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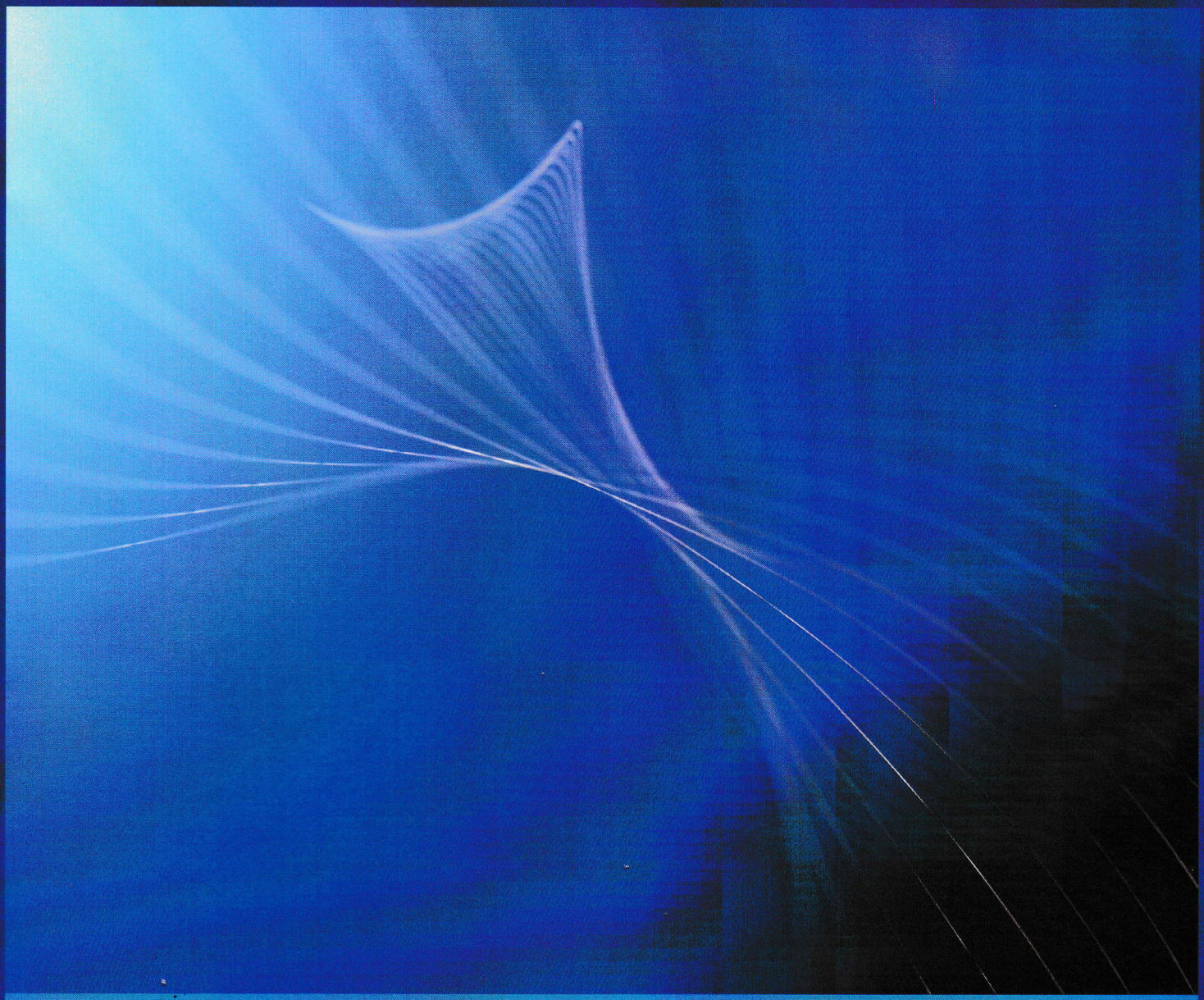

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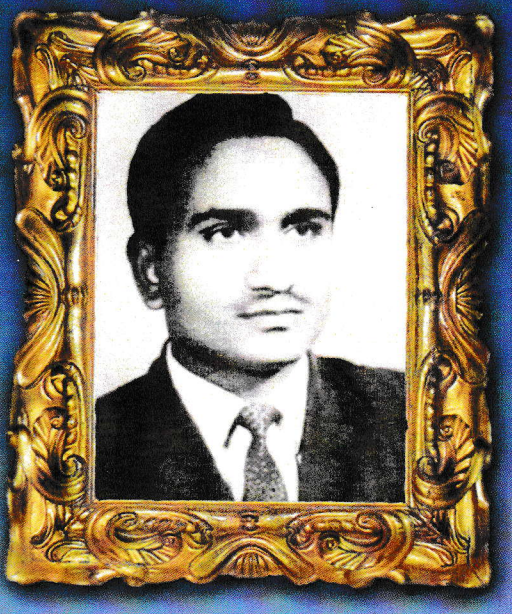
A TRUE VISIONARY

"You see things and you say **Why***? But I dream of things that never were and say* **Why** *not?"*

- George Bernard Shaw



Shri Jagannath Gupta
(1950 - 1980)

Also a true visionary...who dared to dream!
He lives no more but his dreams live on....and on!

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And more dreams to come!

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EDITOR's Desk

Dear Reader,

"Wisdom is to know that we don't know."— —Socrates, 469–399 BC

It is with much joy and anticipation that we celebrate the launch of "JIMS JOURNAL OF SCIENCE &TECHNOLOGY"(JJST) with this inaugural issue. On behalf of the JJST Editorial Team, I would like to extend a very warm welcome to the readership of JJST. I take this opportunity to thank our authors, editors and anonymous reviewers, all of whom have volunteered to contribute to the success of the journal. An enormous amount of work has done into the development of this journal and I believe you will see that effort reflected in this edition and in the impact it will have on the field. It has been an interesting journey in many aspects.

JJST is dedicated to the rapid dissemination of high quality research papers on how advances in Science and Technology can help us to meet the challenges of the 21st century, and to capitalize on the promises ahead. We welcome contributions that can demonstrate near-term practical usefulness, particularly contributions that take a multidisciplinary / convergent approach because many real world problems are complex in nature.

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Finally, we wish to encourage more contributions from the scientific community to ensure a continued success of the journal. Authors, reviewers and guest editors are always welcome. We also welcome comments and suggestions that could improve the quality of the journal.

Prof. (Dr.) R .K. Raghuwanshi

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Vol 3, Issue II, July-December 2019

Preparation of Granular Activated Carbon from Agri-Waste of Maize- Cob and Its Application for Adsorption of Heavy Metal Ions.

