) Reasonable cost of credit (d) Supervision combination with technical guidance (f) Scientific repayment procedure (g) Stabilization measures.

Credit Society Provides short-term and medium term loan to the members to agricultural purposes. The society prepares A.C.L. (Annual Credit Limit) Applications and gets them sanctioned by the central bank in advance. This statement contains the details such as crop raised in the area, sources of irrigation, number of acres available, the amount of loan required etc. At the time of need actually, the amount is drawn from this limit for agricultural operations. Medium term loans are sanctioned for erection of pump sets purchase of bullocks, milk cows and agricultural implements; both the short term and medium term loans are sanctioned as per the scales of finance fixed by the technical group convened by the Central

Bank Loans are sanctioned on personal securities to the borrowers. The personal security is fled on Triangle basis as A to B, B to C, and C to A. Landless agricultural laborers small and marginal farmers are also sanctioned loans. Under crop loan system loans are sanctioned in cash and kind components by the society. Short term loans are sanctioned far a period of 6 to 15 months and medium term loans are sanctioned for the period of 15 months to 5 years.

Other activities:

The Credit Societies undertake other functions to provide various services to the members. It deals in controlled articles and others supplied by the civil supplies corporation and marketing societies at reasonable prices. Agricultural machinery such as tractor, power sprayer are maintained by the society and hired for its members. Societies deal in fertilizers and pesticides are retailers of marketing society and distribute them to members both for cash and credit. They also supply HYV of seeds and agricultural implements to the members at reasonable and concessional prices. Certain societies have godown and the farmers store their produces in them and they are also sanctioned pledge produce loans. The farmers can sell their produces at the appropriate time and have better prices. The credit societies disburse jewel loans to the members of the society.

Problems of PACS

Today almost all primary cooperative societies are facing serious problems. The important ones are discussed below:

1. **Non-viable units:** The base of the movement namely Primary Agricultural Credit Societies are feeble and non-viable. Most of them have poor membership and are working with inadequate working capital, only few societies satisfy the minimum criteria of viability. All India Rural Credit Review Committee 1969 stated "A large number of primary societies are neither viable and must be regarded as inadequate and unsatisfactory agencies for dispensing production oriented credit". Further the need for reorganization of societies into viable units has been largely recognized by the states, concrete action to put the policy into practice has been lacking in several states.
2. **Dormancy of Societies:** Many Primary Agricultural Credit Societies are lying dormant, as on 20th June 1977, 9263 societies covering 35306 villages were dormant. They constituted 7% of tine total societies several of the societies which have been classified as activate of non-dormant have in fact been doing token business and cannot be considered active.
3. **Uneven growth:** The credit movement has not developed on a uniform basis in the country. There is marked disparities region wise, and unevenness in its development. The proportion of rural population served by Primary Agricultural credit societies was 80% in Karnataka 69% in Tamil Nadu 52% in Maharashtra while in Assam. West Bengal and Bihar this proportion was as low as 15%, 23%, and 28% respectively. Even within the same state, there are interregional disparities. In A.P such disparities are marked between Rayalseema and Telengana Regions on the one hand coastal areas on the other.
4. **Inadequacy of credit:** The Quantum of loan supplied by them is not only adequate. It is far below even the absolute Minimum credit requirements of the farmers. Average Loan advanced by these societies' works out to be about Rs.677 per member which is by no means satisfactory. In such cases, the farmers have to recourse to usurious money lenders. Just 40 percent of its members borrowed from the society. Review committee stated, "Cooperative credit has frequently fallen short of standards of timeliness, adequacy and dependability.
5. **Defective loan policies:** The Agricultural Credit societies in most of the states have not re-oriented their loan policies according to the crop loan system. Following defects are still to be observed in their lending operations.

a) No proper timings for either disbursement or recovery of loans.
b) Entire loan is let out in lump sum once in a year instead of being paid in installment.
c) Loans in kind are not generally given
d) Loans are still given on the security of landed property and not on anticipated crops.

6. **Delay in loan disbursement:** There is inordinate delay on the part of lending agencies in actual disbursement of loans. There is a big time lag between the loan application and its disbursement. The process is delayed by a period of 3 to 4 months.
7. **Inadequate Supervision and Defective audit:** There is no satisfactory arrangement for strict supervision over the proper utilization of loans by A.C.S to their members; neither the members of the managing committee keep a watchful eye nor the inspection staff usually vigilant in this matter. This ineffective supervision has led to a number of abuses in the working of these societies. A Good deal of loans given by these societies a good deal of loans given by these societies being misused.
8. **No Linking of credit with making:** The success of the crop loan system was dependent on the condition that A.C.S should be able to forge an organic link with the marketing societies. However, so far, credit has not been effectively linked with marketing. They do secure agreement that the members would sell their produce through the marketing societies, in practice such agreements are not taken seriously either by the members who sign them or by the A.C.S who takes them or by the A.C.S who takes them.
9. **Crippling problem of over dues:** It is a serious problem to the short-term cooperative credit structure. Mounting over dues crode the financial resources of an institution and ultimately cripple its normal working. In other words, the test far sound working of a cooperative institution is the over dues. It is their laxity which leads to this over dues. As the resources are not their own, they are not much worried about their recovery willful default is considered to be the most dangerous trend and has created a complacency among prompt members.
10. **Ineffective management:** The above problems arise on account of inefficient and ineffective management members of the management do not take sufficient interest in the working of their societies. In some of the society's annual General Meetings are-not held regularly. Most of the societies do not have trained or paid secretaries or managers.
11. **Absence of thrift:** Societies have not succeeded even on a modest scale to tap the savings of the rural masses. Nobody lays any emphasis on this aspect. So long as the habit of thrift and savings is not encouraged among the rural masses, it will have to be admitted that the Agricultural credit movement has failed in India.
12. **Domination of vested interest:** Affect the working in primary agricultural credit societies adversely. Political parties are increasingly using these societies to perpetuate their hold on the rural masses. Leadership of many societies has gone in the hands of money lenders, Jagirdars and politicians. Sometimes, the members of the rival group persuade people not to repay the dues so as embarrass the group to which the ruling management belongs.
13. **Neglect of small farmers:** They have not helped small farmers. Large slice of the cooperative finance was taken up by the big and large farmers. Just 15% of the cooperative credit had gone to those having 5 acres or less, 39 percent to those having 5-10 acres and 46 percent to still larger land – holders.

D.R.GADGIL summed up to the weaknesses of tine cooperative credit as under:

"The main short comings of the cooperative credit system which vary from state to state are the problems of overdue. Indifferent managements, dominance of cooperatives by vested interests, shortage of resources, lack of efforts to mobilized deposits, untrained staff/and weak

arrangements for linking credit with marketing".

Performance of PACS at a glance

Primary Agricultural Credit Societies including LAMPS and FSS

Value Rs. in million	**2017 – 18**	**2018 - 19**
Villages Covered by PACS	100%	100%
Total No. of PACS	100,604	95,670
% of Viable PACS	65.4%	65.5%
Total membership (million)	109.8	102.8
Total share capital	Rs.36,194.3	Rs.43,086.5
% of Government participation	13%	10.3%
Total Deposits	Rs. 109,961.6	Rs.131,353.2
Total Reserves	Rs.16,805.9	Rs.21,050.6
Total Loans advanced	Rs.247385.7	Rs.293,264.4
(a) % of ST Loans advanced	84.1%	80.3%
(b) %of MT Loans advanced	15.5%	18.1%
Total Working Capital	Rs.440,833.3	Rs.493,729.0
Total Demand	Rs.272,281.6	Rs.323,558.0
Total Overdue	Rs.95899.6	Rs.110886.2
% of overdue to demand	35.2%	34.3%
Agricultural requisites distributed	-------	Rs.19,687.4
Consumer goods distributed	-------	Rs.9465.8

Large Sized Adivasi Multi – Purpose Societies (LALMPS)

There are 357.56 lakhs of tribal population in India and most of them are illiterates. By capitalizing their illiteracy they are exploiting in many ways. There had work goes fruitless and the middle men enjoy the benefits derived from their sincere and hard work. They collect forest products and sell them at cheaper rates without knowing even the real values of the produces. But their life is full of stress and strain and risky, too. Their standard of living is very poor and there is no proper arrangement for providing them credit and other facilities. Keeping in view their difficulties and problems, it was considered necessary to have special types of societies for their welfare.

1. **Share Contribution by the Government:**

Large-sized Multi-purpose societies in the tribal areas were on the pattern recommended by the Bawa committee (1971). These societies are eligible for share capital contribution by the Government up to Rs.1 Lakh irrespective of their overdue. Small-sized tribal societies are eligible for Share contribution by the Government to the extent of Rs.15,000/- normally and a maximum of Rs.50,000/- on the merits of each case. These societies are functioning in Tamil Nadu since 1976-77.

2. **Organization:**

Societies have been organized under the scheme of intensive Tribal Development programme to provide the tribal population, the integrated credit, marketing and all other services for their economic development.

3. Services Undertaken:

a) Provision of short, medium and long term loans for agricultural purposes.
b) Provision of agricultural inputs.
c) Provision of domestic requirement.
d) Provision of technical advice and guidance.
e) Marketing of agricultural produce.
f) Provision of credit for consumption and social obligations.
g) Mobilization of deposits.
h) Collection and marketing of forest products; Consumption loans are provided to a maximum of Rs.100/- per member and the rate of interest charged is 14% for all loans taken by them.

4. Management

These societies are managed by a committee of members as shown below (a)Tribal Members = 6

(b) Non –Tribal Members=2

(c) Officials = 7

The official members are drawn from Revenue, Forest Animal husbandry, Horticulture and Cooperative Departments. A representative of the financing bank will also be a member in the board of management.

The presidents of the societies are appointed by the Registrar; there may be either officials or non officials.

The committees of management also nominated by the Registrar.

The society should have a competent and adequately qualified General Manager and other technical officials to undertake various activities. The State Government should agree to subsidy the cost of the General Manager and other members of the staff during the gestation period.

5. Share Capital Subsidy:

Share capital subsidy is granted at the rate of Rs.50/- tribal family.

Government assistance

1) Share Capital participation.
2) Construction of godown 50 percent.
3) Share capital subsidy.
4) Interest subsidy
5) Risk fund subsidy
6) Managerial subsidy
7) Price fluctuation fund subsidy
8) Assistance for vehicle and driver.
9) Assistance purchased of furniture.
10) Subsidy for the quarters of Managing Director and other members of the staff.
11) Sheds and rooms.
12) Plough bulls subsidy.
13) Training cost

The staff of the department is also sanctioned at free cost.

6. Financing Bank:

The Society should prepare Annual credit limit applications get them sanctioned every year by the central cooperative bank to which it is affiliated. The bank charges interest at 4 percent. They are providing integrated credit, marketing and all other services. They are assisted by Government liberally LAMPS extend financial assistance to meet the needs of tribal members who carry on agricultural operations. Governments are subsidizing interest margin. Government takes welfare measures through LAMPS for improving economic conditions of tribal people.

Thus 18 LAMPS in Tamil Nadu are functioning for the social and economic development of the poor tribal. “16 societies are situated in integrated Tribal development project (I.T.D.P) areas and the remaining 2 societies are in Non-integrated Tribal Development project. (Non-ITDP areas)

The Farmers Service Societies (F.S.S.)

The farmers require not only credit, but also timely availability of inputs and allied services. The small farmers, managerial farmers and agricultural labourers have not been provided with credit and other services to the extent necessary. They require technical advice and services such as storage processing, marketing and transportation facilities at a single point. The existing cooperative institutions are not able to

provide all these services to the weaker sections. Recognizing these aspects, the National Commission on Agriculture recommended the organization of Farmers Service Societies, one for each block or any other viable unit of a convenient size, consisting of 10 to 20 villages. The recommendation of the National Commission on Agriculture was accepted and the F.S.S. was organized since 1973-74. These institutions were organized in the cooperatively under developed areas.

1. Objectives

a) The main objectives of the F.S.S. is to help the small farmers, marginal farmers, agricultural laborers and artisans by providing credit and integrated services, employment opportunities and distribution of consumer goods.
b) To provide short-term, medium term and long term loans.
c) To coordinate with other agencies to produce, purchased and supply of agricultural inputs, cattle feed, raw material and machinery for agricultural and small-scale industry.
d) To sell all the producers of agricultural and the products of the other industry.
e) To maintain stud bulls, rams etc.
f) To own or hire processing units and godowns.
g) To maintain model farms.
h) To own or hire agricultural machinery, tractor, power tiller, bull-dozer, sprayer, etc.
i) To act as the agent to land development banks and marketing societies for issue of loans and recovery.
j) To borrow funds from cooperative and commercial banks for members and non-members.

2. Size of Society

The smaller type of society would cover a compact area with a population of about 10,000. The bigger society would cover a Whole National Extension Block. A society with a Block as its area of operation should open branches necessary to serve the people effectively Appointment of Technical staff.

Three subject matter specialists, one each for poultry, dairy and agriculture will be appointed. One subject matter specialist for each branch of the services society should also be appointed. Among the three, one will be an Agricultural Extension officer and the other two will be village level workers who will also be technically nullified. The salaries of the technical staff will be subsidized by the state Government for a period of five years.

As the successful working of the F.S.S. depends upon the effective local participation and leadership, the State Government play an active role in developing the societies.

3. Capital

The value of one share is Rs.20 for regular members and Rs.10 for nominal members. Government shall purchase shares at the rate of Rs.500/- per share. Other cooperative organizations also contribute to the share capital of F.S.S.

Conclusion

Primary Agricultural Credit Societies (PACS) are the kernel of the cooperative movement in India. These societies are functioning at the village and offer short term and medium term credit. A person who resides or owns lands in the area of operation of the society can become a member if he had attained the age of 18. The sources of funds of PACS can be classified as internal sources and external sources. The internal sources consist of share capital, entrance fee, reserves and deposits from members. Loans from central cooperative banks, loans grants and subsidies from the government are the external sources of funds. Raising resources, timely short and medium term credit, supply of necessary inputs to members, undertaking marketing of agricultural products, supply of certain consumer goods, inculcating thrift and self help among the members are the functions of primary credit societies. Today almost all PACS are facing many problems.

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SMART DRIP IRRIGATION FOR EFFICIENT USE OF WATER MANAGEMENT AND CONSUMPTION USING IoT ENABLED SYSTEMS

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ABSTRACT

The smart water irrigation system developed by our team is an adaptive plants and crops irrigation system. The purposes of our smart water irrigation system are to provide a water delivering schedule to the crops to ensure all the crops have enough water for their healthy growth, to reduce the amount of water wasted in irrigation, and to minimize the economic cost for the users. Our system takes in real time data of the water content of the plant as input argument, combines it with other parameters such as water cost schedule and precipitation on the crop field, runs the designed linear optimization system periodically and outputs the most efficient amount of water the plants need, which is translated by a specific actuation time of the water pumps. The linear optimization system, which is essentially the brain of our system, is able to make decisions for the users when to distribute water into the crops fields and how much water should be delivered. Given the number of factors to take into account and the different crop requirements to take into account for each type of plant, this problem because much too complex to solve through simple management methods and has to be supported by automated systems such as the one provided by our group. This concept presents the design of IOT based water flow system that stores and retrieves information from cloud. The use of Arduino or Rasperry pi is used as the interfacing unit that connects cloud and mobile apps for controlling the system. This system Saves water and preserve water for future use. Future technology of IOT is introduced. It implements an automated system for water management process. Preserve more water during the course of crop yield. Automatic process is initiated. Alert mechanism is done using mobile apps/system. Controlling data using cloud store.

***Keywords**: Smart irrigation, IoT cloud control, Water consumption, efficient irrigation system, IoT in agriculture*

INTRODUCTION

Problem Definition: Need of the system

India agriculture's revenue occupies 12% of the total revenue of agriculture. At the same time, the agriculture in India consumes 80% of water usage of the state, not including some other water activities such as groundwater extraction which may potentially increase this figure to a higher level. The drought in India covers almost 75% in agriculture lands has lasted for four years, which already causes huge economic loss to this market. Farmers have generally changed the types of crops which consume less water to maintain their business. While if there is not an ultimate solution to increase the irrigation systems in India now, there is going to be a catastrophe on agriculture market.

Therefore, this project develops smart water irrigation system to save the water sustainability of the regional area, to maintain the crop fields environmental friendly by preventing soil and earth from getting flooded or dried, and, most importantly, to save economic cost of water usages for the farmers and for the whole market. While several different environmental factors play a key role in agricultural productivity, this project focuses purely on the water consumption aspects of agriculture. The project is a scaled version, as much in size as in complexity, of what agricultural estates experience on a daily basis.

With water being such a crucial focus of Indian agriculture nowadays, several different water economization techniques and procedures have been put into practice already. Drip system irrigation is becoming

more and more generalized and drought resistant crops are starting to replace too heavy water-consuming plants. However, following a study initiates the method enabling the largest amount of water saving is through the installation of smart irrigation systems, as shown in the graph below:

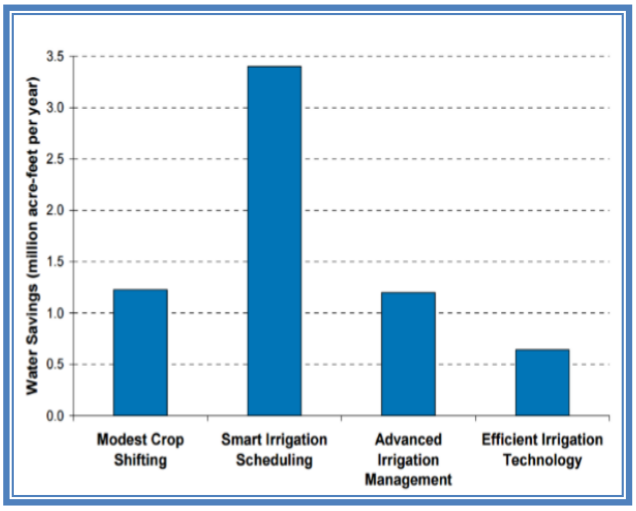

Fig 1: Water consumption methods

The modest crop shifting is able to save approximately 1.25 million acre-feet per year, the advanced irrigation management is able to save about the same amount of water and the efficient irrigation technology will also save around half a million acre-feet per year. However, the smart irrigation scheduling, which is essentially the concept smart water irrigation system is adopting, can save more the total of all these alternative irrigation methods. This is also the reason our work would like to increase the irrigation system efficiency using the smart irrigation scheduling instead of other irrigation methods or concepts.

Scope

The agriculture system is not guided using automated system and cloud store as the cost involved is huge. IoT mechanism is not used for water management process and controlled via smart applications. The absence of cloud store will not store the automated processing data and no data management is done. The focus of the smart water irrigation system, using the linear optimization designed, is to provide a comprehensive water delivering schedule which could both ensure that plants could have enough water for their growth and costs the minimum money for the water usage. The focus of the study is also trying to make all the information visual to the user and take in user defined input as new parameters into the linear optimization system using smart drip irrigation using cloud and mobile apps.

LITERATURE SURVEY

Yunseop (James) Kim et al, “Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network”, IEEE transactions on instrumentation and measurement, vol.57,no.7, pp.1379- 1387, July 2018 address the need for smart irrigation for controlling the data via remote sensor. The data received are distributed and uses wireless sensor for controlling the overall activities of the smart drip irrigation.

Mahir Dursun and Semih Ozden,” A wireless application of drip irrigation automation supported by soil moisture sensors”, Scientific Research and Essays Vol. 6(7), pp. 1573-1582, 4 April, 2017**.** This work focus on implementing automated drip irrigation for formulating the process using soil moisture. The automation is done with predefined system for sensing soil moistures. Based on the soil moisture the functionality of drip irrigation is set. The impact of wireless application targets soil moisture and the drip level is set based on the moisture level.

Gracon H. E. L. de Lima et al, “WSN as a Tool for Supporting Agriculture in the Precision Irrigation”, 2010 Sixth International Conference on Networking and Services, pp.137-142, 2017.

K.Prathyusha1 et al, “Design of embedded systems for the automation of drip irrigation”, IJAIEM Volume 1, Issue 2, October 2017.

Yiming Zhou et al, "A Wireless Design of Low-Cost Irrigation System Using ZigBee Technology", IEEE 2009 International Conference on Networks Security, Wireless Communications and Trusted Computing, vol. 1, pp.572 – 575, 2009. This work develops low cost irrigation system as the current irrigation system needs more

investment.

EXISTING SYSTEM

The architecture of our cyber-physical system starts from the infrastructure, which are the crop plants. In the crop field, there are two types of sensors: the drip and the liquid flow meters sensors, which will be elaborated in the Hardware Components. The soil moisture sensors generally tell the current water content of the crops, and the liquid flow meters will tell the amount of water has been delivered. An additional advantage of the flow meter is that it enables to water flow in the irrigation network and provide less consistent water resources.

The data collected using model gives optimized solution and send the data back to the database. Now, a web visualization model will be established and all the data from the database will be presented as plot on the dashboard using cloud store controlled by mobile apps. Users can able to control the drip flow by switching it on/off using mobile controlled devices. The database, now containing the optimized solution, will send data back to the actuator, which is the pump in the crop field, to distribute and deliver water as expected.

In existing system the following are considered as key problem for implementing smart drip irrigation. The agriculture system is not guided using automated system and cloud store as the cost involved is huge. IoT mechanism is not used for water management process and controlled via smart applications. The absence of cloud store will not store the automated processing data and no data management is done

PROPOSED SYSTEM

IoT unit:

The system consists of the following units:

- **Drip sensor motor** – circulate water for crop using IoT mechanism
- **WiFi-Shield** – controls IoT unit and extends the functionality in remote place
- **Mobile** – Controlling the overall system and provide interface to the drip irrigation and cloud store
- **Drip tubes and wire –** Manually sends water to the crops in the field
- **Arduino** – Embedded board that controls the overall system

There are a number of possible difficulties that the software must be able to cope with. These include:

1. No automated system using Mobile app and cloud

2. No proper system control

3. Poor lighting and low contrast due to overexposure, reflection or shadows.

4. Remote extension of IoT system that is operated even at long distance based on coverage area.

5. A different font, popular for vanity plates (some countries do not allow such plates, eliminating the problem).

6. Lack of coordination between IoT and overall system.

RESULTS AND DISCUSSIONS

- **Arduino Uno**: Arduino is our microcontroller, which can receive the data collected by sensors and send signals to control the actuators. It's also connected to computer, which can send data and receive data from computer. The data received is controlled using mobile apps and cloud
- **Liquid Flow Meters:** Liquid Flow Meter sits in line with our water line, and uses a pinwheel sensor to measure how much liquid has moved through it. The sensor comes with three wires: red (5-24VDC power), black (ground) and yellow (digital pin). By counting the

pulses from the output of the sensor, we can easily track fluid movement: each pulse is approximately 2.25 milli liters.

- **Wifi-Shield :** Extending the system functionality to operate remotely
- **Mini DC12V Micro Brushless Water Oil Pump 240L/H 5W:** Water pump is used to pump water from water container. Because it requires 12V power and Arduino can only provide 5V power, we use a relay and a 12 VDC adapter. We connect water pump to a 12 VDC adapter first and then connect the adapter to relay. The relay is connected to the normal AC outlet. This can prove water pumps enough power.
- Water pump is also our actuator. We control it through controlling relay. The relay can receive digital signal and has 2 pins: red (digital pin) and black (ground). We connect the relay to Arduino so Arduino can control the relay and the water pump.

SOFTWARE

- Arduino Code:
  - PumpCon.ino: It can receive the data collected by one Liquid Flow Meter sensor and one Soil Moisture sensor. It also can receive the data sent from Serial in order to control one water pump. Because we use two Arduinos, we just connect both to the same laptop and upload the Arduino codes to each of them respectively by changing ports.
- CloudLPApp: The CloudAPP used free IoT cloud Blinky, which is a web application capable solving simple Linear Program. We interact with the app according to the RESTful Web API below.
- DBNanoServer: This nanoserver is also written by Eric Burger, which is core of software part. Its main function we use is to store data into database or select data from database.
  - Senddata: send the grass moisture, impatiens moisture, cumulative water provided to grass and cumulative water provided to impatiens data to database.
  - ListenData: listen the processed results from database. The processed results are water amount needed to provide to grass in the next one hour data and water amount needed to provided to impatiens in the next one data.
  - Process result: calculate how much time should water pumps keep running. It uses water amount divided by water flow rate.
  - Listen: listen the grass moisture data, impatiens moisture data, water consumption percent during normal day data, grass water demand data, impatiens water demand data from data base.
  - Optimization: our optimization model function. It uses inputs, like grass and impatiens moisture data, water consumption percent data, grass and impatiens water demand data to build an optimization model. Then it sends the built up matrices to Cloud Solver API to solve it.
  - SendData: send the cost of irrigation, water needed to provide to grass and water needed to provide to impatiens data to database.
  - Casestudy.py: The purpose of this script is to compare the total cost of normal irrigation way and the total cost of our smart irrigation system to irrigate 1 acre grass one day and the amount of water spend for the crops.
  - Cloud: The first main function of it is to load page content when you click on different sections of the web page. The second main function is to make plots according to the data in database.

The last one is to post the user input

from a form to the nanoserver and then the nanoserver will store it in the database. The main functions are:

- loadContent: load all page content containers, including Overview, Parameters, Files, Plots and Export.
- loadData: load all data from the NanoServer API.
- loadStreamIco: load a stream icon in data-select div
- loadStreamPlot: load a stream plot in content div.
- reloadPlotAndExport: reload the Plot and Export displays by retrieving most recent data from db server.

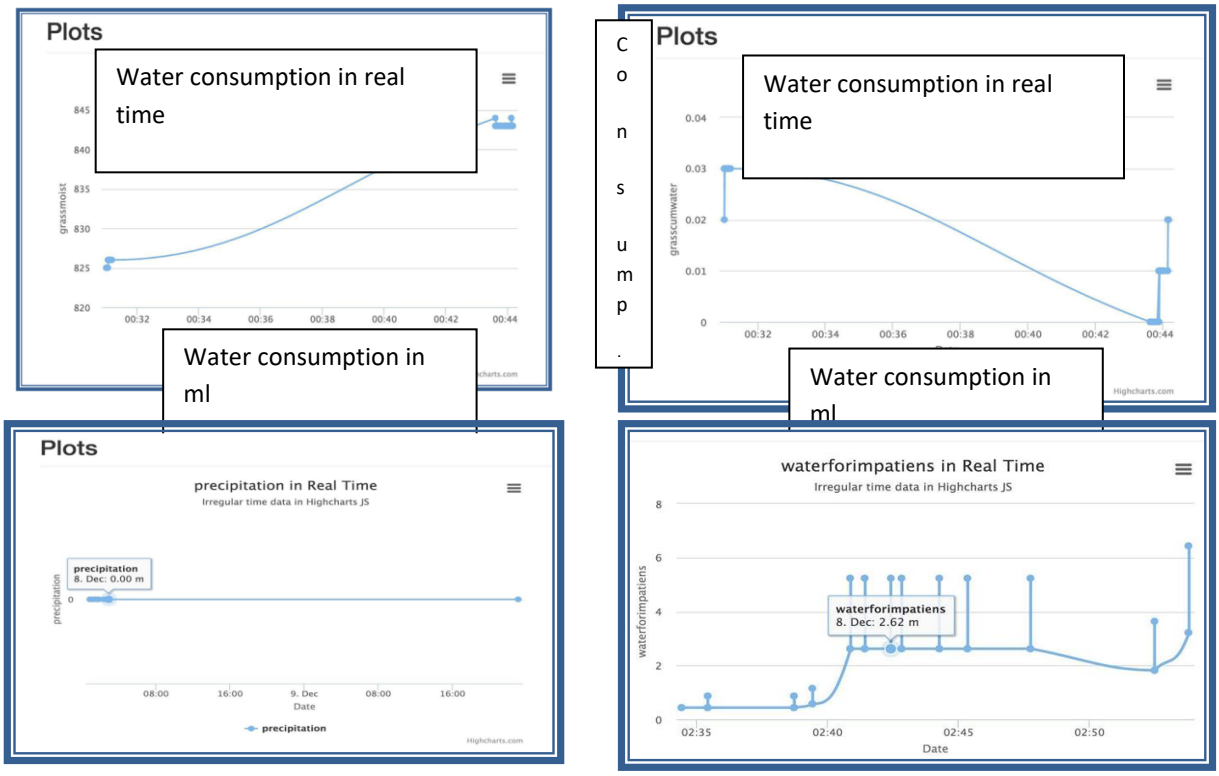

Fig 2: Water consumption chart to maintain and record water flow

Water consumption content data: Recent data is plotted in the following graph. The water consumption sensor reading for saturated water content is about 5 to 10 liters so we can say that the crop pot water content close to the saturation, which is due to the fact that the plants were repetitively irrigated during the exposition at a rate far beyond their intake capacity. If the code had been left to run a lot longer, the adaptive system comparing values from 3 days ago to the current values would have diminished the supply constraints in order to account for this oversaturation. We have assumed that the maximum of 1 litre of water is spending for crop cultivation. We can also see that the water consumption doesn't keep increasing up to complete saturation because the supply constraints were satisfied by the consumption alone so that no extra water was needed to be provided, hence not increasing the overall water consumption any further.

Cumulative water volume provided to crop data: This is the raw data sent from the liquid flow meter sensor, which sits in line with the water pipe connected to the crop pot. For the left end we can see that the cumulative water amount provided to crop are around 5 to maximum of 30 litres consumed per .003 ml. For the right end we can see that the cumulative water amount provided to grass is around 0.02 ml. The reason that there is still water provided to crop when the crop water consumed is close to saturation is because on showcase we want to show demo to people so we didn't run Listenandprocee.py, which

means we didn't run optimization model and let actuation part code listen to historical processed results of optimization model so there was water provided to crop even though there was enough water for crop.

This is one of optimization model results. It represents how much water we need to provide to crop in the next one hour. Since we didn't run optimization model on Feb 9 (showcase day), the following plot is just based on Feb 8 data. Combined with crop – watering flow data on Feb 8, we can find that the optimization model decides to provide some water to crop which is nearly 120 ml approx for all crops planned and set for cultivation. The observation is set of 30 litres stored in a container. Since our optimization model gives us 4 water volume results for next four hours one time, we can see there are four points at the end of plot. There is a peak because the water cost at that hour is low so we want to provide most of water to crop at that time. The trough shows that water cost at that hour is high and optimization model decides to provide less water. The reason why we don't consume whole water available for cultivation is that when the water cost is low because we don't want our plants overcome litre water in a small time range.

CONCLUSION

We believe such smart system can be interpreted with the future IoT technologies as the parameter is set to be enhanced with the advanced systems. Moreover water consumption can be handled in a versatile way once the overall consumption is known before cultivation. The climatic change parameter also plays a vital role in the entire process.

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CLASSIFYING THE INFERTILITY TREATMENT SUCCESS RATE BASED ON LEARNING FROM MULTI LAYER PERCEPTRON NETWORK

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ABSTRACT

Artificial Neural Network is permitted as an influential classifier for medical diagnosis for early recognition and success rate prediction of diseases. In this work, ANN is used for predicting the success rate in Infertility treatment. Multi-Layer Perceptron Network (MLPN) with Feed-forward back propagation learning algorithm is used as a classifier for classifying the patient record as success (1) or un success (0). In the proposed work, MLPN with 5 hidden neurons in the single hidden layer is used to predict the infertility treatment. This MLPN shows good performance in predicting the treatment success level with improved accuracy and less error. The MLPN is trained and tested with 18 and 10 features in the data set. The data set with 10 features is obtained by hybriding the Ant Colony Optimization Algorithm with Rough Set Theory.

Index Terms—*Artificial Neural Network (ANN), Multilayer Perceptron, Back Propagation Learning, Hidden Neurons, Sensitivity, Specificity, Accuracy, False Positive Rate.*

Introduction

Infertility is defined as the incapability to attain pregnancy after one year of unprotected intercourse. It is difficult a rising amount of married pairs about the planet. It is considered as the most important health problems in developing countries [ ]. WHO has also accredited infertility as a public health concern [1, 2]. 60-80% couples are infertile throughout the world among which 20-25% is from India [3]. The causes for the infertility are due to male factor, female factor, combination of both male and female factor and also due to unexplained factors. The effective ways like ART (Assisted Reproductive Technologies), In IVF (Vitro Fertilization) has evolved in medical field to deal with this cause. The achievement rate attained by this behaviour has been enlarged newly up to 10 percent. But it still fits only to the 40% of the people [4]. It is a challenging task for an embryologist to analyze and associate the large number of features. The technology is still lagging behind to improve the success rate in infertility treatment. To fill the gap of the technology lagging, Data Mining is introduced as an intelligent diagnostic and classification tool. The process of extracting value from the database is defined as Data Mining. To accomplish this aim, this paper expands a Multilayer Perceptron network and trains it to increase the success rate prediction. This work reduced the total number of features by combining Ant Colony Optimization Algorithm and Relative Reduct Algorithm.

The paper is organized as the portions: Section II examines several of previous studies carried out in calculating the achievement rate of IVF treatment. Section III shorts the data set used for the testing. Section IV illustrates how the Multilayer Perceptron Network (MLPN) is set for training. It also examines how the back propagation algorithm is employing for learning the network. Section V considers briefly about the results obtained. And finally the paper is concluded in Section VI.

Artificial Neural Network in Classification

Er, Yumusak and Temurtas [5] presented a comparative study based on multi-layer, probabilistic, knowledge vector normalization and general regression for chest disease diagnosis. Das, Turkoglu and Sengur [10] constructed a neural network ensemble methodology for diagnosing the heart disease. SAS enterprise miner 5.2 is used to construct the required network.

Moein, Monadjemi and Moallem [6] analyzed the procedure of medical diagnosis by converting it into machine implementable format. Symptoms from eight different diseases are taken and applied to MLP neural network. The results obtained support the role of data Fuzzification for the neural network based automatic medical diagnostic system. Lin [7] used Classification and Regression Tree (CART) and Case Based

Reasoning (CBR) techniques for intelligent diagnosis to diagnose the liver disease.

In this paper [8] the author's premeditated apply of neural network in data mining. It comprise the experiential that utilize of neural network is especially broad in data mining suitable to various qualities like Similar Performance, Self-organizing adaptive, Robustness and Fault Tolerance. It was utilized for business applications similar to pattern recognition, Classification, Prediction.

In this paper [9] the author discussed a data mining application of Neural Network (NN) is extremely broad. The NN can be exploited to model difficult associations among input and output or to discover patterns in data. Data mining procedure is composed by three key stages: Data preparation, Rule Extracting and Rules Assessments. The collection of neural network model and data mining technique can significantly raise the effectiveness of data mining techniques and it has been largely used [9].

This study [11] describes that suitable to an improvement in information technology, the field of Business Intelligence (BI) and Data Mining (DM) arose. The objective of BI/DM is to estimate knowledge from raw data. For Neural network (NN), flexible and Support Vector Machine's (SVMs) and nonlinear classification method, appropriate to analytical presentations they are capable. In general the outcomes achieved are aggressive. In mostly the NN for regression ones and SVM model for the categorization task [11].

In this paper [12] the author reported that the back propagation technique is used for supervised neural network and was developed for metal alloys. For the training of artificial networks it requests Unsupervised Learning, Supervised Learning and Reinforcement Learning [12]. The neural network can be separated into subsequent type of feed forward neural network and recurrent neural network.

The major aim of data mining [15] is to mine knowledge from enormous amount of data. The well-known approaches to data mining incorporate neural and symbolic form. Fuzzy neural network method is used as channel among numerical data and symbolic representation. By using fuzzy logic the authors expressed knowledge in such an approach which is accepted for the people to recognize.

Methodology

For classifying the infertility data set as success or un success, Multi Layer Perceptron Network (MLPN) is used. The network is trained and tested with the Back Propagation Learning Algorithm. The Training and Testing Algorithm used for learning the MLPN is as follows:

Step 0: *Initialize the weight and learning rate*

Step 1: *Perform Steps 2 to 9 when stopping condition is false*

Step 2: *Perform Steps 3-8 for each training pair*

Feed-Forward Phase (Phase I):

Step 3: *Every input element accepts input signal x_i and forwards it to the hidden unit (i=1 to n)*

Step 4: *Every hidden unit z_j (j=1 to n) summations its weighted contribution signals to compute net input:*

$$Z_{inj} = V_{oj} + \sum_{i=1}^{n} x_i v_{ij}$$

Compute outcome of the hidden unit by relating its establishment function over Z_{inj}

$Z_j = f(Z_{inj})$ where

$$f(Z_{inj}) = \frac{1}{1+e^{-\lambda Zinj}}$$

Step 5: *For every output unit y_k (k=1 to p), compute the net input:*

$$Y_{ink} = w_{ok} + \sum_{j=1}^{p} zjv_{jk}$$

And be relevant the activation function to analyse result signal

$$Y_k = f(Y_{ink})$$

$$f(Y_{ink}) = \frac{1}{1+e^{-\lambda Yiink}}$$

Back-propagation of error (Phase II):

Step 0: *Initialize the weights. The weights are occupied from the training algorithm*

Step 1: *Perform Steps 2-4 for each input vector.*

Step 2: *Set the activation of input unit for xi (i=1 to n).*

Step 3: *Compute the net input to hidden unit x and its output. For j=1 to p,*

$$z_{inj} = v_{0j} + \sum_{i=1}^{n} x_i v_{ij}$$

$$z_j = f(z_{inj})$$

Step 4: *Now add the output of the output layer unit. For k=1 to m,*

$$y_{ink} = w_{ok} + \sum_{j=1}^{p} z_j w_{jk}$$

$$y_k = f(y_{ink})$$

Sigmoidal activation function is used for calculating the output.

Step 6: *Every result element y_k (k=1 to m) accepts a objective pattern equivalent to the input training pattern and compute the error modification term:*

$$\delta_k = (t_k - y_k) f'(y_{ink})$$

where

$$f'(Y_{ink}) = \lambda f(Y_{ink})[-f(Y_{ink})]$$

On the beginning of the considered error modification term, the weight and unfairness is updated as follows:

$$\Delta W_{jk} = \alpha \delta_k z_j$$

$$\Delta w_{ok} = \alpha \delta_k$$

Also, transmit δ_k to the hidden layer backwards

Step 7: *Every hidden unit (z_j, j= 1 to p) calculations its delta inputs from the result units:*

$$\delta_{inj} = \sum_{k=1}^{m} \delta_k w_{jk}$$

The term δ_{inj} gets increased with the derivative of (Z_{inj}) to compute the error terms:

$$\delta_j = \delta_{inj} f'(Z_{inj})$$

where

$$f'(Z_{inj}) = \lambda f(Z_{inj})[1 - f(Z_{inj})]$$

On the starting point of planned δ_j, the weight and partiality are considered as :

$$\Delta V_{ij} = \alpha \delta_j x_i$$

$$\Delta V_{oj} = \alpha \delta j$$

Weight and bias updation (Phase III):

Testing Algorithm:

Step 8: *Every outcome element (y_k, k= 1 to m) revises the unfairness and weights:*

$w_{jk}(new)=w_{jk}(old)+\Delta w_{jk}$

$w_{0k}(new)=w_{0k}(old)+\Delta w_{0k}$

Every hidden unit(z_j=j=1 to p) updates its unfairness and weights:

$v_{ij}(new)=v_{ij}(old)+\Delta v_{ij}$

$v_{0j}(new)=v_{0j}(old)+\Delta v_{0j}$

Step 9: *Ensure for the stopping condition. The stopping condition might be confident amount of epochs reached or when the definite result equals the objective output.*

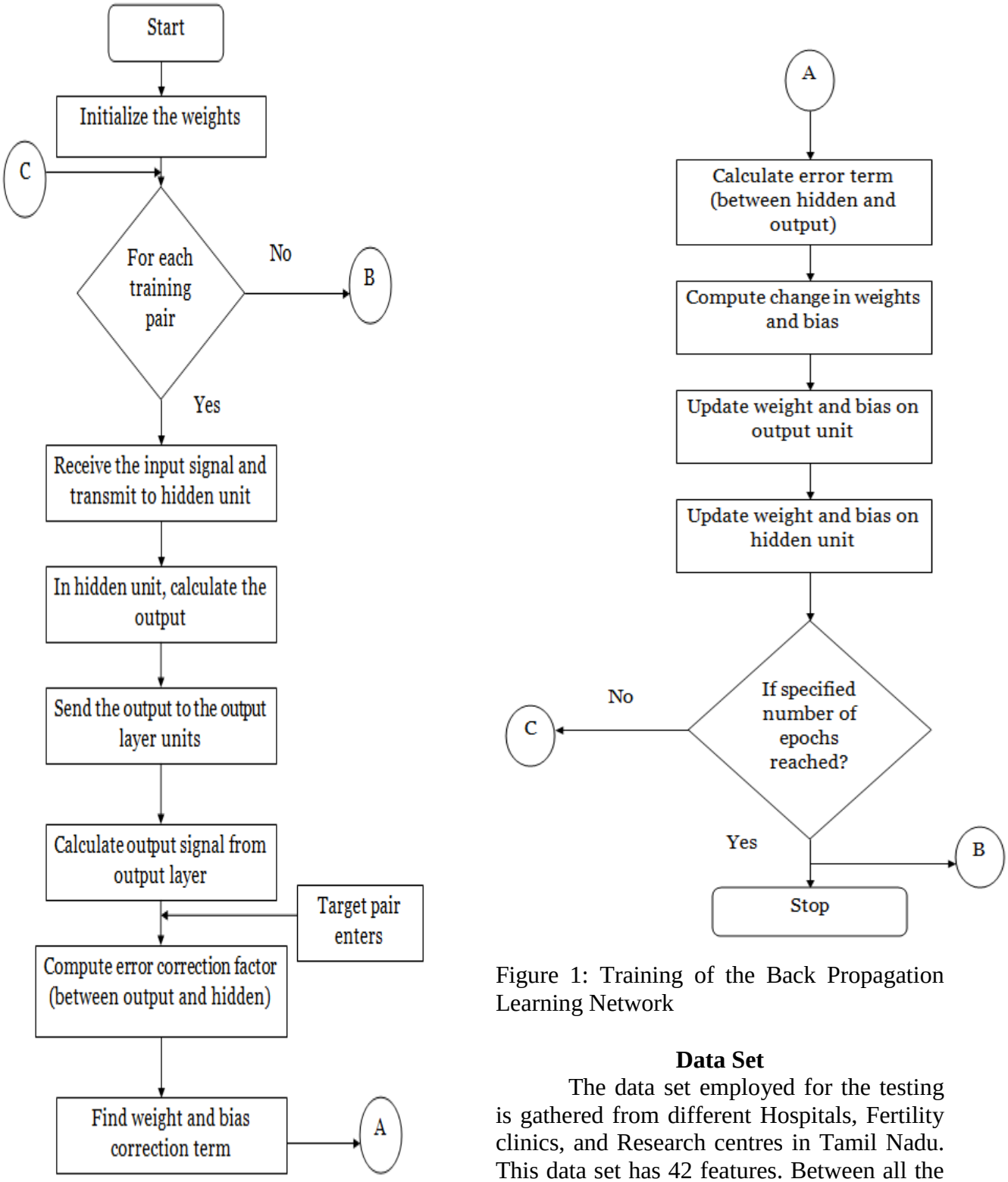

Figure 1: Training of the Back Propagation Learning Network

Data Set

The data set employed for the testing is gathered from different Hospitals, Fertility clinics, and Research centres in Tamil Nadu. This data set has 42 features. Between all the 42 features (attributes), 34 features is taken for the research based on the doctor's suggestion.

Attributes used for this work				
Name	Earlier Surgery	Endometriosis	Liquefaction Time	Male Factor Only
Unknown feature	Pre-Existing Symptoms of Depression	Tubal Infertility	Sperm Concentration	Severe Male Factor

Place	Fear And Negative Treatment Attitude	Ovulatory Factor	Sperm Motility	Female Factor Only
IVF Treatment	Psychological And Emotional Factors	Hormonal Factor	Sperm Vitality	Combined Factor
Miscarriage	Difficulty In Tolerating Negative Emotions For Extended Time	Cervical Factor	Sperm Morphology	Unknown Factor
Miscarriage Causes	Improbability	Unsolved feature	Amount of Oocytes recovered	Place
Medical Disorders	Strain Of Repeated Treatment	Semen Ejaculate Volume	Amount of Embryos Transferred	IVF Treatment

Table 1: Attributes used for this work

The list of features given in Table 2 is taken for reduction based on doctor's suggestion.

Semen Ejaculate Volume	
Liquefaction Time	
Sperm Concentration	Sperm Concentration
Sperm motility	Sperm motility
Sperm vitality	
Sperm morphology	
No. of oocytes retrieved	No. of oocytes retrieved
No. of embryos transferred	No. of embryos transferred
Male factor only	Male factor only
Severe male factor	
Female factor only	
Combined factor	
IVF Treatment	IVF Treatment

Table 2: List of attributes chosen for experimentation

Experimentation and Results

The proposed MLPN is trained by using the Scaled Conjugate Gradient (SCG) Algorithm. A number of algorithms like Levenberg-Marquardt (LM) Algorithm, Resilient back propagation RPROP (RP) Algorithm, BFGS quasi-Newton (BFG) Algorithm, Gradient descent with momentum and adaptive linear propagation (GDX) Algorithm are there to train the network. Table 3 discusses the features of the algorithm used for training the network. It is observed that the scg algorithm performs well even in increase in the number of weight and there is no decrease in the performance of the network. And it has only the modest memory requirement. This factors lead to use the scg Algorithm for training the MLPN.