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Abstract- **The present work explored the use of Maize cob, anagricultural waste corn cob by chemical and physical activations in mills, as a potential feedstock for the preparation of granular activated carbon. Chemical activation of this precursor was done by using phosphoric acid as dehydrating agent. The preparation method was optimized by, the effect of the main process parameters (such as acid concentration, temperature of pyrolysis and impregnation ratio) on the performances of the obtained granular activated carbons (expressed in terms of iodine and methylene blue numbers and specific surface area) was studied. The optimal activated carbon was fully characterized by considering its adsorption properties as well as its chemical structure and morphology. A modification of the chemical characteristics of the sorbent surface was performed by adding $KMnO_4$ as oxidant to enhance the adsorption capacity of this carbon for heavy metals. The evaluation of the efficiency of this treatment was considering the adsorption of Cu^{2+} ions as a model for metallic species. The high capacity of the activated carbon to reduce $KMnO_4$ into insoluble manganese (IV) oxide (MnO_2) which impregnated the sorbent surface, this result was shown by Column adsorption tests. The results has also indicated that copper uptake capacity was triply enhanced for the permanganate - treated activated carbon.**
This study showed that the activation of agricultural waste corn cob with phosphoric acid and $KMnO_4$was suitable for the preparation of large-surface-area activated carbons.

Keywords - Activated carbon, Agri-waste maize cob, chemical activation, modification, metal adsorption.

I. INTRODUCTION

Various technologies such as precipitation, ion exchange, membrane filtration and reverse osmosis have been applied for the removal of pollutants from wastewaters (Chen and Wang, 2000; Vinod and Imran, 2000). However, these methods have somehow proven disadvantageous in as much as they require expensive equipment and/or continuous need of chemicals (Malkoc et al., 2006). Moreover, sometimes the above-mentioned methods fail to meet the Environmental Protection Agency requirements (Borba et al., 2007). Because of the limitations of conventional methods for metal removal, the most useful alternative appears to be the adsorption process. This method is a cost-effective and user friendly technique for the removal of metallic micro -pollutants from water. Also, adsorption has been found to be better than other techniques for water re-use in terms of the initial cost, ease of operation and insensibility to toxic substances (Jusoha et al.,2007).

Activated carbon (AC) is the most commonly used and most effective adsorbent (Vinod and Imran, 2000, Chen et al., 2003, Daifullah et al., 2007). Nevertheless, its application fields are restricted due to its high cost. The use of low-cost wastes and agriculture by- products to produce activated carbon has been shown to provide economical solution to this problem (Cimino et al., 2005, Ioannidou, and Zabaniotou, 2007). The adsorption of organic micro -pollutants by activated carbon is being widely used in water and wastewater treatments and the advantages of this adsorbent have been well documented (Strelko and Malik, 2010). In other respect, there is evidence in the literature that activated carbon can remove metal ions, especially Cu^{2+}, from aqueous solutions (Chen et al., 2003, Strelko and Malik, 2010). However, sorptive capacity of untreated activated carbons towards heavy metals is rather low (Strelko and Malik, 2010). To enhance sorption capacity for cationic and oxy-anionic metal species, modifications of activated carbon using oxidant agents have been reported, among which we can state HNO_3, H_2O and O_3 (El-Hendawy, 2003, Cimino et al., 2005, Daifullah et al., 2007, Quintanilla et al., 2007, Takaoka et al., 2007, Strelko and Malik, 2010). These reagents introduce weakly acidic oxygen groups through surface oxidation of the sorbent. The most widely used carbonaceous materials for the industrial production of activated carbons are coal, wood and coconut shell (Vernersson et al., 2002, Yang and Chong Lua, 2006). These types of precursors are expensive and are often imported, making it necessaryfor developing countries to find a cheap and available feedstock for the preparation of activated carbon for use in industry, purification and treatment of drinking water and wastewater. Several suitable agricultural by-products (lignocellulosics) including peach stones (Molina-Sabio et al., 1995), date stones (Girgis and El-Hendawy, 2002, Haimour and Emeish, 2006) waste apple pulp in cider production (Suarez-Garcia et al., 2002), rice husks (Chuah et al., 2005), pistachio-nut shells (Yang and Chong Lua, 2006) and grain sorghum (Diao et al., 2002) have been investigated in the last years as activated carbon precursors and are still receiving renewed attention. In comparison, maize cob waste received much less consideration as lignocellulosic material for activated carbon production (Baçaoui et al., 2001, Cimino et al., 2005).

Maize cob, corresponding to the remaining residue of agri-

waste, represent a yearly average of 2×10^5 tons depending on the zones (Sellami et al., 2008). The use of this material as precursor for the preparation of granular activated carbon produces not only a useful adsorbent for the purification of contaminated environments, but also contributes to minimizing the solid wastes.

From another angle, phosphoric acid can be used as activating agent in chemical activation method of any carbonaceous precursor. It is noteworthy that phosphoric acid is widely used in the chemical processing of activated carbon (Molina-Sabio et al., 2003) since it offers some advantages such as its non-polluting character (compared to Zn Cl_2) and its ease of elimination by water extraction after carbonization (Suarez-Garcia et al., 2002, Gomez- Serrano et al., 2005).

The adsorptive properties of activated carbon depend on the nature of the precursor, the type of activation (chemical or physical) as well as on the processing conditions (Rivera-Utrilla et al., 1991, ASTM, 1999, Yun et al., 2001, Girgis and El-Hendawy, 2002, Puziy et al., 2002, El-Sheikh et al., 2004, Stavropoulos and Zabaniotou, 2005, Mudoga et al., 2007). It has been shown that in case of chemical activation, concentration of the dehydrating agent, impregnation ratio and pyrolysis temperature globally govern the properties of the resulting activated carbon (Diao et al., 2002, Girgis and El-Hendawy, 2002, Haimour and Emeish, 2006). Performances of the obtained carbons are generally expressed in terms of some properties, among which: surface area, cation-exchange capacity (CEC), bulk density and adsorption efficiency towards iodine, phenol and methylene blue are frequently considered (Vernersson et al., 2002, Haimour and Emeish, 2006, Yang and Chong Lua, 2006).

The present work explored the use of agri-waste maize cob as a potential feedstock for AC preparation. For this purpose, chemical activation, using phosphoric acid as dehydrating agent, was adopted. To optimize the preparation method, the effect of the main process parameters (acid concentration, impregnation ratio, temperature of pyrolysis step) on the performances of the prepared activated carbons (in terms of specific surface area) was studied. Characterization of the activated carbon obtained in the optimal conditions was conducted, using the following techniques: infrared spectroscopy for chemical structure and scanning electron microscopy for morphology. Adsorption characteristics of this sorbent were also determined. A modification of the chemical characteristics of the sorbent surface was performed, using $KMnO_4$ as oxidant to increase the adsorption capacity of this granular activated carbon for heavy metals. The efficiency of this treatment was evaluated by finding the adsorption of Cu^{2+} ions as a model for metallic species. $KMnO_4$ treatment and Cu^{2+} adsorption tests were carried out in a small-scalecolumn.

2. MATERIALS AND METHODS

2.1 Preparation of activated carbons

Consumed corn cobs, obtained from agri -waste was used as raw material for the production of activated carbons via chemical activation. For this purpose, phosphoric acid was retained as a dehydrating agent. Each preparation test was conducted as follows: 40 g of the crushed (diameter < 1.5 mm) and dried precursor were mixed with H_3PO_4 solution having different concentrations (30to85 % H_3PO_4 in weight). The impregnation ratio, defined by the weight ratio of impregnate (H_3PO_4) to precursor, was 1; 1.25; 1.5; 1.75; 1.85 and 2. The impregnation was carried out in a stirred Pyrex reactor equipped with a reflux condenser. Stirring was used to ensure the access of the acid to the interior of the maize cob particles. The temperature and the duration of the reaction were 104 °C and 2 hours, respectively. Agitation and heating were ensured by a heating magnetic stirrer with connected temperature regulator probe made of teflon. The pyrolysis of the impregnated material was conducted in a cylindrical stainless steel reactor, inserted into a tubular regulated furnace under continuous nitrogen flow (0.5 L min^{-1}). Pyrolysis temperature ranged from 350 to 650 °C, while activation time was maintained at 2hours.

After cooling down to room temperature, under the same flow of nitrogen, the obtained activated carbon was thoroughly washed with hot distilled water until neutral pH. The sample was then dried at 105 °C overnight, ground (until a particle size ranging between 100 and 160 µm) and finally kept in hermetic bottle for subsequent uses.

2.2 Characterization of the preparedadsorbents

2.2.1 Iodinenumber

The iodine number is defined in terms of the milligrams of iodine (I_2) adsorbed by 1 g of activated carbon when the iodine equilibrium concentration is 0.01M (Haimour and Emeish, 2006). In this work, the three-point method was adopted. The latter avoid the use of the correction factor usually employed in the less accurate single point-method (ASTM, 1999). The procedure of the iodine number determination is as follows: three dry samples of activated carbon were weighed out into three 250-ml conical flasks (sample weight ranged between 300 and 600 mg). Ten milliliters of 5% (in weight) hydrochloric acid solution were added to each flask and then mixed until the carbon became wet. The mixtures were then boiled for 30 s and finally cooled. One hundred milliliters of 0.05M standard iodine solution were added to each flask. The contents were vigorously shaken for 30 s and then immediately filtered. A 50-ml aliquot of each filtrate was titrated by a standardized 0.1M sodium thiosulfate solution. For each sample, the obtained iodineresidual concentration should be included into 0.004 and 0.02 M. The plot of the

amount of iodine fixed per gram of sorbent versus residual iodine concentration gives a straight line which allows determining graphically the iodine number (ordinate corresponding to a residual concentration of 0.01M).

2.2.2 Methylene blue (MB)adsorption

Methylene blue adsorption tests were conducted by mixing 0.300 g of the prepared activated carbon with 100 mL of 1000 mg L^{-1} methylene blue solution (Yang and ChongLua,2006). Afteragitationduring24h,thesuspensionwasfilteredandtheMB residual concentration was measured at 660 nm, using an UV/vis spectrophotometer (OPTIMA, SP-3000 plus). An already existing linear Beer–Lambert relationship was used for the determination of the concentration.

2.2.3 Cation-exchange capacity

In studies on activated carbons, Bohem's titration was widely used to determine the CEC of sorbents (El-Sheikh et al., 2004). A weighted amount of adsorbent (0.100 g) was placed into an Erlenmeyer flask. A volume of 20 ml of 0.1M NaOH solution was added. To attain equilibrium, the suspension was shaken for 24 h. After filtration, the residual NaOH concentration was determined by titration with 0.1M hydrochloric acid solution, using phenolphthalein as indicator. The quantity of consumed NaOH was converted to CEC and expressed in mequiv. g^{-1} (Puziy et al.,2002).

2.2.4 Specific surface area

Specific surface area of the prepared activated carbons was evaluated through N_2 adsorption at 77 K, using an Autosorb1-Quantachrome instrument. The BET (Brunauer–Emmet and Teller) model was applied to fit nitrogen adsorption isotherm and evaluate the surface area (S_{BET}) of the sorbent (Vernersson et al.,2002).

2.2.5 Bulkdensity

Activated carbon sample was placed in a graduated cylinder, tapped several times until constant volume and then weighted. The bulk density was calculated as the ratio of the weight sample to its volume and expressed in gcm^{-3} (Mudoga et al., 2007).

2.2.6 Morphologyanalysis

In order to know the structure sight of activated carbon, scanning electron microscopy (SEM) was generally employed to visualize sample morphology. Pore structure and structural changes happening after chemical activation could be also observed. In the present work, the raw material (maize cob waste) and the activated carbon prepared in the optimal conditions were analyzed by this technique using a Philips XL30 microscope.

2.2.7 IR spectroscopyanalysis

FTIR spectroscopy was used to study the surface functional groups and structure. The FTIR spectra of the raw material and the resulting activated carbon were recorded between 400 and 4000 cm^{-1} in a NICOET spectrometer.

2.2 Columnstudies

2.2.1 Preparation of $KMnO_4$-modified activated carbon

The modified activated carbon was prepared as follows:

The adsorbent was transferred into a laboratory column packed at the bottom with glass wool and previously filled with distilled water. The column was performed in a Pyrex glass tube of 0.7 cm internal diameter and 14 cm in effective height. It is equipped with fixed polypropylene end caps, polyethylene bed support and Luer-Look inlet and outlet fittings. After settlement, by gravity, of the activated carbon particles, the adsorbent bed was covered with a thin layer of glass wool in order to avoid disturbance during the inlet of the influent. The level of water or solution present at the top of the bed was always fixed at the same level as that of the glass wool. A peristaltic pump (Gilson- Mnipuls 2) - connected to the bottom of the column by a silicon tube of low internal diameter (diameter = 1.2 mm) and very limited length (to minimize dead volume) - ensured a flow-rate of 0.5 mL min^{-1}. The total dead volume fraction of the column(bed void volume + connection tubing volume)/carbon bed volume) was53.3%.

To modify the activated carbon surface, a 10^{-3}M $KMnO_4$ solution (pH equal to 6.06) was pumped down through the column. The effluent, collected at the bottom of the column with an automatic fraction collector (Gilson), was sampled in 30-ml tubes, and stored for Mn analysis and pH measurement. Thereafter, the modified activated carbon column was washed with doubly distilled water.

2.2.2 Copperadsorption

A copper solution, with a concentration of 470 mg Cu^{2+} L^{-1}, was fed through the column containing unmodified or modified activated carbon. The same peristaltic pump was used to ensure an influent flow-rate of 0.5 mL min^{-1}. The influent pH was 4.79. Column effluent was collected in 30-ml tubes for subsequent copperanalysis.

For column studies, the breakthrough curve relative to each considered metallic specie (Mn and Cu) was plotted. This curve translates the metal concentration evolution in the collected effluent versus the effluent cumulative volume, which is expressed in term of number of bed volumes (BVs). This number is defined as follows (Chen and Wang, 2000, Chen et al., 2003):

$$\text{Number of bed volumes} = \frac{Volume\ of\ collected\ effluents}{Volume\ of\ carbon\ Bed} \quad \ldots\ldots\ldots\ldots (1)$$

For all solute/sorbent combinations, the breakthrough curves are approximately S- shaped (or are approaching an S-shape). The breakthrough point is defined as the phenomenon when the solute begins to appear in the effluent, while exhaustion point occurs when the outflow concentration reaches the inflow concentration (Chen and Wang, 2000, Chen et al., 2003). The $KMnO_4^-$ modification of the activated carbon bed and the copper retention studies were carried out at room temperature (23–25 °C).