Table 3: Back propagation learning algorithms

Algorithms	**Memory Requirements**	**Problem Applied**	**Convergence speed**	**Performance**
lm Algorithm	High	Function Approximation	Fastest	Performance degrade with the increase in weight
RP Algorithm	Small	Pattern Recognition	Fastest	Performance degrade with the increase in weight
SCG Algorithm	Modest	Function Approx	Fast	Performance doesn't

		imation and Pattern Recognition		grade. Perform well for network with large number of weight
BFG Algorithm	High	Function Approximation	Fastest	Performance degrade with the increase in weight
GDX Algorithm	Low	Function Approximation	Slower	Performance degrade

The Network has three layers namely, input layer, hidden layer and output layer. The input layer has 18 inputs and output layer has one input which depicts whether the results is success or unsuccessful. Fixing the amount of neurons in the hidden layer is an important task. If the network is tested with the low number of neurons in the hidden layer mean, there is chance for under fitting whereas enlarge in the amount of neurons which are not acceptable by the network will result in over fitting. The theory behind fixing number of hidden neurons in the hidden layer is:

[1] The finest dimension of the hidden layer must be among the dimension of the input and output layers.

[2] Amount of neurons in the hidden layer is equivalent to the mean of amount of neurons in the input layer and output layer

To discover the amount of hidden neurons, equation 1 is used.

$$N_h = \frac{N_s}{(alpha * (N_i + N_o)} ----> (1)$$

Where,

N_k = Amount of neurons in the hidden layer

N_i = Amount of neurons in the input layer

N_o = Amount of neurons in the output layer

Alpha = arbitrary scaling factor (value lies between 2-10)

The trial and error technique is used to fix the amount of neurons. The Table 4 depicts the value of Mean Squared Error (MSE) and Accuracy obtained in the case of training the network with the specified amount of neurons. The layer with number of neuron 5 shows more accuracy than the other ones. Figure 2 portrays the comparison in the accuracy value with the different number of neurons. The hidden layer with 5 neurons has the highest accuracy of 73.7%. Hence the MLPN network is trained using the SCG Algorithm with 5 numbers of neurons in the hidden layer. The hidden layer is chosen to be one in number. The number of hidden layers can be increased depending on the complexity of the problem. The MSE value should be lower as possible for producing promising results.

Table 4: Performance of the network with different number of hidden neurons

No. of neurons in the hidden Layer	**Time taken for execution (seconds)**	**MSE**			**Accuracy (%)**
		Training Value	Validation Value	Testing Value	
1	7	1.76779e-1	1.90260e-1	2.36664e-1	71.9
2	2	1.81819e-1	1.92901e-1	2.51144e-1	71.1

3	9	2.67856e-1	2.32561e-1	2.32337e-1	67.5
5	**4**	**1.82542e-1**	**1.66082e-1**	**2.42003e-1**	**73.7**
6	7	5.46731e-1	4.76213e-1	6.73211e-1	43.9

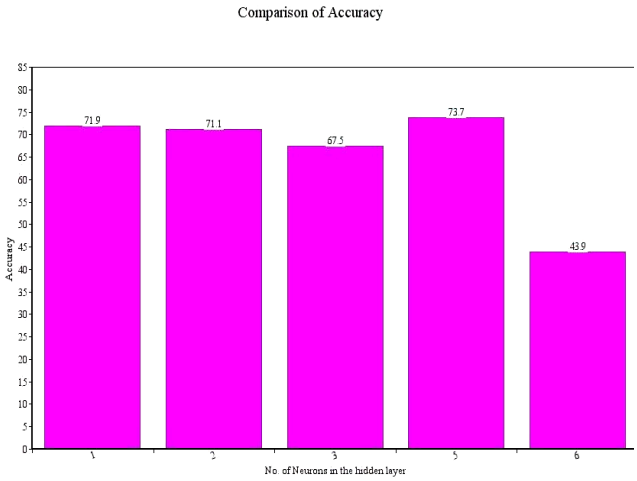

Figure 2 : Comparison of Accuracy

The metrics like Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV), False Positive Rate (FPR), False Discovery Rate (FDR) and False Negative Rate (FNR) is used to estimate the performance of the network with altered amount of neurons.

$$Sensitivity = \frac{TP}{(TP + FN)} \quad ----> (2)$$

Specificity is described as the determine of proportions of negatives that are accurately recognized. It is also symbolized as True Negative Rate.

$$Specificity = \frac{TN}{(TN + FP)} \quad ----> (3)$$

PPV is defined as

$$PPV = \frac{TP}{(TP + FP)} \quad ----> (4)$$

The Balance of PPV is the False Discovery Rate(FDR)

$$FDR = \frac{FP}{(TP + FP)}$$

or

$$FDR = 1 - PPV ----> (4)$$

The Negative Predictive Value (NPV) is defined as

$$NPV = \frac{TN}{(TN + FN)} \quad ----> (5)$$

False Positive Rate (FPR) (α) is defined as

$$FPR = \frac{FP}{(FP + TN)}$$

or

$$FPR = 1 - Specificity ----> (6)$$

FPR is the Type I error. It occurs when the null hypothesis is rejected even when it is true. FNR (β) is the Type II error which occurs when the null hypothesis is accepted, when it is false. It is defined as

$$FNR = \frac{FN}{(TP + FN)}$$

or

$$FNR = 1 - TPR \quad ----> (7)$$

Where,

TP- True Positive

FN- False Negative

FP- False Positive

TN- True Negative

Table 5 displays the results obtained when experimenting with different number of neurons. The results obtained with 5 hidden neurons shows promising results than the other neurons in the hidden layer. Figure 3 depicts the results obtained while training the network with different number of neurons in the hidden layer.

Table 5 : Results obtained using different number of neurons in the hidden layer

No. of neurons in the hidden Layer	Sensitivity	Specificity	PPV	NPV	FPR	FDR	FNR
1	0.62	0.84	0.83	0.63	0.16	0.17	0.37
2	0.61	0.83	0.83	0.62	0.16	0.17	0.38
3	0.58	0.82	0.83	0.56	0.17	0.17	0.42
5	**0.65**	**0.83**	**0.81**	**0.68**	**0.17**	**0.18**	**0.35**
6	0.43	1	1	0.03	0	0	0.57

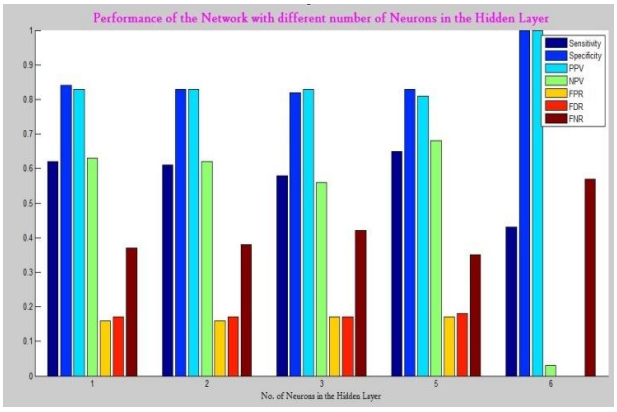

Figure 3: Results obtained using different number of neurons in the hidden layer

The Figure 4 shows the performance plot for the dissimilar number of neurons. In the Performance plot, the test and Validation curve should be the same. If the test curve increase over the validation curve, there is possible for the network to over fit. Training curve should decrease along with the increase in the number of iterations. It was observed that the performance plot for the network with 5 hidden neurons is better than the other ones.

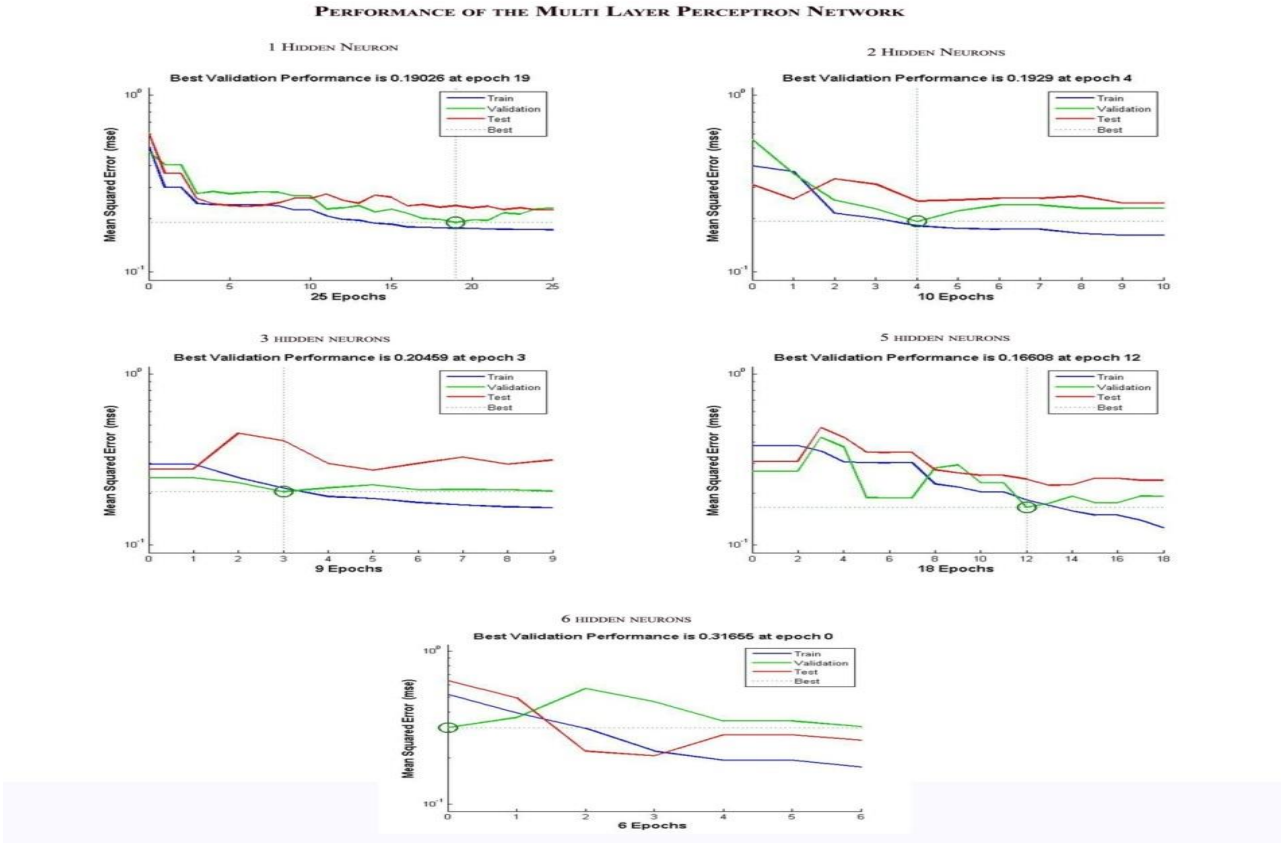

Figure 4 : Performance plot for various number of neurons in hidden layer

Figure 5 depicts the training state of the network. When the training MSE decreases, then the testing and validation MSE should decrease too. The validation fails when the validation MSE increase in Value.

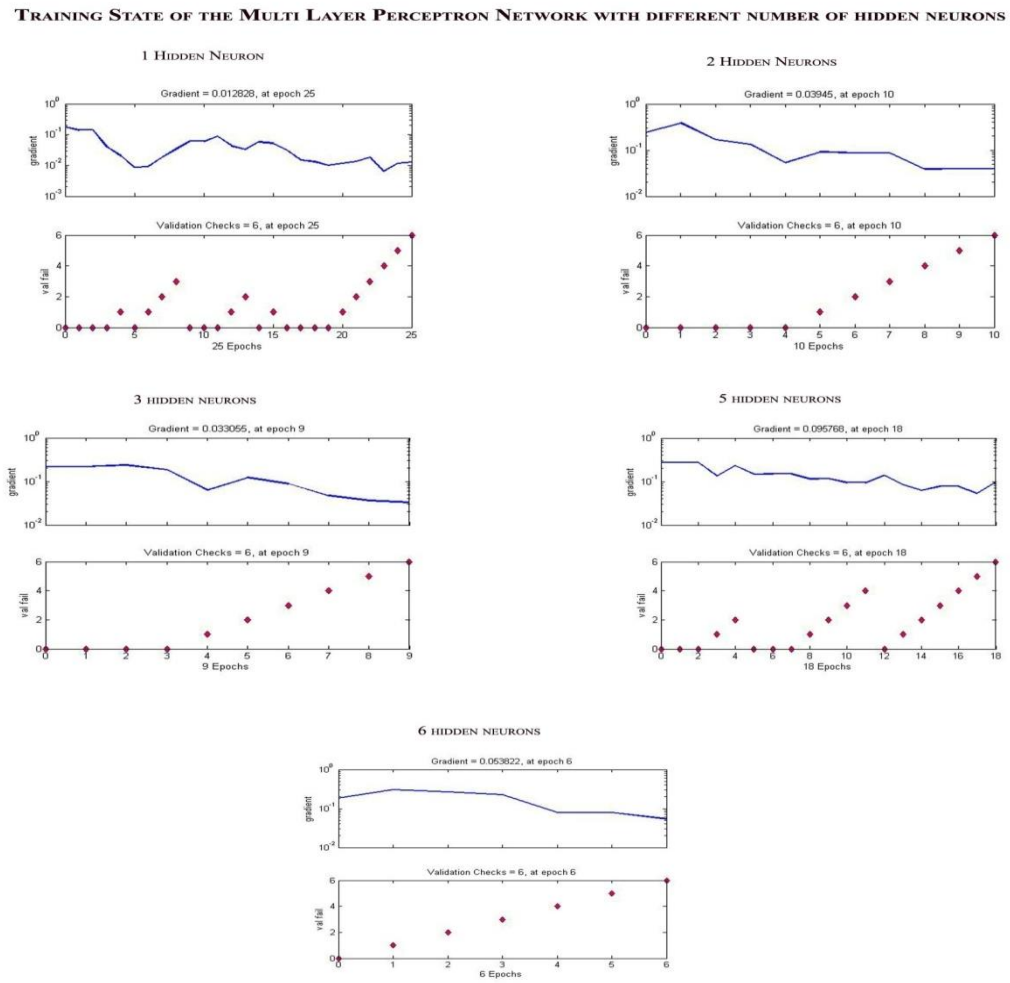

Figure 5: Training state for the different neurons

Figure 6 shows the confusion matrix plot obtained while training the network. The figure explictly proves that the accuracy obtained with 5 hidden neurons is higher than the other results. Figure 7 shows the Receiver Optimal Characteristic (ROC) Plot obtained while training the network. It is plotted with True Positive Rate with False Positive Rate. The Confusion Matrix and ROC plot obtained using the 5 hidden neurons network is promising while comparing the Confusion Matrix of other neurons.

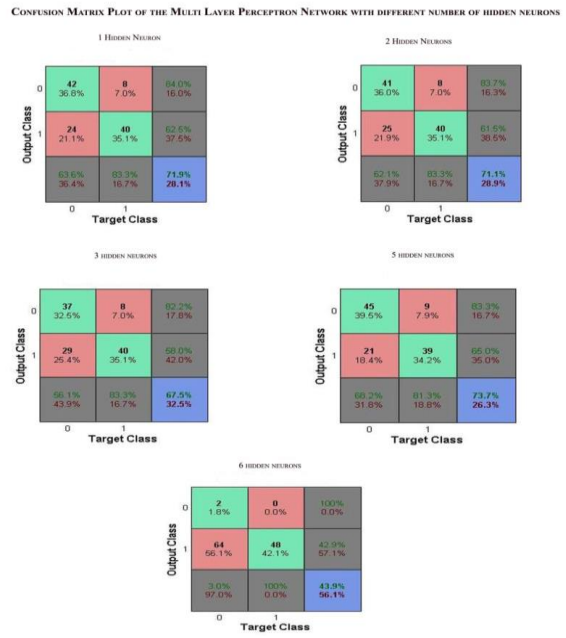

Figure 6: Confusion Matrix for the Network

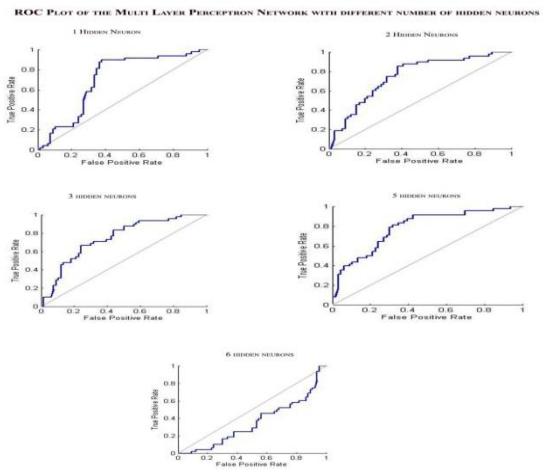

Figure 7: ROC Curve for the Network

The optimal data set obtained from the Algorithm is then trained by the MLPN with SCG as training algorithm. The network has 10 input neurons in the input layer, 5 neurons in the hidden layer and 1 neuron in the output layer. The results obtained are very promising. The results obtained from the network classified the outcome as Success or Unsucess. The Figure 8 shows the results obtained from the optimal data set.

PERFORMANCE OF THE NETWORK WITH THE OPTIMAL DATA SET

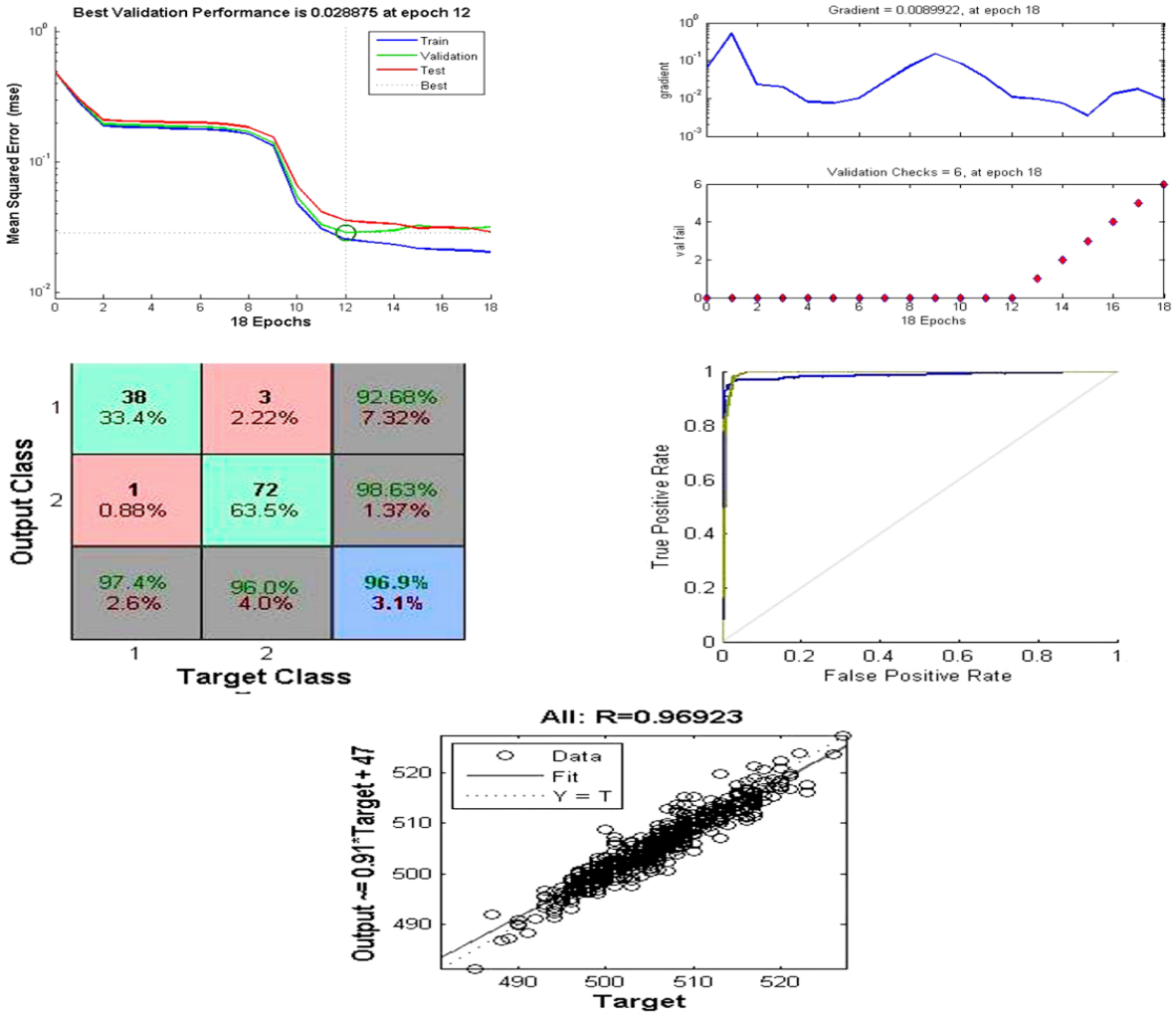

Figure 8: Performance of the Network with optimal data set obtained using hybrid Algorithm

Figure 9 depicts the comparison of the performance of the data set with 18 features and optimal features. The accuracy is increased to 96.9% from 73.7 %. This promising results obtained indicated the MLPN is best for classifying and recognizing the pattern of the network. The PPV, FNR, FDR, FPR is higher in the optimal data set and the NPV is reduced. The Sensitivity, Specificity and Accuracy in classification are also increased by training and testing the features of the optimal data set rather than the original data set with 18 features.

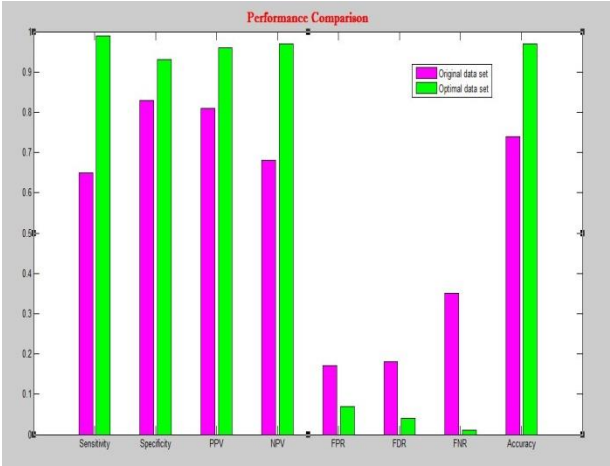

Figure 9: Comparison of the Performance

CONCLUSION

In this work, the MLPN is employed to predict the success rate of the Infertility treatment. It is observed that the success rate is improved 96.9%. While comparing the performance of the network with other metrics like Sensitivity, Specificity, TPR, FPR, PPV, NPV, FDR and FNR, the proposed MLPN with 5 hidden neurons in the hidden layer performs well. The number of hidden layers in the network depends upon the complexity of the problem. As there is possible for the problem size to increase, there is option to increase the number of hidden layers and test the network. This MLPN with Feed Forward SCG Back propagation Learning Algorithm perform well in classifying the patients for the infertility treatment with a promising accuracy of 96.9%.

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PROBLEMS AND PROSPECT OF CONSUMER COOPERATIVES IN INDIA

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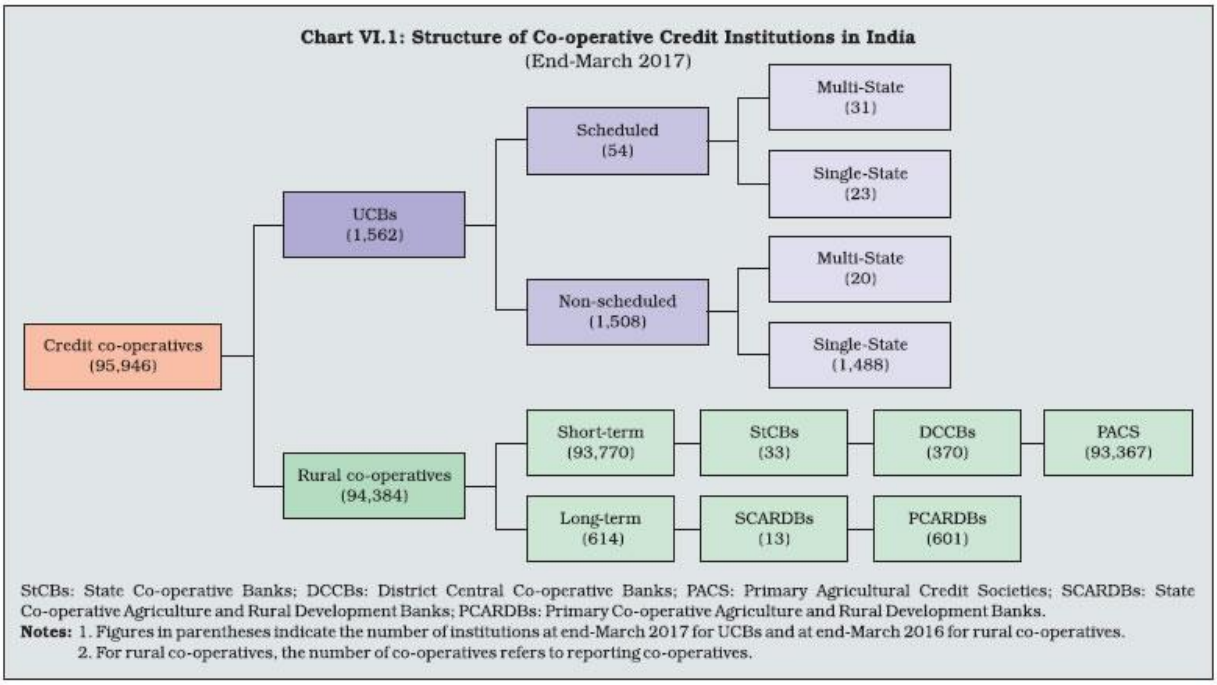
ABSTRACT

Co-operative is the united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise. In this study has described the problem and prospect of Consumer Cooperatives in India. It is suggested that to facilitate building up of integrated co-operative structure. It is concluded that the co-operatives in India have made an all-round progress to contribution public wealth.

Keywords: Co-operative, Growth and service

INTROUCTION

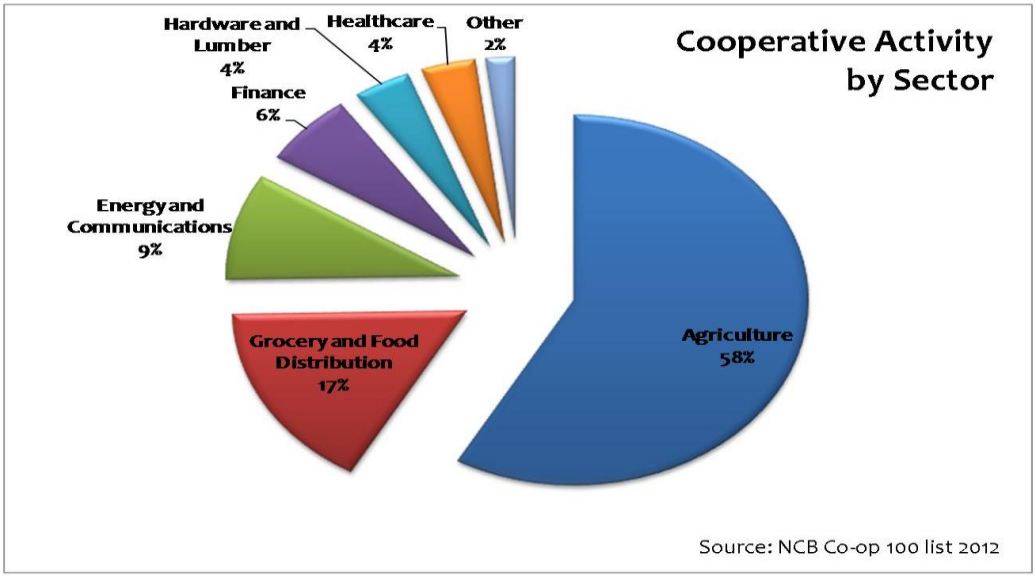
Co-operative is a kind of social enterprise which is defined by the International Co-operative Alliances as an autonomous association of Persons' United Voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise. Mukhi, H.R. (2005) It is Cooperative societies were created long before with the intention for the fair-trade movement to help workers improving their livelihoods. India since the country's independence from Britain in 1947 has observed a huge growth in Cooperative societies serving mainly the farming sector.In 1919, with the passing of the Government of India Act, 1919 Cooperation as a subject was transferred to the provinces. Bedi, R.D. (2001) The Bombay Cooperative Societies Act of 1925, the first provincial Act to be passed, among others, introduced the principle of one-man one-vote.



The agricultural credit scenario was a matter of concern during that time and various committees looked into the problems of cooperative banks in various provinces. The Royal Commission on Agriculture in 1928 also reviewed the cooperative sector. In both

agricultural and non-agricultural non-credit sectors, societies were organized, but most faced difficulties in operation as a result of opposition by private marketing agencies and also the inexperience of their office bearers. Mathur, B.S. (2002) A significant development of this time was the setting up of the All India Association of Cooperative Institutes in 1929. Establishment of Reserve Bank of India (RBI) in 1934 was a major development in the thrust for agricultural credit. The Reserve Bank of India Act, 1934 required the RBI to set up an Agricultural Credit Department. The Mehta Committee appointed in 1937 specifically recommended reorganization of Cooperative Credit Societies as multi-purpose cooperatives.

Cooperative activity by sectors



The Second World War boosted the prices of agricultural commodities leading to increased returns to farmers and consequently reduction in over-dues to the cooperatives. To counter shortages of essential commodities for domestic consumption as well as raw materials, the Government resorted for procuring commodities from producers and rationing for utilization of cooperatives. This provided a momentum to the growth of multi-purpose cooperatives.The period 1939 to 1945 provided a further stimulus for the growth of the Urban Cooperative Credit structure. Many societies had started banking functions and had grown in sizeand operations over a period of time, though activities were diversified.

Rochdale Cooperative Principles

1. Low membership fee, or share value, within the reach of those interested in improving their financial status.
2. Wide distribution of hares, rather than being concentrated in the hands of the few.
3. Democratic control; one-man; one-vote, regardless of the number of shares owned.
4. Sell for cash, in order to avoid losses connected with the extension of credit.
5. Goods sold at regular retail prices, in order to avoid price-cutting, I war with competitors.
6. Low rate of interest paid on capital stock, and the distribution of savings based upon the amount of patronage contributed by each member.
7. Political and religious neutrality.
8. A certain percentage of the profits set aside for educational purposes.

CONSUMER COOPERATIVES ACTIVITIES

1. Rural Network
2. Agricultural Credit disbursed by Co-operatives
3. Agricultural Credit disbursed by Co-operatives
4. Fertilizer disbursed (6.049 million Tons)
5. Fertilizer production (3.293 M.T. - N&P) Nutrient
6. Sugar produced (10.400 million tons)
7. Capacity Utilization of Sugar Mills
8. Wheat Procurement (4.50 million tons)

9. Animal Feed Production/Supply
10. Retail Fair Price Shops (Rural + Urban)

11. Milk Procurement to Total Production
12. Milk Procurement to Marketable surplus
13. Ice Cream Manufacture
14. Oil Marketed (Branded)
15. Spindale in Co-operatives (3.518 million)
16. Cotton Marketed / Procurement
17. Cotton yarn/Fabrics Production
18. Handlooms in Co-operatives
19. Fishermen in Co-operatives (Active)
20. Storage Facility (Village level PACS)
21. Rubber processed and marketed
22. Areca nut processed and marketed
23. Direct employment generated
24. Self-Employment generated for persons

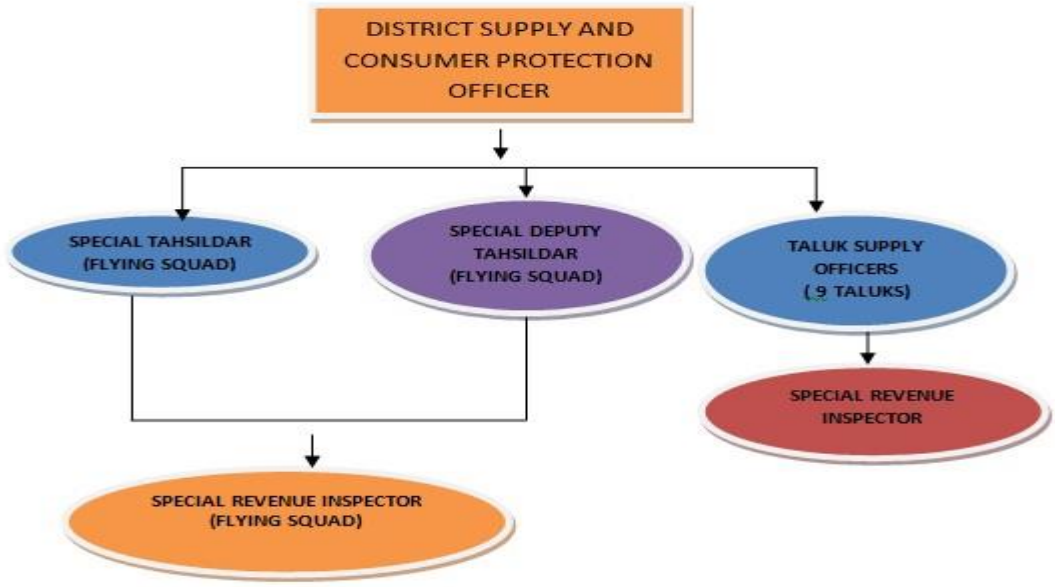
25. Salt Manufactured (18,266 Metric Tons)

Types of consumer cooperatives:

- Credit Unions
- Utility Co-operatives
- Electric Co-operatives
- Telephone Co-operatives
- Housing Co-operatives
- Food Co-operatives
- Nursery/Child-care Co-operatives
- Health Co-operatives
- Other Co-operatives

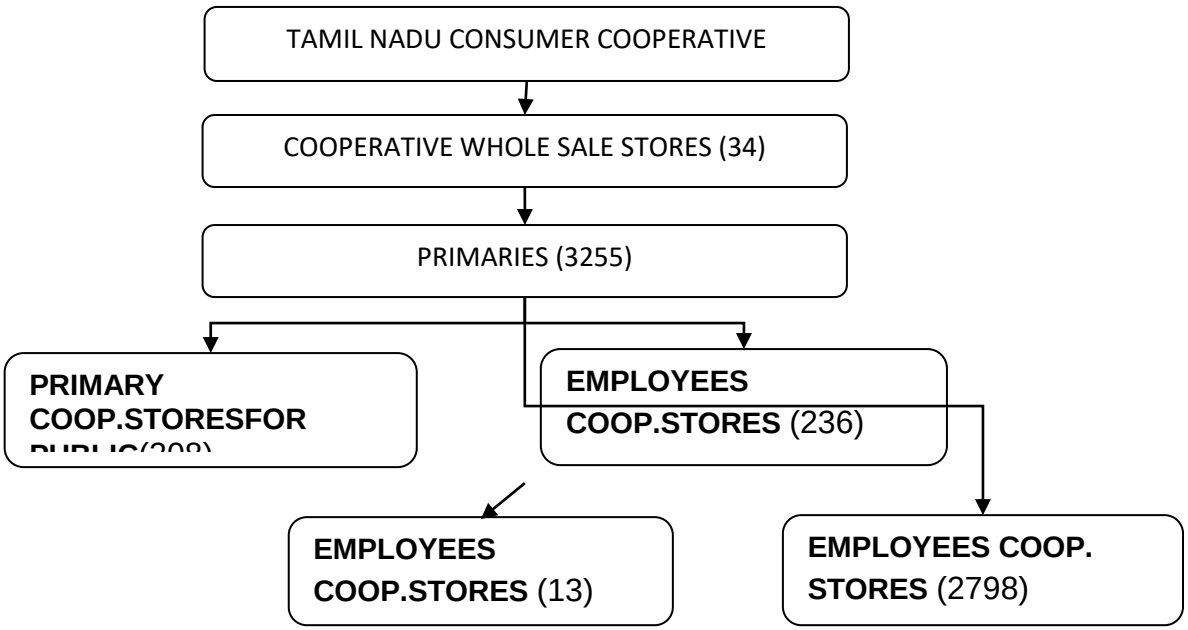
TAMIL NADU CONSUMER CO-OPERATIVE

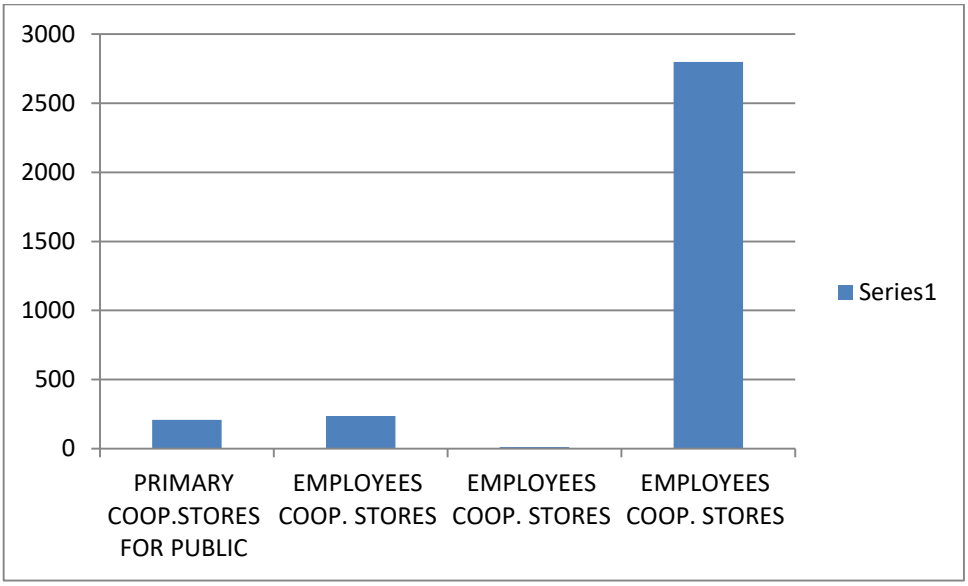
The Consumer Cooperatives do market intervention and cater tothe needs of the consumers. They are giving quality consumer goods, to thepublic at reasonable price and at correct weight.Tamil Nadu was the pioneer in Consumer Cooperative movementhas developed even before Independence. Triplicane Urban CooperativeSociety was organized in the year 1904, when the first Cooperative Societies Actwas enacted in the year 1904, Inthe very beginning the consumer movement was confined only to urban areasbut later on spread to semi-urban and rural areas. From the year 1972, theConsumer Cooperatives are implementing the P.D.S. 21623 fair price shops arerun by the Consumer Cooperatives in Tamil Nadu.



In Tamil Nadu the Consumer Cooperatives are functioning underthree tier system, Tamil Nadu Consumer Cooperative Federation at the apexlevel, 34 Cooperative wholesale stores at the district level and 457 PrimaryCooperative Stores excluding 2798 students Cooperative stores at the baselevel.

TAMIL NADU CONSUMER COOPERATIVE





Duties of the State

The Primary duties of the State are to providefood security to its people. Distribution of essential commodities on family cardshas been in vogue in Tamil Nadu since 1964. The Public Distribution Systemhas been the lifeline for a section of people in our country especially for thoseliving below poverty line. The distribution system envisages sale of essentialcommodities such as Rice, Sugar, Wheat, Kerosene etc. at subsidized ratethrough fair price shops both in the urban and Rural areas. In Tamilnadu thePublic Distribution System is being implemented by the Tamil Nadu CivilSupplies Corporation and the Cooperative Department. Out of the total numberof fair price shops 95% of the fair price shops are run by the CooperativeDepartment through various Cooperative Institutions such as District Consumers"Cooperative Wholesale Stores, Cooperative Marketing Societies, PrimaryAgricultural Cooperative Banks, Primary Cooperative Stores, LAMPS etc. ThusCooperatives play a predominant role in the distribution of essential

commoditiesunder Public Distribution System. The policies regarding Public Distribution System are being taken by theCivil Supplies and Consumer Protection Department, procurement, processing,storage and transportation of essential commodities up to Taluk godown level aregoverned by the Tamil Nadu Civil Supplies Corporation Ltd. Distribution ofessential commodities from Taluk level godowns of Tamil Nadu Civil SuppliesCorporation to Fair price shops are being done by both Tamil Nadu Civil SuppliesCorporation and Cooperatives.

Problem of Co-operative

1. Lack of spontaneity:

Co-operative has lacks spontaneity in the sense that it has not been emanated from the people themselves. They usually do not come forward to organize co-operatives on their own accord. On the other hand, the rural perceive the cooperative societies and banks as government lending agencies. They are interested only in deriving benefits from them instead of contributing anything in return.

2. Lack of funds

The cooperatives have resource constraints as their owned funds hardly make a sizeable portfolio of the working capital. With weak owned fund base, the borrowings of the cooperatives from the central financing agency are considerably conditioned. This has stood in the way of adequately meeting the credit requirements of the existing as well as new members.

3. Neglecting the demand aspect

Historically, the cooperatives have been viewing the problem of agricultural credit from the view point of "supply". The "demand" aspect is neglected.

4. Loans for productive

The Co-operative Credit Societies do not cater to all the credit requirements of the farmers. They grant loans only for agricultural operations. Farmers approach the money-lenders to meet their other requirements. This divided allegiance to the co-operative society and the money-lender stands in the way of the growth of the co-operative movement.

5. Negligence of non-credit aspects

By and large the Primary Agricultural Cooperative Societies are disbursing credit only and have not yet emerged as true multipurpose institutions, undertaking diversified functions besides credit.

6. Regional disparities:

There have been good deals of regional disparities pertaining to credit availability. The picture of credit availability in the Eastern states, tribal and hillyregions is simply dismal. Consequently, the farmers in these regions farm technology.

7. Lack of co-operation

In the Indian context, most of the people are in the grip of illiteracy, ignorance and conservatism. They do not understand the significance of cooperation in their lives. Absence of willing cooperation on their part hinders the growth of cooperative movement.

8. Exploitation:

In the absence of proper marketing arrangements and functions at the level of Primary Agricultural Cooperative Societies, the rural poor falls prey to the mercy of middlemen who exploit the situation.

9. Defective management

The cooperative credit structure is criticised on the ground that it is mostly managed by landlords and large farmers. Hence small and medium farmers do not get their fair share. They are often deprived of the assistance from the co-operative society. Large farmers and landlords, with their superior economic and social power, manage to have a greater hold on these societies. A lion's share of benefits goes to them. In this way, the cooperatives suffer from nepotism,

favouritism and partiality. The growth of the cooperative movement, thus, is severely affected.

10. Political interference:

Political interference acts as a formidable obstacle for the growth of cooperative movement. The co-operative societies have become the hot bed of politics in rural India. The selection of beneficiaries is mostly done on political considerations.

11. Performance

In the absence of high standards of performance, cost of credit and other operations of the institutional cooperative system do not remain at a low level. Further, inadequate interest acts as a setback to finance the weaker sections.

12. Lack of co-ordination:

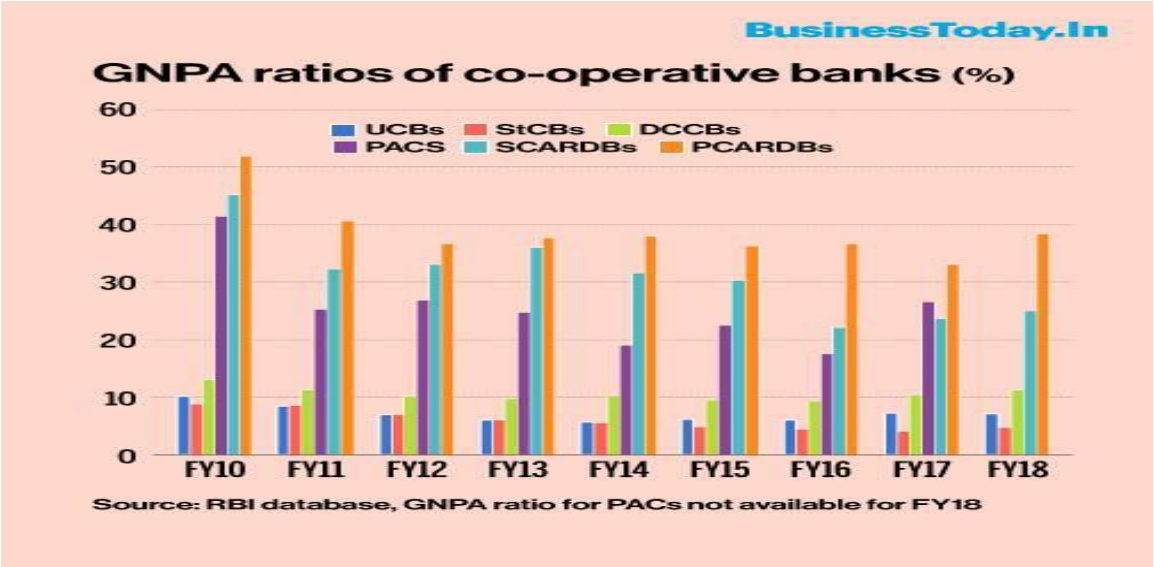
There has been a lack of co-ordination among the institutional agencies at the grass-root level. Defaulters of co-operatives can become borrowers of other agencies. Such double financing and over-lapping are found simply because of lack of co-ordination.

13. Problem of overdue

Last but not least, the major problem of co-operative credit is ever-rising overdue. The performance on the recovery side has been dismal. 27 to 50 per cent of the overdue have been reported in respect of the Cooperative Credit Societies. Overdue also exist with respect to Central Co-operative Banks and Land Development Banks. Obviously, the high level of overdue hinders the process of re-cycling of credit.

Growth of Cooperative Sector in India

Singh (2016) India has basically an agrarian economy with 72% of its total population residing in rural areas. The rural people need lot of services in daily life which are met by village co-operative societies. The seeds of cooperation in India were sown in 1904 when the first Cooperative Societies Act was passed. Since then, the cooperative movement has made significant progress. Cooperatives have extended across the entire country and there are currently an estimated 230 million members nationwide. The cooperative credit system of India has the largest network in the world and cooperatives have advanced more credit in the Indian agricultural sector than commercial banks.