2.4 Metallic species analysis and pHmeasurement

Effluent samples, collected from column tests, were analysed for metal species (Mn and Cu) using Acetylene-Air Flame/ Atomic Absorption spectrophotometer (HITACHI Model Z-6100). The pH of solutions were measured by a high precision pH-meter (Metrohm, model 632), equipped with a combined glass electrode (Metrohm). Preliminary standardisation was systematically carried out using suitable buffer solutions.

2.5 Chemicals

All chemicals used (H_3PO_4, I_2, methylene blue, $Na_2S_2O_3 \cdot 2H_2O$, NaOH, HCl, $KMnO_4$ and $CuSO_4 \cdot 5H_2O$) were of analytical grade. Solutions were prepared by dissolving the corresponding reagent in doubly distilled water.

3 Results and discussion

3.1 Preparation of activated carbons: effect of processing parameters

Within the scope of our researches, an attempt has been made to optimize the process parameters which lead to an activated carbon with good characteristics. The surface area of the sorbent increases first rapidly (from 716 to 1020 $m^2 g^{-1}$) with an increase of acid concentration from 35 to 60% H_3PO_4, and then slightly beyond 60% H_3PO_4 (1062 $m^2 g^{-1}$ for 85% H_3PO_4). Taking into account the slight increase of the specific area occurring in the acid concentration range 60–85% H_3PO_4, and the handling difficulties of the most concentrated commercial phosphoric acid (85% H_3PO_4 in weight) owing especially to its high viscosity, a concentration of 60% H_3PO_4 seems to be the most suitable for the development of a high specific surface area of the adsorbent material.

The effect of pyrolysis temperature on the methylene blue number of the adsorbent shows that the quantity of methylene blue adsorbed begins to increase with an increase of the temperature from 350 to 450 °C, and then decreases when the temperature exceeds 450 °C. Thus, keeping the pyrolysis temperature at around 450 °C leads to a better development of the sorbentporosity.

Several investigators have established that in the case of H_3PO_4 activation of other agricultural materials (woods, coconut shell, date pits, grain sorghum), temperaturesneighbouring 450 °C were also suitable to obtain optimal properties of the activated carbons (Jagtoyen and Derbyshire, 1993, Molina-Sabio et al., 1995, Diao et al., 2002, Girgis and El-Hendawy, 2002).

Contrary to methylene blue, which is the most recognized probe molecule for assessing the ability of the sorbent to remove large molecules via its macro porosity (pore diameter greater than 1.5 nm), iodine number gives an indication on micro porosity (pores less than 1 nm in diameter). The effect of the impregnation ratio on the iodine number is illustrated in Figure 1. The highest iodine number was obtained at an impregnation ratio of 1.75. At a value more or less than 1.75, the iodine number decreased. Therefore, 1.75 is the suitable impregnation ratio value leading to the best iodine number and, consequently, to the best development of micro porous structure.

The above results show that the most efficient activated carbon is that obtained under the following optimal conditions: an acid concentration equal to 60% in weight, an impregnation ratio of 1.75 and a pyrolysis temperature of 450 °C. It is to note that results obtained when studying the effect of each parameter (acid concentration, impregnation ratio and pyrolysis temperature) on the whole considered properties, namely iodine and methylene blue numbers and specific area (results not shown), lead to the same optimalconditions.

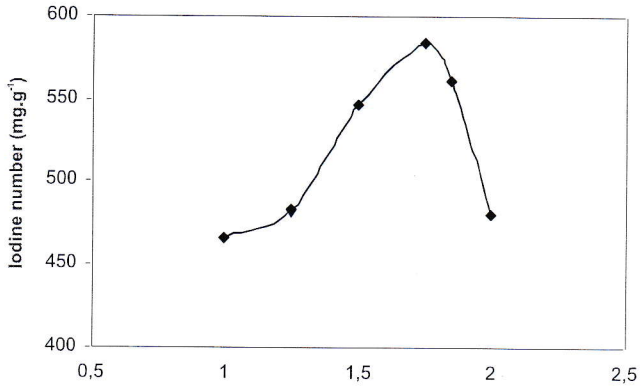

Figure 1: Effect of impregnation ratio on the Iodine number (H_3PO_4 concentration: 60%; Pyrolysis temperature: 450 °C; Pyrolysis duration: 2H)

3.2 Characterization of the optimal activatedcarbon

3.2.1 Adsorptioncharacteristics

Characteristics of the activated carbon prepared under the optimal conditions mentioned above, are given in Table 1. For the sake of comparison, we have shown in the same table the values of some activated carbon characteristics available in literature. As it can be seen, the characteristics of the carbon obtained in this work compare well and sometimes more favorable than the other sorbents. The yield of the activated carbon – which is defined as the weight ratio, on a dry basis, of

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the resulting activated carbon to that of the original maize cob waste(Diao et al., 2002) – is in our case 42.9%. This value is significantly higher than those observed for other lignocellulosic materials such as holm-oak sawdust (25.5%), rockrose (20.0%) and olive-wood sawdust (22.9%) (Gomez-Serrano et al., 2005)

	Activation process (activation agent)	Adsorbent characteristics				Reference
		I_2 (mg g^{-1})	BM (mg g^{-1})	S_{BET} (m^2 g^{-1})	Bulk density (g cm^{-3})	
Maize cob wastes	Chemical (H_3PO_4)	583	312.5	1020	0.551	This work
Coconut shell	Chemical (H_3PO_4)	*-	-	-	-	ASTEE, 2006
Grain sorghum	Chemical (H_3PO_4)	-	-	182-508	-	Diao et al., 2001
Peach stones	Chemical (H_3PO_4)	-	-	632	0.56	Molina-Sabio et al., 1995
Maize cob waste	Chemical (KOH)	-	190-262	367-506	-	Stavropoulosand Zabaniotou,2005
Maize cob	Physical (steam)	-	-	514-1271	-	Baçaoui et al., 2001
Olive stones	Physical (steamand N_2 gas mixture)	574	-	-	-	Galiatsatou et al. 2002

Table 1: Compared characteristics of the optimal activated carbon

3.2.2 IR spectra and SEMmicrographs

Pore structure of the AC is very important in determining adsorption properties of the sorbent. However, the importance of the surface chemistry of AC should not be ignored. In this work, infrared spectroscopy was used to obtain information about the chemical structure and functional groups of the raw material and the prepared activated carbon (Zawadzki, 1989, Jagtoyen et al., 1992, Pastor-Villegas et al., 1993, Vinke et al., 1994, Solum et al., 1995, Gomez-Serrano et al., 1996). The FTIR spectrum of the maize cob waste is shown in Figure 2. This spectrum is quite similar to that of other lignocellulosic materials such as pistachio-nut shell and rockrose (Pastor-Villegas et al., 1993, Gomez- Serrano et al., 1996). The band located at 2929 cm^{-1} corresponds to the C–H vibrations in methyl and methylene groups. The band at 1738 cm^{-1} is ascribed to carbonyl C=O groups. The olefinic (C=C) vibrations cause the emergence of the band at about 1651 cm^{-1}, while the skeletal C=C vibrations in aromatic rings cause another two bands at 1510 and 1425 cm^{-1}. The vibrations at 1462 and 1377cm^{-1} are assigned to the bands – CH_3 and –CH_2– (Jagtoyen et al., 1992, Gomez-Serrano et al., 1996). The band at 1323 cm^{-1} can be attributed to (C–O) vibrations in carboxylate groups. The band at 1246 cm^{-1} may be attributed to esters (e.g. R–CO–O–R´), ethers (e.g. R–O–R´) or phenol groups. The intense band at 1048 cm^{-1} may correspond to alcoholic groups (R– OH). The C–H out-of-plane bending in benzene derivative vibrations causes the band at 895cm^{-1}.