The growth is the importance aspect of the organization The village cooperative societies provide strategic inputs for the agricultural sector, consumer societies meet their consumption requirements at concessional rates; marketing societies help the farmer to get remunerative prices and co-operative processing units help in value additions to the raw products etc. In addition, co-operative societies are helping in building up of storage go-downs including cold

storages, rural roads and in providing facilities like irrigation, electricity, transport, and health. Various development activities in agriculture, small industry marketing, and processing, distribution and supplies are now carried on through co-operatives. In fertilizer production and distribution the Indian Farmers Fertilizer Cooperative(IFFCO) commands over 35 percent of the market. In the production of sugar, the cooperative share of the market is over 58 percent and in the marketing and distribution of cotton, they have a share of around 60 percent. The cooperative sector accounts for 55 percent of the looms in the hand-weaving sector. Cooperatives process, market and distribute 50 percent of edible oils. Dairy cooperatives operating under the leadership of the National Dairy Development Board and through 15 state cooperative milk-marketing federations has now become the largest producer of milk in the world. The groundwork for this was laid in the early 1970's when the largest dairy development programme in the world - Operation Flood - was launched. Operation Flood was a national marketing strategy linked to a dairy infrastructure development programme that created a chain of dairy processing plants, collection stations and a national milk transportation grid. With the passage of the Insurance Act, cooperatives have been allowed to entry into the insurance business. Insurance is a field where the immense potential of cooperatives remains untapped. The Indian Farmers Fertilizer Cooperative has recently teamed up with a Japanese company and formed a joint venture for undertaking general insurance business in India.

Recommended from an Expert Group constituted by the Government of India

i) To facilitate building up of integrated co-operative structure

ii) To make the co-operative federation organizations responsive towards their members

iii) To minimize government interference and control in the functioning of co-operatives

iv) To eliminate politicization from the cooperative sector.

CONCLUSION

Consumer Cooperatives is significant role in our distribution system. Consumer cooperatives aim is improving the public wealth and livelihood. They should develop a vision to integrate quality with cost reduction and consumer focus and launch quality initiatives. The introduction of new projects and programmes, consumer cooperatives should pay adequate attention to project planning, monitoring and budget allocations for proper implementation. Public wealth is the priority function of consumer cooperative. The co-operatives in India have made an all-round progress to contribution public wealth.

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A STUDY OF GLORIFICATION OF INDIGENOUS CULTURE IN ANEES SALIM'S NOVELS, THE BLIND LADY'S DESCENDANTS, VANITY BAGH AND TALES FROM A VENDING MACHINE

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ABSTRACT

Culture is created and spread thorough mankind, by the states, social groups and individuals. Cultural research has become the new fashion in literary studies now. In it, the study is carried out from the point of view of the cultural contents and way of life of the people.

In India, due to the long past foreign rule and also due to the trade and commerce worldwide, many natives have adopted the elements of a colonizing subculture which greatly influence the dresses, religions and languages of people even today. Among the mixed citizens, the indigenous peoples make it a point to preserve their religions, traditions, customs and the early way of life which are mostly associated with people, places and things of all sorts. Accordingly, indigenous cultures, traditions, languages and habits etc. are given prominence in the literary works today.

Anees Salim is an Indian Author known for his works such as *The Blind Lady's Descendants*, *Vanity Bagh* and *The Small Town Sea*. It is likely that he chooses to represent the native Muslim community in Kerala. In line with this, nearly all his books are centered on Muslim families, their culture and way of life, except the first one, but even that has an interesting character called, Rabiya. As a member of the Indigenous culture, Anees Salim seems to glorify his traditional cultures through his works.

The present study proposes to analyse how the elements of Muslim cultures, customs and languages are duly exemplified in *The Blind Lady's Descendants, Tales from a Vending Machine* and also in the *Vanity Bagh*,

Key Words: *Cultures, Customs, Religions, Traditions and Languages etc.*

Introduction

The cultural identity of India can be found in the hundreds of wonderful traditions of many religions and communities in India. India's languages, religions, dances, philosophies, cuisine, languages, music, architecture, meals and customs fluctuate from place to place. Indian culture is an amalgamation of numerous cultures. The land on which Indians live and the natural resources on which they depend are inextricably linked to their identities, cultures, livelihoods, as well as their physical and spiritual well-being.

As a Muslim Author, Anees Salim focuses on the Kerala Muslim Culture. Salim's last three books, *Vanity Bagh*, *Tales from a Vending Machine* and *The Blind Lady's Descendants* highlight the lower-working class Indian Muslim heroes and account for the particulars of their lives in a straightforward manner. He portrays social disarray with astonishing daintiness of touch. His emphasis is on multi-dimensional individuals.

The book, *The Blind Lady's Descendants* is a family novel. It follows the everyday fightings, misgivings and yearnings of an Indian Muslim family. Anees Salim weaves a story around a family, particularly a traditional south Indian family. In the family, the father and mother remain in conjugal bonds with no affection or compassion between. Each of the kids have their own qualities. Amar is the story teller in the novel. He undertakes to write a diary about the Bungalow. The book deals with the doings of the children when they were kids. It also tells about the memories, damages, revelations, and the dearly held secrets.

The blind lady is Amar's maternal grandmother, who in the end gets executed by her own daughter, Asma, the mother of the

four youths. Hamsa, the father of four children, is never- endingly baffled. He stealthily married another woman at Malabar where he went every now and then on his business. Sophia, the third child fails miserably in boat mishap. Akmaldisappears after his change from a religious boy to a radical terrorist. Hasina, the most seasoned girl, got married to a local professor. Amar, is the only one who remains till the end to unveil the story.

Amar is religious and Akmal is too fanatic. Jasira and Sophiya are totally different in appearance and in character. The battles among the kin, the battle for property, the frivolous and jealous nature of the individuals in the Bungalow are brought before the audience through Amar.

What the audience get to know further of the novel is the progressive unfurling of the disintegrating condition of the physical and the psychological connections of the members of the family both inside and outside the home. The story follows the lives of the occupants of the Bungalow. It tells about the useless guardians, the mother's bemoaning over the loss of her adored children and the father's usual goings to Malabar and also of the visually impaired grandma who shapes a feeling on everything; of the uncle who composed his name on each book alongside the time he completed the process of understanding it. Also, of the kind, caring and more youthful sister who suffocates while endeavoring to pick a water lily; the egotistical, vainglorious senior sister for whose marriage the family auctions the blind lady's Bungalow; and the ardent senior sibling who says his supplications five times each day.

While describing the lives of the characters, Anees Salim weaves the string of the present day political reality such as the destruction of the Babri masjid, the death of Rajiv Gandhi, and the contrasting responses of the Muslims of the Bungalow.

In a straightforward manner, Anees describes how Amar's mind does hundred somersaults for the duration of Friday prayers, how he imagines the imam with a goatee, how he prays without his mind being in prayer, how people are instructed in Surah Maun of the Holy e- book. All these are associated with the aid of a child's reminiscences of his early days who, like the children of the most Muslim households, had completed studying the Quran before he embraced teenage.

> I had already become an atheist.I embraced atheism at the age of thirteen and a bit. At thirteen, I had finished my Quran lessons, along with Akmal. I was a quick learner, quicker than Akmal, who saw the hand of Allah in everything.We had a Quran instructor who came to the Bungalow every evening on a rickety bicycle, the end of his white turban flying behind him like a kite's tail as he rode down the drive (BLD, 7).

In *Tales from a Vending Machine*, a lively, winsome young lady named Hasina works, at an airport vending machine. She leads a modern, self-dependent life. She wanders off in fantasy land about fighting a terrorist who attempts to 'capture' the plane. However, she sobs when she thinks of the obliteration of the Twin Towers and also she gets reminded of how the top of the building crumbled smoothly to the ground like a wedding cake.

Salim shows how a specific world can become both a cage and a sanctuary. What happens when the limits of what you should or should not do are foreordained by individuals in power and when this in turn makes an endless loop.

Hasina Mansoor is functioning as a sales young lady in the Fresh and Hot refreshments, Instant tea/espresso Vending Machine claimed by the rich-Shylock, Haji Osman. The tea is truly costly, yet it is the least estimated thing accessible in the air terminal prior. Haji Osman, is a figure of parody who speaks the incongruity and logical inconsistencies among the Muslim people's group, who does not miss an exorbitant Hajj journey every year, consistently holds two Tasbih reciting

wearables in two hands yet arranges Hasina's abba that she cannot wear purdah at the candy machine as that may unfavorably influence the business.

Hasina pleasantly vindicates Haji Osman and the coupon man at whatever point they insult her by serving a tea added with two mothballs and wishes them 'Upbeat crapping'. She has a hint of desire towards her twin indistinguishable sister Shamla. Hasina pays Shamla's school expenses. Her dad is wiped out and still runs the obligation ridden Mustafa stores, a material shop lacking advancement and brilliance. Her mom is fairly apathetic and more youthful. Her sibling Ali has learning disability. On the upper story of their home, lives her dad's half-aunt, Laila, her spouse and child Eza who are in consistent battle with Hasina's family over the property. Eza and Hasina are in a secret of relationship.

In a universe of impassive individuals, unpleasant, gossiping neighbors and associates, what she clutches is the invaluable chances of meeting big names at the clinic. She meets the Pakistani cricketer, Wasim Akram at the air terminal, encompassed with the fans and supporters, who gives a signature to just her. Such minimal things light in her life.

In contrast to other young ladies, Hasina Mansoor, the Vending Machine administrator at the International Airport was resolved, goal-oriented. Actually a young lady like Hasina finds it hard to keep up even herself yet Hasina additionally takes care of her family. She even thinks about the entire Muslims. She despises Jews and America since they scorn Muslims. She is agitated about Saddam Hussain's merciless hanging. In Hasina's words,

> you know why the Americans showed the hanging on television? They were simply revenging; it was their yelling at all Muslims in the world: you watched the collapse of our nice little trading centre. Now you watch the death of your hero. Bloody Muslims. I hate America… (TVM, 102)

Hasina says, she despises "juice" (Jews) who slaughter the Palestinians.

Hasina is a character whom no one can reduce to any labels. She continually proclaims I am Hasina MANsoor, I have a Man in my name.

Anees Salim is effective in depicting customary existence of Muslim individuals without turning to any emotionalism. He comes out with a story that depicts the life of a gathering of youthful Muslim young men living in a Mohalla called 'Vanity Bagh'. The men over there are roused by the legend of Abu Hathim. The 'Vanity Bagh' is mockingly considered to be a 'Little Pakistan'.

The reason was that while playing against England, Pakistan won the cricket world cup in 1992. The triumph was commended in the Vanity Bagh with a long Hank of fireworks. Quickly there was police attack requesting who observed Pakistani's triumph. Yet, the answer was that they observed England's thrashing, the ex-ruler of India. After that incident, the place turned into little Pakistan.

> After 9/11, Muslims are not welcome in America even if they are the best computer expert or psychologist… if they could strip people like Abdul Kalam and Shah Rukh Khan at airports, what chances do for an infamous individual. (VB 57-58)

Vanity Bagh is about the life of a boy from the minority community. The book is not about hope. It is about hopelessness. More than anything else, it is about distress and religious intolerance that can divide humanity and win elections.

Imran Jabbari who is blamed for the 11/11 sequential impacts and condemned for sixteen years in jail, lives in Vanity Bagh, a Muslim majority mohalla, named by sensation mongering press as 'Little Pakistan', close by a Hindu larger part area Mehandi. Imran Jabbari is a child of the Imam of the Masjid-e-Mosavi.

The offspring of the region are all nonconformists at different phases of tutoring, since none is keen on schooling. There was likewise a Madrasa, however the most elevated taking in they could obtain from the point was just the capacity to peruse the letter-sets from the quran.

Many of the kids are named after heroes in the politics and cricket of Pakistan. With the novel extravagant Muslim names for youngsters supplanting the ancient old ones of seniors in theMohalla was quite normal. It was even inevitable, to be named after someone rich and famous from Pakistan…, some of singers, some of actors. Thus, there were Yahya, Zia, Benazir, Zulfikar, Nawaz Sharif. What's more, Vanity Bagh and Mehandi had, been on conflicts and banner battles in their rounds of common need to feel superior.

Summation

Anees says in one of his interview that "I don't view myself as a representative of the Muslim people group, however I might want to record its feelings of trepidation, hesitations and expectations".

By analyzing the scenes and situations described in the above mentioned novels, it is clear that the novelist has brought into limelight the nuances and intricacies found deep in the Muslim families and their indigenous culture. While referring to unique culture-based events and incidents and some of the aspects of the traditional muslims, the author has not used any synonymous or equivalent English words so as to make them explicit to the target audience. It seems to be an attempt to glorify the innate traditional Muslim culture to the wider and general audience. Thus, the narrative technique is quite enlightening, innovative and insightful and it paves the way for further analysis.

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THE OTHER SIDE OF SILENCE

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ABSTRACT

The other side of silence generally refers to the marginalized section of society whose minds were manipulated, voices were suppressed and their dreams were shattered. In correspondence to the partition holocaust or encounter the other side of silence mainly refers to the underrated section -women, children, untouchables, lower caste and ordinary people. We find a prolific litterateur Urvashi Butalia was the first to come up with an oral history of a human tragedy under the name "The Other side of Silence." She examined through interviewing diaries, letters, memoirs etc. to recount the traumas that the women in particular experienced. She hopes that giving a voice to the voiceless will help heal the trauma and repair the India Pakistan relationship very interestingly, the two female writers Baldwin and Ali with their female protagonists Roop and Nazneen and their experiences have tried to be a light at the end of the dark tunnel. "What the Body remembers" is the first English work looking at partition from a Sikh woman's perspective. The notion of what women were for actually finds the missing puzzle to connect the dots through the prescribed book "What the Body remembers".

The strength, stigma, vibrancy and determination is what Bricklane teaches us. The journey of soul growth, abandonment and evolution through the transformative Nazneen's self-discovery debunks the myth of women equivalent to men in all areas of requirements.

KEYWORDS: *Shackle, convulsions, marginalized, patriarchy, transformation, solace, tragedy*

INTRODUCTION

The partition of India was the highest human convulsions in history. The division of India into two countries - India and Pakistan and the massive destruction, dismay, bloodshed and violence that followed shook the nations on both sides of borders and boundaries.

The year 1947 witnessed a million deaths. Many women were abducted and raped. Huge numbers of people were displaced, countless children disappeared and most importantly homes, villages, communities, families and relationships got destroyed. More than half a century later Urvashi Butalia comes up with an extraordinary oral history of a human tragedy - " The other side of silence." Through interviews conducted over a time period of 10 years and examination of diaries, letters, parliamentary documents, memoirs, Butalia connotes- the marginalised people of history- children, women, ordinary people, the lower castes, the untouchables have been affected brutally. She details the demographic and ethnic developments that affected Partition and recount the traumas that women, in particular, experienced including her own family. Butalia hopes that by putting the unspeakable into words, she will help heal the trauma and thereby help repair the India - Pakistan relationships. She presents a sensitive and moving account of her quest to hear the painful truth behind the silence. The feminist Butalia sat in conversation with Charlie Smith one day as a part of the Indian Summer Festival regarding - " The other side of silence." Smith said the book ' shattered the taboo and started a conversation.'

The twenty-first century has witnessed several women writers expressing their heartfelt disagreement, despair and dismay towards the conservative patriarchal dichotomy to enslave and cage women into the four walls of their houses.

Monica Ali's Nazneen in 'Brick Lane' is no exception. Ali is credited for picturizing the portraiture of an illiterate immigrant married Bangladeshi woman seeking her true solace. The quest towards the unknown – The journey towards self-discovery and the transformation to light metaphorically Nazneen's inner growth from being a shy, coy meek to ultimately realizing her true potential and thus her breakthrough moment. The break free, in short, a rebel in Nazneen that Ali poured was not an easy cake to digest as she had to go through severe mental transition, pebbles on her path and most importantly conflict with her educated husband. The hypocrisy hits her hard when

we find the hypocrite, educated, conservative husband of Nazneen refuses her to go to college to learn.

Nazneen found her new love in Karim a radical and had a physical relationship with him but this could not satisfy her entirely and they parted their ways. At last, we witness Nazneen going for ice skating that she once dreamt only. The sole journey and soul growth with the transitional period she had in her life ultimately made her victorious. Women writers since time immemorial have gone through several cases of abuse, misconduct that has hit them hard physically, emotionally, mentally and psychologically. Feminism is a huge outbreak to stand out in protest towards all the injustices that womenfolk, in general, had to go through. The world has witnessed an urge and a quest to raise a voice for self-protection. The brutal torture that women went through during partition especially raises our goosebumps. Earlier times some of the writers stood for the cause of protecting women rights but since a few years, back a trend can be viewed amongst the writers to be a voice for the voiceless.

Shauna Singh Baldwin is amongst such writers, first in her tribe to raise awareness and courage to speak for the subjugated, dominated and marginalized section of the society. In the novel " What the Body Remembers" partition is considered as a subject matter in which Baldwin opens up the other side of the silence of women and has successfully drawn out the feminine reality of time with the depiction of Sikh women's domestic experiences and account of political turmoil. It is the first English work looking at partition from a Sikh woman's perspective. The story opens up with the beautiful 16 years old Roop married to a man 25 years her senior in 1937. Sardarji, on the other hand, has a barren first wife Satya but in fact, knowing the secret she agrees and is confident enough that she will win over her husband. When Roop bears two children she becomes compelled to give her children to Satya as Sardarji was struggling with his guilt of being unjust to the first wife. The twist of the tale turns into a roller coaster ride as the rest of the family moves to Lahore leaving angry and heartbroken Satya into isolation, pain and ultimately to suicide.

The story lights up with Roop inheriting Satya's spirit as she journeys with her children from Lahore in Pakistan to Delhi in India in search of security and safety. The conflict and struggle between the two women to assert their authority over their husbands and children serve as an allegory to the partition of the nation and ongoing political struggle. The constant changing notion of home for both women and marriage serves as a metaphor of both exile and uprooting of one's home. Baldwin challenges the projection of women as sexual objects unlike her male counterparts Khushwant Singh and Chaman Nahal. Satya's infinite love for Sardarji stands very much different from that of Roop. Satya tried to win over her husband with her truth, reality and sharp mind not fluttering her eyelashes like Roop. A straightforward and outspoken woman who falls prey to the usual norms of the society of fertility or-What women are for actually? A sense of betrayal and cheating conflicts within her mindset beyond the limit of tolerance when Sardarji moves to Lahore with Roop and children: "I am not a wife, for my husband has abandoned me. I am not widow for he still lives,... no one....." (Baldwin 401).

Realising to go to a place where she can start her life without fear by her own choice, she chooses suicide that will remind Sardarji of his guilt and presence to be felt with her absence. Unlike Satya, Roop's sufferings have been told by the writer on a different level. But the basic reality of the doom of a woman is to be born as a woman. The novel in short is a gem of women's pain, bitter experiences, the trauma of the bloody holocaust with the intermixture of women's spirit that portrays through the disembodied voice of Satya who voice about the female agony during the partition in which women suffered the most.

In 1947, the predominantly Hindu region of West Bengal was made part of India, while the mostly Muslim region of East Bengal became part of Pakistan, So the act of

partition perpetrated by British colonial powers led to decades of unrest and disharmony with East Pakistan suffering prejudices at the hands of West Pakistani forces. In 1971, after the Bangladesh liberation war, East Pakistan declared independence becoming the People's Republic of Bangladesh. The novel towards the end reveals the terror attacks of September 11 in the U.S shaking and shaking the Bengali residents of Tower Hamlets who were targeted in numerous racially motivated incidents.

Monica Ali's novel "Bricklane" is a splendid daring, brilliant, intensely gripping and involving one. The heart of the novel and its most assured achievement is Nazneen herself. Ali portrays her journey from submissive, teenager to hesitant independent mother with poetic intelligence.

Monica Ali is a fabulous writer and "Bricklane" is a finely observed, deeply compassionate, and tender novel. Ali writes with a mixture of passion and restraint that is totally exhilarating. Ali has an impressive command over her story.

Conclusion

Soul's growth is parallel with every struggle it encompasses courageously so is the story of women's liberation psychologically into a win-win situation in the contemporary world.

The contemporary world is a kingdom of striving, seeking, yarning norm so is the demand to overcome obstacles that add to the soul's growth. The story of female folk suffering mutilating endlessly and compromising to adhere to orthodox hierarchy is a historical saga. Many female writers since time immemorial have raised their voices to spread awareness amongst people to stop the game of injustice, inhuman torture, forcefulness, physical, emotional and mental violence that results in trauma. Women in general have always been the soft targets of any battle. It is so unfortunate that the society that worships deities becomes the partner in crime to take away the peace, hope, longing for life and disregard their hearts calling.

So the process to break the chain is parallel between soul growth and women's liberation. The procedure of both as has been witnessed by us throughout the centuries is a win-win outcome. The intensity of ruthless bloodshed violence, torture that women irrespective of any caste, class or community went through, shows that women were the battleground of any massacre. These days due to the excessive torture, sufferings, womenfolk went through arouse a need of liberation, awareness, consciousness and protest. Whether it be through words written or spoken verbally women have been able to break free. Metaphorically speaking the truths of soul's growth – the process of spiritual awakening to enlightenment to moksha is not an easy cake too. All the great saints – be they Swami Vivekananda, or Gautam Buddha all had to undergo immense development internally to match up to their highest future self. Both linked up together consistently the stories of breaking free are similar. The toil, the labour and hardship the women went through caused a sort of awakening in their mind and in the collective to be the truth, to find the light, to be the love.

OBJECTIVES

(1)To present how ' voice for the voiceless, a quest to unleash the painful truth behind the silence can provide more power to the underrated section of society.

(2) To project the despair and dichotomy that conservative patriarchal hierarchy ushered to enslave and cage women being the soft target of any encounter.

(3) To transient the transformative journey of self-discovery in the process to channel the light within to break free and accomplish to subvert the myth of hush always for the subjugated.

FINDINGS

(1) The first objective taken has been found verified and justified because in 'What the Body Remembers 'the protagonists Satya and Roop seem to vibrate to the mentality of the womenfolk in general. Baldwin is the first Sikh Canadian, first in

the tribe to raise awareness to speak for the marginalized, be it through the caricature of her portraiture of a strong, stout combative lady Satya or even Roop ----------the spirit inherited from Satya after her death to be the raising voice and rising star to support and protect for the greater cause of equality and humanity.

(2) The second objective has been verified in the sense our celebrated and unique protagonist Nazneen portrayed by Monica Ali is so inspiring to break the shackles of conventional patriarchy to establish her sense of freedom and cherish her wildest dreams. She is an immigrant Bangladeshi uneducated married woman who from her zone of nothingness went to the heights of the fulfilment of going for ice skating for the first time.

(3) (3) Our third objective has also been found verified and justified because both the protagonists' Roop and Nazneen took as a replica to resemble a change in the societal thinking pattern with their evolution and self-discovery has surprised us. Nazneen's journey from being an uneducated immigrant, a Bangladeshi lady who was caged into the four walls of enslavement, finally managed to access education and unleash her dream of ice skating. Whereas Roop, a shy, coy, meek, docile lady's transformation into a strong-headed woman wins our heart and we are full applauses for her as she breaks the patriarchal shackles.

(4) So, we find that all three objectives are fully justified and verified.

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AN EMPIRICAL STUDY ON INVESTMENT BEHAVIOUR AND SATISFACTION LEVEL OF BANK EMPLOYEES IN TRICHY DISTRICT

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ABSTRACT

The concept of savings is really essential to cope with the fast evolving multi-faceted social commitments. Savings and Investment are commitment of a person's funds to grow future income. Human needs are unlimited hence he has to work more. In this research paper an attempt has been made to study the bank employee's individual behaviour and level of satisfaction towards various investment alternatives. The study was made with a sample of 75 private bank employees in Trichy district, through a structured questionnaire using the statistical tools such as measures of regression analysis, analysis of variance .The results of multivariate analysis revealed that there is no significant difference between expected return satisfaction and Investment evaluation decision. Anova also revealed that there is no significant difference between expected return and the level of satisfaction of the respondents

Key Words:*, Satisfaction level, Expectation, Investment behaviour, Investor Information and Investment Avenues Trichy*

Introduction

Investment is common to all societies and this practice differs from person to person . In India there are various investment avenues available to meet differing needs of investors. The investors saving schemes will have a significant impact on the saving behaviour of people. A study on behaviour and level of Satisfaction assumes a greater significance in the formulation of policies for the development and regulation of savings in general and protection and promotion of small and household investors in particular. Some of these investment avenues offer attractive returns but with high risks and some offer lower returns with very low risks.

Literature Review

Ishwarya P (2014) had undertook a study the behaviour and satisfaction level of investors towards various investment alternatives available for the salaried class employees in the city of Mangalore. The study was conducted with an objective to ascertain the behaviour of salaried class employees and to measure the satisfaction level of salaried class employees towards available investment avenues. The researcher has taken an sample of 100 respondents using convenient sampling technique. It was concluded that that most of the respondents expressed their views positively towards investment activities. Majority of the respondents are not only less aware about the investment avenues but also they are less satisfied about their investment in marketable securities. The research also concluded that 36% of respondents are satisfied on their investment in non- marketable securities and 64% of respondent's satisfaction is poor. It was also concluded that 88% of respondents are satisfactory on their investment and only 12% of respondents perceived and reported to have lower degree of satisfaction on their investment in physical assets.

Vinoth R & Rajkumar R (2013) has undertaken a study titled, "Investors satisfaction, expectations and practical problems on mutual fund investments – An investigation study with special reference to Coimbatore City", with an objective to study the priority of investments over mutual funds by the investors, to study the practical problem of mutual fund and to study the expectation of mutual fund investors. The study was carried out with a sample of 150 respondents through a structured questionnaire using convenient sampling technique. It was concluded that high returns was the top priority while ranking the decision making factors. The respondents also felt that the mutual funds have not offered the expected returns for their investment. It was also concluded in the research that majority of the respondents

were satisfied on the service of agents of mutual fund organisations. It was also concluded that personal factors of the respondents have no significant influence on the source of awareness of mutual funds and type of business, whereas the personal factors have significant influence on the type of scheme.

Umamaheswari S & Ashok Kumar M (2014), had carried out a study titled, "A special study on Coimbatore based salaried investors awareness, attitude, expectation and satisfaction over their investments" with an objective to explore the investment attitude of the investors to perceive their level of satisfaction about their investment policies, to observe the motivating factors for their investment policies with a special reference to expected rate of return on their investment besides exhibiting the investors decision making in opting for the investment policies. The research was carried out with structured questionnaire and a sample of 1000 respondents. It was concluded in the research that relative portion between the demographic factors and the satisfaction level of salaried class investors about their investment policies. It was also proved that the rate of return of salaried class of investors on their investment policies is necessarily influenced by their demographic constituents.

De clercq B, J.M.P.Venter & C.J.van Aardt (2012) undertook a study titled, "An analysis of the inter-relationship between savings product usage and satisfaction using a SERVQUAL framework" with a sample of 700 respondents in South Africa with an objective to study the relationship between usage and satisfaction levels attributed to various saving products. The researcher conducted correlation and regression analysis to ascertain the level of usage relating to financial products with the level of satisfaction ascribed to the products. It was concluded that very high positive correlation coefficients indicates strong relationship between the variables. Higher the usage and higher satisfaction with respect to saving products. It is also concluded that the importance of financial product providers continuously strive to improve satisfaction levels among savers so that higher usage levels can been courage, and to increase the savings base with diverse products so as to give more returns to savers over the medium to long term, cannot be over-emphasized.

Objective of the study

From the above literature review, it can be understood that the studies in respect of the level of satisfaction with reference to bank employees were not made earlier. Hence an attempt has been made to analyse the satisfaction level of the banking professionals with the following objectives.

- To study the mean, deviation, of the selected demographic variables
- To analyse the variance between investment and level of satisfaction
- To analyse the expectation and level of satisfaction and investment evaluation decision

Hypothesis

H0: There is no significant influence on demographic factors on investment.

H0: There are no significant difference between expectation, satisfaction and Investment

Decision

Research Methodology

The research methodology depicts the flow of the research process and serves as guidance for the research to carry out the research study. It comprises of data source, sample size, sampling techniques and tools of analysis. In this study, the analyst has utilized the essential information acquired from 100 respondents working in banking part.

Statement of the problem

The development of any economy depends on healthy savings and proper allocation of capital for the developmental activities of any country. The avenues of investment and the investors' opinion based on their preferences vary from person to person. Liquidity and

safety play a major role in the investment decision; tax exemption and other factors are also taken into consideration. Apart from the above factors, there are demographic factors which influence the decision on investment. This article discusses the factors which affect the investment behavior of individuals in the city of Trichy.

Data Analysis and Interpretation

Primary data was collected through questionnaire comprising of various parameters from the respondents. The information generated through the survey is being reported through the tabulation of categorical variables and the results are discussed below.

Table I Descriptive statistics

Particulars	N Statistic	Mean Statistic	Standard Deviation Statistic
Age	100	1.26	0.972
Gender	100	1.40	0.502
Marital Status	100	2.85	0.430
Qualification	100	2.08	0.779
Annual Income	100	3.13	0.959
Percentage of Savings	100	2.10	1.119
Annual Investment	100	4.34	0.783
Awareness	100	2.48	0.617
Grade of Employment	100	2.72	0.7 30
N	100		

Show that the mean, mode and median differences are very high. Mean value of Age is 2.72 and it shows that the majority respondent belongs to the age group between 31 and 40. 17.6% of respondents belong to less than 30 years, 48.8% of respondents belong to 31-40, and 23.2% of respondent belongs to 41-50 and the rest 10.4% belong to above 50 years. Gender shows that 80% of the respondents were male and the rest belongs to women.

The mean value of marital status is 2.85 and shows that majority of the respondents were unmarried (84.8%). The mean value of educational qualification is 2.08 and showed that 27.2% of the respondents were graduates, 37.6% of the respondents were post graduate and 35.2% of the respondents were professionals.

The mean value of annual income shows that 2.13, which shows that 25.6% of the respondents earning less than five lakhs, 48% of the respondents earnings between 5-10 lakhs, 16.8% of the respondents earnings between 10-15 lakhs. 7.2% of the respondents' earnings between 15-20 lakhs and the rest 2.4% belong to above 20 lakhs per annum. The mean value of percentage of savings is 2.10 which shows that 36% of the respondents percentage of savings is less than 10 percent, 29.6% of the respondents percentage of savings is between 10-15 percent, 23.2% of the respondents percentage of savings is between 15-20 percent and the rest 11.2% of the respondents percentage of savings above 20 percent of their earnings.

Table 2 ANOVA

	Sum of Squares	df		Mean Square	F	Sig.
Regression	13.754	5		3.173	15.783	0.000[a]

Residual	31.136	95		0.156		
Total	48.712	100				

- **Predictors:** Level of satisfaction, Return expected, Annual Income, Educational Qualification, Percentage of Savings
- **Dependent Variable:** Annual Investment

Table 3 Return expected and level of satisfaction

ANOVA (Return expected-Level of Satisfaction)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0.195	4	0.399	0.566	0.534
Within Groups	25.513	96	0.255		
Total	43.908	100			

Null Hypothesis: There is no significant difference between its expected return and the level of satisfaction of the respondents.

Interpretation: Based on the result generated by SPSS, the significant value is 0.566 and it is greater than 0.05. Hence the null hypothesis is accepted since there is no significant difference between the levels of satisfaction of respondents with respect to their expected return. Expected returns from investment not influence the satisfaction level of the respondents.

Findings

- Gender, Marital status, Annual Income, Annual Investment and Grade of employment shows Leptokurtic and Age, Educational qualification, Percentage of savings and awareness.
- Majority of the respondents are in the age group of 31 – 40 and more than 65% of the respondents are males.
- 48% of the respondents are in the income group of Rs.5-10 Lakhs and more than 50% of the respondents are fully aware of the investment.
- Annual Income and Percentage of savings influencing the amount of annual investment
- No significant difference between its expected return and the level of satisfaction of the respondents.
- There is no significant difference between Expected return - satisfaction versus investment evaluation decision under safety principal and liquidity.

Conclusion

It is extremely important for the policy makers and regulatory authorities to understand the investors' perceptions, preferences, and their concerns on the market. A study may be conducted exclusively for other sector of employees with a perspective to help and promote the investors. Also research may be pursued to help the middle income group in making best investments clubbed with higher return and satisfaction to the investors. Investment procedures must be simple and clear to attract more investors.

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CHEMICAL AND GREEN SYNTHESIS OF ZNO NANOPARTICLES FOR STUDYING ANTIBACTERIAL ACTIVITIES

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ABSTRACT

In this paper, ZnO nanoparticles were synthesized by two methods, i.e., hydrothermal as well as green synthesis method using leaf extract of Corriandrum sativum. The antibacterial activity of as-synthesized nanoparticles was studied using Escherichia coli (E. Coli) as test bacterial strain . Although chemical and green synthesis methods are mostly used for nanoparticles synthesis but the green synthesis is a better choice due to eco-friendliness. ZnO nanoparticles have found fabulous application in biomolecular detection, diagnostics, micro electronics and water remediation.

Keywords: *Corriandrum sativum, Characterization, hydrothermal method, Zinc oxide nanoparticles, Zinc acetate*

INTRODUCTION

Nanoparticles form a special group of materials due to its unique features and various applications in different fields [1]. Studying these features has always been of great interest to many scientists. In fact, nanoparticles show unique properties as compared to their bulk size counterparts [2]. Various materials which were considered to be safe shows toxic behavior at nano size range [3], which is related to the increase in surface area and high reactivity of nano size materials [4, 5]. A larger surface area ensures an increased range of interaction of materials with bio-organics present on the viable cell surface [6]. The antimicrobial activities of inorganic metal oxide nanoparticles such as ZnO, MgO, TiO_2, SiO_2 shows their potential application in diagnostics, surgical devices and nano-medicine based antimicrobial agents [3, 5, 7-9]. The advantages of using these inorganic oxides nanoparticles as antimicrobial agents are their greater effectiveness on resistant strains of microbial pathogens, less toxicity and heat resistance. Also, they provide mineral elements essential to human cells and even small amounts of them exhibit strong activity [4, 10,11]. Among metal oxide nanoparticles, ZnO nanoparticles is one of the inorganic nanoparticle that shows features like chemical and physical stability, high catalytic activity, effective antibacterial activity as well as intensive ultraviolet and infrared adsorption with broad range of applications as in semiconductors, sensors, transparent electrodes, solar cells, etc. [1,12]. Also in recent years, ZnO has received considerable attention because of its unique optical, piezoelectric, and magnetic properties [13]. In Addition, ZnO particles have bactericidal effects on both Gram-positive and Gram-negative bacteria. They even have antibacterial activity against spores, which are resistant to high temperature and high pressure.

From the literature, it is evident that the antibacterial activity of ZnO nanoparticles depends upon the surface area and concentration, while the crystalline structure and particle shape have little effect. Also smaller the size of ZnO particles, better is its antibacterial activity. Thus higher the concentration and larger the surface area of the nanoparticles, the better is its antibacterial activity. The present investigation, therefore, was aimed to determine the antibacterial activity of ZnO nanoparticles toward E. Coli as Gram-negative bacteria in laboratory condition.

In this paper we are reporting preparation of ZnO by chemical as well as green synthesis method. Green synthesis technique uses

pollutant free methods to synthesize nanomaterials. Though physical and chemical methods are used for nanoparticles synthesis, the biogenic fabrication is a better choice due to eco-friendliness [14, 15].

In the present work, we have used eco-friendly method for the synthesis of Zinc Oxide nanoparticles using aqueous leaf extract of Corriandrum Sativum with Zinc acetate dihydrate as precursor. Corriandrum sativum also known as cilantro, Chinese parsley or dhania is an annual herb in the family Apiaceae [16]. It is a soft, hairless plant growing upto 50 cm. The leaves are uneven in shape, broadly lobed at the base of the plant and slender. Recently nano particles synthesis was achieved with bacteria, fungi, actinomycetes [17-19] and use of plant extract such as neem, camellia sinensis, Corriandrum, nelumbo licifera, ocimum sanctum and several others which is compatible with the green chemistry principles [20, 21]. Among these approaches, the use of plant extracts has compensation such as easily available, safe to handle and possess a broad viability of metabolities.

Along with this ZnO was also prepared by hydrothermal method. ZnO can also be prepared by chemical methods such as hydrothermal method, chemical precipitation [22, 23], sol-gel, solvothermal [24-27] electrochemical and photochemical reduction method [28, 29]. Chemical method leads to the presence of some toxic chemicals adsorbed on the surface that can lead to adverse effects [30].

EXPERIMENTAL PROCEDURE

CHEMICALS:

Zinc acetate dihydrate (99% purity) and sodium hydroxide (pellet.99%) were used as the introductory material was supplied by Sigma-Aldrich chemicals. The fresh leaves of Corriandrum sativum were washed thoroughly with double distilled water, grinded and were filtered through Whatman filter paper was used for further.

SYNTHESIS OF ZnO NANOPARTICLES:

ZnO nanoparticles were prepared by two different methods. In synthesis I ((Green synthesis method (ZnO-1)) 0.02M aqueous Zinc acetate dehydrate was added to 50 ml of distilled water under constant stirring. Aqueous leaves extract of Corriandrum were introduced into the above solution after 10min stirring .Then 2.0M NaOH was added to make pH 12 resulted in a pale white aqueous solution. Then the solution was placed in a magnetic stirrer for 2hrs. The pale white precipitate was then taken out and washed over and over again with distilled water and ethanol to get free of the impurities. Then a pale white powder of ZnO nanoparticles was obtained after drying at 60°C in vacuum oven over night.

In synthesis II (Chemical method), 0.02M aqueous Zinc acetate dihydrate was dissolved in 50 ml of distilled water under vigorous stirring. Aqueous 2.0M NaOH was added drop by drop to reach pH 12. Then the solution was placed in a magnetic stirrer for 2 hour. The white precipitate formed was washed thoroughly with distilled water and ethanol to remove the impurities. The precipitate was dried in a hot air oven for overnight at 60°C. Complete conversion of $Zn(OH)_2$ into ZnO NPs took place during drying. The antimicrobial activities of both particles were done by Agar well diffusion method.

RESULTS AND DISCUSSION

XRD ANALYSIS OF ZnO:

The crystallinity, phase and purity of as-prepared samples were determined by X-ray diffraction. Typical XRD patterns of as-synthesized nanoparticles were -

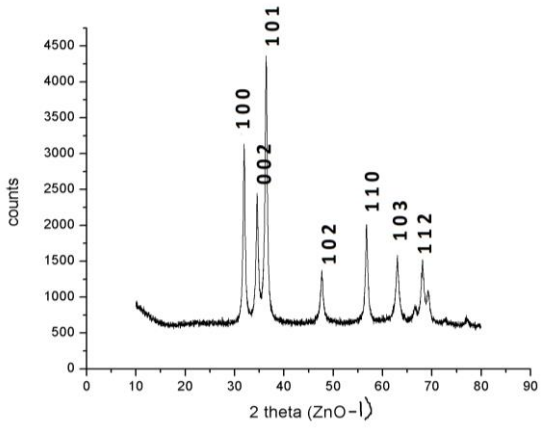

Figure 1(a)

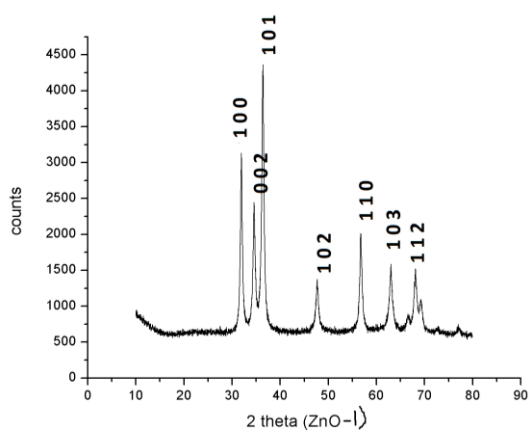

Figure 1(b)

Figure 1(a) and Figure 4.1(b) clearly indicates nine major peaks at 2θ values of 31.90°, 34.55°, 36.32°, 47.61°, 56.63°, 62.99°, 68.06°, 69.23°, 77.43°, which corresponds to (100), (002), (101), (102), (110), (103), (112), which are in good agreement with wurtzite ZnO (JCPDS CARD NO: 36-1451). Zinc oxide nanoparticles synthesized results confirmed that the ZnO nanoparticles are of wurtzite hexagonal type structure.

ANTIBACTERIAL STUDY OF ZnO NANOPARTICLES

The antimicrobial activities of both particles were done by Agar well diffusion method (Figure 2).

Figure 2

It was found that ZnO Particles prepared by green synthesis were showing better antibacterial activity than chemically synthesized particles.

CONCLUSIONS

In this paper, we synthesized ZnO nanoparticles by two methods i.e. hydrothermal as well as green synthesis using leaf extract of Corriandrum sativum. XRD study reveals that the sizes of as-synthesized particles are in nano range. Though chemical and green methods both are used for nano-particles synthesis but synthesis method is a better choice due to ecofriendliness. The eco-friendly high efficient ZnO nanoparticles prepared from Corriandrum leaf extract are expected to have more extensive application in biotechnology, sensors, medical, catalysis, optical devices, DNA labeling, drug delivery and water remediation.

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FACTORS AND GLITCHES THAT INFLUENCE INVESTMENT DECISION - A SURVEY IN TIRUCHIRAPPALLI CITY

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ABSTRACT

Investment plays a key role for successful enrichment of post retirement life or any emergency needs or for children education and so on. Every Investor has a motive behind his investment and at the same time while making Investment there are certain factors that affect the investors investment plan. A proper awareness cum knowledge regarding the various investment avenues would help the investors to decide the appropriate avenue. Hence the present study aims at finding the investment avenue that investors are aware off, Motives behinds investment and the problems that affect the overall investment behaviour of the Investors in Tiruchirappalli city.

Key Words: - *Investment, Investors' problems, and Factors that affect investment decision.*

Introduction

Introduction of the study

Cash that is leftover meeting all the monthly expenses are generally used to make investment in any of the investment avenues with the anticipation that it will generate some additional income in the future that can beat the present inflation cum all the future requirements plus the emergency needs if any. Investors make investment according to their needs or motives behind the investment hence they should analyze, study the respective avenue before they make investment. In an economical term, an investment means procurements of goods that are not used immediately but are used in the upcoming future to generate wealth. In financial term, an investment means possessions of financial asset that will stipulate additional earnings in the future or later can be sold at a higher price for a profit.

Each and every investor has unique motive while making investment like tax exemption, or they expect a good return, or they consider the duration of investment or the risk linked with the investment and at the same time while making investment investors do face certain issues, Hence according to the investors motives the investment options should be customized and a proper awareness regarding avenues need to be provided so that investors can make a perfect decision about investment portfolio, which in turn will generate income both to the country's economy as well as the individual investor.

Problem Statement

The present study is carried out in Tiruchirappalli city to understand the investment behaviour pattern of the investors and the factors that influence their investment decision. While making Investment the foremost problematic issue that arises are regarding the selection of appropriate investment avenues according to their motives and how to overcome the problems faced by them while making investment. The statement of problem accounts to "Factors and Glitches That Influence Investment Decision - A Survey in Tiruchirappalli City".

Objectives

1. To identify the investment behaviour pattern of investors in Tiruchirappalli City.
2. To analyze the influence of demographic factors of investors in Tiruchirappalli City.
3. To find out the overall investment behaviour performances of in Tiruchirappalli City.

Hypothesis

1. H1: There is no significant relationship between frequencies of Investment with Demographic factor in Tiruchirappalli investors.
2. H2: All the factors have equal impact for Investment pattern of investor's behaviour impact by Tiruchirappalli investors.
3. H3: Independent variables are not having significant influence on overall investment behaviour pattern of investors and problems faced while making investment

Research Methodology

In this analytical study, investors' investment behaviour pattern in Tiruchirappalli City was analyzed and for this purpose 120 investors samples were identified using purposive sampling. Their responses were collected through questionnaire and were processed using SPSS version 20 software as a part for main study. For analysis, descriptive statistics, Friedman's test for k-related samples, Chi-square tests, Factor analysis, and Multiple Regression Analysis were used. The secondary data was collected with the help of reference books, journal, research papers and websites are also used under this study.

Limitation of the Study

The study was limited to a sample size of 120 respondents only. The study was conducted only in Tiruchirappalli city.

Review of Literature

Ms. Rajaj Arora (2015) published a paper titled ***"Indian Investor Behaviour",*** has concluded that time period of investment, different investment objectives, choice of investment avenues and various characteristics like return on capital, safety, corporate governance etc. is directly related to age and occupation of an investor and investors consider equity market as effective financial instrument followed by real estate and commodity market. It was also found that people depend mostly on news channels to known about financial product followed by financial advisors.

Dr. S. Poorna Prabhat, N. Srivani and Ch. Varalakshmi (2016) published a paper titled ***"Investors Perception Towards Different Investment Avenues",*** they have made an attempt to analyze the investment behaviour of investors against various investment avenues from Vijayawada City. They found that gender and age have no impact on investment decision of the investors while the variables like income level, occupation and education shows an impact on investment decision of the investors.

Anugrah Rohini Lal & Dr. N.L. Gupta (2017) published a paper titled ***"An Analytical Study on Relationship of Age, Gender and Income with The Investment Preference towards Fixed Deposits: A Study in Uttarakhand",*** they tried to find out the relationship of Age, Gender and Income with Investment preference towards fixed deposits of investors in Uttarakhand. They found that gender and income have significant relationship while making investment in fixed deposits while age doesn't affect the investment preferences. They also found that mostly salaried class, low- and middle-income group prefer fixed deposits.

Disha (2018) published a paper titled ***"A Comparative Study on The Perception of Investor Towards Derivatives and Equity",*** has analyzed the perception of investors towards Derivatives and Equity in Indore City and concluded that there is no significant difference in the investment pattern between the equity and derivatives, apart for this various factor that influence the selection of equity and derivatives were analyzed and found that derivatives are less speculative and has sufficient protection measures taken by the regulatory bodies. In case of equity, it easy and traditional, it is less risky and has sufficient protection measures taken by the regulatory bodies.

G. Velmurugan, V. Selvam and N. Abdul Nazar (2015) published a paper titled ***"An Empirical Analysis on Perception of Investors' Towards Various Investment Avenues",*** they have tried to explore the investors' perception towards various investment Avenues in Vellore City, Tamilnadu. They found that aged and high-income investors prefer to invest only in post office and bank deposits for safety reason.

Dr. Bharti Wadhwa, Dr. Anubha Vashisht &Ms. Davinder Kaur (2013) published a paper titled ***"Investors' Attitude Towards Mutual Fund Investments",*** they have concluded that return from the investments, credit rating agency is the topmost concern of the investors apart from that financial literacy of respondents is very important for making investment in Mutual funds. They also insisted that Mutual fund companies should promote financial awareness amongst the respondents so that their income and savings are channelized towards Mutual Funds.

Prof. Samita Kher & Dr. P. N. Shende (2013) published a paper titled ***"A Study of Investment Pattern of Central Government Employees After the Implementation of Sixth Pay",*** they found that due to the implementation of six pay commission the amount of investment in each avenue has increased and even the central government employees are venturing different investment avenues. The major share of investment is done in insurance sector for tax benefits and high security, the investment appetite has changed from short term to middle or long-term investment.

N. Geetha & Dr. M. Ramesh (2011) published a paper titled ***"A Study on People Preferences in Investment Behaviour",*** has conducted the research in Kurumbalur and found the respondent are not much aware about the stock market, equity, bond and debenture. They also concluded that all the age group prefer to invest in insurance, PPF, NSC and bank deposits come income level is the important factor that effects the portfolio of investors and proper awareness regarding the stock market and their service need to be provided by the stock Brokering firms.

Qiujun Lan, Xuqing Xu & Xingye Hu (2017) published a paper titled ***"Predictability of Investment Behaviour Based on Personal Characteristics about China's Individual Investors",*** they have considered four principles to filter personal characteristics of the investors named as, "common", "easy to measure", "Stable", and "Relevant. They found that investors' personal characteristics are strong predictors of investors behaviour apart from those three personal characteristics as "professional knowledge levels", "investment experience" and "income level" have the most significant impact on all types of investment behaviour. Based on the selected significant personal characteristics it provides a better understanding of the individual investors and explore the irrational behaviour of investors in the financial market in China. Further these results could not only provide decision information for investor education, marketing and service personalization, but also provide clues to strengthen customers' cost control, quantitative management and risk control.

Dr. Bhumija Chouhan (2020) published a paper titled ***"Current Scenario of Investing Pattern of Indian Investors' with Special Reference to Northern and Western Region",*** has mainly focused on the investment pattern of the investors of northern and western part of India and aspects that are considered while making investment decisions. He found that investors of Northern of part of India preferred FD, Saving and Life Insurance while investors of Western part of India preferred in MF, Life Insurance, PPF and FD and Saving account. The reason for selecting these investment avenues were to meet future expenses and for tax saving. There is no difference in discernment across north and west regions.

Data Interpretation

1) Factors influencing investors' investment behaviour pattern

Factors influencing investors' investment behaviour pattern in the study area has been measured by variables. Based on the agreement given by the respondents, factor analysis with principal component method using vari-max rotation was applied to group the variables in to factors. The result of the KMO measures of samples adequacy and bartlett's test of sphericity indicates that application of factors analysis is appropriate for the data. The KMO measures of sampling adequacy was 2162.339 and it was significant ($p<.001$). eighteen variables are reduced into fewer factors by analyzing correlation between variable (investors behaviour). In this case, eighteen variables were reduced to four major factors.

Table-1

Factor Analysis

	Items-Total Statistics	
	Regular Return	Cronbach's Alpha
Factors-1	12.1. Capital Appreciation	.800
	12.2. Liquidity	.771

	12.3. Yield rate will be good	.737
	12.4. For additional income	.906
	Safety of money invested	
Factors-2	12.5. Securing for children's education	.831
	12.6. Securing for post-retirement	.856
	12.7. Securing for emergency Purpose	.874
	12.8. Saving money for my future safety	.856
	Tax Benefits	
Factors-3	12.9. Diversification of Assets	.839
	12.10. Compete against inflation	.873
	12.11. Escape from tax load	.937
	Problems Faced while making Investment	
Factors-4	13.1 Reliability on available information	.849
	13.2 The ability to choose the best Avenues	.843
	13.3 Understanding the tax rule	.794
	13.4 Anxiety of losing money	.835
	13.5 Lack of Investment plan	.695
	13.6 Lack of Investment Awareness	.766
	13.7 Income is not Sufficient for investment	.784
	Overall Cronbach's Alpha	2162.339

The above all eighteen items reliability co-efficient are found to be satisfactory. Therefore, the final version of the questionnaire was prepared and it is used for the study.

2) Chi-Square Test: To test the relationship between Demographic factors and frequency of investment

Null Hypothesis:

$H0_1$: There is no significant relationship between frequencies of Investment with Demographic factor in Tiruchirappalli investors.

Alternate Hypothesis:

$H0_{1:}$ There is significant relationship between frequencies of Investment with Demographic factor in Tiruchirappalli investors.

Table-2 Consolidated Results of Chi-Square Test

	Table Value	d.f	Calculated Value	Level of Sign.	Result
Age	32.00	16	34.925**	1	Significant
Gender	9.488	4	12.089	5	Significant
Marital Status	21.026	12	8.001	5	Not

					Significant
Education	21.026	12	21.076	5	Significant
Occupation	15.507	8	18.878	5	Significant
Annual Income	15.507	8	15.525	5	Significant

Inference

Frequencies of Investment is categories with five distributions viz Monthly once, Quarterly, Half-yearly, Annually and no specific time limit. Age of the customers were categorized with five distributions viz. Between 20-30 years, 31-40 years, 41-50 years, 50-60 years, and Above 60 years. There are two kind of genders Male and Female, Marital status three groups married, Unmarried and others (divorce, etc). Education divided into five modes Schooling, UG, PG, Professional, and others (more than one). Occupation salaried, business and others (more than one). And Annual income three categories up to 2,50,000, 2,50,001-5,00,000 and Above 5,00,000.

The results of the relationship between "Frequencies of Investment with demographic factors like age, gender, Marital Status, education, occupation, and annual income" were presented in the table 1 which shows that alternate hypothesis is accepted, except for marital status.

Except the calculated value of marital status, the other five variables Age, gender, education, occupation and annual income is more than the table value at 1% and 5% level of significance. Hence, the null hypothesis is rejected and concluded that the investors investment behaviour is impacted with most of the demographic factors like age, gender, education, occupation, and annual income" investment behaviour is significantly related to the factors in Tiruchirappalli.

3) Friedman's test for k-related samples:

Awareness of investors are divided in to nine major parts Bank deposits, company deposits, Post Office Deposits, shares/Debentures, Gold, real estate, Insurance Premium, Recurring Deposits, and Mutual Funds are tested with Friedman's test for k-related samples the test result and discussions were presented below.

The respondents have ranked, to test the significance of various factors that influence the preferences of investors. Friedman's test for k-related samples was applied to study the relationship between various factors that influence the preference of investors towards available Investment Avenues.

Null Hypothesis H01:

All the factors have equal impact for Investment pattern of investor's behaviour impact by Tiruchirappalli investors.

Table-3

Ranks			
	Mean Rank	Chi-Square	Ranking
1. Bank Deposits	1.24	278.694 (P<.001)	9
2. Company Deposits	4.99		7
3. Post Office Deposits	5.31		5
4. Shares/Debentures	5.76		3
5. Gold	5.86		2
6. Real Estate	4.77		8
7. Insurance Premium	5.29		6
8. Recurring Deposits	5.63		4
9. Mutual Funds	6.16		1

The results of the Friedman's test showing that the null hypothesis is rejected at 1% level. Not all the factors have equal impact on investment behaviour pattern of investors in Tiruchirappalli.

4) Multiple Regression Analysis for Overall Investment Behaviour Pattern of Investors and Problems Faced While Making Investment.

By considering impact of investment behaviour pattern of investors the factor that motivates the investment decision are classified into: regular return, safety of

money invested and tax benefits with Problems Faced while making Investment are categories, Reliability of available information, the ability to choose the best avenues, understanding the tax rule, anxiety of losing money, lack of investment plan, lack of investment awareness, and income not sufficient for investment.

Table-4

ANOVA[a]									
Model		Sum of Squares	Df	Mean Square	F Calculated value	F Tabulated	Sig.	R	R Square
1	Regression	1710.362	12	142.53	17.956	4.95	0		
	Residual	849.338	107	7.938					
	Total	2559.7	119					0.6	0.4
a. Dependent Variable: Overall investment behaviour DV									
b. Predictors: (Constant), regular return, safety of money invested and tax benefits with Problems Faced while making Investment are categories, the ability to choose the best avenues, understanding the tax rule, anxiety of losing money, lack of investment plan, lack of investment awareness, and income is not sufficient for investment.									

Investment behaviour pattern of investors influenced as measure variable. Multiple regression analysis was conducted to examine the relationship between the impact of investment behaviour pattern of investors towards Problems Faced while making Investment.

Null Hypothesis:

H01: Independent variables are not having significant influence on overall investment behaviour pattern of investors and problems faced while making investment.

Table 4 shows the result of the liner regression analysis summary for overall investment behaviour pattern of investors and problems faced while making investment in Tiruchirappalli. In the above Table the F calculated (17.956) is greater than F tabulated (4.95). Therefore: the null hypothesis is rejected, with significant value=.000<0.005. There is positive relationship between the independent variable's investment behaviour pattern of investors the factor that motives your investment decision are categories regular return, safety of money invested and tax benefits with Problems Faced while making Investment are categories, the ability to choose the best avenues, understanding the tax rule, anxiety of losing money, lack of investment plan, lack of investment awareness, and income is not sufficient for investment.

R value = (0.6), Which refers to coefficient of correlation of the independent variable and the dependent variable satisfaction is highly influenced by investment behaviour pattern of investors in Tiruchirappalli district.

Table-5

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.817[a]	.798	.761	1.81740
a. Predictors: (Constant), regular return, safety of money invested and tax benefits with Problems Faced while making Investment are categories, the ability to choose the best avenues, understanding the tax rule, anxiety of losing money, lack of investment plan, lack of investment awareness, and income is not sufficient for investment.				

b. Dependent Variable: Overall investment behaviour DV

The above table shows the model synopsis of overall investment behaviour pattern of investors and problems faced while making investment is influenced (predictor) and it explains the 76.1 % of investors overall investment behaviour is impacted (R^2=0.761).

Finding

Demographics factors like age, gender, education, occupation, and annual income has impact on the investor's investment behaviour pattern whereas Marital status has no impact on the investment behaviour.

Investors have more awareness about Bank Deposits, Real estate, company deposits, post office deposits followed by insurance premium and it clearly shows that investors have less awareness regarding mutual fund.

The overall investment behaviour pattern of investors is impacted by the investor's motivation behind the investment cum the problem faced by them while making investment.

It was also found that the major factor that motivates the investors while making investment are regular income, safety of money invested, securing for children's education and securing for post- retirement.

Suggestion

Investors intensely trust that saving is very essential for future but accurate awareness regarding the various investment avenues like mutual fund need to provided so that they diversify their investment and at the same time can earn more to beat the inflation. There are lots of financial awareness program conducted regarding the investment option available in the market and a lot of investment videos are available in the internet, but a decorum needs to be maintained so that investors can attend them and gain proper knowledge. A proper knowledge regarding various investment avenues will help the investors to diversify their investment and cope up with their risk.

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DEPLOYING WEB SERVICES IN CLOUD ARCHITECTURE

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ABSTRACT

Cloud Computing is an emerging technology for business people. It involves the concept of scaling the computing resources as per the enterprise need and also offer on-demand services to the end-users.Cloud computing provides endless benefits and is a cost effective model considered as modular, self-describing, self-contained and freely attached applications that can be identified, located, and invoked across the web. This paper presents the deployment method of web services in cloud architecturefor enabling the heterogeneous computing systems. Due to the rapid growth of web services the requirement for web service composition is becoming a significant task for the developers and researchers. The main aim of this paper is to build the web services as a core function and deploying it both inside and outside of the cloud architecture.

Keywords: *Cloud Computing, Web Services*

Introduction

Agility is the ability of a business to adapt rapidly and cost efficiently in response to changes in the business environment. It can be achieved by quickly adapting goods and services to meet customer demands. Basically, agility is a concept that incorporates the ideas of flexibility, balance, adaptability, and coordination under one umbrella. In an increasingly challenging business environment, enterprises can no longer expect to thrive on the basis of existing business and IT strategies. Unlike the time-consuming, expensive application modernization projects of a decade ago, transformation initiatives based on social, mobile, analytics and the cloud are cost-effective and efficient. The cloud provides a natural platform for optimizing existing IT systems to increase operational efficiencies while driving business agility and growth. Cloud computing strategy drives business agilities are,

- **Faster time-to-market** - Cloud computing [11, 12] allows companies to significantly decrease the time it takes to provision and de-provision IT infrastructure, speeding delivery of IT projects that are critical to revenue growth or cost reduction. While a physical server could take days or weeks to procure and provision, a cloud server takes minutes.
- **Automation** - Cloud computing simplifies re-deploying resources through automation. The efficiency of cloud computing reduces the amount of time and IT systems administrator has to spend on managing and supporting infrastructure.
- **Pay for the number of resources to utilize and require** - The pay-per-use model of cloud computing offers its subscribers the opportunity to either rent or subscribe to the platforms, systems, infrastructure and data services which can be rapidly scaled up or down on need basis. This eliminates the risk of committing a lot of finances on insignificant or less useful resources which are required to store these entities themselves.
- **Faster innovation –** Cloud computing allows companies to support an increased pace of product development and marketing programs that better align IT infrastructure and management costs with the goals and objectives of the business. The flexible infrastructure that cloud offers translates into businesses enhancing their agility rather than being inhibitors of the change. It allows organizations to step up or tone down their operations to support their business goals such as attracting and retaining new customers or speeding up the time-to-market for latest services.
- **No need to wait for hardware and software resources –** The cloud makes everything accessible via the Internet. Conventional business processes need weeks or months at times to set up hardware and develop software. The

setup can be ready within few hours in the cloud.

- **Flexibility and scalability** – Due to the pay-per-use flexibility of the cloud, end-users are able to scale fast based on the demands of the business. Among the common workloads that require on-demand scalability named as, testing and development, load testing, a new application etc.

The need of Web services is recently, commercial applications [10] use variety of modern programming platforms like Java, .NET Angular JS, Node.js, etc. to develop their web or internet based applications to the end users. These heterogeneous applications require some sort of communication to interact between them i.e. the applications are built using different programming languages and it becomes difficult to ensure exact communication between applications. The web services will provide a common platform that allows multiple applications to build on different programming languages to have the ability to communicate with each other.

Literature Review

Anwar et al., 2017 presented the utilization and the concept of web services. In that, the computational load is to delegate to remote servers for execution. Preferably to clone the mobile device or to delegate the entire application based on Virtual Machine (VM) migrations, the mobile based applications might be served as web services and the devices precisely approach to access those web services without any authority and complications.

M. Ali et al., 2015 stated that web service in terms of application accessible to other kind of application over the internet. The application interaction is regardless of the operating platform everyone agrees the procedure and guidelines for interaction. While comparing with mobile devices the design transmitwith limitations like, lowbattery time consumption, diminished processing power with defined bandwidth.

M. Shiraz et al., 2015 presented the mobile web service. It providesauto-configured and self-handling service to address the issues of conventional computationaloffloading techniques lacking in-depth resources and energy exhausting features. F. AlShahwan and K. Moessner, 2010 have presented the simulation and testing of Web services as a computational offloading solution formobile computing. The researchershould focused to selectthe tool for structuring theweb services amongst Simple Object Access Protocol (SOAP) and Representational state transfer (REST)for service usages like deducing the transmission distance to a single hop, duration delayed during execution and low energy consumption etc.

WU Nai-zhong, 2013 have proposed cloud computing web service management function with monitoring section. Itisa real-time monitoring system facilitateQuality of Service (QoS) in information.As certain red signal, prompt the system in which automaticallypermitthe resource adjustment function and choosecost in-expensivemode to satisfythe end-user essential, outlooks and purposes.To perform automation process it includes modules as, process, monitor,compose / race, match and order etc.

M. Lanthaler and C. Gütl, 2010 have presented the concept of offloading through Web services which is implemented with two types of load carrier protocols as,SOAP a standard ObjectOriented Technology (OOT) relying on the extant protocols likeSimple Mail Transfer and Hyper Text Transfer Protocol (SMTP & HTTP) for messages transaction and consignment. The transmission of the data takes place viaweb is in XML (Extensible Markup Language) format. However, REST is used for building up the Web services, categorized a resources oriented technology and it is an architectural style of World Wide Web (WWW)in which the communication takes placevia HTTP.

M. Armbrust et al., 2009 presented the definition of cloud computing as service utilization i.e. published via internet as well as data handling center in which it requires hardware and software resources to access the cloud services. L. M. Vaquero et. al., 2008 proposed cloud computing is simple with available memory of virtualized resources these resources can be dynamically reconfigured to accommodate in shifting

system load and resource utilization in an feasible manner

Foster et al., 2008 presented the advantages of cloud computing as, on-demand computing services, during process the users dynamically relate / exemption their resources, in order to achieve the robustness and efficiency of cloud offers different levels of virtualization, and its service models as, Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS).

Technologies and Processes forDeploying Web Services

A web application is an application that a user can operate through a server on the internet. More and more web applications are developed because the world is eventually becoming more digitalized.Web services can be defined as the method (mobile and desktop) communicate or interact over the WWW.The web service is application software devised to facilitate M2M interaction over thecomputer server.The Web Service Description Language (WSDL) is structured so that it can define data that is coming through it.This data is then turned into a format that the two machines interacting can understand each other. In Fig. 1. Shows aninterpretation of web service and its tasks. The client demand a series of web service calls via requests are made with the support of Remote Procedure Calls (RPC) to a web server in which it demandthe relevant web service hosted on the cloud.

For instance Amazon web service provides appraise for their products taken online from amazon.com. The User Interface (UI) is built in any one of the modern programming language but it should have the capability to communicate with web service technique. The major component for service designing requires schema design for data transmission between client and server. The schema design is in the format of XML represented as intermediate language in which it is simple and flexible to learn the web service.

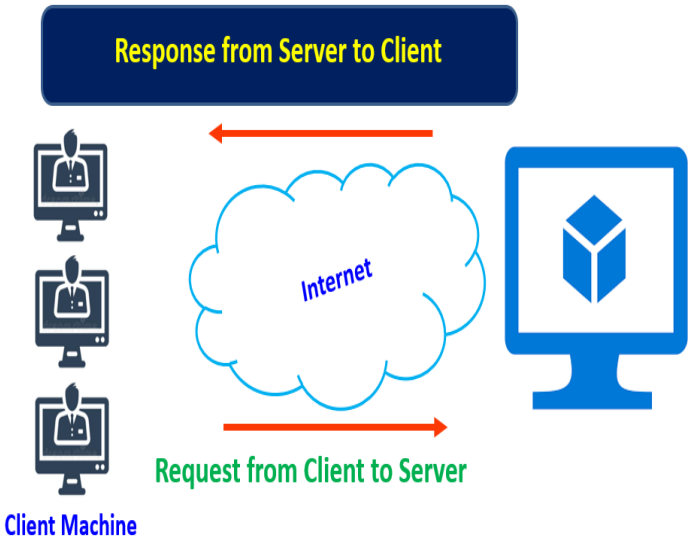

Fig.1. Model of web service

The web services utilize SOAP for transfer the XML between different kinds of applications via HTTP. The components utilized for programming the web services are,

- SOAP aka transportindependent messaging protocol. It is based on transferringXML data as SOAP messages in XML template with definite structure is followed for a specific pattern, but it not included in content section and it's all transmit the complete information via HTTP - a standard web protocol.The structure of SOAP includes, a root as first element <Envelope>in an XML document. The root element consist of header and body section.
- The header section comprises routing data to transport the XML document to the required client machine. The body section comprisesdefinite information.

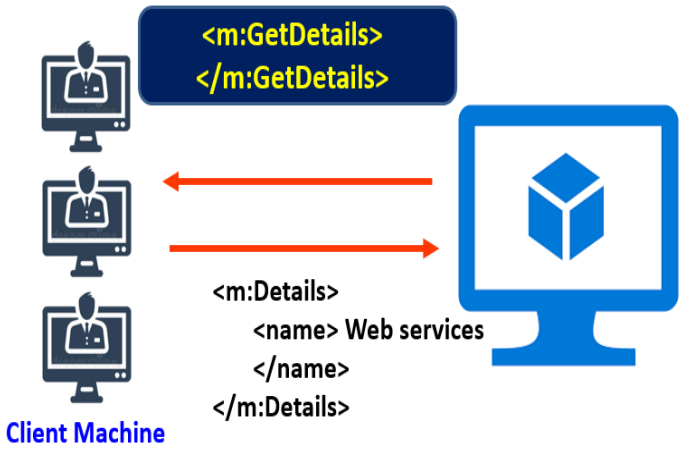

Fig.2. SOAP protocol

- WSDL - A web service is not functioned if WSDL unable to initiate. While invoking the web service the client application must recognize where the web service was actually exists. Then, the client application needs to know actual function to invoke the exact web service. It might be made with the support of WSDL an XML based file which helps to recognize the web service location and its utilization. WSDL statement consisting of,
  - <message> - It is used to define the different data elements for each operation performed by the web service. Example: Fig.2. information exchanged between the web service and the client machine operations are performed efficiently. The client machine contains an element ID of type string or text to identify the exact information. The web service offers response operation contains an element Name belongs to a type string or text.
  - <portType> - Characterize the operations to be performed by web service. For instance Fig. 2. encompass input and output message.
  - <binding> - This element contains the protocol HTTP utilized to perform details for the body of the operation, It includes namespace and information encoding technique.
- Universal Description, Discovery, and Integration (UDDI) - A typical approach for describing, publishing, and discovering the web services afford by service provider. UDDI offers a specification for hosting the web services and provides a repository on WSDL files might be hosted on to the server. Now the client machine will access the UDDI service that deeds the database comprise of WSDL documents. For instance, a telephone directory has details like name, address and telephone number of an individual like the similar approach the UDDI registry will have the entire significant message for the web service in case the client machine knows where it might be located.

Web service Deployment

The cloud is different from traditional hosting environments when you use PaaS like Azure App Services as, Hosting a web application outside the cloud requires a server that runs an Operating System (OS) like Windows or Linux and runs a web server to host your application, like IIS or Apache Tomcat. Developer would be responsible for the application, but sometimes also for parts of the OS and the web server. For instance, ensure that the right IIS modules are installed, or setting the correct access rights on an application pool.

Hosting a web application inside the cloud provides Azure App Services in there are still servers in a datacenter that run the application. MS-Azure runs a magical abstraction piece called the Azure Service Fabric which abstracts server resources and makes sure that when a server fails, application keeps running on another server. It also offers scaling the underlying resources. The Web App has settings similar to those of a web server like IIS or Tomcat.

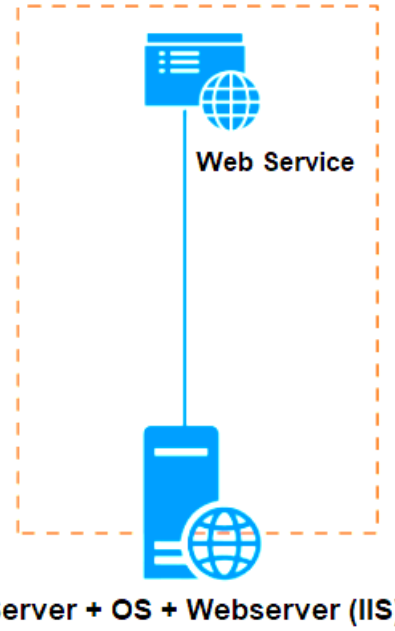

Fig. 3. Deploying a Web Service – Outside Cloud Architecture

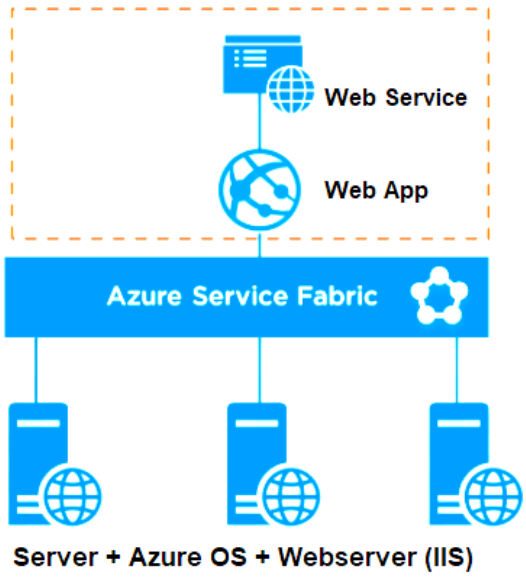

Fig. 4. Deploying a Web Service – Inside Cloud Architecture

The unique characteristics of an ideal cloud technology model are,

- Scalability - Access to unlimited computer resources without thinking about the economic aspects. This feature needs planning & provisioning
- Low Entry barrier - Users can gain access to systems for small investments also; which allows the offer to access global resources to small ventures
- Flexibility - Cloud provides high economic elasticity. Users can re-size their resources based on their need. This feature allows optimizing the system & captures all possible requirements
- Utility - As cloud provider's pay-as-you-go model, users can match their needs & resources on an ongoing basis. This eliminates waste and added benefits of shifting risks from the client

Conclusion

Initially, the Web services are designed to support interoperability of M2M interactions using WWW. The communication is based on the principle of requests and responses, carried out with XML messages.The major issue occurs in web service composition is the difficulties of maintaining the existing running web service due to the changes of business requirements, deployment environment, and other dynamic factors.To resolve the issues the software engineer, researchers need to interact with cloud providers to find out an effective way of approach.

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AN EFFICIENT NETWORK SECURITY ON SDN WIRELESS ENVIRONMENT

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ABSTRACT

Programming Defined Networking (SDN) is another frameworks organization perspective that permits a controller and its applications an incomparable capacity to have exhaustive association detectable quality and versatile association programmability, therefore engaging new advancements in network shows and applications. One of the middle advantages of SDN is its reliably brought together control plane to give the entire association detectable quality, on which various SDN applications depend. Unprecedented for the composition, we propose new attack vectors exceptional to SDN that truly challenge this foundation. Our new attacks are genuinely practically identical in soul to parodying attacks in legacy associations (e.g., ARP hurting attack), at any rate with tremendous differentiations in abusing intriguing shortcomings how current SDN functions remarkably as opposed to legacy associations.

The productive attacks can effectively hurt the association geology information, a significant design block for focus SDN sections and topography careful SDN applications. With the hurt organization detectable quality, the upper-layer OpenFlow controller organizations/applications may be totally tricked, provoking certified seizing, refusal of organization or man-in-the-middle attacks. As shown by our examination, all current major SDN controllers we find keeping watch (e.g., Floodlight, OpenDaylight, Beacon, and POX) are affected, i.e., they are reliant upon the Network Topology Poisoning Attacks..

INTRODUCTION

SOFTWARE DEFINED NETWORKS

Programming Defined Networking (SDN) has arisen as another organization worldview to advance the hardened organization foundation by isolating the control plane from the information plane (e.g., switches), just as giving comprehensive organization perceivability and adaptable programmability. As the mind of the organization, a SDN regulator awards clients an extraordinary device to plan and control * The initial two creators contribute similarly to the venture. the organization utilizing their own applications on the regulator's center administrations. In scholastic conditions, yet in addition in certifiable creation organizations, SDN, especially its famous acknowledgment OpenFlow1 , has been progressively utilized.

Numerous application situations have been considered and sent from that point forward, going from grounds network advancement to cloud network virtualization and datacenter network improvement. Since the regulator is the center of the SDN engineering, if the OpenFlow regulator experiences any genuine weakness in its plan/execution, the whole organization would be tossed into mayhem, or even absolutely heavily influenced by aggressors.

we study network geography administrations/applications of the standard OpenFlow regulators and recognize a few new weaknesses that an assailant can endeavor to harm the organization geography data in OpenFlow organizations.

The entire organization wide perceivability is one of the key advancements given by SDN contrasted with heritage organizing innovations.

As a crucial structure block for network the executives, the geography data is embraced to most regulator center administrations and upper-layer applications, e.g., those identified with bundle directing, portability following, and organization virtualization and improvement.

Notwithstanding, if such basic organization geography data is harmed, all the needy organization administrations will turn out to be promptly influenced, causing cataclysmic issues. For instance, the directing administrations/applications inside the OpenFlow regulator can be controlled to cause a dark opening course or man-in-themiddle assault

SHORTEST PATH ON SDN ENVIRONMENT

Private broadband utilization is developing quickly, expanding the hole between Internet specialist co-op (ISP) expenses and incomes. In the interim, multiplication of Internet-empowered gadgets is blocking access organizations, corrupting end-client experience, and influencing content supplier adaptation. In this paper, we propose another model whereby the substance supplier unequivocally flags quick and moderate path prerequisites to the ISP on a for each stream premise, utilizing open APIs upheld through programming characterized organizing (SDN). Our first commitment is to build up a design that upholds this model, introducing contentions on why this advantages customers (better client experience), ISPs (two-sided income), and substance suppliers (fine-grained command over peering plan). Our subsequent commitment is to assess our proposition utilizing a genuine hint of more than 10 million streams to show that video stream quality debasement can be almost wiped out by the utilization of dynamic fast tracks, and site page load times can be massively improved by the utilization of moderate paths for mass exchanges. Our third commitment is to build up a completely practical model of our framework utilizing open-source SDN segments (Open stream switches and POX regulator modules) and instrumented video/document move workers to show the plausibility and execution advantages of our methodology. Our proposition is an initial move towards the drawn out objective of acknowledging open and lithe access network administration quality administration that is worthy to clients, ISPs, and substance suppliers the same.

FIXED-LINE Internet Service Providers (ISPs) are progressively facing a business issue private information utilization keeps on developing at 40% per annum, expanding the expense of the framework to ship the developing traffic volume. Be that as it may, incomes are developing at under 4% per annum, inferable essentially to "level rate" evaluating. To limit this extending hole among cost and income, ISPs have endeavored choking chosen administrations (like distributed), which started public objection (bringing about "internet fairness" enactment), and now regularly force use portions, which can smother conveyance of imaginative substance and administrations. It is progressively being perceived that guaranteeing practical development of the Internet biological system requires a reevaluate of the plan of action, that permits ISPs to abuse the assistance quality measurement (notwithstanding data transfer capacity and download quantity) to separate their contributions and tap into new income openings.

OBJECTIVES

Coming up next are the principle destinations of the tasks.

- We at that point examine the relief strategies against the Network Topology Poisoning Attacks and present
- TopoGuard, another security expansion to SDN regulators, which gives programmed and ongoing location of Network Topology Poisoning Attacks.
- Our assessment on a model execution of TopoGuard in the Floodlight regulator shows that the safeguard arrangement
- Can successfully secure organization geography while presenting just a minor effect on ordinary activities of OpenFlow regulators.

RELATED WORK

In this administrative work [1] Yiannis Yiakoumis, has proposed Policy-

producers, ISPs and substance suppliers are secured adebate about who can handle the Internet tra_c that ows into our homes. In this paper we contend that the client, not the ISP or the substance supplier, ought to choose how tra_c is focused on to and from the home. Home clients think most about their inclinations, and on the off chance that they can communicate them well to the ISP, both the ISP and client are in an ideal situation. To test the thought we assembled a model that allows clients to communicate significant level inclinations that are meant low-level semantics and used to control the organization.

Home organizations are a fundamental piece of the advanced house hold, and as the quantity of associated gadgets and applications develop, we develop more subject to the nature of our home Internet association. We anticipate that the network should be quick, consistently on, dependable and responsive. Just, we don't need the organization to hold up traffic of the applications we use at home. We place expanding requests on our home organization, with video real time, video talk, VoIP, gaming and cloud-based reinforcement currently being ordinary. In the previous a year the measure of traffic on home organizations has expanded by half (from 7:0 GB permonth to 10:3 GB). Our applications strive with one another for the last-mile association, regularly causing blockage and awful client experience.

Notwithstanding taking incredible steps in the transfer speed conveyed to the home, Internet specialist organizations (ISPs, offering link or DSL) actually battle with how to divide the accessible band width between clients' applications. As of late, numerous ISPs have presented questionable information cap designs and impeded traffic-serious applications, starting extraordinary discussion and energizing feelings of trepidation that ISPs will attempt to compel the applications we use.

In this administrative work [2] Yiannis Yiakoumis, has proposed Despite the fame of home organizations, they face various foundational issues: (I) Broadband organizations are costly to convey; and it isn't clear how the expense can be shared by a few specialist co-ops; (ii) Home organizations are getting more diligently to oversee as we associate more gadgets, utilize new applications, and depend on them for diversion, correspondence and work|it is regular for home organizations to be inadequately overseen, unreliable or downright broken; and (iii) It isn't clear how home organizations will consistently improve, after they have been sent, to offer consistently better assistance to home clients. In this paper we propose cutting home organizations as an approach to conquer these issues. As a component, cutting permits various specialist co-ops to share a typical framework; and supports numerous approaches and plans of action for cost sharing. We propose four prerequisites for cutting home organizations: transfer speed and tra_c disconnection between cuts, autonomous control of each cut, and the capacity to change and improve the conduct of a cut. We investigate how these necessities permit cost-sharing, out-sourced the board of home organizations, and the capacity to tweak a cut to offer better assistance. At last, we depict an initialprototype that we are sending in homes. Broadband availability, and an organization inside the house, are fundamental elements of a cutting edge family. A huge assortment of home gadgets associate with the Internet, and high transmission capacity Internet applications, for example, video and sound real time, top notch video conferencing, record sharing and reinforcement are currently ordinary. Be that as it may, regardless of enormous interests in broadband, and longer than a time of involvement in home WiFi , home organizations actually face various fundamental difficulties.

In this desk work [3] Jon Matias, has proposed A following stage in the development of Access Networks presents a situation wherein the reasonable rivalry among specialist organizations is empowered through the sharing of access framework. CAPEX reserve funds or administrative

perspectives are right now advancing such a situation. By adding lack of bias, the positive input circle incorporates clients, specialist co-ops and organization administrators. The NANDO project carries out another layer 2 methodology for Neutral Access Networks. This NAN proposition incorporates an organization administrator choice component, a protected launch of administrations and a prefix-based sending approach (Ethernet-PF). The Open Flow innovation has been chosen for its arrangement. Open Flow is a convention by which an outside substance (regulator) can handle/change the stream table of a switch, which manages the sending cycle. This paper is centered around depicting the NANDO situation and the most significant execution subtleties identified with Open Flow. Furthermore, a point by point portrayal of the created regulator and its operational model are appeared, including some agent models. At last, the useful attainability of NANDO is approved in a situation where numerous administrators share a similar actual framework for administration conveyance.

In this administrative work [4] Alok Kumar, has proposed WAN transmission capacity stays an obliged asset that is financially infeasible to considerably overprovision. Thus, it is imperative to distribute limit as per administration need and dependent on the gradual estimation of extra designation. For instance, it could be the most elevated need for one support of get Ï«Gb/s of transfer speed however after arriving at such a distribution, gradual need may drop strongly preferring portion to different administrations. Spurred by the perception that individual streams with ûxed need may not be the ideal reason for data transfer capacity allotment, we present the plan and execution of Bandwidth Enforcer (BwE), a worldwide, various leveled data transmission portion foundation. BwE upholds: I) administration level transfer speed portion following focused on transmission capacity capacities where a help can address a discretionary assortment of streams, ii) autonomous distribution and assignment approaches as per client characterized chain of command, all representing a worldwide perspective on transmission capacity and disappointment conditions, iii)multi-way sending normal in rush hour gridlock designed organizations, and iv) a focal managerial highlight supersede (maybe flawed) arrangement during remarkable conditions. BwE has conveyed more help eõcient transmission capacity use and easier administration underway for a very long time.

In this desk work [5] Carlee Joe-Wong, has proposed Charging various costs for Internet access at various occasions prompts clients to fan out their transmission capacity utilization across times. The inquiries are: is it attainable and what amount advantage would it be able to bring? We create anefficient approach to figure the expense limiting time-subordinate costs for an Internet specialist co-op (ISP), utilizing both a static meeting level model and a unique meeting model with stochastic appearances. A key advance is picking the portrayal of the improvement issue with the goal that the subsequent details remain computationally manageable for huge scope issues. We next show reproductions representing the utilization and restrictions of time-subordinate valuing. These outcomes exhibit that ideal costs, which "reward" clients for conceding their meetings, generally relate with request in every period, and that changing costs dependent on constant traffic appraisals may altogether lessen ISP cost. How much traffic is leveled out over times relies upon the time-affectability of meetings, cost construction of the ISP, and measure of traffic not expose to time-subordinate costs. At last, we present our framework incorporation and execution, called TUBE, and the verification of-idea experimentation.

PROPOSED METHODLOGY

To relieve such assaults, we research TopoGuard(Topology Guard) conceivable protection methodologies. We note that it is hard to just utilize static setup to tackle the issue (like utilizing static ARP section for has or the port security highlight for changes to address ARP harming assaults), since it

requires drawn-out and blunder inclined manual exertion and isn't reasonable for taking care of organization elements, which is a significant development of SDN. To more readily adjust the security and ease of use, in this task, we propose Topo Guard, another security expansion to the current Open Flow regulators to give programmed and ongoing location of organization geography abuse.

By using SDN-explicit highlights, Topo Guard checks precondition and post condition to confirm the authenticity of host movement and change port property to forestall the Host Location Hijacking Attack and the Link Fabrication Attack.

ALLOCATION OF TRAFFIC ACROSS MULTIPLE ROUTING PATHS

This module is accustomed to allotting traffic across different directing ways within the sight of position as a lossy organization stream enhancement issue. We map the improvement issue to that of resource allotment utilizing portfolio determination hypothesis which permits singular organization hubs to locally portray the position effect and total this data for the source hubs. We play out the main security investigation on the SDN/Open Flow Topology Management Service. Specifically, we have found new weaknesses in the Device Tracking Service and Link Discovery Service in eight current standard SDN/Open Flow regulators.

CHARACTERIZING THE IMPACT OF POISIONING

In this Module the organization hubs to appraise and portray the effect of position and for a source hub to consolidate these evaluations into its traffic designation. All together for a source hubs to join the position sway in the rush hour gridlock distribution issue, the impact of position on transmissions over each connection should be assessed. Notwithstanding, to catch the jam mer portability and the unique impacts of the position assault, the nearby gauges should be persistently refreshed. We propose Network Topology Poisoning Attacks to misuse the weaknesses we have found. We exhibit the attainability of those assaults both in the Net beans imitating climate and an equipment SDN testbed.

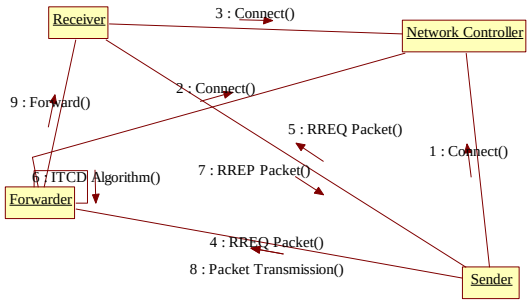
EFFECT OF JAMMER MOBILITY ON NETWORK

In this module The limit demonstrating the connection greatest number of utilizing min max planning which can be shipped preposterous connection. At whatever point the source is producing information with high bundle convey rate be sent at an opportunity to happen. On the off chance that the source hub gets mindful of this impact the portion of traffic can be changed low conveyance proportion on every one of ways accordingly recuperates the way.

ESTIMATING END-TO-END PACKET SUCCESS RATES

The bundle achievement rate gauges for the connections in a steering way, the source needs to assess the viable start to finish parcel achievement rate to decide the ideal traffic allotment. Expecting the all out time needed to ship bundles from each source s to the relating objective is irrelevant contrasted with the update hand-off period. We research the safeguard space and propose programmed moderation approaches against Network Topology Poisoning Attacks, alongside a model protection framework, Topo Guard, presently carried out in Floodlight, yet could be effortlessly reached out to different regulators. Our assessment shows that Topo Guard forces just an irrelevant execution overhead.Organizations clients are alloted scattering advantages by the confided in expert in a PKI for the organization proprietor. Notwithstanding, the organization proprietor may, for different reasons, imitate network clients to spread information things.

Fig 1:Overall Architectural Diagram



EXPERIMENTAL SETUP

Table shows the execution seasons of some significant activities in Topogaurd SDN. For instance, the execution times for the framework instatement stage and marking an arbitrary 20-byte message (i.e., the yield of Proposed calculation) are 1.608 and 0.6348 ms on a 1.8-GHz Laptop PC, individually.

Table : Running Time for each phase of the basic protocol of Topogaurd SDN (Except the Sensor node verification phase)

Table 1: Performance Calculation

Time	System Initialization	IP-Link FabricationAttacks	The certificate generation (i.e., signing a 20 byte message)
Time (CPU = 1.8 GHz) (µs)	1608.0	1576.31	634.8
Time (CPU = 2.6 GHz (µs)	1111.3	1092.12	435.4
Time (CPU = 3.1 GHz) (µs)	931.1	915.18	372.3

Consequently, whenever proposed Topogaurd SDN is utilized, producing a client endorsement or marking a message takes 0.6348 ms on a 1.8-GHz Laptop PC.

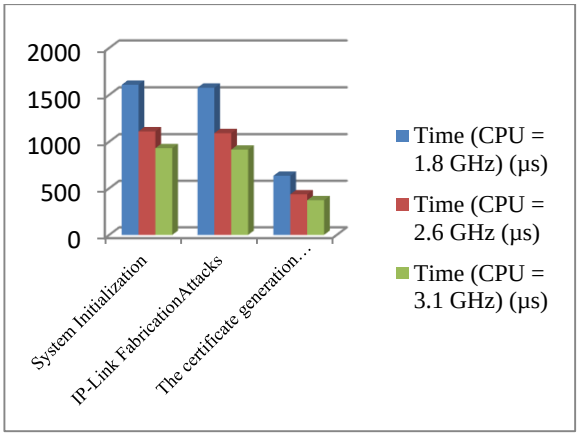


Fig 2: Graphical Representation Performance Calculation

CONCLUSION

The Poisioning Network steering has been created in a particularly organized way which is diminishing the traffic further turn of events. The coding is done in improved on way as they are more reasonable and flexible.The assess the impact of changing organization and convention boundaries to notice the presentation patterns utilizing the poision mindful traffic allotment plan. Specifically, we are keen on the impact of the update transfer period and the greatest number of directing ways on the presentation of the flow allotment.

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COVID-19: ANALYSIS AND STUDY TO IDENTIFY COVID SPREAD THROUGH GRAPH THEORY

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ABSTRACT

The graph theory design model is widely used in determining the best strategies for the improvement of the impact of infectious diseases. Currently, the design model of a complex system such as the huge spread of Covid-19 is among the typical disease. The aim of this article is to provide an analysis using graph based design model of the Covid-19 spread in different countries. The article investigates the studies related to the design of graph theory models related to Covid-19 analysis. Based on the factors affecting the spread of disease and its characteristic, the process is developed starting from origin. We propose a intangible model of COVID-19 by taking into consideration of social distance, contact duration with an infected person and their characteristics. The graph theory models are analyzed based on the scenarios. The application for wide spread of Covid-19 disease analyze the experiments related to the most affected areas. The advantage of this graph based model analysis enables the undetected cases in particular area. The duration of contact, social distance helps to detect cases in various aspects. In future research will study and extend the analysis to check the impact on the number of infections and their models.

INTRODUCTION

The current epidemics, environmental pollution and an increase of transmittable diseases affect individual's life and the development of countries. The problem of spread of transmittable diseases is at the main focus of the world society and plays a vital role in public health. As of 22nd March 2020, the rapid spread of pandemic corona virus disease- Covid 19 has affected the most of the population and recitals for more than 1 million deaths (WHO). The Covid-19 virus causes a serious risk for the human health, development, production and social life. In this condition the prediction of spread of the disease is an important issue to forecast and to consider the preventive measures by based on the characteristics of Covid-19.

Designing is one of the roughly used tools for[3] predicting related to the pandemic situation in the world. At current situation it is a relevant problem to develop the reproduction designs of complex systems to predict the process of spread of disease. The past adequate mathematical theory plays a vital role for securing accurate level of spread of disease. The designing of pandemic processes can be view seriously as an integral part of medical demographics system of the government and in prediction of diseases. For the period of pandemic the planning and decision making is not an easy task. The decisions are prepared with limited experience for an indecisive situation and experience in swiftly changing ratio which is used to observe the novel corona virus.

The vaccines available in different countries and cities are encouraging the non spread of pandemic situation. Even though, it makes reassuring about the rapid transmission of disease[10]. The large number of individuals expends a long period of propagation and can able o transmit the disease to other people.

In order to avoid this situation the design models are important for decision making on Covid -19 spread areas. It is not possible to carry over the avoidable situation to the next occurrences of Covid-19. The strategies will be useful to take the survey and make some decision on spread of pandemic situation.