The above-IR analysis shows the absence of nitrogen and sulphur groups in the maize cob waste structure, whereas we note the presence of different oxygen groups, mainly: carbonyl, alcohol and phenol groups, ethers and esters. The spectrum of the optimal adsorbent prepared in this work is given in Figure 5.

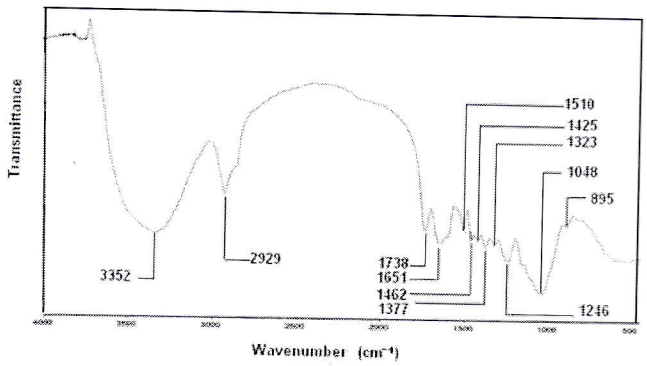

Figure 2: FTIR spectrum of the maize cob waste

We essentially mentioned that the absorption in the region 1300–1000 cm^{-1} is generally ascribed to phosphorous and phospho-carbonaceous compounds (Jagtoyen et al., 1992, Solum et al., 1995). Due to the overlap of absorption bands from many oxygen and phosphorous compounds in this region, an unambiguous assignment is difficult. However, based on our analysis data, activated carbon obtained in this work contains about 1.5 wt% phosphorous (dry basis), which suggests the incorporation of this element in the activated carbon structure.

When comparing the two spectra, we can show that deep modifications take place in the wave number range 1700–1000 cm^{-1}. These modifications make the spectrum of the activated carbon less complicated than that of the precursor. Considering the spectrum of the carbon, we can essentially notice:

• Adramaticdecreaseinintensityofthebandcorrespondingto C=Ogroups(~1700cm^{-1}). This suggests that phosphoric acid activated carbon contains less C=O groups than the raw material.

The decrease of the amount of carbonyl groups may be due to hydrolysis effect of H_3PO_4, resulting in the decomposition of these groups and subsequent release of their by-products as volatile matter;

• A disappearance of the weak band set located between 1500 and 1200 cm^{-1}, and a shift of the C–O band from 1048 to 1169cm^{-1};

• A disappearance of the olefinic C=C band (1651 cm^{-1}) and the appearance of a strong absorption band (1555 cm^{-1}) corresponding to aromatic C=C groups. This translates the fact that the activated carbon structure is richer inaromatics.

Taking into account the whole observations and comments given above, we can conclude that the acid impregnation of the raw material followed by the pyrolysis step lead to a more carbonaceous and aromatic structure due to the dehydration

effect of H_3PO_4 and evolution of volatiles during pyrolysis. In another respect, IR and chemical analysis suggest that phosphoric acid chemical activation leads to the incorporation of phosphorous element in the structure of the obtainedcarbon.

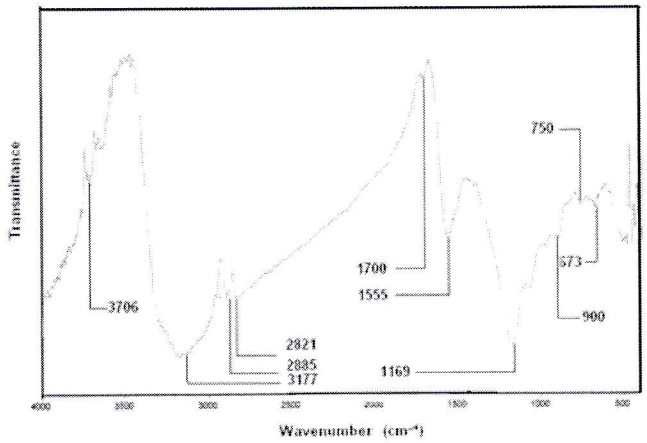

Figure 3: FTIR spectrum of the optimal activated carbon

The microstructure of the raw corn cobs and the resulting activated carbon prepared in the optimal conditions are shown in Figure 4. For the maize cob waste (Figure 4a), the surface was quite smooth without any porous structure except for some occasional cracks or curves. Comparison of the precursor morphology with that of the derived carbon (Figure 4b) attests substantial changes occasioned by phosphoric acid activation. The sorbent surface exhibits a clear porous structure and a predominately microporous character which is responsible of the high developed surface area of this material and of its high iodine number.

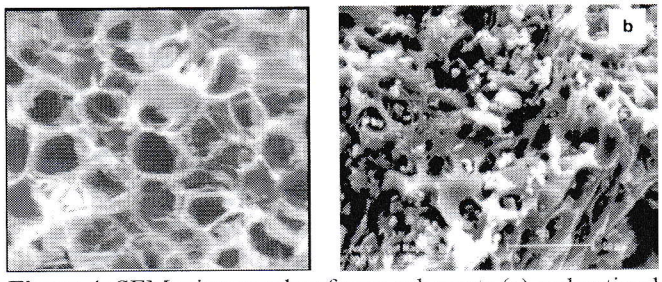

Figure 4: SEM micrographs of corn cob waste (a) and optimal activated carbon (b)

3.3 Column studies: $KMnO_4$-modification of the optimal activated carbon and copperadsorption

Modification of the surface chemistry of carbons is recognized as an attractive route towards the novel application of these materials as polyfunctional adsorbents as well as catalyst supports (El-Hendawy, 2003, Vladimir and Danish, 2002).

Metal uptake by activated carbon is assumed to be function of the amount of polar or acidic groups present on the sorbent surface (Toles et al., 1999).

Sorptive capacity of conventional carbons towards heavy metals is rather low. However, metal sorption can be considerably enhanced by the introduction of weakly acidic functional groups through surface oxidation using different agents such as nitric acid, hydrogen peroxide, potassium permanganate and ammonium persulfate (El-Hendawy, 2003). Boehm titrations show that surface oxidation of activated carbons greatly increases the concentration of oxygen-containing surface acidic groups (essentially carboxylic and phenolic surface groups) which improve cation-exchange and complexation properties of these sorbents (El-Hendawy, 2003, Vladimir and Danish, 2002).