The main aim of this article is to create an impact on mathematical theory which allows the prediction of Covid -19 zone and reproductive design of specific characteristics of Coivd-19[1]. The purpose of this research work is useful for stopping the Covid-19 spread at word level. With the help of WHO websites the measures can be evaluated and gathered to understand about the current pandemic situation. The measures are helpful to know about the spread of Covid virus

include environmental measures, detecting cases, social distancing and vaccines. The measures are used in concurrence with individual protective measures against COVID-19 such as regular hand washing and cough etiquette. All public health measures to stop disease spread can be balanced with different strategies to uplift social connection and secure the food contribution.

GRAPH THEORY

The graph theory refers to a set of vertices and set of edges that connect the vertices. The two vertices can be joined by more than one edge is referred as multigraph. A graph can be without loops and with at most a single edge between to vertices is called as a simple graph. The complete graph is defined when each vertex is connected by an edge to every other vertex[4]. The directed graph will be having a direction assigned with each edge or in digraph manner. The practical problems related to many types of processes are the main inputs for the graphical theory. The problems can be represented by using these forms of graphs.In this article, the detection of Covid-19 Spread areas is taken into consideration in order to avoid the spread of diseases. The design model must be a solution to identify the causes of Covid-19 and reflects in the evolution of current century. The analysis of few countries data, it is noted that the infection reached to peak around 15 days after controlling measures.

The expansion rate of infected people was slowly decreasing during this period. Especially the growth rate in some countries remains exponential. The quarantine is insufficient and need strict rules to avoid the spread of disease. In order to detect and reduce created a mathematical design model for the pandemic spread by applying graph theory models. The dynamic growth rate depends on many situations by analyzing preferred data is very useful to predict the situation and affected areas.

The design model using the graph theory was, presented with different predictive algorithms[3] for the number infected cases in the near future. The survey on the graph theory design model implemented using dataset and its predictions.

COVID-19

The Corona Virus(Covid-19) designing of rearrangement of population expresses the dynamic nature of social network and infectious agent using the chain of relations. In this regard, the model must be able to reflect the evolution of an infection in real life accurately to ensure the reliability of spread. As several diseases such as viral infection have been studied for decades, the development of a design model based on data sets enables more flexible cases in this situation. The design models of virus infection[7] are used for decision making in vaccines formula and medications in every day. The researchers proposed some information about novel corona virus, the graph design models of spread of Covid zones[8]. The Covid-19 is a complex issue to take overall the world around at present, the graphic models are used to utilize the virus information in-terms of design models

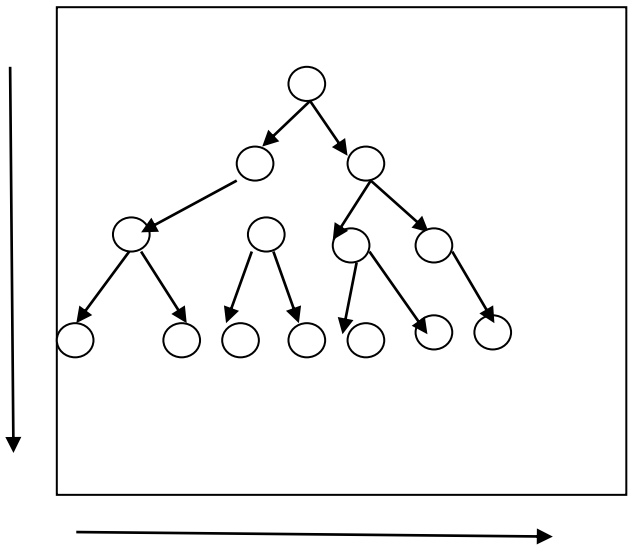


Fig1.Covid-19 Propagation area

NEED FOR IDENTIFICATION OF COVID-19 PANDEMIC-GRAPH THEORY MODEL

The Covid -19 infection will assist the coverage of majority India's health facilities.

In order to facilitate presence of Covid infection prevention measures processing of information is important in all aspects. This design model will enable the collection and pre processing of information regarding the people's health[11] and probability of being infected by corona virus. The analysis of graph model implementation will be decreasing the cases raised in affected Covid spread areas. The pandemic process and locations were identifies using the different strategies in modelling.

4.1 The graph-based visualization

The study and analysis of infection measures used to prevent the spread of Covid-19. The infectious diseases spread via interaction between individuals as without social distancing. The social distance measures are described with graph and set of interactions. In this regard, graph design models can be utilized for visualizing the infectious processes. Graph design models play an important role in analyzing the disease spread and supporting various decision making[13]. In particular, the use of bar graphs enables the visualization of a study and analysis process Alongside the hypotheses proposed in existing approaches, uncertainty regarding epidemic characteristics is one of the drawbacks of these models.

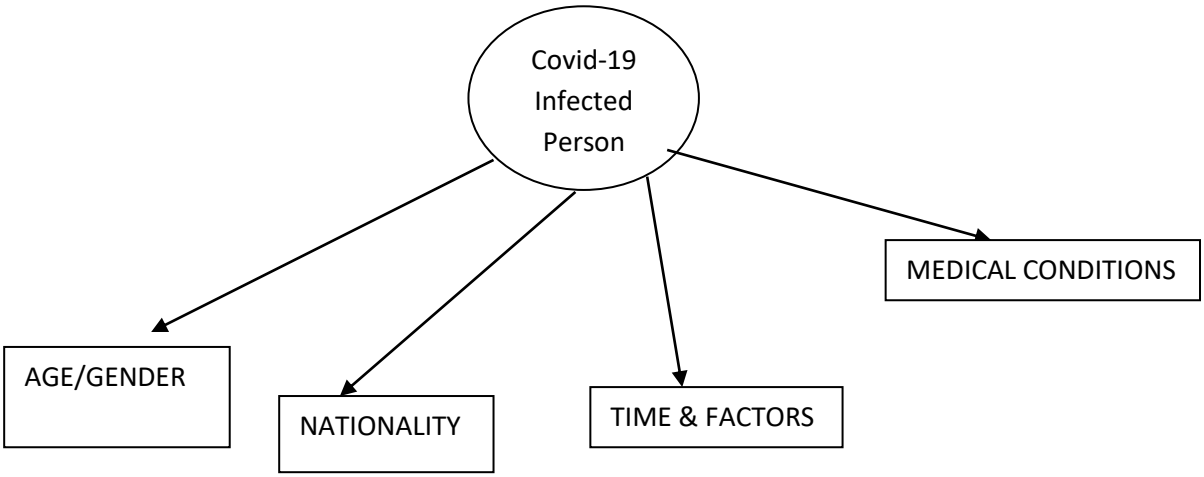
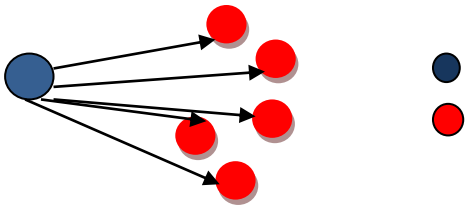


Fig2: Analysis on available information from affected person

As seen from fig.2 the analysis of Covid-19 considering the characteristics of Covid-19. The time period will be calculated starting from the infected person and tracking of the process from human to human transmission of the Covid-19 virus.



-Infected

-Exposed

Fig:3 Covid-19 Spread Visualization through graph model

Conclusion

The experts and governments, non-governmental organization trying to utilize the graph design models to understand about the pandemic situation. The main challenges are the differences between mathematical design models and graph theory design models. The use of different datasets and methodologies are useful to study and analyze the majority issues caused at the Covid affected areas. There is a need to analyze the design model in order to identify

the Covid spread at different areas. This article study will be a proof that large number of research can be done using the study of Covid-19. This article investigates the studies related to graph design model to avoid the transmission of Covid-19. Currently, technologies for maintaining the social distance and contact tracing adopted by governments and other organizations. It must be taken into account to reduce the spread of Covid-19.

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A NEW APPROACH OF DEGREE IN SINGLE VALUED NEUTROSOPHIC GRAPHS

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ABSTRACT

In a crisp graph G=(V,E), we replace vertex and edge sets by single valued neutrosophic sets to generate the single valued neutrosophic graph SVNG G=(A,B). In this paper, we define cardinality of the vertex in G=(A,B) and use this definition to define membership degrees, degree, order and size of the single valued neutrosophic graph G=(A,B), also observe some properties on degree, order and size of G=(A,B).

Keywords: *Single valued Neutrosophic graph, cardinality, degree.*

INTRODUCTION

In real word the most of the problems deals with incomplete, indeterminacy and in consistent information. Neutrosopic sets are the one of the powerful mathematical tool to deals these type of problems. Smarandache introduced the Neutrosophic sets. Neutrosophic sets are broad view of fuzzy sets, intuitionistic fuzzy sets and interval valued intuitionistic fuzzy sets. The SVN sets is a overview of intuitionistic fuzzy sets, the three relationship functions are self-determining and their value belong to [0,1].

Graph theory acting a major part in applied mathematics, In a crisp graph *G=(V,E)*, we replace vertex and edge sets by SVN sets to generate the SVNG *G=(A,B)*. In this paper, we define cardinality of the vertex in *G=(A,B)* and use this definition to define membership degrees, degree, order and size of the SVNG *G=(A,B)*, also observe some properties on degree, order and size of *G=(A,B)*.

Definition 1.1. A SVNG *G=(A,B)* with vertex set V is defined by the set vertex and edge membership functions. The vertex membership functions

$$t_A : V \to [0,1], i_A : V \to [0,1], f_A : V \to [0,1]$$

t_A denote the truth membership function , i_A denote the indeterminacy membership function and f_A denote the falsity membership function of the vertices $a_i \in V$ and $0 \le t_A(a_i) + i_A(a_i) + f_A(a_i) \le 3$ for all $v_i \in V$

The edge membership functions

$$t_B : E \subseteq V \times V \to [0,1], i_B : E \subseteq V \times V \to [0,1], f_B : E \subseteq V \times V$$

are defined by
$$t_B(a_i a_j) \le \wedge \left[t_A(a_i), t_A(a_j)\right]$$
$$i_B(a_i a_j) \ge \vee \left[i_A(a_i), i_A(a_j)\right]$$
$$f_B(a_i a_j) \ge \vee \left[f_A(a_i), f_A(a_j)\right]$$

t_B , denote the truth membership function, i_B , denote the indeterminacy membership function and f_B, denote the falsity membership function of the edges $(a_i a_j) \in E$ and $0 \le t_B(a_i a_j) + i_B(a_i a_j) + f_B(a_i a_j) \le 3$ for all $(v_i v_j) \in E$.

Definition 1.2. In a SVNG $G = (A, B)$, any two vertices a_i *and* a_j are said to be adjacent, if

$$t_B(a_i a_j) = \wedge \left[t_A(a_i), t_A(a_j)\right]$$
$$i_B(a_i a_j) = \vee \left[i_A(v_i), i_A(a_j)\right]$$
$$f_B(a_i a_j) = \vee \left[f_A(a_i), f_A(a_j)\right]$$

The set of all adjacent vertices of a vertex v_i are neighbourhood set of the vertex v_i, and it is denoted by $N(v_i)$.

Definition 1.3. In a SVNG $G=(A,B)$, a vertices v_i is said to be isolated vertex, if there no edges adjacent on v_i.

Definition 1.4. In a SVNG $G=(A,B)$, a vertices v_i is said to be Pendent vertex, if there only one edges adjacent on v_i. A vertex in a SVNG adjacent to the pendent vertex is called a support of the pendent edge.

Definition 1.5. A SVNG $G=(A,B)$ is said to be complete there is a strong edge between every pair of vertices.

$$t_B(a_ia_j) = \wedge\left[t_A(a_i), t_A(a_j)\right]$$
$$i_B(a_ia_j) = \vee\left[i_A(v_i), i_A(a_j)\right]$$
$$f_B(a_ia_j) = \vee\left[f_A(a_i), f_A(a_j)\right]$$

For every $a_i, a_j \in V$.

DEGREE OF VERTEX IN SVNG USING CARDINALITY OF THE VERTEX

In this section we define cardinality of SVNG and also define degrees of the vertex using the cardinality

Definition 2.1. The cardinality of a vertex $a_i \in V$ in a SVNG $G=(A,B)$ is defined by $|a_i| = t_A(a_i) + i_A(a_i) + f_A(a_i)$

Definition 2.2. The neighbourhood t-degree of a vertex $a_i \in V$ in a SVNG $G=(A,B)$ is defined by $d_T(a_i) = \sum_{i\neq j}|a_j|$, for every vertex $a_j \in V$ such that a_ia_j is a t-adjacent vertices. (i.e)

$$t_B(a_ia_j) = \wedge\left[t_A(a_i), t_A(a_j)\right]$$
$$i_B(a_ia_j) \geq \vee\left[i_A(v_i), i_A(a_j)\right]$$
$$f_B(a_ia_j) \geq \vee\left[f_A(a_i), f_A(a_j)\right]$$

Definition 2.3. The neighbourhood i-degree of a vertex $a_i \in V$ in a SVNG $G=(A,B)$ is defined by $d_I(a_i) = \sum_{i\neq j}|a_j|$, for every vertex $a_j \in V$ such that a_ia_j is a I-adjacent vertices. (i.e)

$$t_B(a_ia_j) \geq \wedge\left[t_A(a_i), t_A(a_j)\right]$$
$$i_B(a_ia_j) = \vee\left[i_A(a_i), i_A(a_j)\right]$$
$$f_B(a_ia_j) \geq \vee\left[f_A(a_i), f_A(a_j)\right]$$

Definition 2.4. The neighbourhood F-degree of a vertex $a_i \in V$ in a SVNG $G=(A,B)$ is defined by $d_F(a_i) = \sum_{i\neq j}|a_j|$, for every vertex $a_j \in V$ such that a_ia_j is a f-adjacent vertices. (i.e)

$$t_B(a_ia_j) \leq \wedge\left[t_A(a_i), t_A(a_j)\right]$$
$$i_B(a_ia_j) \geq \vee\left[i_A(a_i), i_A(a_j)\right]$$
$$f_B(a_ia_j) = \vee\left[f_A(a_i), f_A(a_j)\right]$$

Definition 2.5. The neighbourhood degree of a vertex $v_i \in V$ in a SVNG $G=(A,B)$ is defined by $d_N(v_i) = \sum_{i\neq j}|v_j|$, for every vertex $v_j \in V$ such that

$$t_B(a_ia_j) = \wedge\left[t_A(a_i), t_A(a_j)\right]$$
$$i_B(a_ia_j) = \vee\left[i_A(a_i), i_A(a_j)\right]$$
$$f_B(a_ia_j) = \vee\left[f_A(a_i), f_A(a_j)\right]$$

Definition 2.6. The neighbourhood degree of a vertex $v_i \in V$ in a SVNG $G=(A,B)$ is defined by $td(a_i) = d_N(a_i) + |a_i|$

Definition 2.7. In a SVNG $G=(A,B)$ .If $v_i \in V$ is said to be a strong neighbour of vertex $a_j \in V$ such that

a) a_i *and* a_j are adjacent vertices in $G=(A,B)$

b) $d_N(a_i) \geq d_N(a_j)$

Definition 2.8. The order of the SVNG $G=(A,B)$ is defined by $O(G)=\sum_{i\in V}|a_i|$

Definition 3.9. The cardinality of an edge $a_ia_j \in E$ in a SVNG $G=(A,B)$ is defined by $|a_ia_j| = t_B(a_ia_j)+i_B(a_ia_j)+f_B(a_ia_j)$

Definition 3.10. The size of the SVNG $G=(A,B)$ is defined by $S(G)=\sum_{i,j\in V}|a_ia_j|$

Example 3.1.

Consider the SVNG G=(A,B) . Let A be a SVN subset of V and let B SVN subset of E defined by

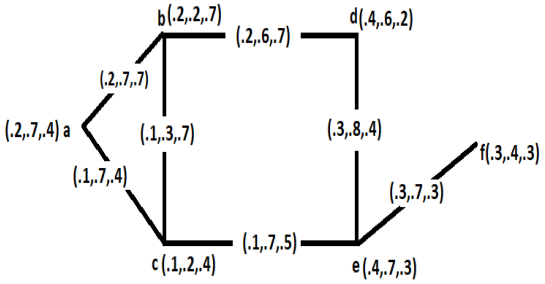

Figure 2.1, *G(A,B)*

In Figure 3.1,

- (*a* , *b*), (*b* , *d*) and (*e* , *f*) are adjacent vertices
- (*a* , *b*), (*b* , *c*) , (*b* , *d*), (*c* , *e*) and (*e* , *f*) are t-adjacent vertices
- (*a* , *b*), (*a* , *c*) , (*b* , *d*), (*c* , *e*) and (*e* , *f*) are i-adjacent vertices
- (*a* , *b*), (*a* , *c*) , (*b* , *c*), (*b* , *d*) and (*e* , *f*) are f-adjacent vertices
- Cardinality of the vertex are $|a|=1.3, |b|=1.1, |c|=0.7, |d|=1.2, |e|=1.4$ *and* $|f|=1.0$.

- Neighbourhood degrees of a SVNG G=(A,B) are

	a	b	c	d	e	f
$d_t(v_i)$	1.1	1.3	2.5	1.1	1.7	1.4
$d_i(v_i)$	1.8	2.5	2.7	1.1	1.7	1.4
$d_f(v_i)$	1.8	3.2	2.4	1.1	1.0	1.4
$d_N(v_i)$	1.1	1.2	0	1.1	1.0	1.4

- A vertex $a_i \in V$ in a SVNG is a pendent vertex if and only if all membership degrees are same. (i.e), $d_t(a_i)=d_i(a_i)=d_f(a_i)$.
- The order and size of SVNG *G=(A,B)* is $O(G)=\sum_{i\in V}|a_i|=6.7$. and $S(G)=\sum_{i,j\in V}|a_ia_j|=9.5$ respectively.

Theorem 2.1: Let $G^*(V,E)$ is the crisp graph of the SVNG *G=(A,B)*, then $O(G)\leq 3[O(G^*)]$.

Proof: let *G=(A,B)* be a SVNG, O(G) be the order of *G=(A,B).*

$$O(G)=\sum_{i=1}^{n}|a_i| \quad \text{and}$$

$$|a_i| = t(a_i)+i(a_i)+f(a_i)$$

$$O(G)=\sum_{i=1}^{n}[t(a_i)+i(a_i)+f(a_i)]$$

$$O(G)\leq 3\sum_{i=1}^{n}n$$

$$\therefore \quad 0\leq t(a_i)+i(a_i)+f(a_i)\leq 3$$

$$O(G)\leq 3|G^*|$$

$$\therefore \quad \sum_{i=1}^{n}n=|G^*|$$

Hence Proved.

Example 2.2.

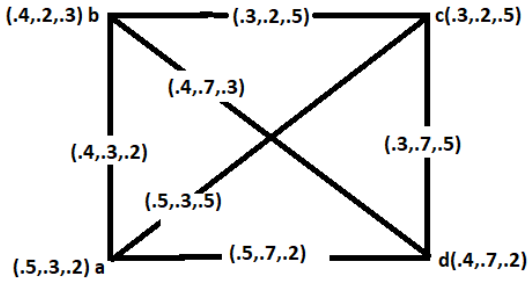

Figure 2.2. Complete SVNG *G=(A,B)*

In Figure 2.2.

- The membership degrees are

	a	**b**	**c**	**d**
$d_t(a_i)$	2.2	3.3	3.2	2.9
$d_i(a_i)$	2.2	3.3	3.2	2.9
$d_f(a_i)$	2.2	3.3	3.2	2.9

- The degrees of the vertices are $d_N(a)=2.2$, $d_N(b)=3.3$, $d_N(c)=3.2$ and $d_N(d)=2.9$

Theorem 2.2: Let $G(A,B)$ is the complete SVNG *G=(A,B)*, then all the membership degrees are equal to the neighbourhood degree of the vertex. (i.e) $d_t(a_i)=d_i(a_i)=d_f(a_i)=d_N(a_i)$

Proof: let *G=(A,B)* be a complete SVNG such that that there is a strong edge between every pair of vertices

$$t_B(a_ia_j)=\wedge\left[t_A(a_i),t_A(a_j)\right]$$
$$i_B(a_ia_j)=\vee\left[i_A(a_i),i_A(a_j)\right]$$
$$f_B(a_ia_j)=\vee\left[f_A(a_i),f_A(a_j)\right]$$

For every $a_i,a_j\in V$. $d_t(a_i)=\sum_{i\neq j}|a_i|$ $[\because G \text{ is complete}]$

$$d_t(a_i)=d_N(a_i)$$

Similarly, we get $d_i(a_i)=d_N(a_i)$ and $d_f(a_i)=d_N(a_i)$

Hence $d_t(a_i)=d_i(a_i)=d_f(a_i)=d_N(a_i)$.

Theorem 2.3: Let $G(A,B)$ is the complete SVNG, if $d_N(a_i)=\Delta_N(G)$ then v is a strong neighbour of all other vertices.

(i.e)

$d_N(a)\geq d_N(a_i)$.

Proof: Let $G(A,B)$ is the complete SVNG such that there is a strong edge between every pair of vertices

$$t_B(a_ia_j)=\wedge\left[t_A(a_i),t_A(a_j)\right]$$
$$i_B(a_ia_j)=\vee\left[i_A(a_i),i_A(a_j)\right]$$
$$f_B(a_ia_j)=\vee\left[f_A(a_i),f_A(a_j)\right]$$

For every $a_i,a_j\in V$.

$$d_N(a_i)=\sum_{i\neq j}|a_i|$$

Let v be a vertex having $d_N(a_i)=\Delta_N(G)$, $d_N(a_i)\geq d_N(a_i)$ since $G(A,B)$ is the complete SVNG and $|v|\leq|a_i|$ for all $a_i\in V$.

$$d_N(a)\geq d_N(a_i)$$

Theorem 2.4: Let $G(A,B)$ is the strong SVNG *G=(A,B)*, then all the membership degrees are equal to the neighbourhood degree of the vertex. (i.e) $d_t(a_i)=d_i(a_i)=d_f(a_i)=d_N(a_i)$.

Proof: let *G= (A,B)* be a strong SVNG such that every edges are strong edges

$$t_B(a_ia_j)=\wedge\left[t_A(a_i),t_A(a_j)\right]$$
$$i_B(a_ia_j)=\vee\left[i_A(a_i),i_A(a_j)\right]$$
$$f_B(a_ia_j)=\vee\left[f_A(a_i),f_A(a_j)\right]$$

For every $a_i,a_j\in V$. $d_T(a_i)=\sum_{j}|a_j|$

a_i *and* a_j *are adjacent vertices*

$$d_t(a_i) = d_N(a_i)$$
$$\therefore\ G(A,B)\ \textit{is strong}$$

Similarly, we get $d_i(a_i) = d_N(a_i)$ and $d_f(a_i) = d_N(a_i)$

Hence $d_t(a_i) = d_i(a_i) = d_f(a_i) = d_N(a_i)$.

Example 2.3.

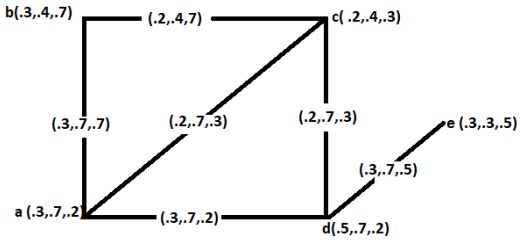

Figure 2.3 Strong SVNG

In Figure 2.3.

- The membership degrees are

	a	b	c	d	e
$d_t(a_i)$	3.3	2.1	4.0	3.2	1.4
$d_i(a_i)$	3.3	2.1	4.0	3.2	1.4
$d_f(a_i)$	3.3	2.1	4.0	3.2	1.4

- The degrees of the vertices are $d_N(a) = 3.3$, $d_N(b) = 2.1$, $d_N(c) = 4.0$, $d_N(d) = 3.2$ and $d_N(e) = 1.4$

CONCLUSION

In this paper, we define cardinality of the vertex in *G=(A,B)* and use this definition to define membership degrees, degree, order and size of the SVNG, *G=(A,B),* also observe some properties on degree, order and size of *G=(A,B).* In future we investigate the various parameters in SVNG.

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AN EFFECIENT KEYWORD SEARCH IN REDUNDANT GRAPHS

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ABSTRACT

Graphs contain path and node weights, representing, for instance, penalty, distance, or uncertainty. The proposed recommendation systems provide a mechanism to assist users in classifying users with similar interests. This makes recommender systems essentially a central part of websites and e-commerce applications. This work focuses on the movie recommendation systems in which the primary objective is to suggest a recommender system through Collaborative filtering. Several approaches have been suggested for providing users with recommendations using their rating history; most of these approaches suffer from the initial lack of item tags. This work suggests utilizing new user demographic data to provide recommendations instead of using rating history to avoid the cold-start problem. The solution in which each content node contains at least one unique query keyword is called minimal answers. This work defines the problem of finding duplication-free and minimal answers based on the Binary Cuckoo Search algorithm for finding such answers efficiently. Extensive experiments were done using a massive real dataset to ensure the potency and effectiveness of the proposed method.

Keywords: *Keyword search, Movie recommendation, Keyword matching.*

INTRODUCTION

GRAPH DATABASES

Graph Database is a record that employs graph structures for linguistics queries with nodes, edges, and properties to represent and store the information. A key conception of the system is that the graph (or edge or relationship). The graph associates the information that is stored in a cluster of nodes and edges, the edges representing the relationships between the nodes. The relationships permit the information within the store to be linked along directly and, in several cases, recovered with one operation. Graph databases have the communications between data as a priority. Querying relationships is quick because they're gradually stored in the database. Relationships may be intuitively visualized to employ a graph databases, creating them helpful for massively inter-connected data.

A graph database is a kind of NoSQL database, created to handle the restrictions of relational databases. Whereas the graph model expressly lays out the dependencies between nodes of data, the relational model and different NoSQL database models join the data by implicit connections. In other hand, relationships are first-class entities in a graph database and might be labeled, directed, and given properties. This can be compared to relational approaches wherever these relationships measure implicit and should be reified at run-time. Graph databases is the database virtually like nineteen seventies network model databases in that each represent general graphs, however network-model databases operate at a lower level of abstraction and lack simple traversal over a sequence of edges.

The underlying storage mechanism of graph databases will vary. Some rely upon a relational engine and “store” the graph data in a table (although a table could be a rational element, thus this approach assess another level of absorption between the graph database, the graph database management system and also the physical devices wherever the information is literally stored). Others use a key-value store or document-

oriented records for storage, creating them inherently NoSQL structures.

Retrieving data from a graph database needs a query language aside from SQL that was designed for the manipulation of data in a relational system and thus cannot elegantly handle traversing a graph. As of 2017, no universal graph query language has been adopted within the same method as SQL was for relational databases, and there are a large variety of systems, most frequently tightly tied to at least one product. Some standardization efforts have occurred, resulting in multi-vendor query languages like Gremlin, SPARQL and Cypher. In additionally to having query language interfaces, some graph databases are accessed through application programming interfaces (APIs).

Graph databases distinguish from graph compute engines. Graph databases are technologies that are translations of the relational online transaction processing (OLTP) databases. On the other hand, graph compute engines are handled in online analytical processing (OLAP) for bulk analysis. Graph databases attracted tidy attention within the 2000s, because of the successes of major technology corporations in using proprietary graph databases, and also the introduction of open-source graph databases. A graph database is a strong device for graph-like queries. For example, computing the shortest route between two nodes in the graph. Possibly graph-like queries might be carried out over a graph database in a natural way. Graphs are versatile, which means it allows the customer to insert new data into the existing graph without loss of application practicality. One such NoSQL database that makes use of this methodology is ArangoDB. ArangoDB is a native multi-model database that supports graphs joined of its data models. It stores graphs by belongings the edges and nodes in separate collections of documents. Data lookup performance is relies on the access speed from one unique node to another. While index-free contiguity enforces the nodes to have direct physical RAM addresses and physically summit to the other adjacent nodes, it leads to a quick retrieval. An indigenous graph system with index-free adjacency doesn't have to shift through some other kind of data structures to discover links among the nodes. Directly associated nodes in a graph are stored in the cache as soon as one of the nodes are retrieved, making the data lookup even quicker than the first time a customer fetches a node. Nevertheless, such improvement comes at a cost. Index-free adjacency sacrifices the competence of queries that don't use graph traversals. Native graph databases use index-free adjacency to process CRUD operations on the stored information.

KEYWORD SEARCH

Keyword research is an exercise search engine optimization (SEO) experts use to discover and research search conditions that customers enter into search engines when looking for products, services or general information. Search engine optimization professional's first research key phrases, after which align web pages with those key phrases to accomplish better rankings in search engines. Once they discover a recess keyword, they enlarge on it to discover related keywords. Keyword inspiration tools normally aid the process, like the Google Ads Keyword Planner, which gives a thesaurus and alternative key-word suggestions.

The goal of key-word research is to generate, with good precision and recall, a huge range of terms which are distinctly applicable but non-apparent to the given input key phrases. The process of keyword research entails brainstorming and the usage of keyword research tools. To acquire the greatest SEO outcomes, it is important to optimize a website's content as well as back links for the maximum applicable keywords. It is ideal exercise to search for related keywords that have low competition and still a high number of searches. This makes it easier to achieve a higher rank in search engines which usually results in higher web traffic. The downside of this practice is that the website is optimized for alternative

keywords instead of the main keyword; main keywords might be very difficult to rank for due to high competition. There are three essential concepts to consider when conducting keyword research. Most search engines use an internal quality system to check website relevance related to possible keywords, a non-relevant keyword is unlikely to rank well for a website.

Keywords are separated into two major groups based on search quantity.

Short -Tail Keywords: Short-Tail Keywords are the most usually searched 20% of keywords. These are typically particularly competitive.

Long-Tail Keywords: Long-Tail Keywords includes of the other 80% of search traffic. They are much more likely to consist of phrases and usually have far fewer average searches per month.

A Keyword search looks for words everywhere in the record. Keyword searches are a good alternate for a subject search while you don't know the standard subject heading. Keyword will also be used as an alternate for a title or writer search if you have incomplete title or writer information. To search by keyword, choose Keyword from the search privileges and type the words you desire to search. Keyword searches can recover a huge number of outcomes. Various privileges are available to help out refine your search and outcomes. Fast Limits can be used while doing a keyword search. Pre-set Limits may be decided before doing a key-word search.

Keyword research is described as the activity of analyzing and locating a list of important keywords for the intention of SEO copywriting. The key phrases, or search phrases, regularly emerge as a manual for the way of your content and advertising approach. Finding high-volume search terms itself isn't always enough. You want to make ensure that the Search Engine Optimization keywords utilized in your content matches together along with your brand, product, or service to the key phrases that your customer use. And that is wherein key-word research happens. Once you've got performed tolerable and thorough research, only then will you be capable of craft a viable SEO approach.

A key-word can include of a single phrases however extra regularly than not it's made out of numerous phrases. For example, "search phrases" is a key-word, as is "best keyword search tool". Even though it is still a technically accurate phrase, there can be a mismatch to what your potential clients are searching for on Google. Keywords which you select to apply should be those that your target audience is searching. Only afterward will it make the attempt of optimizing your page valuable. But more prominently, two related key phrases frequently have unusual search volumes, trends, and opposition levels. Choosing a more pertinent, superior volume keyword might provide you improved outcomes compared to its other semantic or related key phrases.

APPROXIMATION ALGORITHMS

Approximation Algorithms are proficient algorithms that establish approximate answers to optimization problems with verifiable guarantees on the distance of the returned answer to the optimal one. Approximation algorithms logically arise in the field of theoretical computer science as a consequence of the widely believed P $\neq$ NP conjecture. Under this conjecture, a wide class of optimization problems cannot be solved exactly in polynomial time. The field of approximation algorithms, therefore, attempts to recognize how intently it's far feasible to approximate best solutions to such issues in polynomial time. In an overwhelming majority of the cases, the guarantee of such algorithms is a multiplicative one expressed as an approximation ratio or approximation factor i.e., the optimal solution is always guaranteed to be within a multiplicative factor of the returned solution. However, there are also many approximation algorithms that provide an additive guarantee on the quality of the returned solution.

The layout and evaluation of approximation algorithms crucially includes mathematical evidence certifying the worth of the returned answers in the worst case. This distinguishes them from heuristics like annealing or genetic algorithms, which find logically suitable solutions on a few inputs, however provide no clear suggestion at the outset on while they will be succeed/fail. There is prevalent interest in speculative computer science to better recognize the limits to which everyone can approximate positive prominent optimization troubles.

A easy instance of an approximation algorithm is one of the minimum vertex cover problem, wherever the objective is to decide the least set of vertices such that each edge up the input graph encompass a minimum of one chosen vertex. One way to find a vertex cover is to repeat the following process: find an uncovered edge, add both its endpoints to the cover, and remove all edges incident to either vertex from the graph. As any vertex cover of the input graph should use a distinct vertex to cover every edge that was considered in the method, the vertex cover formed, hence, is at most twice as great as the best one. In different words, this is a stable factor approximation algorithm with an approximation factor of two. Under the recent distinctive games conjecture, this factor is even the most excellent potential one. Within a multiplicative factor, for some fixed, and hence produce solutions arbitrarily close to the optimum. Others are not possible to approximate within any constant, or even polynomial, factor except P is equal to NP, as in the case of the most clique problem. Therefore, an important benefit of studying approximation algorithms is a fine-grained classification of the difficulty of various NP-hard problems beyond the one afforded by the theory of NP-completeness. In other words, although NP-complete problems may be equivalent to each other from the perspective of exact solutions, the corresponding optimization problems behave very differently from the perspective of approximate solutions.

KEYWORD SEARCH IN GRAPHS

Vast amounts of graph data are generated every day from a mixture of sources as well as social networks, ecommerce, semantic web (RDF data) and biochemical networks. Yet relational databases are modeled as graphs in which nodes correspond to tuples and edges correspond to primary key – foreign key relationships. As a result, query processing over graphs has become a crucial obstacle. Keyword search in graphs, specially, may be standard and intuitive approach that doesn't need mastery of a new query language such as SPARQL or data of the graph database schema; really, some graph datasets don't have a well-defined schema and thus cannot be explored using structured query languages. Given a node-labeled graph in which nodes contain a group of keywords/terms (e.g., names of individuals, products or chemical compounds), and a query consisting of a group of input keywords, keyword search over graphs aims to seek out relevant sub graphs whose nodes contain the question keywords.

LITERATURE

M. Kargar, L.Golab et.al has proposed the actual graphs frequently contain edge and node weights, describing, for instance, penalty, distance or ambiguity. On this paper revise the trouble of keyword search over weighted node-labeled graphs, where a query consists of a set of key phrases and a solution is a sub graph whose nodes have the keywords. In this paper propose an algorithm that optimizes edge weights and have an approximation ratio of two for the distinctive node enumeration standard. To optimize node weights and the bi-objective function, and also propose transformations that distributes node weights onto the edges. Extensive experiments are going over real-life datasets verify the efficiency and effectiveness of our results.

S. Han, L. Zou et.al has proposed keyword seek affords typical users an easy-to-interface for querying RDF data. In this paper, to form a reasonable proficient best-first search algorithm. RDF data is cherishing an increasing prominence of data extraction and clustering techniques in advance. Some

attempts like DBpedia and Freebase have introduced vast scale RDF repositories. Whereas the SPARQL are the instance query language to authorize the RDF dataset, they is unattainable for regular customers to write SPARQL statements through the diversity of SPARQL pattern and lot of prior knowledge of RDF datasets.

L.Chen, C.Liu et.al has proposed, customers have tend to rely on search engines for sharing their information among web. In this paper, mainly focused and designed a recent issue of batch keyword query processing on a original graph information. That is generally adapted in modern data analytics and management systems. The problem has been formalized into NP-Complete and to develop two heuristic approaches to find efficient query designs that depend on reusing shared computations between different queries. So, design an A* based algorithm to identify the universal optimal execution method for different queries. The extensive experiments have conducted to test the depiction of the three algorithms on DBLP database and IMDB database.

M. Kargar, L. Golab, J. Szlichta et.al has proposed the node-labeled graph, keyword seek reveals of which nodes comprise all of the query key phrases. In this work, introducing the new problem of locating effective solution sub trees of the graph for keyword seek over graphs in the existence of node importance. Define the problem of minimizing the node importance and demonstrate that it is NP-hard. And also define a combined objective function that combines the standards of the node importance and edge weights. For minimizing the node importance and combined objective functions, to recommended greedy algorithms to work out them, and experimentally validate their usefulness and competence on a real dataset (IMDB Database).

Y. Yang, D. Agrawal et.al has proposed evaluating a keyword query is typically drastically more expensive than evaluating an equal choice query, because the query specification is much less complete, and plenty alternative solutions. In this paper, attempting to deal with these need through exploiting the advances in hardware technologies, for example, multi-core CPUs and GPUs. Specifically, to implement a parallel keyword search engine for the Knowledge Bases (KB). Distinctively the Group Steiner Tree (GST) model, extensively used for keyword seek, given technique can obviously work in parallel and nonetheless returns compact solution graphs with rich information. To conduct valuable experiments to expose that our technique is both efficient and powerful on Wiki Search, for Wiki data Knowledge base.

A. Ghanbarpour, H. Naderi et.al has proposed a many real-world networks along with Face book, LinkedIn and Wikipedia exhibit extensive connectivity sides along with profitable content nodes frequently categorized with significant attributes. In this paper, an attribute-specific language model (ALM) and black-aware language model (BLM) is proposed primarily based on language models to rank candidate solutions to keeping their semantic information as much as the attribute level. Extensive experiments carried out on a standard assessment framework with three real-world datasets (IMDB and Wikipedia datasets) illustrate the advanced effectiveness of the proposed rating technique to that of the state-of-the-art methods.

Z. Liu, C. Wang, Y. Chen et.al has proposed archiving graph information over history is demanded in lots of applications, along with social community studies, collaborative projects, scientific graph databases, and bibliographies. This paper proposes a search pattern that may be a slight extension of keyword seen, which permits informal customers to effortlessly seek temporal graphs with elective predicates and rating capabilities associated with timestamps. Then expand algorithms that efficaciously generate top-k query solutions. Extensive experiments are performed on DBLP and Social Network, SNAP to confirm the performance and effectiveness of given technique.

METHODOLOGY

Keyword search is a valuable tool as searching large graph data. It is a comprehensible technique to retrieve graphs as it does not require graphs as it does not require customers to recognize the structure of the graph and sentence structure of the query language. For the first time, explores the problem of multi keyword ranked ontology keyword mapping and search over protected data, and establish a set of strict privacy requirements for such a secure data utilization system.

This work is designed in a way to grouping the keywords with similarity contents using BCS algorithm. Primarily collect the data and done the preprocessing then mapping the keywords using BCS algorithm. Assign that mapping as NP- hard analysis then grouping that keywords using steiner tree method to select the feature and display the results.

A. Binary Cuckoo Search Algorithm

Cuckoo search become motivated through the obligate brood parasitism of a few cuckoo species with laying their eggs in the nests of different host birds. Some host birds can employ direct divergence with the obtrusive cuckoos. For instance, if a host bird discovers the eggs aren't their own, it will each throw these strange eggs away or just discard its nest and construct a new one nest elsewhere. A few cuckoo species a along with the New World brood-parasitic Tapera encompass evolved in one of these method

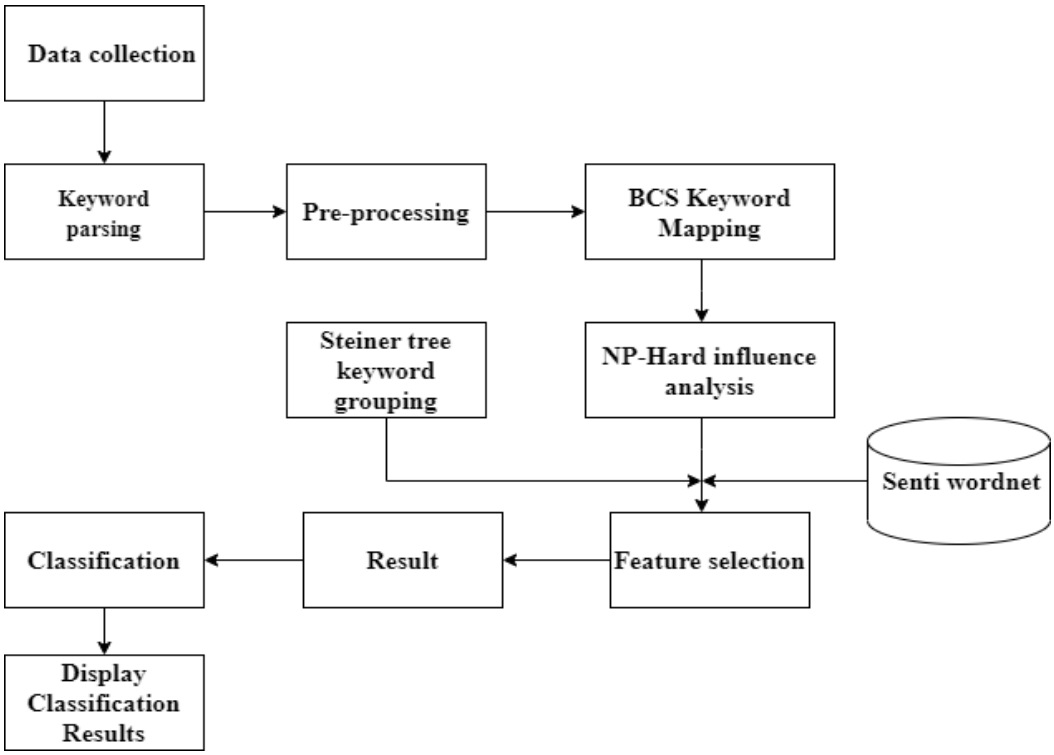

Fig. 1. Architecture

that female scrounging cuckoos are regularly very dedicated in the imitation of colors and pattern of the eggs of some selected host species. Cuckoo search idealized such breeding activities, and therefore may be implemented for different optimization problems. Binary cuckoo search is a binary version of cuckoo search. It was mainly used for feature selection. Proposes two BCS NP-HARD schemes based on the parallel assess of Binary Cuckoo Search Keyword Matching though meeting has different privacy requirements in two dissimilar risk models and investigates a few more improvements of our ranked ontology keyword mapping and search mechanism to assist additional search semantics and active data operations. In our

proposed work K-Means Dynamic Collaborative Filtering recommends items by matching users with other users having similar interests. It collects user feedback in the form of tags provided by user for specific item and finds match in rating behaviors among users in order to find group of users having similar preferences.

B. Dataset and Result

In this experiment, the dataset is taken from some movies details with name, year, genere, director, writer, actors, descriptions and posters. The details are first uploaded in the wamp server and the BCS feature selection scheme was applied the contents are grouped using steiner tree method with content tags.

The result data are automatically grouped by the specific similarity tags like year, cast and director without the duplicate information. First, based on the available information the tags of unrated items are predicted using algorithm. And second, based on the result of predicted tags the system finds relevant items and recommends them to the user.

MovieName	Year	Genere	Director	Writer	Actors	MoviePoster	Descriptions
Avatar	2009	Sci-Fi	James Cameron	James Cameron	Sam Worthington, Zoe Saldana, Stephen Lang, Michel...	FILE/Avatar1.jpg	Avatar (marketed as James Camerons Avatar) is a 20...
WALL-E	2008	Sci-Fi	Andrew Stanton	Andrew Stanton	Ben Burtt, Elissa Knight, Jeff Garlin, Fred Willar...	FILE/wall-e1.jpg	WALL-E (stylized with an interpunct as WALL·E) is ...
Remo	2016	Love	Bakkiyaraj Kannan	Bakkiyaraj Kannan	Sivakarthikeyan, Keerthy Suresh, Saranya Ponvannan...	FILE/Remo1.jpg	Remo is a 2016 Indian Tamil romantic comedy film w...
Rekka	2016	Action	Rathina Shiva	Rathina Shiva	Vijay Sethupathi, Lakshmi Menon	FILE/Rekka1.jpg	Rekka (English: Wings) is an Indian Tamil-language...
Thodari	2016	Romantic	Prabhu Solomon	Prabhu Solomon	Dhanush, Keerthy Suresh	FILE/Thodari1.jpg	Thodari (English: The Train) is a 2016 Indian Tami...
24	2016	Sci-Fi	Vikram Kumar	Vikram Kumar	Suriya, Samantha Ruth Prabhu, Nithya Menen, Sarany...	FILE/241.jpg	24 is a 2016 Indian Tamil-language science fiction...
Dharma Durai	2016	Romantic	Seenu Ramasamy	Seenu Ramasamy	Vijay Sethupathi, Tamannaah, Aishwarya Rajesh, Sru...	FILE/Dharma_Durai1.jpg	Dharma Durai is a 2016 Indian Tamil-language drama...
Silambattam	2008	Action	S. Saravanan	S. Saravanan	Silambarasan, Prabhu, Sneha, Sana Khan	FILE/Silambattam1.jpg	Silambattam (English: Stick fighting) is a 2008 In...
Rajini Murugan	2016	Romantic	Ponram	Ponram	Sivakarthikeyan, Soori, Keerthy Suresh, Rajkiran, ...	FILE/Rajini_murugan1.jpg	Rajini Murugan is a 2016 Indian Tamil-language com...
Star Trek Beyond	2016	Sci-Fi	Justin Lin	Simon Pegg, Doug Jung	John Cho, Simon Pegg, Chris Pine, Zachary Quinto, ...	FILE/Star_Trek_Beyond_poster1.jpg	Star Trek Beyond is a 2016 American science fictio...

Fig 2 Movie Database

DATA VISUALIZATION

The IMDb movie dataset is collected and saved as a text file. This file is then stored in the WAMP server and the values are saved with the corresponding attributes as column headers. IMDb is an acronym for Internet Movie Database and it is an online database of information associated with movies, television programs, home videos, and video games with the cast, production team, and individual biographies, scheme summaries, details, ratings, fan base, and significant reviews. The dataset has a unique id for every detail and node value has been allocated automatically for every word.