As surface modifier agent, $KMnO_4$ behave differently in accordance with the treatment way. When $KMnO_4$ is used in mixture with a concentrated strong acid, like HNO_3, the result of this treatment is a considerable increase of the amount of oxygen-containing functional groups on the sorbent surface (Chen et al., 2007). The reduction products of $KMnO_4$ and HNO_3 are in this case water-soluble species which are eliminated during the subsequent washing step of the treated carbon. In return, in alkaline, neutral and slightly acidic media, $KMnO_4$ is reduced by activated carbon to insoluble MnO_2 which impregnates the sorbent surface (Okoniewska et al., 2008). In this connection, recent studies have shown that some filtration materials with a little or no sorptive properties, such as sand and crushed brick, act as good sorbents for cationic and anionic species when coated with oxides (oxyhydroxides) of iron (III) and essentially manganese (IV) (Benjamin et al., 1996, Boujelben et al., 2008). For these engineered coated sorbents, solutes adsorb at the iron or manganese oxyhydroxide surface by forming complexes with the surface sites (Chen et al., 2007, Benjamin et al., 1996). Since the combination of activated carbon and insoluble MnO_2 (composite media) would take advantage of the strength of these two materials, the second treatment strategy was adopted in thiswork.

3.3.1 $KMnO_4$-modification of the optimal activatedcarbon

To impregnate the activated carbon with manganese (IV) oxide, a 10^{-3}M $KMnO_4$ solution (natural pH 6.06) was used. Figure 7 shows the evolution during the permanganate treatment of the outflow Mn concentration and pH as a function of the collected effluent (expressed in BV). In the course of this chemical treatment, we did not detect any trace of MnO_4^- in the collected fractions, in spite of the percolation of 300 BV of effluent. The quantity of reduced Mn (VII), corresponding to 300 BV, is amounting to 37.9 mg Mn g^{-1} of sorbent. Since the activated carbon was not yet saturated for 300 BV, it might be deduced that the capacity of the carbon column to reduce MnO_4^- is higher than 37.9 mg Mn g^{-1}. However, when the effluent volume reached approximately 150, a very clear yellow-chestnut colour, which could be assigned to MnO_2, was visually detected in the collected fractions. To make certainty that manganese (IV) oxide is effectively at the origin of this colour, chemical tests were

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applied to the collected effluent (Charlot, 1983). The following chemical tests, which were positive, consistedin:

- Oxidation of MnO_2 with persulphate, under heating and in the presence of Ag^+ ion as catalyst, which leads to the formation of MnO_4^- having the characteristic purplecolour;
- Reduction of MnO_2 with oxalic acid, which leads to the formation of Mn^{2+} ions characterized by their pinkcolour.

In addition, when some drops of 10^{-3}M $KMnO_4$ solution were added to a diluted solution of Mn^{2+} ions, the same colour in the collected fractions was obtained. In this connection, it is well known that MnO_4^- reacts with Mn^{2+} ions yielding to MnO_2. Thus, this additional test confirms once again that MnO_2 was at the origin of the observed colour.

To quantify the amounts of MnO_2 present in the different effluent fractions, analysis of Mn element was carried out. Simultaneously, the pH of each fraction was measured (Figure 7). It should be noted that for manganese analysis, MnO_2 present in the collected Samples was first reduced to Mn^{2+} ions with crystallized oxalic acid in the presence of one drop of concentratedH_2SO_4.

According to Figure 7, the curve representing the evolution of Mn concentration have firstly a shape similar to that of a breakthrough curve (effluent volume <150 BV). From this plot, it appears that MnO_2 begins to leak out the column at an effluent volume equal to 16.6 BV, and not at 150 BV as visually detected. The increase of the outflow MnO_2 concentration until 150 BV is accompanied by a simultaneous increase of the effluent pH. This pH evolution may be assigned to the reduction of MnO_4^- to MnO_2 with activated carbon, which is an alkalizing reaction:

$$MnO_4^- + 3e^- + 4H^+ \rightarrow MnO_2 + 2H_2O \quad (2)$$

When the effluent volume is nearly 150 BV, the concentration of Mn (in fact MnO_2) increased significantly while effluent pH slightly decreased. Therefore, it might be suggested that there is possibly a secondary reaction producing MnO_2 and increasing in the same time the effluent acidity. According to the literature (Charlot, 1974, Charlot, 1983), it appears that the only acidifying reactions leading to MnO_2 formation are:

- The reduction of MnO_4^- with Mn^{2+} ions according to:

$$3\,Mn^{2+} + 2\,MnO_4^- + 2H_2O \rightarrow 5\,MnO_2 + 4H^+ \quad (3)$$

This reaction is known to be slow at ambient temperature. However, it can be catalyzed by activated carbon, following the example of the well known reduction reaction of chlorine with water (Lyonnaise des eaux, 1983);

- The oxidation of Mn^{2+} ions with dissolved oxygen in water:

$$Mn^{2+} + \tfrac{1}{2}\,O_2 + H_2O \rightarrow MnO_2 + 2H^+ \quad (4)$$

Which is well known to be catalyzed by MnO_2 settled on the surface of activated carbon (Okoniewska et al., 2008). Reactions (3) and (4) suppose that the reduction of MnO_4^- by activated carbon (Reaction (2)) produces Mn^{2+} in addition to MnO_2 as principal product. This Mn^{2+} production might result even directly according to Charlot(1983):

$$MnO_4^- + 5e^- + 8H^+ \rightarrow Mn^{2+} + 4H_2O \quad (5)$$

or via Mn_2O_3 formation (Charlot, 1983):

$$2\,MnO_4^- + 8\,e^- + 10\,H^+ \rightarrow Mn_2O_3 + 5H_2O \quad (6)$$

Which then spontaneously disproportionate to give MnO_2 and Mn^{2+} according to Charlot (1983):

$$Mn_2O_3 + 2H^+ \rightarrow MnO_2 + Mn^{2+} + H_2O \quad (7)$$

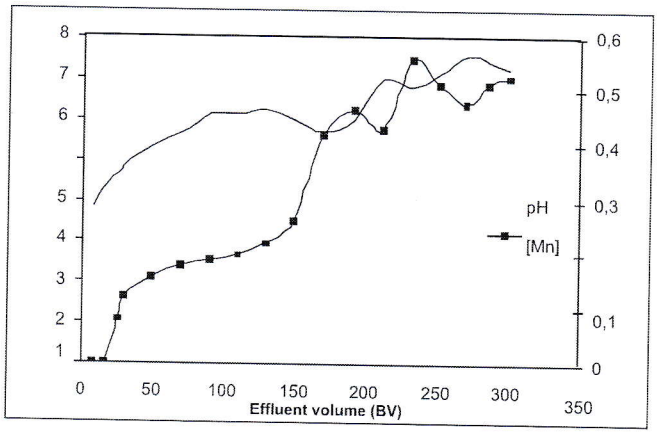

Figure 5: $KMnO_4$-modification of activated carbon: evolution of Mn concentration and pH of the collected fractions of effluent

Coming back to Figure 5, we show that – at an effluent volume greater than 150 BV – the concentration of manganese in the effluent increases while the pH decreases and vice versa. This suggests that Reactions (2) and (3) or (4) are periodically alternated in the carbon column.