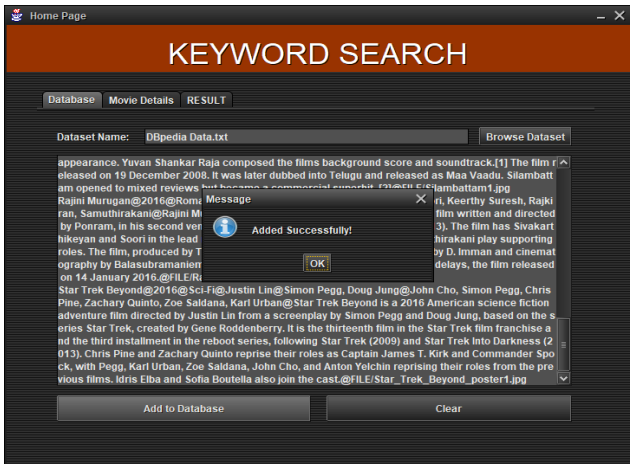

Fig.3 Dataset

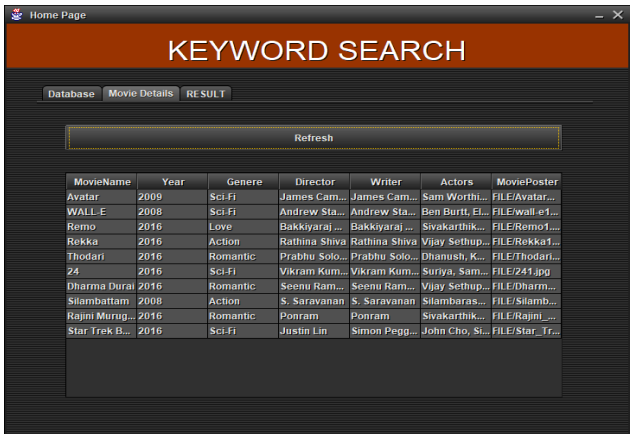

Fig.4 Data Visualization

KEYWORD GROUPING

This module is used to help the protection of the keyword using the BCS Algorithm and to convert the protected keyword. Creation of a database for recommender system, dataset of tags i.e. actual tags is used. The validity of results is based on the use of the dataset, so the creation of a database is one important step. Some websites provide the available datasets which include users and items with significant rating history, which makes it possible to have a sufficient number of highly predicted items for recommendations to each user. This module among various Steiner Tree semantics decides the efficient principle of Binary Cuckoo Search Keyword Matching i.e., as many matches as possible, to capture the similarity between the search query and data datasets.

STEINER TREE MAPPING

The Steiner tree information related to users, movies, and tags has been stored in different tables. DCF recommender system techniques proposed content-based, collaborative and hybrid approaches. The content-based approach recommends items similar to the user preferred in the past. The dynamic Collaborative filtering approach suggests items that users with similar preferences have liked in the past. DCF can combine both content-based and collaborative filtering approaches. Keyword-based collaborative filtering uses the set of items the active user has rated and calculates the similarity between these items and target item and then selects n most similar items. Item's corresponding similarities are also computed. Using the most similar items, the prediction is computed. The information filtering module is responsible for the actual retrieval and selection of movies from the movie database. Based on the knowledge gathered from the learning module, the information filtering process is done. The data are automatically grouped by the specific similarity tags like a year, cast, and director without duplicate information. Thus the system can retrieve the data properly from the database and also get movie tags explicitly from the users.

Fig. 5 Keyword grouping and Steiner tree mapping module

CONCLUSION

This work studied the internal details of a movie recommender system. In particular, on a movie selection mechanism based on collaborative as well as content based filtering, that used to store user preferences for different movie dimensions. The scheme is used to provide desirable guarantees about the nature of recommendation produced and is also robust to variation of user interests. The proposed scheme is not limited to just movie recommender systems. It can be used in any domain. Experiments on actual datasets confirmed that customers discovered the answers produced with the use of proposed strategies. In future work, techniques may be established to broaden algorithms to locate solutions and to rank them primarily based on applicable measures of interestingness. While the available solutions are subgraphs, solutions also can be represented as trees. This may be performed with the support of using a relationship node or with the support of using the set of rules.

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DICTION AND ARTICULATION DIFFICULTIES IN ENGLISH AS A SECOND LANGUAGE LEARNERS IN DELHI-NCR: AN ANALYSIS

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ABSTRACT

Universally understood, language is the primary means of human interaction. The English language being non-native makes people reluctant to use it, which works to their disadvantage in speaking. They are hesitant to commit linguistic mistakes. The fear of failure, laughter, and getting ridiculed makes them uncomfortable to take the first English speech. The accurate pronunciation and intonation embody the ability to have spoken capacity of the English language. This research was conducted in reputed MNCs and Delhi -NCR teaching institutions to find areas where professionals and learners who speak English as a second language face difficulties.

INTRODUCTION

However, we see that only a few languages achieved the stature of being the official language. In the Indian subcontinent, there are numerous languages spoken locally. Hindi and English are the official languages widely used in India. Indian speakers use English intelligibly enough, even much better than other European or Asian non-native speakers of English as it is widely used spoken and written format at Government institutions, public sectors, educational and learning institutions, corporate and workspaces, media, newspapers, science researches, management, and technology books. It is even safer to speak English in India rather than local languages because of ethnic and religious issues. Many Indians admit that they feel more comfortable speaking English than any other regional Indian language.

A BRIEF HISTORY OF THE ENGLISH LANGUAGE

English belongs to the Indo-European family of languages which is a member of the Germanic branch. The Germanic branch may be divided into three groups as east Germanic consisted of gothic, an extinct language. North Germanic language includes the Scandinavian languages. The third group of languages is the West Germanic language, composed of high German, low German, Frisian, and English. Three tribes, namely angles, the Jutes, and the Saxons, settled in England. The Angles came from Denmark, the Saxons were from Holstein in the south, and the Jutes were from the north. These three tribes and the Frisian were worshippers of English linguistic and religious associations between these tribes resulted in a bundle of related dialects, which we today call English. The history of English is broadly understood into three periods:

- 700- 1100AD - The Old English Era
- 1100 - 1500 AD - The Middle English Era
- 1500 AD-Present - The Modern English Era

English is learned everywhere because people have found out that knowledge of English is a passport for a better career, better pay, advanced knowledge, and communication with the entire world. English is also learned for the literature it possesses and for the variety and rich experience it provides. In this computer age, English is bound to expand everywhere. In the Indian subcontinent, English became the dominant language of communication among the educated classes after the minute of Lord Macaulay in 1833.

PHONETICS

Phonetics is the word derived from the Greek word phone which means sound/voice is the "study of the science of speech sound, their production and sighs used to represent them" (robins 1975). In Linguistics, Phonetics is one of the oldest branches and is concerned with the spoken mode of human communication,

Producer of the Sound - The Speaker
Listener of the sound - The Hearer

Being the fundamental concept of linguistics, phonetics is broadly considered in three different aspects.

Articulatory phonetics: The pattern of articulation and involvement of various parts of the throat and mouth in the pronunciation of vowels and consonants

Acoustic phonetics: The study of speech sound transmission that determines how sound travels from speakers' oratory organs to listeners' auditory systems in the form of juddering sounds.

Auditory phonetics: The study that says about the perception of speech sound.. The actual sound that's produced most simply is called - Phone.

The selection and organization of sounds in a particular language constitute the phonology of that language. Definite movements make a sound of the organs of speech. Speech sounds are classified into two types, mainly vowels and consonants. According to received pronunciation (RP), there are 44 speech sounds in English (20 vowel sounds and 24 consonant sounds). Still, there are only 26 letters in the English alphabet consisting of five vowels a,e, i,o,u, and 21 consonants. In English, there is no direct relationship between phonemes (sounds) and graphemes (letters). A phoneme is a link between the orthography (written words) and the sound (spoken words). 'accents' refer to differences in pronunciation. Pronunciation can vary with cultures, regions, and speakers, but there are two wide standard varieties in English pronunciation, viz. British English and American English.

Within British English and American English, there are also a variety of accents. Some of them have received more attention than others from phoneticians and phonologists. These are received pronunciation (RP) and General American (AmE).

Received pronunciation is a form of pronunciation of the English language, sometimes defined as the "educated spoken English of southeastern England". Rp is close to BBC English, and it is represented in the pronunciation schemes of most British dictionaries. Rp is instead a social accent rather than regional, associated with the educated upper classes in Britain.

ENGLISH AS A SECOND LANGUAGE ACQUISITION

The British first arrived in India in the early 1600s and soon established trading posts in several cities under the control of the East India company. By 1765 the company's influence had grown to such an extent that the British effectively controlled most parts of the country. Initially, English was only taught to the local population through the work of Christian missionaries. There were no official attempts to force the language on the masses. Nevertheless, by the 1700s, English had firmly established itself as the language of administration, and many educated Indians were demanding instruction in English as a means of social advancement. By 1857 universities were opened in Bombay, Calcutta, and madras. English was increasingly accepted as the language of government, the social elite, and the national press.

After independence, it was intended that English would gradually be phased out as the language of administration. Nevertheless, there was no simple solution as to which language should replace it. At first, Hindi, the most widely spoken language, seemed the obvious choice. Still, following violent protests in 1963 in the state of Tamil and against the imposition of Hindi as a national language, opinion has remained divided. Even Gandhi, a proponent of a native variety as a national language, accepted that his message was most widely understood if expressed in English. So, although English is not an indigenous language, it remains an 'associate language' in India, alongside Hindi, the 'official language of the Union of India' and eighteen 'national languages,' such as Bengali, Gujarati, and Punjabi, etc., which

have a special status in certain individual states.

The first language (L1) is usually the mother tongue or regional language of the child. The second language is the language (L2) introduced compulsorily either at the end of a primary stage or the beginning of the lower secondary set after attaining sufficient proficiency in the first language by the learner. The main objective of the second language is to enable the speaker for broader participation in society and the nation-leading to secondary socialisation.

Second language acquisition (SLA) refers both to the study of individuals and groups who are learning a language after learning their first one as a young child and to the process of learning that language. The additional language is called a second language (l2), even though it may be the third, fourth, or tenth to be acquired. There are several approaches to the study of the second language, and they can be broadly classified under these three categories by which they are influenced: Linguistic, Psychological, Socio-cultural

INDIAN ENGLISH

General Indian English (GIE) was proposed as an educational standard for teaching English in India in place of British received pronunciation (RP), keeping in view the need to communicate with the minor interference of the mother-tongue with fellow Indians and foreigners (ciefl 1972; Bansal and Harrison 1974).

In India, Indian English is taught in schools, institutions, and colleges. There is a need to investigate lexical differences among Indian English speakers. An estimated 30m people (4% of the population) regularly use English, making India the third-largest English-speaking country globally. English is the associate official language of India, the state language of Manipur (1.5m), Meghalaya (1.33m), Nagaland (0.8m), and Tripura (2m), and the official language of eight union territories. It is one of the languages of the three-language formula proposed in 1968 for educational purposes. English and Hindi are the link languages in a complex multilingual society, in which English is both a library language and a literary language.

Standard English has about 20 vowel sounds (12 pure vowels and 8 diphthongs) and 24 consonant sounds. A large number of indie speakers, sometimes referred to as speakers of general Indian English (GIE), have a 17-vowel system (11 monophthongs and 6 diphthongs):

/iː/ as in plead,

/i/ as in swiss,

/eː/ as in came,

/ɛ/ as in lend,

/æ/ as in tat,

/ɑː/ as in barge,

/ɒ/ as in bot,

/oː/ as in plough,

/ʊ/ as in book,

/uː/ as in pool,

and /ə/ as in focus;

/ai/ as in five,

/ɔi/ as in coy,

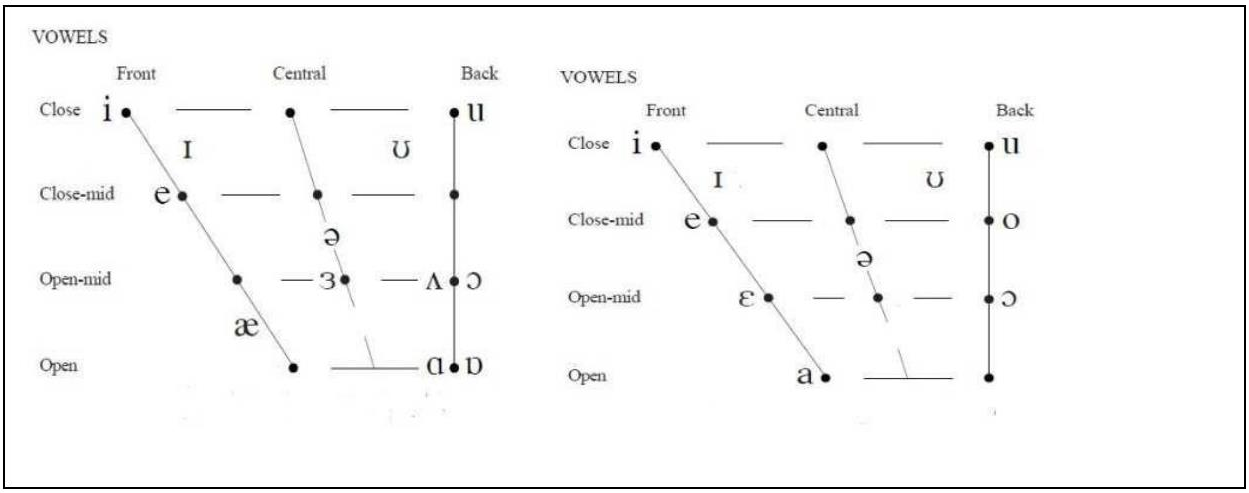
/aʊ/ as in now,

/ɪə/ as in here,

/eə/ as in where,

and /ʊə/ as in doer

Table of conservative sound Hindi & English



Vowels sounds: English vowels sounds: Hindi

The consonants are quite a bit simpler than the vowels. There are generally six types of consonants:

Plosives:. g, k, d, t, b, p

Fricatives: f, v, th, s, z, sh, h and the sound of "si" in "television."

Affricates: "cheese" and "joke."

Nasals: "m," "n", and "ng" as in "thing."

Liquids and laterals. These are the sounds "l" and "r."

Semi-vowels. There are two of these: "w" and "y," as they sometimes work as vowels and consonants.

Generally, there are three main points of articulation or places in the mouth where the sounds are made. These are:

Right at the front of the mouth, using lips and teeth, and tongue. **(p, b, f, v, th, m, w)**

Behind teeth with the tip of the tongue against the ridge behind teeth, or further back against the palate. **(t, d, s, z, sh, n, l, r)**

In the back of the mouth, near the throat. **(k, g, ng, h)**

Table : contrastive consonantal sounds of English and Hindi

Consonants of English										
Place / Manner	Bilabial	Labio dental	Dental	Alveolar	Post alveolar	Retro flex	Palatal	Velar	Labio velar	Glottal
Plosives	p b		t d					k g		
Nasal	m		n					ŋ		
Affricates					tʃ dʒ					
Fricative		f v	θ ð	s z	ʃ ʒ					h
Lateral Fricative			l							
Glide						r	y		w	
Consonants of Hindi										
Place / Manner	Bilabial	Labio dental	Dental	Alveolar	Post alveolar	Retro flex	Palatal	Velar	Labio velar	Glottal
Plosives	p b		t̪ d̪			ʈ ɖ	č ǰ	k g		
Nasal	m		n			ɲ	ň			
Affricates										
Fricative		f v		s	ʃ	ʂ				h
Lateral Fricative			l							
Glide						r	y			

In the Indian subcontinent, the spoken form of the English language carries idiosyncratic features which clarifies the differentiation from the English language of the other

nations such as BRP and GAP. The morphology of Indian English has a lot of adopted terms and usage; hence it makes it creative.

A few examples of various forms of international English like British Received pronunciation and General American pronunciation in differentiation with Indian English are given below.

Phonological variation: Dialects differ. This phonological variation is the difference in pronunciation that creates the difference in dialects. Some specific identifications in accent are visible, but a few merges in.

For instance, the speakers of English in India do not make any difference when it comes to the /v/ sound that we produce with the usage of lower lips, and upper teeth and the sound of /w/ is made when both the lips are involved. We can also consider the sounds of th /θ/ and /ð/ are predominantly replaced by /d/ and /t/.

Lexical variation: lexical differences are not as salient in distinguishing the speech of different social or socioeconomic classes. Accordingly, they have played a much smaller role in social dialectology, which has concentrated on differences in phonology and grammar. The "Genderlects" are the stylistic variation that shows the difference in language used by men vs women.

Grammatical variation: There are two subtypes - Phonology and Syntax. Morphology is the form of the structure of the words, which include phonemes or the smallest unit of meaningful words. On the other hand, syntax is the formation of sentences and phrases that combine words and phrases. Hence syntactic variation is the usage of words within the sentence

Regional variation: In General Indian English, we see a lot of variation because of the various native languages spoken in geographically diverse areas as dialects; hence the regional variation comes into the picture.

Socio-Stylistic variation: The Language and the variation occurred by its usage through various social demographics like High Networth Income Group Vs Economy class speakers. Women Vs Men (gender or sex), Old vs young (age), Ethnicity and race or people who are part of a neighbor's group, particular network at workplace or resident vs people you connect with on social media and other virtual platforms.

Vocabulary variation: There has been a dominating influence of the native languages in the spoken English in India, which we call 'lexicon'. Many Indian native languages have been introduced into the English language spoken worldwide, such as jungle, bungalow, punch, shawl, verandah, etc. It is well-known that Indian languages are largely syllable-timed as distinguished from English which is essentially stress-timed.

Methodology

The present study was aimed at investigating pronunciation faced by the English speakers in Delhi-NCR. The aim of knowing excellent and proper stress and pronunciation of English as a second language is to equip youngsters with linguist skills and adequate knowledge for employment and prepare for self-development. In this present study, the direct impact of native language on the speakers of Indian English Learners has been analyzed.

The descriptive statistical method has been used for this research. The objective of this study was to accumulate data through utterances and the questions and code the gathered data in percentage to analyses the relationship in the phenomenon. We have used questionnaires for some English learning learners and interview schedules for business personals for data collection.

STATEMENT OF THE PROBLEM

The title of the study is given as "A DICTION AND ARTICULATION DIFFICULTIES IN ENGLISH AS A SECOND LANGUAGE LEARNERS IN DELHI-NCR: AN ANALYSIS."

METHOD OF DATA COLLECTION

The selected institutions were visited, and corporates personally sought permission to administer the tools. Then the questionnaire for learners prepared and standardised by the researcher was employed and allocated to them. Every question has some marks given on the front page of the test. Every participant was awarded the score as per the instruction given in the tests. In the end, all the marks were added. Based on the score obtained by each participant, the data were interpreted. The interview schedule prepared and standardised by the researcher was employed on business officials. Then, all the obtained scores were added and interpreted. Data were collected from the informants with the help of a questionnaire by the researcher between 2018 and 2019.

DEMARCATION OF THE STUDY

The teaching instituition of Delhi-NCR schools, language teaching institutions, and corporate houses has been considered are the delamination areas of this study. With the mother tongue as Hindi, the considered criteria for evaluation of pronunciation pattern was based on BrE and AmE.

ANALYSIS AND INTERPRETATION

The data was collected from forty learners, fifty business professionals, and ten language instructors in a few establishments in Delhi-NCR. Eventually, the remedies were given for all the difficulties faced by the language learners of English in the process of acquiring lexical differences in the pronunciation of spoken English. The data analysis helped in identifying the major pronunciation problem areas faced by speakers were as given below:

Consonant clusters.

Fricative sounds

Plural markers.

Vowel sounds have varied spelling.

The finalized questionnaires were administered with the informants, and the testing procedures were carried out in two phases. The first phase, writing, and the second phase was speaking. The respondents were instructed to speak as introduced in the questionnaires. Their answers sheets were checked and scored per the instructions given in the manuals for the written matter. The data collected for each skill were processed and analyzed separately, and errors were identified.

MAJOR FINDINGS OF THE STUDY

Findings based on the analysis and interpretation of data obtained from the administration of questionnaires have been given in three parts:

The first part deals with the findings related to data obtained from learners,

The second part deals with the findings related to data obtained from the English language learners, and in the third part, Findings related to the responses of business officials.

FINDINGS RELATED TO LEARNERS' RESPONSES

The researcher analyzed the responses of learners and summed them up in the form of generalized statements as given below;

FINDINGS RELATED TO THE SPEAKING TEST

On analysing the speaking ability tests in English, the majority were found at a moderate level of speaking ability. Some are below the average, along with a mixture of Indian Languages and dialectic accents among the samples taken from English speaking ability test learners.

Only 11.3 % out of 100 candidates, including learners and professionals, were found highly efficient in the level of English usage. Out of

100 people, only 11.1% of learners and professionals were found at a highly high English level.

The most mispronounced English consonants are due to the non-existence of the sound in the mother tongue.

The calculation of the mode of speaking ability test into plural forms were 14.27 with a deviation standard to 6.30. Hence, we could see that very few vocabularies were pluralized while the correct usage.

FINDINGS RELATED TO WRITING TEST

On analyzing the data of writing ability in English of 100 people knowing and practicing ESL, it was concluded that only 18% were found at the extremely high level of writing ability in English, 24% of learners were found to be under average level, 58% of learners were found to be at a below-average level

FINDINGS RELATED TO LEARNERS' INTEREST AND THEIR LANGUAGE PREFERENCE

An average of 52% of learners had an interest in learning English. The study's findings showed that 60.2% of learners liked learning English, only 42% of learners enjoyed speaking in English, only 24.4% of learners read English dailies.

An average of 43% preferred English learning as only 27.4% of learners liked to watch tv programs in the English language, only 22.4% of learners discussed English in personal matters. 37.4% of learners wrote personal letters in English. 72.2% of learners use dictionaries for understanding the meaning of words.

Only 17.8% of learners differentiated the English words as monosyllabic, disyllabic, and polysyllabic. In comparison, 82.2% of learners replied that English words were not distinguishable to them either in polysyllabic manner, or in disyllabic and monosyllabic pattern.

Only 13.4% of learners responded that they know English phonology. Only 15.6% of learners knew voiced and voiceless consonants. Only 24.6% of learners knew stressed words in English. Only 16.4% of learners use pronouncing dictionary for pronouncing difficult words.

The study's findings show that 73% of learners agreed that pronunciation taught by the teacher was helpful in them. In comparison, 52% of learners responded that they feel that the mother tongue impacts their pronunciation.

Only 47% of learners admitted that the inefficient exposure to foreign languages and culture brought down their own pronunciation while 53% responded that this isn't the case with them.

The findings of this study show that 83% of the language learners did practice to speak it correctly on the other hand rest 17% admitted not to practice the articulation in the proper manner

The findings of the study show that 81% of language learners heedlessly practiced the pronunciation without practice and 63% did feel that the organs of speech affect their mode of articulation. Only 57% of learners responded that they never realized mispronouncing a word.

Only 24.2% of learners studied transcription and the words. 94% replied that the purpose is more to qualify the examination than acquiring the knowledge of pronunciation mechanism. 55% of these learners admitted that they learn more by reading than listening the discussion in the class.

FINDINGS RELATED TO THE INTERVIEW SCHEDULE FOR BUSINESS OFFICIALS

The results of the research show that 80% of business officials like speaking English. 70% of business officials responded that English provides a range of aesthetic experiences in their work. 60% of business officials agreed that they strongly identify with their mother

tongue and the group that speaks it. 90% of business officials responded that when they hear someone say in English, they also make an effort to participate. 65% of business officials agreed that English offers advantages in seeking good job opportunities, while 35% of business officials responded that they don't think so. 85% of business officials believed that speaking English is advantageous in corporate life, while 15% of business officials reacted negatively.

Only 40% of business officials responded that there is a similarity between learning a natural language and learning a programming language. 80% of business officials responded that they use a quick method to build their English vocabulary.

The findings show that 75% of business officials think non-native English speakers most often mispronounce many words. 80% of business officials responded that it is unavoidable that regularly using a foreign language influences their native language. 70% of business officials responded that they feel that the mother tongue impacts their pronunciation.

The research results show that 75% of business officials feel the lack of foreign exposure brings down one's pronunciation. 55% of business officials responded that they blindly follow the spelling in pronouncing a word.

The data analysis shows that 60% of business officials feel that speech organs affect their pronunciation, while 40% don't.

Only 55% of business officials responded that they ever felt mispronouncing a word, while 45% answered that they never felt so.

The research results show that 40% of business officials study transcription along with a word, while 60% responded that they don't do so.

The data analysis shows that 65% of business officials agreed that the lexicon plays a central, productive role in the theory of speech production. In comparison, 35% of business officials disagreed that the dictionary plays a significant, influential role in the view of speech production.

Only 60% of business officials responded that lexicon consists of ordered levels, which are the domain for specific phonological or morphological basis. In comparison, 40% of business officials responded that they don't think so.

The findings show that 70% of business officials accepted that lexical phonology is an approach to phonology that accounts for the interactions of morphology and phonology in the word building process, while 30% of business officials responded negatively.

Only 40% of business officials use lexical phonology to find out the meaning of the word, while 60% of business officials responded negatively.

The results of the research show that 80% of business officials agreed to the fact that mostly duo-syllabic adjectives and nouns, the primary syllable gets most of the stress, while 20% of business officials responded that they don't agree that in most two-syllable nouns and adjectives, the first syllable takes on the strain.

The data analysis shows that 75% of business officials give stress on the second syllable in most two-syllable verbs and prepositions, while 25% of business officials responded that they don't do so.

Only 55% of business officials responded that the words ending with the suffixes er, or, or ly, stress is placed on the first syllable 65% business officials responded that the words that use the suffix ee, ese, eer, ique or ette, have the primary stress placed on the suffix.

CONCLUSION

Pretty visible from the data analysis that clear words enabled the learners to understand quickly. and unknown or new words obstruct them from comprehending the concept. Thus, they failed to recognize the distinction between plural and singular nouns, stress,

phonological and morphological structure of words and sentences.

Indian English speakers tend to stress the first syllable in a word. It can be noticed where they put the stress in particular terms.

Indian English has a system of 17 vowel sounds compared to 20 vowel sounds in BRP (British received pronunciation). In contrast with 12 pure vowels and eight diphthongal glides in BRP, Indian English has 11 pure vowels and six vowel glides. The main lexical differences between the variants are caused by the lack of equivalent lexical units, divergences in the semantic structures of polysemantic words, and peculiarities of usage of some comments on different territories.

General observation suggests that those who start to learn English after their school years are most likely to have severe difficulties in acquiring intelligible pronunciation, with the degree of difficulty increasing markedly with age. This difficulty has nothing to do with intelligence or level of education, or even with knowledge of English grammar and vocabulary. Many learners of English as a second language have "major difficulties" with English pronunciation even after years of learning the language. Hinofotis and Baily (1980) note that "up to a certain proficiency standard, the fault which most severely impairs the communication process in EFL/ESL learners is pronunciation", not vocabulary or grammar. It is crucial at this point to make a distinction between speaking and pronunciation as it is sometimes wrongly applied interchangeably. Pronunciation is viewed as a sub-skill of speaking. Generally, if we want to change the way a learner pronounces words, we have to change the way they think about the component sounds of those words. This goes not just for individual sounds but more prominent elements of speech, such as syllables, stress patterns, and rhythm.

Despite this, the teaching of pronunciation remains neglected mainly in the field of English language teaching. Pronunciation of the second language is a cognitive skill for which some people may have a more natural aptitude and/or interest and motivation than others, but everyone can learn to a certain degree if given appropriate opportunities. The main problem that second language learners have with pronunciation is their need to change an abstract pattern right for the first language they have internalized in childhood. Learners need help in categorizing or conceptualizing sounds in a way proper to English. Simply seeing a speech-wave or a diagram of the articulation of a sound, however, 'animated' and however accurate, will not help them unless they are also permitted to understand what features of the sound are significant and given appropriate ways of thinking about the sound so that they can reproduce it. This is not to say that there are not individual sounds in English, or more especially combinations of sounds, that are difficult for learners from different backgrounds to produce. It is to say that this difficulty is a relatively minor aspect of intelligibility and certainly not the leading cause of the accent. Eventually, there is an individual pronunciation to individual native speaker due to the norms and has nothing to do with intelligence. The issue is they don't have the exposure and understanding of the various sounds but they think it's the variety spoken of the same sound. The major hinderance these learners find is in the copying or imitating the exact sound with cognitive interpretation which is a mix product of fluency of consonants and vowels.

SUGGESTIVE REMEDIES

Based on the findings, the following remedies are suggested, and these remedies would eradicate or at least minimize the problems encountered by the learners in learning English as a second language.

Teaching the language linguistically develops more competency in the learners. That is, the linguistic approach in the teaching of English from the beginning would be helpful for the development of competency in English.

Different types of conversational discourse may be taught, and the learners should be given enough time to develop colloquial

speech during school hours. Informal discourse training will eliminate language shock and cultural shock. Further, that will help to develop the communicative competence of the learners.

While teaching the vocabulary of English, the grammatical functions and linguistic features of words should be conducted. Further, the semantic value of words should be distinguished.

The similarities and differences between l1 and l2 should be taught primarily while teaching syntax, eliminating the habits of literal translation from l1 to l2.

While teaching the pronunciation of words, the phonetic similarities and differences of the phonemes should be demonstrated in the classroom, and practice should be given in this area properly. Further, the awareness about the interference of l1 in the pronunciation of foreign language sounds should be given time to the learners.

The learners may be motivated to interact with instructors and peer groups in English. Further, watching English programs on tv, listening to the radio, loud reading, reading dailies would help develop the spoken language of English.

It is observed that the irregularities and the irregularities of the language rules may be reinforced and taught to avoid the overgeneralization of the verb forms and other grammatical rules.

The reading material should be full of minor vocabulary and the complex vocabularies should be introduced to them further after making them understand the concept. If it is an unfamiliar context, both the context and discourses will make them trouble. So, the use of unknown and tricky words in the learners' familiar context will increase the learners' understanding ability.

The teaching of reading comprehension has to be introduced. That is, how to read, how to understand a text, and how to understand the contextual and literal meaning of words will increase the reading ability of the learners.

The reading games should be introduced in the classroom. Finding phrasal verbs, differentiating the mono, di, tri syllable words, distinguishing the nouns like common, abstract, animate, inanimate, etc. And verbs like transitive and intransitive in sentences or discourse will be helpful for the development of linguistic competency among learners.

Teaching listening comprehension should be taught in the manner: how to understand a context, how to deduce the meaning of an unknown vocabulary in a context, and how to understand the contextual/situational meanings of words.

The English language learners must be provided with different vocabulary to listen and then form autonyms and synonyms which will help them building the vocabulary.

Watching tv programs, films and listening to radio programs will undoubtedly help understand how native and non-native speakers use the English language. It will help them also in understanding the dialectal variation of the language.

Dictionaries are great tools for learning word stress. For every word, the dictionary indicates where the stress goes, such as placing an apostrophe before the stress.

The pronunciation lessons should be there in ESL as a core chapter like vocabulary, sentence structure and grammar. It’s an important part of language learning and linguistic competency.

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AUTOMATED HOME FOR ELDERLY PEOPLE WITH HIGH END SAFETY ENCRYPTION

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ABSTRACT

This work proposes the concept of home automation for elderly people using IoT - cloud platforms like blynk/firebase. The project revolves around securing the devices connected to the cloud so as to protect ourselves and the devices. Inadequate physical security is also an essential barrier to the large- scale activity of IoT systems and broader adoption of IoT applications. So, the physical security must be upgraded using the latest technologies to stay intact. The project is designed in such a way that the appliances connected to the internet can be automated as well as controlled through a virtual remote. To ensure the healthiness of elderly people, a medical dispenser cum reminder is designed to remind elder people about the intake of medicines. The power surge detector is employed to ensure the safety of human beings in case of any high input electrical surge

INTRODUCTION

Home automation has taken its place to a greater extent in this past one decade. When we hear the word automation, the first thought which strikes the mind is the cost of implementation. People who are working in this field are concentrating on the profit alone. The existing system proposes how to connect devices wirelessly and turn it ON & OFF using mobile or computer [1]. Also, the software security is concentrated in majority [2] and the physical security is not considered in certain cases. Technologies have been developed for the betterment of physically disabled people [3] using IoT, monitoring the energy efficiency of a system [4], developing an automated home using speech recognition [5] and so on. But the safety of elderly people who are staying away from their children (or) alone at their home, have been forgotten by most of the people.

This work is proposed to deliver a cheaper automation system with high end physical security and the person can monitor, control and know the status of the appliances, if they have left their parents alone at home (or) elderly people want to let their children know immediately in case of emergencies.

The technologies used are Blynk app, Arduino Mega, Node MCU, sensors and certain output devices.

BLOCK DESCRIPTION

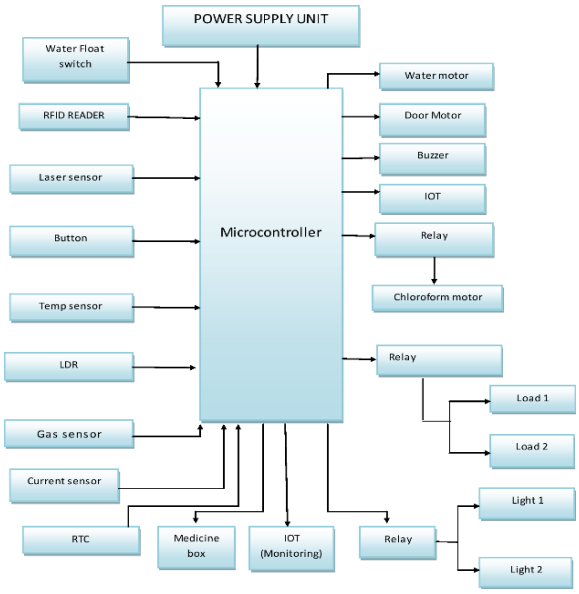


FIG 1: OVERALL BLOCK DESCRIPTION OF THE PROPOSED SYSTEM

OVERVIEW OF PROPOSED SYSTEM

Over the news channels daily, the most frequent news are thefts and disasters occurring particularly at home where elderly people live. According to an article published in Times of India on 13th February 2021, '32- year-old man robs 20 senior citizen houses in Chennai and after the police caught him after a long time using the data fetched from the traffic camera. The cause of this

robbery is the weakness of the elderly people and lack of security. Therefore, there is an urgent need in society to protect people and prevent crimes.SCOPE OF WORK

The scope of the project is to make an effective automated home for elderly people. The automation part monitors the status of the appliances through a telegram bot/Blynk app. This section includes monitoring the gas leakage, water level & leakage, energy consumption, etc. Another aspect of the proposed design is to automate any kind of device available in the home without altering its existing features (architecture). Also, to make sure that the appliances are intact using the normal messaging method in case of internet failure. Highly encrypted technical stacks (physical security using RFID technology) are used so that third-party people cannot access/hack the technology and enter into the home of elderly people who are living alone. Also, the main problem of elderly people is that they tend to forget to take their tablets on time. So, this project proposes an automated health monitoring solution to remind them to take specific tablets at the right time.

PROPOSED SYSTEM

The proposed system consists of appliances that are going to be monitored and controlled in order to prevent any catastrophe, using Blynk, for the benefit of the elderly people. Further, the controller will check if the water level in the tank is at full level, doors are closed or not, whether the gas is turned off, if lights are left turned on during bright day light, whether temperature of the room is too high or low, and so on. These statuses are updated to the Blynk app and we can also control it using blynk itself. In case of internet failure, normal message will be sent to know about the current status at our home. For improving the area of physical security, we are using RFID technology, with which only the owners and those who have the Unique ID can enter the home. If people don't have that unique ID card and if anyone tries to break the home, chloroform will be sprayed inside the home and it will be intimated to the owner using Blynk app. The modules described so far are shown in fig 2. Also, a health monitoring system is designed to remind the elderly people to take specific tablets at the right time, so that they don't forget about their health at certain situations. A power surge detector is designed so that the current sensor detects any surge in the current and trips the circuit to prevent damage to the appliances. These are implemented in the prototype and shown in FIG 3.

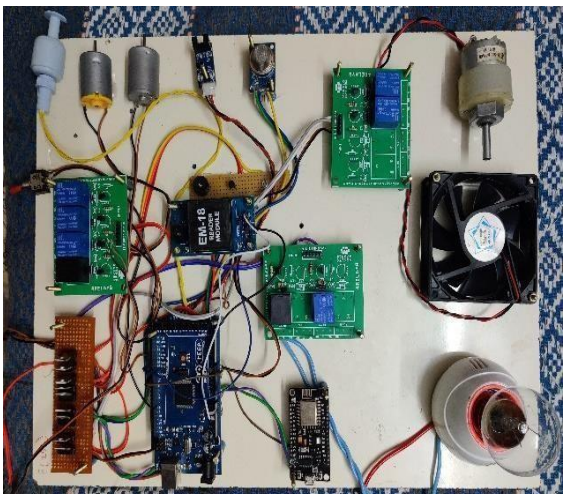


FIG 2: Automation part consisting of prototype of home appliances

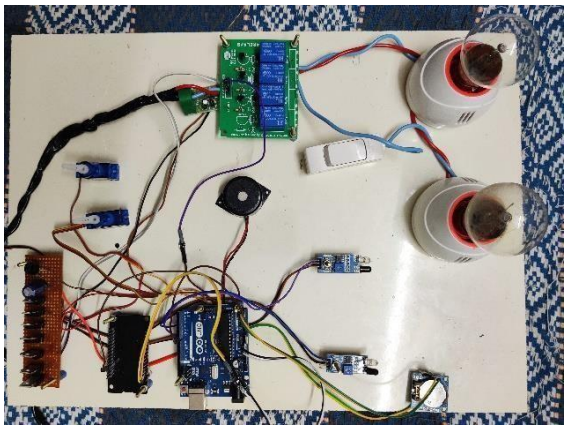


FIG 3: Medical dispenser and power surge & theft detector

IMPLEMENTATION

In the implementation part, there are three phases to be considered. Control phase, monitoring phase, timing phase. Each phase

has its own part and they do their work individually. The control phase is implemented to hardware appliances that need to be controlled. In the monitoring phase, the status of the controlled appliances and also in the timing phase is to repeat the process of a certain period.

CONTROL PHASE

The supply power is regulated using the LM7805 regulator. Then the voltage is supplied to the microcontroller in steps of 5V. The controller provides the control signal to the relay module. There are four control modules. They are door control, IoT control, load control, water level control. To switch ON the whole circuit, the RFID tag is employed. Then, a button is provided to override the RFID module in case of failure or the unique card is lost by the owner. Then speed sensor

is used to detect the opening and closing of the door. If the speed sensor detects any fast movement while opening the door, it will actuate the chloroform motor, which sprays the chloroform from the backside of the door. This is done to improve physical security while staying away from home and prevent theft.

In IoT control, every appliance at home is connected by a relay and controlled using the Blynk app. The control signal is given to the controller through the app or through the cloud. Then it sends the control pulse to the microcontroller and the controller will pass down the pulse to the relay. In this way, the appliances are safely switched ON and OFF using the Blynk app.

In water level control the water starts to flow whenever the water level decreases below the set value. The level is measured using the water float switch. If the water reaches a saturated level, the float switch will be triggered and the water motor will turn off automatically.

In the Blynk app, 2 modes are provided. One is Automatic mode and the other is Manual Mode. In automatic mode FIG 4, the fan, light, water level, and other appliances are controlled & actuated automatically. In manual mode FIG 5, the person can control the appliances by using the Blynk app as a switch.

FIG 4: Automatic Mode

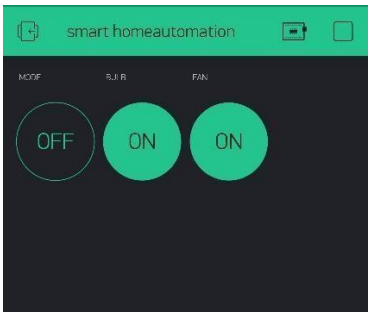
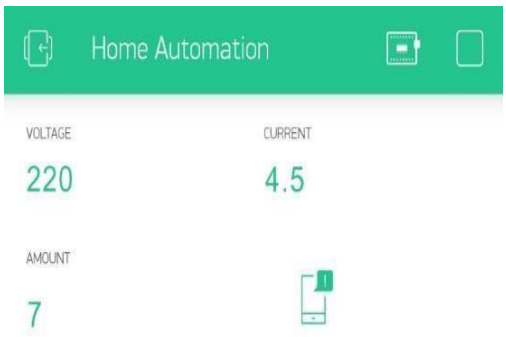


FIG 5: Manual Mode

MONITORING PHASE

The load control is used to control the load flow of the appliances. In case of any power failure or surge in supply, the appliance can get damaged or lead to any disaster. The current sensor is used to prevent this problem by monitoring the flow of current. If it exceeds the limit, then the relay actuator will open the circuit. In this way, we can also detect if the power is tapped from our home.

The current sensor can also be used to calculate the power usage and the appropriate amount will be displayed which is to be paid to the electricity board. The voltage is set as a constant value. By using the power calculation formula P=VI and the energy calculation formula in E = P*t (duration of operation in hr), the amount calculated is shown in FIG 6.



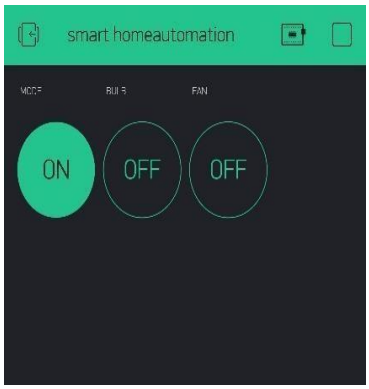


FIG 6: Cost calculation for the energy consumed in the blynk app

TIMING PHASE

For elderly people, the major problem is forgetting the medicine due to memory loss or Alzheimer's disease. In the timing phase, one of the operations performed is the Medicine dispenser. By using the RTC module, the Medicine dispenser is a great tool for elder people. It gives remainder about the medicine and also open appropriate medicine box at appropriate timings fed to the RTC (in 24-hour format) and the servo motor is used for opening and closing of the lid of the medicine box. This ensures that the health of elderly people is monitored and maintained properly.

RESULTS

All the systems & ideas proposed in this work are implemented as a prototype. The designed prototype is shown in the FIG 7 & FIG 8. The prototype is designed and tested several times. It is also ensured that the components used are working effectively and properly.

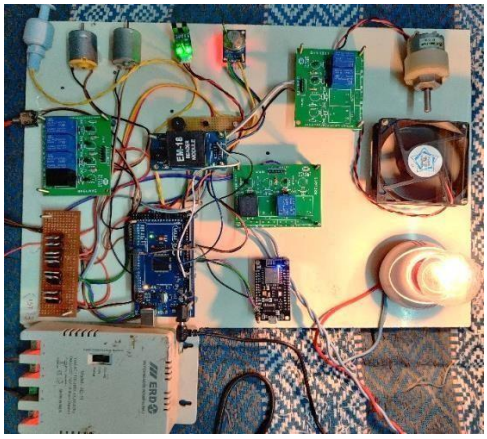


FIG 7: Automation part is done successfully with appropriate output

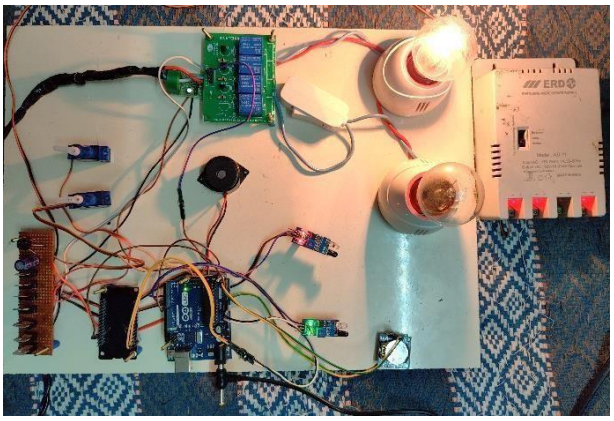


FIG 8: Medicine dispenser and the power surge & theft detector is implemented successfully

CONCLUSION

New challenges always require new thinking. As we move towards the future, wherever people go, the devices available everywhere will be automated. The main motive of this thesis is achieved which is to safeguard the elderly people by automating the devices ensuring the safety of elderly people. The status of the appliances is thus controlled and monitored through the Blynk app successfully. In addition to controlling the appliances, the energy consumed by the appliances is also measured using the Blynk app itself. The Medicine dispenser and power surge & theft detector are also working properly. Thus, the proposed solution is achieved by designing secured home automation and health monitoring system for the elder people which is made persuasive and ensured to be intact in all situations.

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INCREASE OF AIR PURITY IN METROPOLITON CITIES USING AI TREE

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ABSTARCT

Electrical device gismoused for air pollution is the electrostatic electrical device. In the case of heater live gases, this can be utilized. Dissolved residue particles are seen in the interaction gases. Anodes for collecting residual particles are used in this process. Several factors impact the viability of static Precipitators, each with a distinct effect. The cleaning of the gathering structure on an as-needed basis accounts for a significant portion of the time. By vibrating the collecting cathodes, residue is kept on the anodes and removed by the cathodes. The size of a static electrical device can be enormous when dealing with a large volume of cycle gas. Because space is limited, a definitive arrangement is required. This design can travel vertically, for example, by increasing the height and appropriately distributing the assortment area. Old rapping tactics will become ineffective as the height of the rapper increases, and as a result, new approaches will become more popular, increasing the level of vibration. Keeping track of such continuous updates takes time, which is another important consideration. A more pragmatic method is therefore reenactment, followed by real estimation. Implicit Transient Dynamic Analysis (ITDA) is used in this project to demonstrate and examine the collecting cathodes of an Electrostatic Precipitator using FEA.

INTRODUCTION

In our everyday life it is seen that air is contaminated, and our wellbeing hazard has been expanding everyday. The air is tainted by a few elements which are all by man-made substances. There are two classifications those are indoor and out entryway components, those are from our day by day driving vehicles, processing plants, squander burning, construction work ,and the homegrown kitchen. These are the main considerations that the air in the air is contaminated; to decrease the dirtied air is too tough, because all are significant in our every day a way of life.

XISTING SYSTEM

Industrial process gases contain dust particles. This is a big problem of industrial air contamination and must be controlled. Interaction gases contain suspended dust particles. These dust particles are collected on collecting electrodes. The effectiveness of Electrostatic Precipitators is affected by various factors. Periodic cleaning of collecting system plays a major role. Dust gets deposited on collecting electrodes and removed through vibrations of gathering anodes. For huge volume of process gas the size of Electrostatic Precipitator will also be large. Since space is significant imperatives a definitive arrangement will to go vertically i.e. increase the stature and in like manner the assortment region. Since the tallness is increased old methods of rapping will be incapable. This exploratory methodology has significant downsides of higher courses of events and cost involved in physical testing.

PROPOSED SYSTEM

In our proposed framework we are carrying out new strategy for air purification system in metropolitan cities. The system comprises series of specially-adapted greenhouses arranged in top of the framework, which suck in contaminated air and warmth it using sunlight based energy. The air at that point ascends through layers of cleaning channels before being delivered into the air. We can ready to screen the gulf and outlet air smog level and it will automatically updated to the IOT web worker. We can reduce the air pollution in major metropolitan areas . solar – assisted large – scale cleansing system . urban air quality can increased over short distance due to non- uniform distribution of emission source.

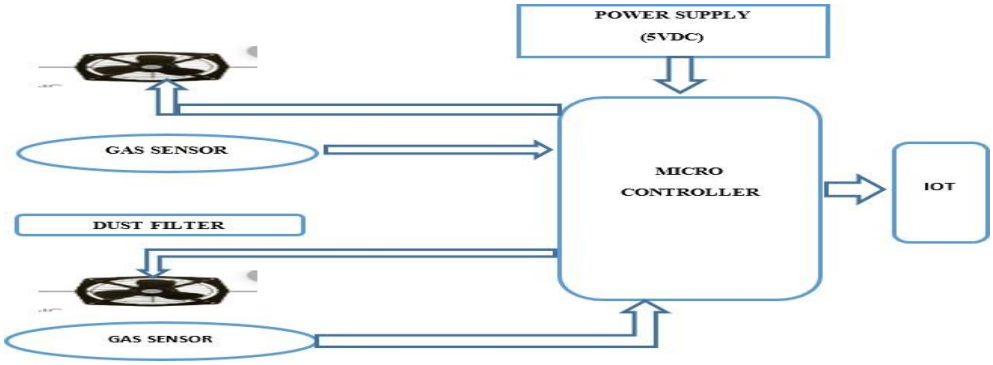

Fig.1.BLOCK DIAGRAM

IMPLEMENTATION

Arduino Software (IDE):

Get the most recent rendition from the download page. You can pick between the Installer (.exe) and the Zip bundles. We recommend you utilize the first that introduces straightforwardly all you require to utilize the Arduino Software (IDE),including the drivers. With the Zip bundle you need to introduce the drivers manually. The Zip file is alsouse fulif you want to create a portable installation. At the point when the download finishes, proceed with the establishment and if it's not too much trouble, permit the driver establishment measure when you get awarning from the working framework The current boot loader consumed onto the Arduino UNO isn't compatible with ROBOTC. In its present structure, you will actually want to download the ROBOTC Firmware to the Arduino UNO, however you won't ready to download any user programs.There a son for this is because there is a bug in the Arduino UNO firm ware that doesn't permit streak compose orders to begin at anyplace yet the beginning of streak memory (0x000000). See the lower part of this page for more technical details.

Power supply

The air conditioner voltage, regularly 220V rms, is associated with a transformer, which steps that ac voltage down to the level of the ideal dc yield. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by as imple capacitor filter to create a dc voltage. This subsequent dc voltage typically has some ripple or ac voltage variation**.**

Gas Sensor

The climate control system voltage, consistently 220V rms, is related with a transformer, which steps that ac voltage down to the level of the ideal dc yield. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by as imple capacitor filter to make a dc voltage. This resulting dc voltage ordinarily has some ripple or ac voltage variation.

RESULT

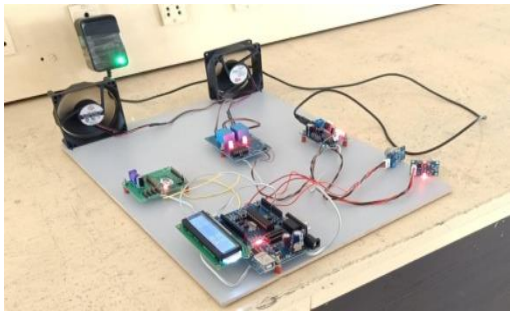

Fig.2.OUTPUT 1

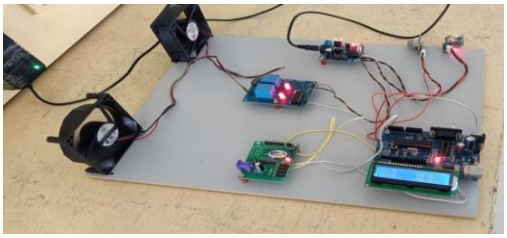

Fig.3.OUTPUT 2

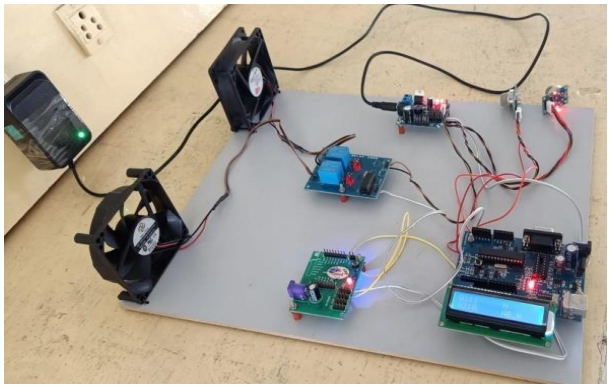

Fig.4.OUTPUT 3

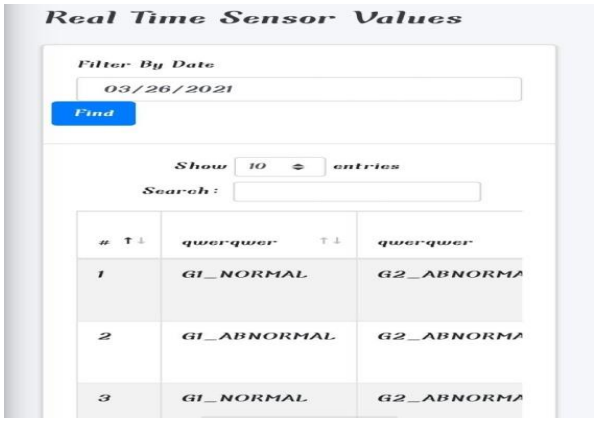

Fig.5.OUTPUT 4

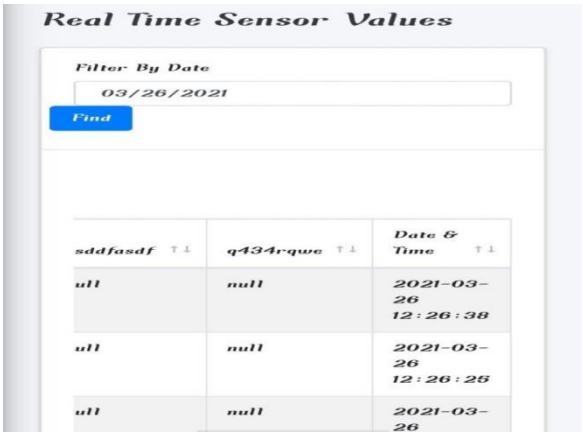

Fig.6.OUTPUT 5

CONCLUSION

The ongoing investigation of the air purging is done dependent on the present air quality and the informational index put away in the framework, contingent upon the variety of the air quality the system generates purified air to the individual.

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"EFFECT OF SELECTED MACRO-ECONOMIC FACTORS ON BSE-SENSEX: REGRESSION VIEW POINT "

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ABSTRACT

The purpose of this paper is to look at the impact of a few macroeconomic factors on the BSE-Sensex with a focus on India. The effect of selected macroeconomic factors such as Inflation (WPI), Foreign Institutional Investments (FII), Foreign Exchange Rate (USD-INR), and Interest Rate (Call Rate) on the BSE-SENSEX is investigated using regression analysis. Monthly data from January 2004 to December 2019 was used in this study. According to the findings, a 100% change in Foreign Institutional Investments (FII) causes a 9% change in the SENSEX, while a 100% change in Exchange Rates (USD) causes a 191 percent change in the SENSEX. The SENSEX is not affected by interest rates (Call Rates) or inflation (WPI). Independent variables such as inflation (WPI), foreign institutional investments (FII), foreign exchange rate (USD-INR), and interest rate (Call Rate) account for 52% of BSE-SENSEX changes.

Key Words: *Inflation (WPI), Foreign Institutional Investments (FII), Foreign Exchange Rate (USD-INR), Interest Rate (Call Rate), Correlation, Regression.*

INTRODUCTION

The stock market is among the most important places for corporations to invest their money. This enables companies to raise capital by selling company shares on the open market in order to fund business trading or growth. It also allows investors to sell their shares in a short period of time. When compared to other investment components, it provides more liquidity to investors.

A macro economy is a cumulative representation of any nation from an economic standpoint. If a country wants to grow, it must consider macroeconomic variables such as inflation, rate of interest, GDP, national income, per capita income, investment, saving, industrial output, exchange rate, fiscal and monetary policy, monetary policy, and so on.

Macroeconomics treats the elements of the economy as a single unit, which is important in understanding the relationships between them. These factors are critical in demonstrating current economic trends and determining the behaviour and attitude of the macro economy. As a result, the government must understand these factors for economic progress, such as inflation and recession, as well as their trends.

The market in which publicly traded company shares are issued and traded via exchanges or over-the-counter markets. The stock market, also known as the equity market, is one of the most important components of a free-market economy because it provides companies with access to capital in exchange for giving investors a stake in the company. The stock market allows you to turn small sums of money into large sums of money and become rich and powerful without taking on the risk of starting a new business or trying to make the sacrifices that often come with a high-paying job.

BSE Ltd was founded in 1875. It was previously known as the Bombay Stock Exchange. The Native Share and Stock Brokers' Association was formed. It has one of the fastest stock exchanges in Asia. It operates at a speed of 200 microseconds. It is one of the most important exchange groups in India. The BSE market is efficient and transparent for trying to trade in equity, debt instruments, derivatives, and mutual funds. It also has a trading platform for small and medium-sized business equities (SME). Over the past 139 years, the BSE has aided the growth of the Indian corporate sector by providing an efficient capital-raising platform.

The study takes into account the Bombay Stock Exchange (BSE) Sensitivity Index (SENSEX) and Macroeconomic Factors such as Interest Rate, Inflation, Foreign Exchange Rate (USD), and Foreign Institutional Investors (FII). These factors are used as a standard by investors or investment managers when comparing their returns to the market return.

Many macroeconomic factors have an impact on the stock market, either directly or indirectly. These variables include GDP, interest rate, inflation, IIP, exchange rate, FII, and so on. The stock market fluctuated in response to changes in these factors. During the last three decades, the stock market has experienced incredible volatility. Many factors influence the stock market, including macroeconomic variables, industrial factors, company factors, and others. The role of economic variables in stock market fluctuations ranges between 30 and 35 percent. As a result, economic factors are regarded as one of the most significant factors in stock market fluctuations. As a result, it is critical to comprehend the relationship between economic factors and the stock market.

MACRO-ECONOMICS

Macroeconomics is the branch of economics that studies the overall behaviour of an economy. It focuses on aggregate economic changes, including the employment rate, national income, inflation, rate of interest, growth rate, GDP, foreign investments, exchange rate, and so on. Macroeconomics examines the economy's overall, big-picture scenario. It focuses on how the economy as a whole performs and then examines how various economic sectors interact with one another. Macroeconomists create models that explain the relationship between different factors. Governments use macroeconomic models to aid in the development and evaluation of economic, monetary, and fiscal policies; corporations use macroeconomic models to set strategies in domestic and international markets; and investors use macroeconomic models to forecast and plan for movements in various asset markets.

This study employs a number of macroeconomic variables, including Inflation, Foreign Institutional Investments (FII), Foreign Exchange Rate, and Interest Rate. The study uses Whole Price Index (WPI) as Inflation, USD-INR as Foreign Exchange Rate, and Call Rate as Interest Rate.

REVIEW OF LITERATURE

Chen et al. (1986) investigated the effect of macroeconomic variables on stock returns in their study "Economic Forces and the Stock Market." They considered short and long-term interest rates, predicted and unexpected inflation, industrial output, and the spread between high and low-quality bonds. The data from 1953 to 1972 was obtained and 12 cross-sectional regressions were applied. It was discovered that some of these macroeconomic variables, such as industrial output and changes in risk premium, have a significant impact on stock returns.

Chowhan et al. (2000) attempted to find reasons for turbulence in the Indian stock market in the short run using the SENSEX as the main index in their study titled "Volatility in Indian Stock Markets." They have attempted to determine how the Sensex, which stood at 2761 in October 1998, rose to 6000 in February 2000, a 117 percent increase in just 15 months, which is not supported by fundamental economic factors in these years, as the Indian economy grew by only 5.9 percent in 1999-2000. According to the findings of this paper, even long-run economic factors do not endorse such a significant rise in stock prices. Such a trend was observed not only in the Indian stock market, but all over the world.

Panda and Kamaiah (2001), in their research paper "Monetary Policy, Expected Inflation, Real Activity, and Stock Returns in India: An Empirical Analysis," used a vector auto regression (VAR) approach to investigate the causal relations and dynamic interactions between monetary policy, predicted

wholesale price index, real activity, and stock returns in the post-liberalization period.

Mishra (2004) investigated the relationship between the stock market and the foreign exchange market in India in his study titled "Stock Market and Foreign Exchange Market in India: Are they Related?" The Granger causality test and Vector Auto Regression techniques were used to investigate the relationship between the stock market and the foreign exchange market. Using monthly time series data for stock returns, exchange rates, interest rates, and money demand from 1992 to 2002, the researchers concluded that there is a unidirectional causality between the exchange rate and the interest rate. It also recommended that there is no granger causality between the return on the exchange rate and the return on the stock market.

Adam and Tweneboah (2008) examined the role of macroeconomic variables in the stock market movement of the Ghana stock exchange from January 1991 to December 2006, using variables such as the Databank Stock Index (DSI), interest rate, inflation, net foreign direct investment, and exchange rate. They used Johansen's multivariate cointegration tests to examine the long run relationship between stock prices and macroeconomic variables. Co-integration analyses substantiate the long - run equilibrium relationship among stock prices and macroeconomic indicators identified in the study over the time horizon. Inflation, contrary to their assumption, correlated positively with share prices.

Pal and Mittal (2011) investigated the long run relationship between two Indian capital markets and macroeconomic variables such as interest rate, inflation, exchange rate, and gross domestic savings in their paper titled "Impact of Macroeconomic Indicators on Indian Capital Markets." Using quarterly data from January 1995 to December 2008 and the unit root test, co-integration, and error correction mechanisms, the research reveals that the inflation rate has a significant impact on both the capital markets, whereas interest rates and foreign exchange rates have an impact on only one capital market.

Bhunia and Mukhuti (2015) examined the impact of domestic gold prices on stock price indices in India from January 1991 to August 2012 using appropriate statistics such as correlation, regression, unit root test, and granger causality test in their paper titled "Relationship between Gold Price and Stock Market-An Evidence of India: Gold Price and Stock Market." The study was based on secondary data collected from the World Gold Council database, as well as the BSE and NSE databases. According to the Granger Causality Test, there is no causality between the nifty and the gold price, the gold price and the Sensex, and the nifty and the Sensex, but there is bidirectional causality between the gold price and the nifty, the Sensex and the gold price, and the Sensex and the nifty. According to correlation statistics, the BSE and NSE are closely linked to domestic gold prices.

OBJECTIVE OF THE STUDY

The main objective of the study is to find out the effect of selected macro-economic factors on BSE-Sensex.

RESULTS

CORRELATION METRIX

	CALL RATE	**FII**	**WPI**	**USD**	**SENSEX**
CALL RATE	1				
FII	0.11	1			
WPI	-0.39	0.04	1		
USD	0.37	-0.03	-0.53	1	

SENSEX	0.30	0.06	-0.40	0.82	1

From the table above, we revealed that Interest Rate (Call Rate) has a positive correlation with all other indicators except Inflation (WPI). FII has a positive weak relationship with all indicators, except negative with Exchange Rate (USD). Inflation (WPI) has a negative relationship with all indicators except FII. The Correlation analysis concludes that SENSEX has been positively related to Interest Rate (Call Rate), Foreign Institutional Investment (FII) and Exchange rate (USD) while it is found to be negative in the case of Inflation (WPI).

REGRESSION

SENSEX AND SELECTED MACRO-ECONOMIC FACTORS

Dependent Variable: LSENSEX

Method: Least Squares

Sample: 2004M01 2018M12

Included observations: 115

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LCALL	0.1425	0.1199	1.1880	0.2374
LFII	0.0956	0.0300	3.1792	0.0019
LUSD	1.9136	0.2410	7.9384	0.0000
LWPI	0.0456	0.0586	0.7789	0.4377
C	0.9782	0.9083	1.0768	0.2839

R-squared	0.5248	Mean dependent var	9.6747
Adjusted R-squared	0.5075	S.D. dependent var	0.5073
S.E. of regression	0.3560	Akaike info criterion	0.8148
Sum squared resid	13.9430	Schwarz criterion	0.9342
Log likelihood	-41.8559	Hannan-Quinn criter.	0.8633
F-statistic	30.3718	Durbin-Watson stat	0.1363
Prob(F-statistic)	0.00000		

MODEL	**R^2**	**Adjusted R^2**	**F-stat.**	**Prob.**
LS=0.9782+0.14LIR+0.09LFII+0.04LWPI+1.91LUSD (1.076) (1.188) (3.179) (0.778) (7.938)	0.5248	0.5075	30.3718	0.0000

LS= Log Sensex, LIR=Log Interest Rate, LFII=log FII, LWPI=log Inflation Rate (WPI), LUSD=Log Exchange rate (USD)

(H_0): There is no significant effect of selected macro-economic factors on BSE-Sensex.

(H_1): There is a Significant effect of selected macro-economic factors on BSE-Sensex.

In the above table, SENSEX is dependent variable, whereas selected macro-economic factors like Interest rate (Call rate), FII, Inflation (WPI) and Exchange rate (USD) are independent variables.

The equation is **LS= 0.9782 + .0142LIR + 0.095LFII + 0.045LWPI + 1.913LUSD.**

Here C is constant and its value is 0.9782 meaning that if there is no independent variable or the value of independent variable is zero then value of BSE-SENSEX is 0.9782. It was found through P-value that there is significant relationship between FII, Exchange rate and BSE-SENSEX as p-value of FII is 0.0019 and p-value of USD is 0.0000 which is significant. Hence, FII and Exchange rate affect BSE-SENSEX. We can accept the alternative hypothesis. But for Interest rate and Inflation, we can accept null hypothesis as p-value is greater than 5% for these two variables respectively 0.2374 and 0.4377 which means that these variables do not affect BSE-SENSEX. The value F statistic is high and the significant its indicated that model is a good fit to data.

In this model R^2 = 0.5248 that means about 52% of changes in BSE-SENSEX are explained by the changes in independent variables. Adjusted R-squared is 0.5075 means model is significantly good.

CONCLUSION

The effect of certain macroeconomic factors on the BSE-Sensex is examined in this article with relation to India, utilising monthly data from January 2004 to December 2019. Correlation and regression analysis were utilised to determine the impact of certain macroeconomic variables on the BSE-Sensex. We inferred from the findings that there is a partial positive link between Interest Rates (Call Rates) and Exchange Rates (USD), as well as between Foreign Institutional Investments (FII) and the SENSEX. The finding demonstrates a weak negative association between Interest Rates (Call Rates) and Inflation (WPI). Additionally, the findings indicate a weak positive association between Foreign Institutional Investments (FII) and inflation (WPI), the SENSEX, and a weak positive correlation between Foreign Institutional Investments (FII) and the exchange rate (USD). Additionally, we determined that there is a partial negative link between Inflation (WPI) and the Exchange Rate as well as the SENSEX. The Exchange Rate (USD) and the SENSEX have a strong positive association. We can conclude from the regression analysis that Foreign Institutional Investors (FII) and Currency Exchange Rates (USD) have a significant impact on the SENSEX. The results indicated that a 100% change in Foreign Institutional Investments (FII) would result in a 9% change in the SENSEX, while a 100% change in Exchange Rates (USD) would result in a 191% change in the SENSEX. Interest Rates (Call Rates) and Inflation (WPI) have no significant effect on the SENSEX. Changes in independent variables such as inflation (WPI), foreign institutional investments (FII), foreign exchange rate (USD-INR), and interest rate (Call Rate) account for 52% of changes in the BSE-SENSEX

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PENA: THE INDIGENOUS MUSICAL INSTRUMENT OF MEITEIS(MANIPURI)

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ABSTRACT

Purpose of Study: *The aim of the study is to investigate the indigenous musical instrument of the Meitei society and its impact on the Manipuri culture and society.*
Methodology: *The methodology of the study will be based on historical and empirical method. The tools and data require for the collection of the work will be based with the help of primary and secondary data. The oral sources will also be adopted in the work, in order to write in a systematic way. The analytical method will also be applied in this study.*
Main Finding: *In this study the main finding is the origin and development of the indigenous Manipuri musical instrument Pena and its impact on the Manipuri culture and society. The Pena is the one of the most importance musical instrument in the origin festival of Lai Harouba. The Pena is one of the unique instruments of the world it is only use in the Manipuri society.*
Application of this study: *This study has more importance to the human civilization and society of the Manipuri culture.*
Novelty/ Originality of this study*: In this study the various numbers of the indigenous musical instruments has to well known of the Manipuri society.*

Key Words: *Pena, Manipuri, Indigenous, Musical instrument, Society.*

Introduction

The Meitei (Manipuri) people who are mainly settled in the north east Indias' state of Manipur with significant numbers of population in Assam, Tripura, Bangladesh and Myanmer have a rich body of folklore which forms a collective source of knowledge and wisdom for the community. The Meitei's, through numerically small, have a distinct civilisation with a long history. The valley used to be ruled by seven clans dividing into seven principalities. From the time of Nongda Lairen Pakhangba ascended the throne of the Ningthouja clan in 33 A.D. there has been a regular history of Manipur. Pakhangba founded a long dynasty which ruled Manipur till its integration with the Indian union. The principalities of the seven clans were regard into the Meitei confederacy one after another. Earlier the word Meitei was known as identical to the people of the ningthouja clan but later when all the clans came into under one political unit it had signified to all.

Review of related Literature

The study on Pena: The Indigenous Musical Instrument of Meiteis (Manipuri) has been insufficient, although some effort in this regard has been made in journal article, seminar papers and book recent and relevant should be presented. e.g. *Aspect of Indian culture (Imphal, 1982) by* E. Nilkanta Singh' was the most important book regarding the introduction of Indian culture as well as also Manipuri culture and its impacts on Manipuri indigenous society and culture. *An Early History of Manipur (Imphal, 1966)* by W. Yumjao Singh has discussed about the introduction of the history of Manipur and also discuss about the indigenous culture of the Manipur. In *Lai harouba : Its Philosophical Meaning and Significance (Imphal, 1962)* written by O.Bhogeswaer Singh clearly mentioned about the introduction and development of Manipuri musical instrument Pena and its impact on the Manipuri society. *'Dance and Culture of Manipur (Culcutta, 1979)* by Ch. Manihar Singh is also one of the important book for the introduction of Manipuri indigenous folk culture in Manipur. '*Manipuri Artki Wari Singbun (Imphal,1973) by* Mutua Bahadur has discussed the emergence of Manipuri arts form and its importance in the Manipuri society. *Manipuri Dance Seminar (Imphal,*

1975) by E. Nilkanta Singh has mentioned various papers in related to Manipuri dance and theatre. And also mention the historical development of the dance and theatre in Manipur. *Meitei Lai-Harouba (Imphal, 1963)* by Ng. Kullachandra Singh has discus about the origin and development of the Manipuri indigenous festival Lai Harouba and role of pena in the Lai Harouba. *Manipuri Lai Haroubagi Festival "Ningsing Chefong" (Imphal, 1973)* by Manipur State Kala Akademi has also discus about the Manipuri indeginous festival of Lai Harouba and importance of pena in the Lai Harouba.

Objective of the Study

The main objectives of this study are:

1. To study the background the origin and development of Pena in Manipuri society.
2. To investigate the process of development the Pena in Manipur.
3. To study the importance of Pena in Manipuri society and culture
4. To focus the role of Pena in Manipuri culture.
5. To study the impact of Pena and traditional Manipuri indigenous folk instrument in Manipur.

Methodology

A large number of Data are available in the form of written records like books, magazines, journals, reports, official records, articles and newspapers etc. For the collection of these data, it is needed to explore from the various record rooms like Imphal East and West district, Cachar district records room and Manipur State Archives, Gauhati Archives, Assam University, Silchar , Manipur University, Canchipur's Library and Silchar District Library etc.

The method of the study will be based on historical and empirical method. The tools and data require for the collection of the work will be based with the help of primary and secondary data. The oral sources will also be adopted in the work, in order to write in a systematic way. The analytical method will also be applied in this study.

Pena and its origin

The Pena is one of the oldest musical instruments of the Meiteis. It brings to the present day a traditional of a pre-Vaishnava period. It is a chord phonic instrument having its peculiar tune, tal, etc., and there is no need of using any percussion instrument to accompany it.

The Pena consists of two parts : Maru(body) and Cheijing(bow). The body of the Pena is made of a coconut shell fastened with a small place of slander bamboo with fastened with a tuft of hair of horse-tail. The bow or the fiddle is made of an arched iron rod with a bamboo handle connected with a tuft of hair. Bows of small jingling balls are tied to the iron rod. The tuft of hair at the body held by the left hand is rubbed with that on the curved iron thus produced is controlled by the fingers of the left hand.

The body of the Pena at its earlier stage was made of the root of bamboo or wood or gourd. The curved iron rod was made of the branch of bamboo and the jingling bells hanging were nongshrik(a kind of seed of a plant which makes jingling sound when it is dry). Leter on during the times of king Khagemba(1597-1652) Takhel Khoma brought coconut shells from Tripura and they replaced the bamboo root.

According to Pandit O. Bhogeswar Singhs' opinion that the two parts of the pena have nine components each. The body of the Pena with all the nine components represents Ema Leimarel Shidabi and it is an the left hand side of the Pena singer while the bow of the Pena consisting of the nine components is on the right hand representing Lainingthou, the lord of the universe (Bhogeswar,1975, Pg-25)**.** So the Pena singer, just at the start of playing , prays to Ema leimarel first bending his head towards the body of the Pena , i.e. left hand side and after that to Lainingthou, i.e. towards the bow of the Pena which is on the right hand.

The Pena is said to be the symbol of the union of Atiya Guru Sidaba and Ema Leimarel Sidabi whom Manipuries regard as the supreme God and Goddess and the sound of the Pena as the one coming out of their union (Subhakar, 1976, Pg.-79). So, it is looked upon as something much more divine than an ordinary musical instrument to be played by anybody. Again, it is termed as the one which gives mental satisfaction when it is heard. Moreover , the sound that charms the human mind is compared to the sound of the Pena (Tamphajao, 1973, Pg.-23). To a Manipuri, it is something above ordinary human reach.

As regards the origin of Pena , it is believed to be the gift of God. The used of this musical instrument in Manipur is from time immemorial and the chronicle *Numit Kappa* supports its use before the days of Christ (Bhogeswar, 1975, Pg.-30). This is believed to have occurred in about 200/300 years before Christ, when khwai Nungjengbam Piba killed the Angom Ningthou with an arrow. Having been frightened by the death of his brother, Sana Khomodon Atomba ran to Lairen Khunbirok of Moirang and remained hidden there. As there was no king in Kanglei, there was great disorder and ultimately the people decided to call him back to be the king. While coming from Moirang to Imphal in the waterways on a small float made of banana plants, Leinung Tharuk Asheiba was playing and singing the Pena in praise of the King. On the way, there were some defects in the Pena and, when the singer was preparing to get it righted, the party reached Shamurou(a place some ten kilometres away from Imphal to the south) and after that there arose a Manipuri proverb which is still in use in the society. It goes like this : " Pena semlingeida Shamurou joui" (while repairing the Pena the party reached Shamurou). From the above it can be surmised that the Pena was in use in Manipur before the days of Christ.

The Pena in Manipuri culture

The Pena had been one of the few instruments which had an inseparable relation with all the cultural activities including religious functions of the Manipuris. There was a separate department in the kings' court called Pena Loisang(Department of Pena) which took up all the matters of public functions where the Pena was necessary(Nandalai, 1974, Pg.-ix). Pena singing was a part and parcel of Manipuri life until Vaishnavism became the state religion and even then its importance cannot be ruled out.

Taking into account bhava, rasa, style and composition of Pena singing, there are three categories as described by Chandam Gopal Singh(Gopal, 1976, Pg.-50). They are as:

1. Lairol: This is a prayer to the gods and goddesses praising their qualities, strength and their propitiation. Most of Pena singing in connection with the Lai-haraoba is of this kind. It is full of shanta and madhur rasa.
2. Wari paring or Kabya Shakpa: It is the narration of the chronicles of the different clans of the Meiteis, and the ballads around the themes of Khamba and Thoibi are in this category. Here karuna, sringar and vira rasa are the main features.
3. Heirol-Leiroi: It is a song giving the description of fruits and flowers and their natural beauties.

Pena music has a great role in the religious matters of the life of the Manipuris. The Lai-Harouba which the foundation of all the culture of the Manipuris cannot be performed without Pena music. The Pena is associated with every item of festival from the beginning to the end. In any traditional ceremonies of the lais the Pena has had its indispensable role.

The Pena singers under the patronage of the king did narrate in the ballad form the puyas or chronicles and even the life stories of extraordinary heroes and they have the preservers of history and culture. Even though there was no written record of their songs, the Pena singers can narrate the story of any kind from one generation to another. A pena singer can be hired by an individual or a

group on payment for a performance in the outhouse or any place prepared for the purpose. Now a days the Pena singers have taken up the episodes from the Ramayana, the Mahabharata and other Hindu puranas in a peculiar Manipuri style enabling one to feel a religious sense (Nilkanta, 1982, Pg.-129).

The Pena was necessary for all the dances including the Lai-Haraoba and Khamba- Thoibi dance and even after adopting Vaishnavism all the traditional dances are to be performed with Pena music. In the early days the ceremonies of birth, marriage, death, etc., were be observed with this instrument and even today the villages of Manipur. In the kings' court it was in use, say, waking up of the king early in the morning and whenever the king was out for some royal duty he would be accompanied by the Pena singers. The Pena singers would play the music in accordance with the function and even the expedition for war, these Pena singer would be in the party.

As the power of the kings is on the decline the glorious days of the Pena singers are also on the wane. But the Pena singers have managed to maintain their status professionally because of the extraordinary qualities of the art of the Pena and the themes of their songs. Even now the young learners of the Pena go to the house of their ojhas(teachers) and learn whatever they can. Now the patronage of this style of singing comes from voluntary organisations and the State Kala Akademi and other cultural forums of the state.

The Pena and Proverbs

As the Pena had been so much connected with the life of the Manipuris there arose some proverb so commonly used in the society. Some of them are:

1. Pena Muklei (as easy as the Pena): this is the most popular proverb used by the Manipuris. Anything that is very easy and simple it is said that it is as easy as Pena playing.
2. Shamu mathunda pena khongba (playing the Pena at the rear of the elephant): the music of the Pena means nothing to an elephant, it neither pleases nor disturbs. So when somebody's speech or action does not have any effect it is said that it is just like playing the Pena at the rear of the elephant.
3. Pena semlingeida Shamurou youi (while repairing the pena the party reached Shamurou) : when some preparation is going on for a work it takes so much time that the very preparation does not serve the purpose. Because by the time the preparation is over the work is almost finished.
4. Pena shakpagi numidangwairam (the evening of the pena singers) : This proverb was lately introduced at the time of Maharaja Chandrakirti when the Pena singers made an attempt to complete a connected story of Khamba and Thoibi. The singers had to complete the chapter of their singing, to observe the tradition, before sunset(at sunset the king was to leave for some other work) and so they hastened so much at the eleventh hour. The meaning is to do something hastily at the eleventh hour.

Dress of the Pena Singing

The Pena singing is clad in a white dhoti and put a turban of the same colour. If a Pena singer is recognised by the king he is allowed to put on a khaman chatpa dhoti in place of the white one. The khaman chatpa is very much respected and can be worn only by those who are authorised by the king. The singers put on gold bangles and gold ear-rings. Somtimes a singer wears resham phurit (a shirt made of velvet).

Conclusion

In this study the main finding is the origin and development of the indigenous Manipuri musical instrument Pena and its impact on the Manipuri culture and society. The Pena is the one of the most importance musical instrument in the origin festival of Lai Harouba. The Pena is one of the unique

instruments of the world it is only used in the Manipuri society.

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EMERGING ROLE OF BLOCKCHAIN TECHNOLOGY IN THE INTERNET OF THINGS

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ABSTRACT

The arising Blockchain innovation shows promising potential to improve modern frameworks and IoT via equipping various technologies and digital devices with additional data processing, handling, storage and its encryption. In the last decade, plenty of disrupting approaches and applications have arisen and considering that digital transformation and technical shift, a lot of blockchain technologies have put in a tremendous amount of effort and contribution from both modern and scholarly experts. With the introduction of this details survey of literature and existing papers, we have attempted to discuss the emerging role of technologies powered by blockchain innovation in enabling IoT frameworks. A blockchain-equipped IoT system is presented and essential methods are introduced. Also, major applications and key challenges are discussed as well. Thorough research for the latest ideas, patterns, and concerns is also discussed related to the Blockchain-enabled IoT. In this paper, an intensive survey on the most proficient approach to mold the technology of blockchain based on various requirements of IoT for enabling blockchain-based Internet of Things (BIoT) methodologies is introduced. After depicting the fundamentals, the most important applications are discussed to emphasize the effect of blockchain technology over traditional IoT applications. Then, the current challenges and potential improvements are discussed with regards to numerous perspectives that influence the design, advancement, and plan of BIoT applications. At last, a few ideas are identified determined to direct future BIoT experts and developers on a part of the issues that should be handled before deploying the next generation of BIoT applications.

Keywords: *Internet of Things (IoT), Blockchain Technology, Control Systems*

INTRODUCTION

Both Blockchain and the Internet of Things (IoT) are the two significant arising technologies of the traditional internet-empowered period of innovation. Both of these innovations are now at their pinnacle of influence while both are projected to almost require one more decade to totally develop. Indeed, comparing with early predictions, blockchain - without changing a lot - drifted at its present continuous pace on the development and hype. Unexpectedly, the IoT has advanced reasonably – winning inside a similar circular segment of the curve. Such relapse of IoT, as far as arriving at the development level, is somewhat justified by its far and wide reception in diverse applications and the security concerns raised to this point.

However, both of these technologies are distributed, independent, and decentralized frameworks having serious possibilities to support each other in the long run. IoT requires reinforcing its security while Blockchain has them because of its broad utilization of cryptographic systems and Blockchain needs contributions from the various nodes for its P2P (Peer-to-peer) model while IoT encapsulates them inside its engineering.

Blockchain innovation is a revolution in frameworks of record and has been anticipated by the business and research experts as an emerging tech that can have a huge part to play in checking, controlling, and, in particular, securing IoT gadgets (Panarello et al., 2018). The analysts depict a blueprint that work with the sharing of IoT resources and benefits and enable the automation of time-sensitive work processes cryptographically (Samaniego and Deters, 2016).

This paper discusses arrangements and workarounds to feature that the blockchain

and IoT can be leveraged together. For instance, data communication by IoT gadgets is cryptographically proofed by the mark of the sender who holds a unique key pair; in this way, the validation and integrity of sent information are ensured. Besides, all exchanges made to or by IoT gadgets are recorded on a distributed ledger that can be tracked easily. Although the blockchain may seem like an antidote to address the security layer of IoT that exists in centralized frameworks, there are still many challenges that hinder its integration into current IoT networks. As of late, there is an immense amount of speculation from the industries as well as huge interest from the academic world to carry out intense research with regards to these difficulties (Panchal et al., 2021; Raya et al., 2021; Ganapathy et al., 2021; Manojkumar et al., 2021; Sharma et al., 2021; Hussain et al., 2021). For instance, the risks related to the consensus protocols of blockchain technology are becoming a critical issue in the field. Besides, forks also carry threats to hinder the performance of consensus algorithms. Additionally, it has been observed that 51 percent of new blockchain technologies are prone to vulnerabilities (Bahack, 2013). Simultaneously, a lot of power has to be consume to support some of the high-end Blockchain (Ali et al., 2016).

LITERATURE REVIEW

Until a couple of years ago, blockchain innovation was just implemented with regards to payment systems, i.e., Bitcoin (Nakamoto, 2008) and Ether. Somewhat recently, increasingly more non-financial use cases for blockchain innovation emerged (Bynagari & Ahmed, 2021), for example, supply chain management and digital identification (Roeck et al., 2020). The later use cases identified the benefit of integrating blockchain with different innovations like IoT and AI.

For instance, Huh et al. (2017) examined the utilization of blockchain to further develop the framework foundation of different IoT gadgets. Dorri et al. (2017) defined how the engineering of blockchain can be changed to such an extent that the next framework is better prepared to equip IoT gadgets, particularly the speed of transactions. Other than focusing on a blockchain regarding IoT, a few papers also targeted the combination of blockchain and AI (Manavalan, 2020). Until this point, the emphasis is essentially on interfacing blockchain with another intelligent technology to make it savvier and faster, like IoT and AI, and not using all three technologies at the same time.

Nonetheless, the genuine capability of these new, arising innovations might be discovered only if these are combined. Singh et al. (2020) designed a blockchain-based framework that integrates IoT and AI. As opposed to Kumar Singh, this paper gives a non-specialized outline of the advantages of blockchain-based IoT applications and frameworks and how these two complement each other.

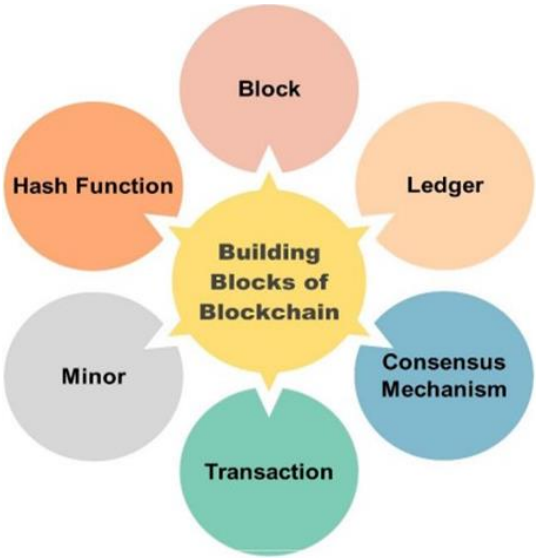

Fig. 1. Main Building Blocks of Blockchain Technology

Note that the ideas discussed in this paper apply to both public and private blockchain. The major difference between the two types of blockchain is that in a public blockchain each member can access the information stored on the blockchain. Whereas, in a private blockchain, access to information is limited to some specific parties. For the accomplishment of this paper, it is optional whether the access is public or private as the use cases could be executed on both blockchain types. Moreover, it should be

noticed that blockchain, by some other database, is affected by poor data quality. Since this subject isn't related to blockchain-based data, it won't be talked about further in this paper.

FRAMEWORK OF DECENTRALIZED ACCESS CONTROL SYSTEMS IN IOT

The design presented in this section shows a decentralized framework where data with respect to access control is stored and handled utilizing Blockchain. Each one of these participating entities are important for this framework other than IoT gadgets and the management hubs.

However, nodes in a network should incorporate a duplicate copy of the connected blockchain network. This infrastructure will be significantly huge and will continue to expand over time Bynagari, N. B. (2015); Fadziso, T., & Manavalan, M. (2017); Manavalan, M. (2014); Manavalan, M., & Bynagari, N. B. (2021); Neogy, T. K., & Bynagari, N. B. (2018). Most IoT gadgets cannot store blockchain data because of their nature. Thusly, our engineering does exclude IoT gadgets in the blockchain and, then again, characterizes another node that calls for access control data from the blockchain network for IoT devices.

Table 1: Simple comparison of IoT and Blockchain to different areas

Areas	Internet of Things	Blockchain Technology
Privacy	Lack of privacy and re-sources	Ensures that participating entities are secure
Bandwidth	Limited bandwidth and resources	High bandwidth
System Structure	Centralized	Decentralized
Scalability	Efficient to contain a large number of devices	Poor scalability with a large network
Resources	Restricted resources	Highly resource consuming
Latency	Low latency	Time-consuming
Security	Poor	Highly secure

Moreover, this framework includes a singular smart contract that characterizes each one of the activities allowed within the framework. The mentioned contract is unique and can't be erased from the framework. Components called 'managers' are required to communicate with the smart contract to characterize the access strategy of the overall framework.

Wireless Networks

A wireless network is a medium of communication within the network that allows correspondence in applications with restricted capacity and some prerequisites. Moreover, the IoT gadgets having a connection with the wireless network are somewhat restricted in their power, memory, and accessibility. IoT gadgets don't have a connection with the blockchain network here. Hence, one of the prerequisites of our engineering is that each one of the gadgets should be uniquely identified around the world in the network of blockchain technology. Whereas, public key generators can give a possible way out for the issue creating huge and complex values. Using the preexisting cryptographic methods would make a public key for each gadget. Therefore, authorizing encryption will make sure that all the identifiers in the framework are unique in nature.

Managers

In this framework, manager plays the role of a responsible entity who's answerable for dealing with the authorizations of IoT gadgets. Usually, these entities are considered as trivial nodes in the framework. Such nodes don't store any data or validate the transactions like the miner nodes do. Therefore, IoT gadgets can likewise play the role of managers in the framework. Furthermore, utilizing this methodology managers should be continually connected with the blockchain network, which assists

with reducing the consumption of resources. In any case, enlisted IoT gadgets need to be assigned under a node of manager. This procedure is followed in order to keep managers away from enlisting gadgets under their nodes without approval from those devices. What's more, all enrolled IoT gadgets in the framework need to have a connection with at least one manager in the system. Otherwise, no one will be able to manage with that gadget. Nonetheless, an enlisted IoT gadget may have a connection with more than one manager simultaneously (Manavalan & Chisty, 2019).

Agent Nodes

This node within the decentralized network is an important element to deploy the main smart contract. Agent Node is the main proprietor of smart contract during the entirety of the framework. When the smart contract is approved in the network, agent node is assigned an address that is directly connected to the smart contract. If communication has to be established within the network, each one of these nodes has to know the address of smart contract.

Smart Contract

The framework being discussed in this section is administered via the activities characterized in a smart contract. This is a unique agreement and can't be erased from the framework. Consequently, each one of the tasks allowed in the framework is characterized and is activated by the transactions carried out in blockchain.

When a transaction is activated through an exchange, the blockchain miners will store the data of that particular activity around the world. The activities and accessibility of smart contracts is likewise available all over the world. What's more, it should be understood that in this frameworks, only managers are the ones who can connect with smart contracts to characterize new strategies for the framework.

Blockchain Network

The blockchain entity in a framework is a private element to incorporate simplicity. In our case, a private blockchain is ideal because all of the components are diverse, ensuring a more solid result while assessing the framework. Be that as it may, in a real-world scenario, a public network of blockchain must be utilized to work with the mass adoption of the proposed solution.

On the other hand, private blockchain networks can be easily understood by anybody but just written by private nodes. These networks assist with keeping the whole blockchain secure and stable by keeping the record of exchanges and storing duplicates of the transactions. Various nodes can leverage the blockchain network to store and access the plan of action. This sort of data is completely decentralized and carefully designed.

Management Nodes

As referenced previously, IoT gadgets don't have a place with the blockchain network. Most IoT gadgets are extremely restrained. Those constraints confine IoT gadgets to be essential for such networks. Being essential for the network refers to keeping a complete tracking data of blockchain transactions and creating duplicates of them locally.

These nodes, often referred to as 'management nodes', are integrated directly with a node of blockchain itself. Various networks can be interfaced with a management node and we can also connect various other nodes with the same blockchain node. IoT gadgets may have the option to demand access data from the network using these nodes.

WHY BLOCKCHAIN FOR IOT? – DETERMINING THE NEED FOR BLOCKCHAIN

Before diving into the details on the best way to utilize a blockchain for IoT applications, it should be first determined that a blockchain isn't generally the best answer for each IoT situation. Customary databases or DAG (Directed Acyclic Chart) ledgers might be a superior fit for certain IoT applications. In particular, to decide whether the utilization of a blockchain is fitting, an engineer must

choose if the following features are fundamental for an IoT application.