3.1.1 Cu^{2+}adsorption

Adsorption experiments of copper were conducted through the both treated and untreated activated carbon bed with $KMnO_4$. The obtained breakthrough curves are shown in Figure 8. As it can be seen, the breakthrough occurs at 2.7 and 25.6 BV for unmodified and $KMnO_4$-modified adsorbent, respectively. From these plots, the adsorption capacity (q_{max}) of the carbons for Cu^{2+} ions was determined using the following relation (Tremillion, 1965):

$$(V_{PI} - V_D)\,[Cu^{2+}]_0 = m \,.\, q_{max}$$

where V_{PI} is the effluent volume corresponding to the point of inflexion of each breakthrough curve, V_D is the total dead volume of the column, $[Cu^{2+}]_0$ is the influent concentration and m is the amount of activated carbon present in the column.

The obtained values were:

q_{max} = 12.0 mg Cu^{2+} g^{-1} for unmodified carbon q_{max} = 35.3 mg Cu^{2+} g^{-1} for modified carbon

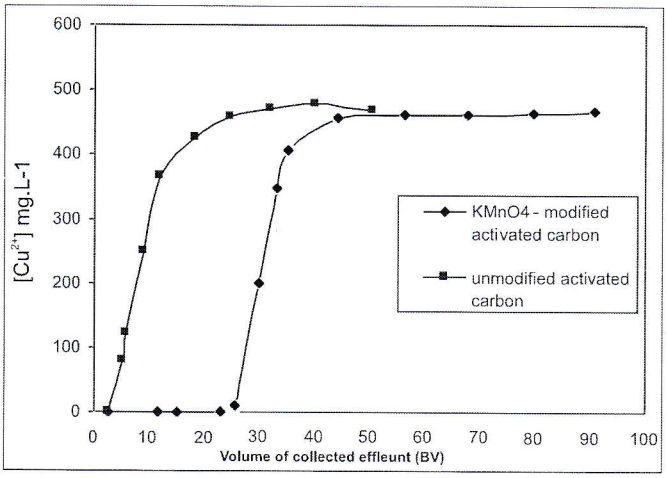

Figure 6: Breakthrough curves for copper adsorption relating to $KMnO_4$-modified and unmodified activated carbon

Thus, a marked increase in the copper uptake capacity of the modified activated carbon is observed. Indeed, this capacity is enhanced by a factor of up to 3 for the MnO_2- impregnated carbon. In these conditions, we can conclude that $KMnO_4^-$ treatment of conventional activated carbon considerably improves the adsorption capacity of this sorbent towards copper as a typical transition metal. Copper uptake capacities (q_{max}) depend on the nature of the starting materials, the activation process and the modification method used for the preparation of the sorbent. Copper (II) uptake capacities (q_{max}) equal to 5.08 and 18.22 mg g^{-1} were for example obtained by Vladimir and Danish (2002) when using unoxidized and HNO_3-oxidized commercial activated carbon, respectively. On the other hand, when considering rice husk modified by tartaric acid under particular conditions, Cu^{2+} uptake capacity of 29 mg g^{-1} was observed (Wong et al., 2003, Chuah et al.,2005).

3 Conclusion

Based on the results obtained within the framework of this study, it appears that maize cob waste may constitute a suitable precursor for the manufacture of a powerful activated carbon through chemical activation with phosphoric acid. The most efficient activated carbon is that obtained under the following optimal conditions: an acid concentration equal to 60% H_3PO_4, an impregnation ratio of 1.75, and a pyrolysis temperature of 450 °C. The adsorption characteristics of the activated carbon prepared under these conditions compare well, and sometimes more favorably than the previously reports for activated carbon inliterature.

The main conclusions that can be drawn from the current investigation are given below:

- The capacity of the optimal activated carbon to reduce MnO_4^- exceeds 37.9 mg Mn g^{-1} ofadsorbent;
- A marked increase in the copper uptake capacity of the modified activated carbon is observed. Thus, the capacity for copper sorption was enhanced by a factor of up to 3 after modification of the produced activated carbon by permanganate treatment under specifiedconditions.

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Capture the Flag: Learning Security Through Game

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***Abstract*- The Information Technology has developed rapidly over the past few decades.The need for knowledge in the field of Cyber Security is increasing day by day. The training and teaching methodologies used are only theoretical, the information in books although increase the knowledge of an individual however does not help them in the real world scenario. These traditional ways of teaching Cyber Security has led to the decrease in the confidence of an individual when faced with a real world problem. To overcome this issue a concept on Capture the Flag was introduced which helps an individual to tackle the issues faced in real world in a simulated environment. This game based technique not only piques the interest of an individual in the field of Cyber Security but also backs the confidence for tackling the problems. This method of breaking down the concepts into challenges and trying these challenges in a competitive environment was widely successful.**

Keywords-capture the flag, learning through game, simulated environment, cyber-crimes, vulnerability assessment and penetration testing

I. INTRODUCTION

As the influence of Information Technology is rising, the number of users using the internet has exponentially increased resulting inmore data transferred over the internet. With this increase in technology many sectors have moved over to the internet in order to provide more quality and cost efficient user experience. As banking sectors moved to the internet, the real money transactions started taking place over the internet which led to increase in the Cyber Crimes. Since so much valuable data is now being stored and moved over the internet there are many people who try to steal this data for their own benefits.

The concept of Cyber Security was introduced to inform the people about the threats and risks of using the technology. The risk of using a vulnerable device or technology has led to the downfall of many enterprises and organisations. The lack of knowledge in the field of Cyber Security is the main cause which make people fall prey to the Cyber Criminals.

The concept of Cyber Security being taught theoretically did help increase the awareness of cyber risk but did not help the people to overcome or to fix the problems. Since this passive method of teaching only introduces an individual to the concepts and does now teach how to apply the concept, a method was required to make people learn about the fixing the issues created by poorly designed technologies. A way in which people can visualise and see how these technologies actually work will help them understand the background details of the process.

Capture the Flag is a method of teaching the concept of Cyber Security in a fun way. This game based teaching method is called gamification. Gamification is the application of game-design elements and game principles in non-game contexts [1][2]. This method encourages people and keep them engaged in the activity. CTF evolves into a network and information security game [3], even used as a teaching and learning material [4], and as well as a selection tool in network and information security competitions [5].This attempt insecurity learning in the form of CTF game learning provides experience that plays key role in introducing networking concepts and network security skills as those can assist people to apply basic safety principles and techniques for the protection of computers and real-world network systems.

II. CYBER ATTACKS

A cyberattack is deliberate exploitation of computer systems, technology-dependent enterprises and networks. Cyberattacks use malicious code to alter computer code, logic or data, resulting in disruptive consequences that can compromise data and lead to cybercrimes, such as information and identity theft[12].