Table 2: Brief comparison of public, private, and consortium Blockchain

	Public Blockchain	**Private Blockchain**	**Consortium Blockchain**
Participation in Consensus	All nodes	Single network	Selected nodes in multiple networks
Access	Public read/write	Can be limited	Can be limited
Identity	Pseudo-anonymous	Approved entities	Approved entities
Immutability	Yes	Partial	Partial
Transaction Processing Speed	Slow	Fast	Fast
Permission-less	Yes	No	No

Decentralization

IoT applications request decentralization when there isn't any reliable framework. Be that as it may, numerous users blindly trust certain organizations, government offices, or banks, so in case there is common trust, a blockchain isn't needed.

P2P Transactions

In IoT, most of the communication goes from nodes to gateways that direct the information to a remote server or cloud. Interchanges among peers at a node level are really not normal, aside from some specific applications. Some additionally different ideal models cultivate communication among nodes at a similar level, as it occurs in fog computing with local routes.

Decentralized Payment Systems

Some IoT applications might need to perform financial exchanges with third parties, and some applications don't. Also, financial exchanges can be carried out by traditional payment frameworks, despite the fact that they typically infer to pay transaction costs and it is important to trust banks or any middle man.

Public Sequential Transaction Logging

Numerous IoT networks collect information that should be time-stamped and stored consecutively. In any case, such requirements might be handily satisfied with conventional databases, particularly in situations where security is ensured or where cyber threats are uncommon.

Distributed Systems

Distributed frameworks can likewise be based on top of cloud servers or any type of traditionally distributed framework. The need for this element isn't sufficient to justify the utilization of a blockchain. There also must be an absence of trust in the content that deals with the distributed computing framework.

Collection of Micro-transactions

Some IoT applications might have to track each transaction to keep up with visibility, for accountability purposes or because that big data methods will be applied afterward. In these circumstances, a blockchain might be helpful. Be that as it may, different applications don't have to store each collected value. For instance, in remote agricultural tracking, where communication is pretty much costly, it is common to utilize IoT hubs that come into play consistently to acquire information from sensors. In such cases, a local framework might collect and store the information, and when daily it sends the collected data all together in one transaction.

MAJOR APPLICATIONS OF BLOCKCHAIN TECHNOLOGY FOR IOT

IoT in Healthcare

The utilization of Internet of Things in medical care has enabled field experts to manage the healthcare systems with medical information identified with the patients, their families, their close ones, and also the medical care experts. Healthcare information

called such as EMR (Electronic Medical Records) is stored by medical experts due to its sensitive nature. To work with healthcare data, there are more advanced mechanics such as EHRs (Electronic Health Records) having a more detailed information structure as compared to the former. To facilitate the possibility of the distributed databases, a new methodology based on a blockchain approach has been introduced lately. In this model of blockchain, a block is initiated and shared when new data related to patients and their medical records is recorded. In this way, we have an improved sense of data accessibility and portability about patients.

IoT in 5G

In the generation where IoT is taking higher and higher leaps, 5G will empower a completely portable and interconnected environment for millions of digital objects and devices. To effectively address and solve the issues related to privacy and protection of data in the 5G-enabled ecosystem, a security framework supported by blockchain and data sharing plan would come in handy. This approach shall be based on the idea of adding different building blocks to the network of blockchain where each new block is integrated with the network through its hash value. It's noteworthy that the past value can be perceived from the block header easily.

IoT in Vehicles

The idea of incorporating IoT in vehicles is emerging. It enables the addition of vehicle systems into the new generation of IoT to build up intelligent correspondence among vehicles and connected networks. Nonetheless, some new papers attempt to carry out a blockchain approach to IoV. Firmly based on a decentralized model, Huang et al. presented a model for EVs and their management of charging activities. The model uses ECC, generally known as Elliptic Curve Cryptography, to compute values of electric vehicles and stations where EVs are charged.

Collaborative Video Delivery

Delivery of excellent graphical content in the IoT these days is a challenge to tackle for internet service providers. To cope up with that, experts proposed a processing tool for collaborative video delivery based on absolutely decentralized technology. In particular, this service is based on 3 blockchains specifically as follows: the content facilitating blockchain, the delivery checking blockchain, and the monitoring blockchain.

IoT in Cloud

Billions of IoT gadgets transfer their information using cloud platforms. Experts presented a smart resource management tool for remote servers based on blockchain innovation, in order to eliminate the heavy costs resulting due to power consumption. In this model, users use their private keys to label a transaction carried out through blockchain-based exchanges, while the local users look for the transmission transactions. In the end, whole block is disposed of if it doesn't go through the validation step.

CHALLENGES IN INTEGRATING BLOCKCHAIN WITH IOT

Adding blockchain to IoT poses further functional and technical challenges since the advancement of BIoT applications is a complicated process that is influenced by numerous perspectives that are interrelated. The primary challenges are depicted in the following subsections.

Data Privacy

Each one of the users of a blockchain is recognized by its public key or its hash. This implies that secrecy isn't ensured and, since all exchanges are shared, it is feasible for outsiders to analyze such exchanges and collect the actual identifications of the members. Data privacy is considerably more complicated in IoT conditions since IoT gadgets can reveal private client information that could be stored in a blockchain whose security prerequisites vary starting with one

country then onto the next (Bynagari & Amin, 2019; Manavalan, 2018).

Identity verification may likewise be an issue in IoT: if an entity is answerable for approving users, it can likewise have the option to block them. To address such a challenge, it is proposed that a permissioned blockchain must be used for accessing and dealing with numerous IoT nodes. The proposed framework gives an overall entity verification management that increases security and privacy against cyber-attacks by randomizing keys. Such keys are produced locally on the gadget and they are never shared from it.

Scalability and Storage Issues

Data limit and issues related to scaling huge amount of data have been profoundly addressed in the literature. In this tech, the network is continually progressing, at a pace of one megabyte per block within every ten minutes, and duplicates have been stored along with the blockchain nodes (Manavalan & Ganapathy, 2014). However only some specific full nodes store the complete data where data storage needs are critical.

As the size of the data block develops, nodes require an ever-increasing number of storage resources, in this manner lessening the framework's ability to scale. What's more, a large chain affects the execution of the framework, for example, it increases synchronization time for new users.

Energy Efficiency

Usually, IoT nodes use resourceful hardware that is fueled by batteries. Along these lines, energy efficiency is vital to empower a dependable node arrangement. However, numerous blockchains are shown to be huge consumers of power. In such cases the greater part of this huge energy consumption is because of two elements:

- **Mining:** Blockchains like Bitcoin use huge amounts of power because of the mining system, which includes a consensus protocol that comprises brute force to locate a hash.
- **P2P interchanges:** P2P interchanges require edge gadgets that must be controlled, which could prompt the waste of energy. A few experts proposed energy-effective conventions for P2P networks, however, the issue actually must be read further for the particular instance of IoT networks.

CONCLUSION

The standard of the Internet of Things (IoT) is structuring the pathway for a digitally modern world, where a large number of our everyday objects will be interconnected and will connect within an ecosystem to collect relevant data and automate certain tasks. Such an accomplishment needs, in addition to other things, consistent validation, data protection, security, right strategies against cyber-attacks, easy deployment of frameworks, and regular maintenance. Such provisions can be brought by blockchain, an innovation brought into the world with a digital currency called Bitcoin. Within an ecosystem of complicated IoT devices and applications, different gadgets are interconnected to develop, gather, scale, deploy, and store information. The enterprises are showing strong curiosity in promoting the combination of both IoT and blockchain-supported business work processes. Because of these fast achievement in these fields and ideas on plans of action, IoT is relied upon to be highly applicable in multiple ventures.

Through this paper, we have gained insights regarding the possible mixture of IoT and blockchain technology from a new perspective. An IoT system completely backed by decentralized capacity of blockchain has been presented and relevant applications are discussed. We've also tried to shed some light on the challenges that are faced by field experts more often than not. Along with these challenges and difficulties, we have presented the hindrances identified with research patterns related to blockchain-empowered IoT.

With a few difficulties introduced in IoT engineering, integrating the IoT into one of the distributed technologies might be the right decision. Among the normal types of

distributed technologies is the blockchain. It uses a decentralized methodology that conveys better productivity and reduces the occurrence of a weak point. The integration of blockchain with IoT can resolve issues of the IoT frameworks and provide an effective method for future works. Hence, the purpose of this paper was to give a thorough idea of coordinating the IoT frameworks with blockchain innovation. After introducing the basis of IoT and blockchain, the paper gave an extensive insight into how blockchain presents better use cases for IoT applications in various fields.

Moreover, ongoing research introducing the combination of IoT and blockchain is likewise introduced. Then, blockchain as a service for the IoT is looked upon to show how different provisions of blockchain can be implemented for different IoT sectors.

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THE IMPACT OF RESTORATION PROCESS ON THE CULTURAL HERITAGE VALUES

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ABSTRACT

This study aims to understand the impact of the restoration process on historical values in developing countries. So, this study is intended at explored the confluence of the restoration process and heritage value of the historical building and raises concerns regarding the conventional definition and conceptualisation of 'preservation.' Based on the reality of developing axis to the treatments and architectural regulations, the article calls for more research on the subject and active involvement in restoration efforts in the conservation sector. In this qualitative study, after documenting literature, a case study has been observed with an analytical description for understanding the reality of the conservation process in Iraqi Kurdistan. With an introduction to specific recommendations to conduct the conservation process following engineering and scientific methods, the building achieves renewal, sustainability, and the region's highest historical, architectural, social, cultural, economic, and tourism potentials. General goals and strategies have been suggested to conserve the old castle of Sherwana. The cultural heritage of a region reflects the identity and the civilisation of that nation. It also represents the connection between its past-present-future. That architectural heritage must be looked after, conserved, rehabilitated and updated to suit Modernisation.

Keywords: *Cultural Heritage, Architectural Conservation, Restoration Process, Historical Values, Castles.*

Introduction

The threats and harm to Iraq's cultural heritage have grown substantially in recent decades. Continuous conflicts between the 1980s and the present, massive plundering, the impacts of the erosion and silting process, infrastructure-building issues, and land extension have had a profound influence on the cultural heritage across the nation. The degree of such harm has only been partially recognised, and extensive analyses and reporting have yet not been generated. Furthermore, the scientists have focused on threatening and destroying the cultural heritage caused by environmental processes or violent conflict, following up on recent policy developments and the constantly growing issue of climate change, which have less emphasis on international architectural heritage conservation regulations (Zaina, 2019).

A place's features are tied to its history since it was created during a certain period (Oppong, Marful, & Sarbeng, 2018). Preserving a society's products/buildings is an architectural responsibility, so architectural conservation is considered one of the scientific fields that its importance is growing especially in the modern age. Since architectural heritage is a cultural treasure that gives good components for inspiration and introduction in current architecture and construction activities, it is considered a cultural asset. Preservation, as defined by 'Fielden,' is a combat against collapse and destruction aspects brought to buildings or facilities by a variety of reasons, the majority of which are produced by humans. While the humankind is a part of construction, it is also a primary cause of destruction for a variety of reasons. The most fundamental cause is ignorance and lack of interest in the legacy.

Moreover, as described by Petzet (2009), architectural preservation maintains the edifice and buildings and prevents them from falling, in case not repaired, and repairing the parts that were tarnished in the past. When it became more comprehensive, preservation is called urban preservation, which is considered a planning process, protection and raising the value of a complex of buildings and sites of historical or architectural value. According to Elsayed (2020), the conservation process in the Middle East, as she describes Cairo as an example, is working on individual buildings rather than the context of cultural heritage, which leads to the increase of risk at Iraqi Cultural Heritage.

The reports on the heritages that are at risk from International Council on

Monuments and Sites (ICOMOS) (Arlotta, 2019) and some funding organisations such as UNESCO (Wilcox, 2020), Iraq and Iraqi Kurdistan, in specific, has not been mentioned in the last two reports on the sites that at risk. While Iraq has many archaeological, historical and cultural heritages; thus after the ISIS battle, most of those heritages had demolished(Stone, 2009). Therefore, pay attention to Iraq's heritage is one of the weak points in protecting the world's heritage, as it is out of advising, having committees for protecting its heritage. Even though there are a few studies on Iraqi heritage, more specifically, no scholar has been found about Iraqi Kurdistan's heritage and its historical and architectural value, as there are no theoretical standards for the conservation process in this country.

So, this study aims to emphasise the importance of the architectural heritage of Kurdistan across different ages, focuses especially on Sherwana castle in the Kalar district as the case study, which is considered as the cultural identity and character of that area. Accordingly, the study deals with the conservation of the architectural heritage of the Kalar district done to the Sherwana castle, which was exposed to re-building processes in two different periods, leading to the loss of the original features of the building.

Theoretical Understanding of the Architectural Conservation Concept

Depending on the definition of the word of 'conservation' is anything done to maintain artworks or historical items in excellent condition (Joudifar, 2016). Preventing decay and degradation is the act of conservation. It covers all methods that prolongs the life of cultural and natural assets in order to preserve it for subsequent generations. The idea of architectural conservation dates back to the ancient ages. A glance at the history of ancient Iraq confirms that this idea existed in the ancient civilisation of the Mediterranean and appeared with different styles, such as keeping important buildings like temples and palaces. In the modern age, the idea originated in Europe as a trial to protect immovable cultural properties (Appelgren, 2019; Braudel, 2002). As a result, the architectural legacy/conservation is interpreted, understood, and managed in such a way ensures its survival for future generations (Foster, 2020).

In the late eighteenth century, some archaeologists and museum experts have made studies and scientific research on preservation work done in the past. 'Steward & Rivett' prepared drawings of Athens city in 1764; 'The Adam Brothers' worked on a documentary study accompanied with valuable drawings for the 'Diocletian Castle' in 'Split'' city in Yugoslavia, in 1777 (Thom, 2017), as they accompanied Napoleon in his trip to Egypt with several scientists and wises, who performed studying and analysis to the ancient Egyptian arts. Their researches affected the art style in the empire all over Europe. However, the first one who established concepts for architectural preservation in the modern age was the Englishman' W. Morris' (1834- 1896), an artist, craftsman, poet, critic, and political thinker in Victorian England (Yount, 2005). He has been impressed by the great loss of cultural heritage due to the stylistic restoration performed by Great Britain's artists. He suggested establishing a special organisation that undertakes to observe the historical monuments, draw the public's attention, and awaken their sensation that historical buildings are unique monuments. In 1877, Morris achieved success and established an organisation for protecting historical buildings, 'SPAB – Society for the Protection of Ancient Buildings' (Donovan, 2007). There are two basic directions and methods in architectural conservation and treatment. (a)The first direction emphasises the structure's originality. This direction stresses the necessity to maintain the original structure using original raw materials. (b)The second direction emphasises the importance of the structure as a historical symbol, and this direction accepts the idea of building re-construction and creating a second copy, which is considered by the first direction as

counterfeiting of the historical facts (Committee, 2003).

As for conservation methods, there are traditional methods and contemporary methods. (a)Traditional Method of Conservation: It seeks to halt and suspend the visible consequences of the building's degradation without addressing the underlying reasons. (b)Contemporary Methods of Conservation: The primary goals of these approaches are:

(1) Ensure that the building has a continuous purpose via maintenance and renovation, and that its cultural and economic values are protected.
(2) Assigning a specific framework to the building that is similar to the original purpose does not create a significant gap between the past and the present.
(3) Considering the original character and objectives of the building before performing any modifications and considering a relationship with the neighbouring (Heritage & Copithorne, 2018).

The contemporary methods in conservation may include the following three levels:

(1) Gradual destruction: Using the underpinnings as a core to create the structure in the same shape as before. This process becomes acceptable only when it is impossible to keep the historical remains of the building for a long time and when normal maintenance costs are very high.
(2) Partial Conservation (Retention): A technique for applying to a structure was kept, although its function is no longer suitable for current use. As a result, minor adjustments would be made to rehabilitate it and find a new purpose that is specific to the demands of the region. It is important to consider that the changes, to be the least, do not affect the original character of the building.
(3) Complete Conservation: It is the conservation and preservation of buildings that could be preserved in its original forms while performing the same purpose (Stanley-Price & King, 2018).

1. Methodology

In this qualitative study, after documenting literature, a case study has been observed with an analytical description for understanding the reality of the restoration process concerning architectural values of historical heritage in Iraqi Kurdistan. This documentation process has three facets: the first step is documenting the literature, then documenting the original history of the case study and the restoration quality, finally, forming a comparison between the literature and what has been done in the case study; Sherwana castle.

3.1 Case study

Sherwana castle is located on the Sirwan (Diyala) river in Kalar, Iraqi Kurdistan, to the east of Kifri and to the west of Qasr Shirin and Sarpol Zahab in Kermanshah Province in western Iran. Kalar is one of the twin towns of Smud and Kalar. After the 1991 Kurdish revolt against the Ba'ath party, Smud was renamed (Rizgari). During Saddam Hussein's administration, the Smud neighbourhood served as a Kurdish displacement camp (URL1, 2021).

The castle is resting on two hills. It is believed that the second hill that is directly under the castle is an artificial hill created by piling up soil sacks when the castle was constructed. While the first hill (Sherwana Hill), with a height of 20m, the width is more than 180m, has special importance since it is an ancient hill. Due to the significant historical value of this hill, it was inspected in 1989. As a result, some archaeological relics of ancient civilisations were discovered. The remains of an Islamic civilisation go back to the (Abbasid & Umayyad) caliphate between the 8th and 10th Centuries, consisting of some potteries (glassware and ordinary) been found under the topsoil layers. In addition, some remains of the Sasanian civilisation consist of many antiquarians such as houses, bricks, gold and silver currencies. Apart from

the above mentioned, more findings addressed such as; volcano stones and glass, historical tools used by humans, contemporary to the same period of Charmo village (Kopanias, MacGinnis, & Ur, 2015).

The castle is home to the Jaff family and can be visited by travellers. According to many historians' opinions, such as; (Taha Baqir, Fuad Safar, Mohammed Amin Zaki, and Mustafa Nariman, etc.), the castle was built by (Mohammed Pasha Jaff) and still stands to this day. Concerning the year of construction, many believe that it was constructed between 1866-1874 when Mohammed Pasha Jaff was only 54 years old (Jamie, 2017). There are many interpretations about the reason behind constructing the castle, which is including, military basis. It is believed that it was used as a military fort, while in fact, it does not imply any of the military bases; therefore, this belief is considered incorrect. Secondly, love promise, it is said that 'Mohammed Pasha' has promised his lover and then fulfilled the promise. Moreover, the most accepted belief is that 'Mohammed Pasha' has built this castle as an administrative centre for his clan, to manage people's affairs. Furthermore, as a tradition at that time, it was common for such a man to have his castle, along with the line of other clan leaders and kings (URL2, 2014).

3.1.1 The features of the Sherwana Castle

The castle's style is similar to the style of buildings in 'Sanandaj' (Kurdistan of Iran) during Ardalan principality, which is known as a staid Kurdish style. At the same time, it is common to see similar castles in the other regions of Iran (Reference).

In General, Sherwana Castle has been used as follows:

- The basement was used as a prison, water storage, and storehouse.
- The first floor was a place for cookers, servants and on-duty patrol and had special places as a reception for guests.
- The second floor was a special living room for Mohammed Pasha's family, a special meeting room, and another private room for the Pasha (King), located to the south, which overlooks the frontal side of the castle. It is a beautiful room full of ornamentations.
- Room of (Klaw Farangy): another special room of the castle was a private room for the Pasha (King). The arches of this room overlook the four sides of the castle.

However, the ornamentations of the castle are (Botanical, Geometrical animal) engraved on gypsum, lime, and brick, mixed giving a beautiful touch to the castle at the locations where implemented. The scenes mostly consist of images of flowers, stars, fabulous creatures.

Throughout the history of Sherwana Castle, the following stages of restoration and adapting to re-use has been four times recorded as shown below:

1) In 1927, rented by the Iraqi Government from the Jaff family and used as an administration office for the district after renovation. The major changes affected the top of the towers, and stairs added for vertical circulation.

2) At the beginning of the 1940s, the castle been renovated by (Karim bag, the son of Fatah Bag). The main modifications were changing the doors, windows and using steel in the penthouse room.

3) In 1990, the former president of Iraq (Saddam Hussein) visited the district and gave instructions to renovate the castle to convert it into a tourism landmark; the renovation was done by unqualified staff.

4) In 1997, another renovation was made by the Regional Government – Sulaimani Administration.

In every stage, there are changes either in space organisation, façade of the building, the floors, features of used architectural elements, or in the materials that used in the restoration process.

Findings of the Study

The castle went through many restoration processes that were hypothesised in this study as losing its original shape for many reasons, such as (a) natural factors (represented by rainwater, humidity, and other factors), caused big damages to the façade. (b)Human factors, whether deliberate, represented in negligence and lack of periodical maintenance of the building, or preservation and renewal work performed aimed at developing and renovation, led to the annihilation of the architectural and historical value of the castle. Moreover, (c)accidental, represented in the absence of awareness by official departments regarding the importance of historical and heritage buildings.

In this research, the evaluation of the restoration process aimed to rehabilitate the castle by reaching its original shape. The aim is to restore the authentic form of the castle. Many steps have been followed in this research to achieve this goal. However, there is a lack of historical documents related to the castle to prove its origin. Moreover, the loss of original architectural elements was investigated to conclude the shapes and properties of the original elements of the castle. These steps are accomplished as documentation of the existing castle, reaching the possible original shape of the castle before its renovation. Personal interviews with experts, historians, engineers, and citizens of the region to get their opinions about the original shape of the Sherwana Castle.

Components of the Castle: It consists of a basement, two stories, and a big room (Klaw Farangy). Currently, the basement is filled up. It has been used as a prison, water storage or storage for materials, livelihood, etc. has several rooms. Structure of the Castle: Forms a square, having a tower at each corner; each tower is heptagonal in shape, giving the castle a beautiful appearance, including some arches of different sizes. The Ground Floor consists of one sitting room (Iwan), two large rooms, and two passageways. Those two passageways have functional importance, leading to the back towers and the stairs connecting the ground floor to the first floor. The First Floor consists of four main rooms, a hall, and a passageway leading to one of the towers. It also contains the stairs that connect the first floor to the upper floor. Farangy Room (Foreign Room): It can be considered the second floor, having an octagonal shape, it contains some arches. It is one of the most attractive parts of the Sherwana Castle. Materials used in the Castle: The main materials utilised in the castle's construction are burned brick, gypsum, lime and timber. Measurements of the Castle: The height of the castle's three floors is 12.30m, the width of the frontal side is 19.35m, while the backside is 18.50m, and the length of the eastern side is 15.40m, while the western side is 15.20m.

The castle has been restored many times, none of them has been performed based on heritage preservation principles. In each renovation, the building has lost parts of its architectural properties. We realise a big difference if we compare the castle's images from the 1980s and the current ones. Experts believe that the local authorities did not pay enough attention to the historical and heritage value of the Sherwana Castle, used as governmental offices instead, and suffered from many changes.

Analysis of architectural dimensions

Analysis of the Sherwana Castle's Façade

As can be seen in table 1, the general view of Sherwana Castle has been changed. For instance, after restoration, there is a two-floor penthouse, which did not exist in the past, as this is true for both towers. Despite the ornamentation on the parapet did not appear in the photo of the past. However, in the original building rounded arch/Roman arch has used. After restoration processes, the arches are switched to pointed/ gothic arches. Without depending on the castle's original features, the conservation of the façade has been completed, such as opening the windows in the main façade.

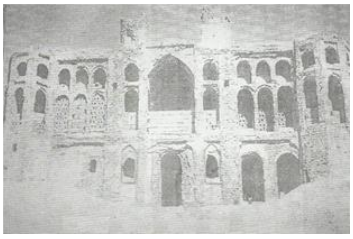
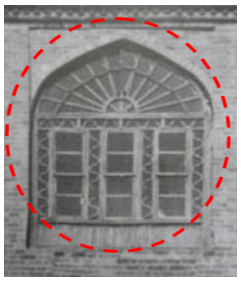
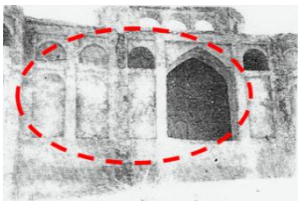
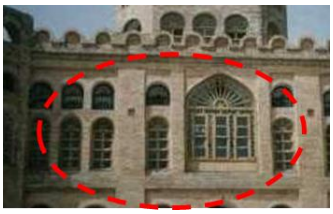
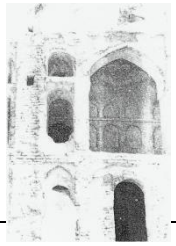
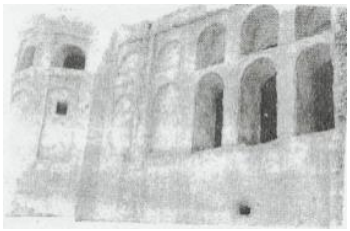
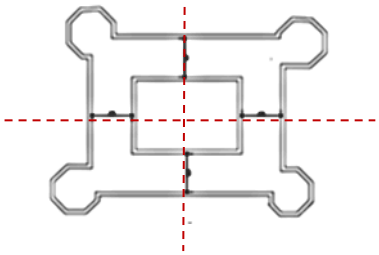
Before Restoration	After Restoration
	
General View of the Sherwana Castle before and after restoration	
	
A complete distortion of the original form of the net	
	
Baseless conversion of parts of the façade without proper study of the origin features	
	
Changing the shape of the main	
	
Changing the original features of a part of the building	

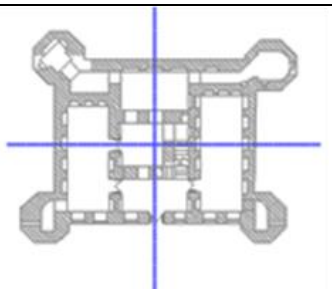
Table 1. Analytic study of Sherwana castle (Source: Researchers)

Architectural Context Analysis of the Castle

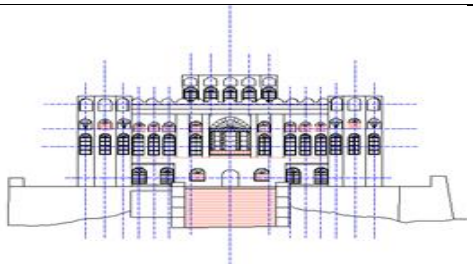
As a collection in the local history books existed about the castle, the plan has four symmetrical axes that opposed each other with a simple plan and a courtyard. While after restoration processes, those axes shifted, and the partitions are added. In addition, from the first constructing until the present, with all of the restoration steps, the overall plan, façade and overview of the castle have been tried to maintain the general context, the height of the building and the symmetrical balance, see fig. 1



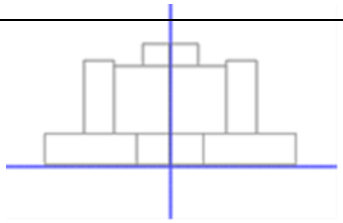
Keeping the broad context of the mass

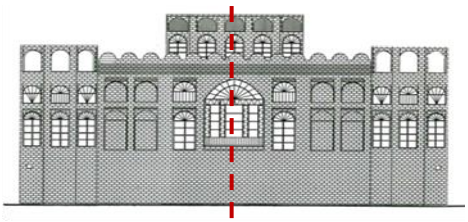


Castle Plan (after restoration)



Keeping the height of the blocks consistent with the overall proportion (after restoration)





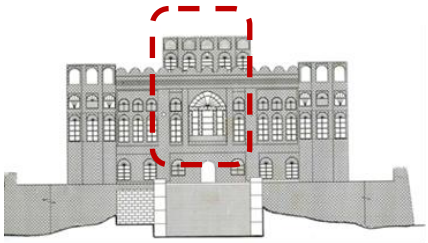
The inclusion of additional components (after restoration) resulted in the development of an exterior formal balance.

Combine pieces from several styles. (after restoration)

Fig. 1: Architectural Analysis of the Castle of Sherwana changes compiled by authors

Analysis of the Sherwana Castle's Architectural Elements

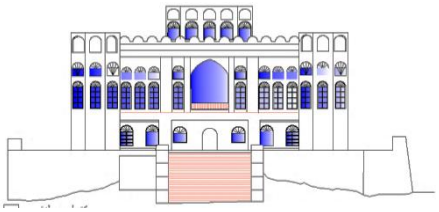
Throughout the restoration stages, remarkable changes have been made, leading the castle to lose its originality parallel to its architectural and historical value. As illustrated in fig. 2, the dominance of the element is clear within the overall form with a partial change in its original shape—the addition of decorative elements and inscriptions in the interior space. The use of pure and quiet colours is in line with the function of the building. The proportion of parts together has been balanced after the last restoration process. The use of local materials led to the creation of a kind of formal unity. In addition, the combined elements derived from different civilisations affect the overall composition, although the simplicity of the entrance lines has been maintained obviously. Finally, lines in facade formation have been blended.



The dominance of the element within the overall form with a partial change in its original shape

Addition of decorative elements and inscriptions in the interior space

The use of pure and quiet colours is in line with the function of the building



The proportion of parts together and part with all

The use of local materials led to the creation of a kind of formal unity

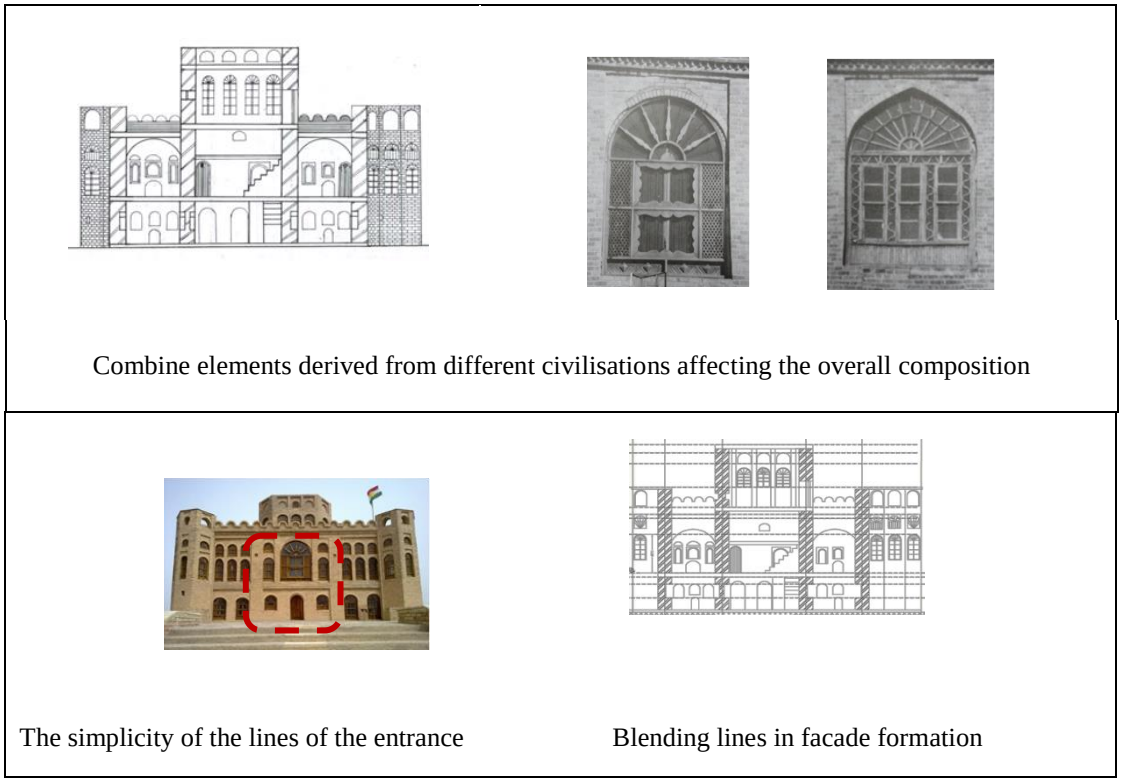


Figure 2. Analysis of Sherwana Castle's Architectural Elements, by authors

Overall, the influences of the restoration process that the castle underwent has been illustrated in table 2 below:

Table 2. Main/secondary variables and the corresponding indicators (Source: Researchers)

Field	Main Terms	Secondary Terms	Indicators	100 %	75 %	50 %	25 %	00 %
A	Architectural Order	Architectural style	Construction materials are incompatible with the heritage				■	
			Forms are not similar to the original			■		
		Architectural configuration	Forms are based on different cultural backgrounds				■	
		General Context	Mixing old and new			■		
			Fusion of elements from of different orders				■	
		Unity	Unity in modern heritage style			■		
			Unity by the designer style				■	
			Unity by domination in the inclusive shape		■			
			Unity by domination in the general context	■				
			Formal unity	■				

		Façade colours	Variation in colour				■	
			Mixing of lines		■			
			Type of colour				■	
	Architectural treatment	Complementary elements	Ornamentations		■			
			Calligraphy				■	
		Entrances			■			
	Extensions	Heights				■		
		Proportionality	Parts with together		■			
			Part with whole	■				
		Harmony	Functional	■				
			Symbolic		■			
		Element configuration			■			
		Scale	Humane		■			
			Inhumane				■	
		Balance	Formal	■				
			Functional		■			
			None-formal				■	
	Transformation	Size-wise					■	
		Subtraction						■
		Addition					■	

The negative impact of the renovations

Although, all the above renovations were done just to maintain the building. Nevertheless, it resulted in the following damages to the building:

- Decrease in the height of the floor to the ceiling due to frequent flooring construction with different materials.
- Using new materials led to the effacement of the original materials
- Filling the basement with soil.
- Using gypsum plastering and concrete for inner spaces.
- Using lighting elements in contrast to the building's historical nature.

Proposal of re-restoration of the Sherwana Castle

As a result of the analysis and findings of this study, several points were derived from being useful in the future restoration of Sherwana Castle to maintain it. These suggestions are presented below:

- Following the theoretical framework and documentation of the existing status of the Sherwana Castle, the research proposes the following as a guideline for preservation:
- Removal of additional flooring layers was added through the different renovations to reach the original level of each floor.
- Re-activate the basement that has been filled with soil during the 1990 renovation.
- Restoring the original pointed arch of the main windows of the main elevation.
- Review the design of all doors and windows in general, since they have been changed during the previous renovations. The advantage of similar castles having the same style in Iran cities, such as 'Sanandaj', can be taken to reach a shape similar to the original.
- Using lighting fixtures appropriate with the traditional shapes rather than the ordinary fluorescent bulbs. All electrical cables have to be hidden.
- Removal of the gypsum plaster on walls and ceilings shows the original material of the inner walls.

Conclusion

Heritage buildings in developing countries faced negligence concerning restoration or conservation. Sherwana castle in Kalar district in Iraqi Kurdistan is one of the examples that underwent several endeavours of restoration. However, back in time, through documenting the past literature, it has been found that the restoration endeavours affected the architectural values and the history of the castle. This study delved into the existing literature, and personal interviews were done to know the date of the building and the conditions of its usage.

Performing survey processes at a level of the urban fabric of Kalar district in Iraqi Kurdistan is to define the heritage and historical buildings by the involved bodies in this concern. So, documentation and registration of all historic buildings in the district depending on architectural and historical records. This is to guarantee completing rehabilitation work, to ensure the compatibility of renovation works and future modifications with the new architectural character of the building. This research paved a way to confirm the axis of active understanding and perception between academic and professional offices involved in architectural preservation by reaching centralised instructions by concerned parties such as the Museum of Antiquities, the Directorate of Religious Endowments, and Kalar University.

The study suggests having cooperation with concerned international parties, such as; the United Nations Education, Scientific and Cultural Organization 'UNESCO' and the International Assembly for historical buildings and sites, as well as signing agreements and protocols with the councils of Arabic, Islamic, and international cities aiming to exchange experiences and recognise the best positive practices in architectural and heritage preservation. Therefore, this study proposed a theoretical framework to return the historical and architectural value to the Sherwana Castle.

The establishment of a central office for architectural preservation in Kalar University, suggested by this research, offers engineering, technical, and historical consultancy in architectural preservation for ancient, historic, heritage buildings in the district. That can present pioneer examples in reparation and architectural preservation, supervised by top experts in architectural preservation.

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ASSESSMENT OF ORGANISATIONAL DEVELOPMENT PRACTICES AND ORGANISATIONAL CLIMATE IN TIRUCHENGODE AGRICULTURAL PRODUCER'S COOPERATIVE MARKETING SOCIETY

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ABSTRACT

Human resource management is the most vital aspects of cooperative management. Tiruchengode Agricultural Producer's Cooperative Marketing Society is sample area of the study. Convenient sampling technique is applied. The total sample is 184. The revealed that the respondents having experience 10-20 years have been found to have higher level of organisational climate as compared to the other two categories of respondents.

***Keywords**: Organisational Development, Climate, Agricultural Cooperative*

INTRODUCTION

Organisational development is a contemporary approach to management of change. It seeks to chance the values, beliefs, attitudes, strategies, structure and practices to enable the organisation to better adopt to change in the environment. Bowditch and Buono (2007) The importance objective development is to prepare the organisation to meet the challenges of changes. Lawrence James and Allan Jones (1974 Human resource management is one of the most important managerial functions encompassing in its ambit all aspects of the organizational interactions with people, whether within itself, Forehand and Gilmer (1964) Management of human resources includes guiding human resources into a dynamic organization that attains its objectives with a high degree of motivation & morale and to the satisfaction of those concerned with it. Campbell (1970) The functions of human resource management in Cooperatives add value to the organization in terms of member value. It achieves this objective by influencing the behavior of employees resulting in operational excellence, product leadership and improved employee relations.

STATEMENT OF THE PROBLEM

Cooperatives are socio-economic organization have community service as their essential ethos. They are primarily meant to help poorer section of the society. The Indian cooperative movement is the largest in the world, representing 25 crore members and over 8 lakhs cooperatives from village to national level, covering various sectors like credit & banking, marketing, dairy, sugar, consumer, fertilizer, handloom, fisheries, housing, tribal, labour etc., It has proved to be an effective economic instrument for ensuring growth with equity and they have made a visible and significant contribution to the overall economic growth of our economy. Today, cooperative cover about 95% of villages and 71% of rural households and they are recognized as an important sector of our country that serves marginalized and weaker sections (Girish Mangleek, 2016).

Cooperative marketing organization is association of producers formed for the

collective marketing of their produce and for securing for the members. A marketing cooperative is set up in order to market and sell the surplus produce of its members, as the members cannot consume themselves. It is act as agents between the number's farmers and traders. Cooperative marketing is a very important tool for economic development in rural areas and it involved in agricultural marketing and procurement activities for the benefit of the farmers.

Human resources are by far the most dynamic and important resources needed to move wheels of an economic activity. In recent years, the economists have added 'human resource' besides land, capital and technology as key factory for building and developing the nation. Unlike other resources, this resource presents its own unique characteristics of the resource of all resources which are harnessed to begin any economic enterprises including marketing cooperatives. Men, machines, materials and money are the most important factors essential for the development and growth of marketing cooperatives of these the human factor or manpower stands foremost and constitutes the basis for successful working of cooperative marketing societies. The overwhelming significance of human factor is due to the following unique characteristics.

RESEARCH METHODOLOGY

The study intended to conduct this research on Assessment of organisational development practices and organizational climate in Tiruchengode Agricultural Producer's Cooperative Marketing Society. The research carried out here is descriptive in nature

Sample population and size

Grade - I	:	Manager Accountant and Internal Checker	:	30
Grade - II	:	Senior Assistant, Office Assistant and Junior Assistant	:	120
Grade - III	:	Assistant, Packer and Driver	:	38
		Total	:	**188**

Hence, the total sample is – 184.

Statistical tool

Collected data through scheduled were converted in to tables format for easily understand and analysis. Arithmetic mean, standard deviation, coefficient of variation, percentage and tabular statistical tools were used in this study.

ANALYSIS OF INTERPRETATION

Table 1 Assessment of organisational development practices

DETAILS	CALCULATED
MEAN	29.02
STANDARD DEVIATION	8.20
CO-EFFICIENT OF VARIATION	28.25

Source: Primary Data

Table 1 Assessment of organisational development practices. It is showed that fact that the mean value is 29.02, which indicates the TCMs changed their organisational

development practices. The standard deviation and coefficient of variation value are SD= 8.20 and CV= 28.25.

It is concluded have that the TCMs respondent believe that organisational development can changed the development of human resource and may lead to increase in effectiveness of organization.

Table 2 Assessment on organisational climate

Dimensions	Calculated values			t-test
	Mean	S.D	C.V	
Integration	3.71	0.73	19.67	0.1022
Flexible structure	3.78	0.69	18.25	0.0822
Mutual trust	3.84	0.58	15.10	0.0405
Recognition of Individual	3.71	0.60	16.17	0.4910
Job design & working life	3.60	0.64	17.77	0.2960
Personal development programme	3.42	0.59	17.25	0.0183
Justice in treatment	3.42	0.59	17.25	0.0183
Open discussion of conflict	3.82	0.73	19.10	2.9759
Democratic function	4.25	0.59	13.88	0.0012
Sense of identify	3.65	0.46	12.60	0.0013
Overall	37.87	3.08	8.13	0.2360*

(**Source:** primary data); CV= co-efficient of variation; * non-significant

It is evident from the above table that the assessment of organisational climate on dimension wise and overall basis. The overall mean, standard deviation and co efficient of variation values are Mean= 37.87, standard deviation= 3.08, and co-efficient of variation= 8.13. The t-value obtained in the case is 0.2360, which is not significant at 0.05 level of confident. This shows that the tiruchengode agricultural cooperative producer marketing society organisational climate is just better.

Taking into consideration the dimension wise position on seven dimensions of organisational climate mean values are higher between 3.71 and 4.25. Namely, democratic function, justice on treatment, mutual trust, open discussion of conflict, flexible structure, integration and recognition of individuals. The rest of three dimension of sense of identity, job design & working life and personal development programme are below the mean value of 3.65. It regarding to democratic function, the mean and standard deviation values obtained are M= 4.25, S.D= 0.59, the t-value obtained is 0.0012 which is significant. The result revealed that the TCMS organisation is more interested to treatment among employees. It can be

concluded that the sample marketing society has just better organisational climate for the development of their human resource and organisation.

Table 3 Differentiation between organisational development and organisational climate based on gender

Gender	organisational development					organisational climate			
	F	Mean	SD	DF	Test	Mean	SD	DF	Test
Male	128	38.95	7.21	187	t=0.49	48.47	7.92	187	t=0.12
Female	60	38.12	8.41		NS	48.27	8.35		NS

Source: Primary Data, NS - Not Significant

Table 3 explains the differentiation between organisational development and organisational climate based on gender. The results of the sample reveal that there is no variance in organisational development on the basis of gender. The mean value for organisational development in case of male respondents is 38.95 and for female respondents it is 38.12. The computed 't' value 0.49 is quite less than table value of 't' at 0.05 level which implies that there is no significant difference in the organisational development of employees based on the gender.

Similarly, no significantly difference has been found in the level of organisational climate of employees on the basis of gender. The mean value for organisational climate in case of male responds is 48.47 and for female respondents it is 48.27. The 't' value is found to be 0.12 which quite less to support significant differences in results of two groups. Therefore, the results do not support rejection of null hypotheses.

Table 4 Differentiation between organisational development and organisational climate based on work experience

Experience	organisational development					organisational climate			
	F	Mean	SD	DF	Test	Mean	SD	DF	Test
Up to 10 years	105	38.47	7.29	186	t=10.98	47.40	7.22	186	t=33.18
11-20 years	22	40.44	7.74		NS	50.68	8.53		NS
21 & above	61	49.32	8.98			38.42	8.18		

Source: Primary Data, NS - Not Significant

Table 4 describes the differentiation between organisational development and organisational climate based on work experience. The mean value for organisational development case of employees having experience up to 10 years is 38.47, for respondents having experience between 11 and 20 years is 40.44 and for respondents having experience above 21 years is 49.32. The 't' value is found to be 10.98 which indicates significant differences in the results. Hence it can be concluded that organisational development increases with age. So, the null hypothesis is rejected that work experience does not affect organisational development level.

The mean for organisational climate in case of respondents having experience up to 10 years is 47.40, for respondents having experience between 10 and 20 years is 50.68 and for respondents having experience 21 and above years is 8.18. The 't' value is found to be 33.18 which indicate a significant difference in the results of respondents with different years of work experience. The statistics of this result support that work experience has got relationship with organisational climate of respondents. The respondents having experience 10-20 years have been found to have higher level of organizational climate. Hence, it can be concluded from the results that organisational climate has connection with work experience and null hypotheses is rejected.

This is revealing that as the work experience increases, the level of intelligence quotient also increases. No other demographic variable of respondents except long work experience has shown significant relationship with their organisational climate. Long experience of job leads to a sense of security, belongingness and thus leads to organisational development

.

Table 4 Differentiation between organisational development and organisational climate based on educational qualification

Qualification	organisational development					organisational climate			
	F	Mean	SD	DF	Test	Mean	SD	DF	Test
Up to 12	22	36.88	7.66	186	t=1.25	48.67	6.49	6.49	t=1.49
Graduation	88	38.33	7.46		NS	49.38	49.38	8.29	NS
Above Graduation	78	39.58	7.78			47.24	47.24	8.06	

Source: Primary Data, NS - Not Significant

Table 4 describes the differentiation between organisational development and organisational climate based on educational qualification. The mean value for organisational development in case of up to 12^{th} std. respondents in 36.88, for under graduates' respondents is 38.33 and for above graduate's respondents is 39.58. The 't' value is found to be 1.25 which is an indication of insignificant differentiation in the mean values of organisational development in relation to groups based on qualification.

The mean for organisational climate in case of up to +2 std. respondent is 48.67, for under graduate are 49.38 and for above graduates' respondents is 47.24. The 't' value is found to be 1.49 and it support insignificant variance in the level of intelligence quotient and organisational climate of respondents on the basis of educational qualification.

CONCLUSION

The present status of an employee is having poor climate condition. The TCM should provide at least a reasonable working condition and working environment. The significance of human resource management

in marketing cooperatives is gaining momentum in recent years due to vast improvement in their business transactions and employees' strength. It has assumed great importance in the process of management and decision making.

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