The countries in above graph suffer from Cyber Attacks resulting in huge amount of data loss resulting in falling of

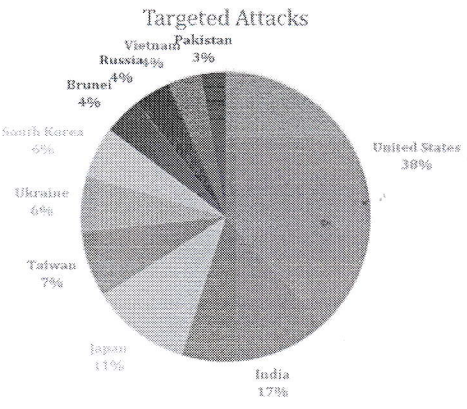

Fig. 1. Top 10 countries facing Cyber Attacks

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economy. India is the 2nd most targeted country hence it is necessary to spread the awareness among the citizen of the country about the importance of Cyber Security.

Worldwide spending on information security products and services reached $114 billion in 2018, an increase of 12.4 percent from 2017, in 2019 the market is forecast to grow 8.7 percent to $124 billion[13]. The money invested on Cyber Security is increasing per year, since a lot of organisations have shifted their databases to cloud storages and require better security to maintain the confidentiality of the data.

III. CAPTURE THE FLAG

CTF game is divided into three frequently used-scenarios: Jeopardy, Attack-Defence and Mixed [6].In Jeopardy scenario, the players are asked to solve several tasks – to gain and collect points. The winner is the player who has the highest point accumulation. In Attack-Defence scenario, the players are divided in to two teams. Each team play the role to attack and maintain the computer system provided to the team. Both teams are obliged to attack the opponent team as well as protect their asset. More precisely, each team is responsible to protect a host set and withhold the flag (confidential information) within the host. Each team is notallowed to prevent another team to attack their host. Instead, the team's priority is to detect attacks from opponents. Additionally, each team must attack another team and retrieve the flags for each hacked host. Mixed scenario is implied as the mixture of the two previous scenarios [3].

A. Why CTFs?

Jeopardy scenario CTF is used to teach Security as it uses a problem statement and requires a possible path to reach a solution. Due to this approach jeopardy style CTF comes out to be the best gamification approach there is to pique the individual's interest towards Cyber Security. Since solving simple challenges also increases the confidence and encourages the person to push for more difficult problems.

Flags used in the CTF are basically strings which tells are participant the hint to reach the next flag or just encoded string which upon submission grants points. CTF's were designed to test the participants cyber security knowledge but it could also be used as a tool to teach Cyber Security. Since CTFs are similar to real world scenarios they give the participant a feel to what the real world problem is like.

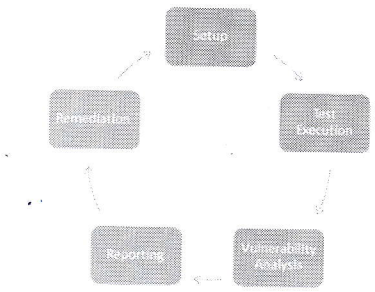

Fig. 2. Steps of Vulnerability Assessment and Penetration Testing

VAPT is a process in which the Information & Communication Technologies (ICT) infrastructure consists of computers, networks, servers, operating systems and application software are scanned in order to identify the presence of known and unknown vulnerabilities [7]. The main goal of a CTF is to perform VAPT of the system to learn for present vulnerabilities and try to penetrate them for the flags.

The Vulnerability Assessment part teaches the participants about the security risks of a system as well as teaches them the underlying concepts of the system, the Penetration Testing part is done to make the participant aware how the hackers use the tools and techniques to compromise the vulnerable system. By learning these techniques the individual gets to know about the exact flaw of the system and can now patch it up to prevent further exploitation.

B. Creating CTFs

The CTF used to teach the Security concepts is hosted on a virtual environment, the virtualisation is achieved using the hypervisor. A hypervisor or virtual machine monitor (VMM) is a computer software, firmware or hardware that creates and runs virtual machines. A computer on which a hypervisor runs one or more virtual machines is called a host machine, and each virtual machine is called a guest machine. The hypervisor presents the guest operating systems with a virtual operating platform and manages the execution of the guest operating systems[8].

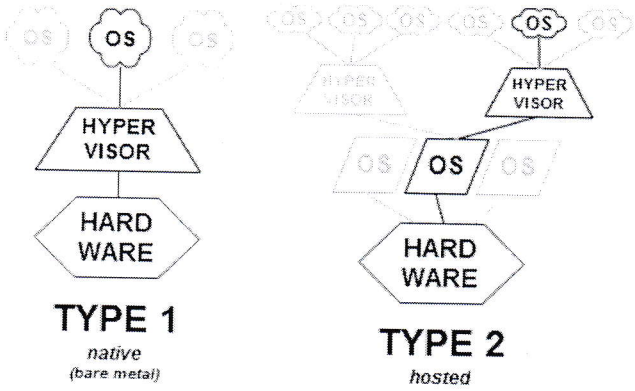

Fig. 3. Type 1 and Type 2 Hypervisors

Since this project is made for teaching purpose no proprietary software is used in making of this CTF. Oracle VirtualBox is a free and open-source hosted hypervisor for x86 virtualization, developed by Oracle Corporation.The Operating System chosen for the project is Ubuntu which is a free and open-sourceLinux distribution based on Debian[9]. Ubuntu 16.04 codenameXenial Xerus is chosen for this project.

Many services are started on the virtual machine to provide a real life server scenario, services like FTP, SSH, HTTP, etc. are started on this machine. All the services stared on this project are also open-source. All of these are the basic services generally enabled on a normal computer server. These servers are exploited by malicious hackers to extract confidential data

of multiple users. All this is achieved because of the mis-configured services or using the vulnerable applications on the server. To make people understand the necessity of using properly patched and configured application these services are enabled on the virtual machine.

Since the CTF is hosted on virtual environment it can be exported to external platform to be tested or played upon.

C. Exploiting the CTF

To exploit the virtually hosed CTF we need another operating system, this will be attackers operating system who will be exploiting the services hosted on the CTF (server). This attacker is actually the participant who is participating in the CTF or learning about the Cyber Security through CTF.

Kali Linux is a Debian-derived Linux distribution designed for digital forensics and penetration testing. It is maintained and funded by Offensive Security Ltd[10]. Kali is also open-source operating system available for download. Kali Linux has over 600preinstalled penetration-testing programs, including Armitage (a graphical cyber-attack management tool), Nmap (a port scanner), Wireshark (a packet analyser), John the Ripper password cracker, Aircrack-ng (a software suite for penetration-testing wireless LANs), Burp suite and OWASP ZAP web application security scanners[11].

The CTF starts by attacker connecting to the same network where the vulnerable virtual machine is hosted. The basic methodology is usually to perform the Vulnerability Assessment first then to go for the Penetration. To gather the information about the services hosted on the system scanning is done through various tools which are installed in Kali Linux.

As soon as the flag is captured a screenshot is taken as a proof and to post it on POC (Proof-of-Concept). In case of online CTF flag is required to be submitted for the points. The online judgement manager verifies the flag and grants the points accordingly.

The CTF we are making in our project is actually a Boot2Root

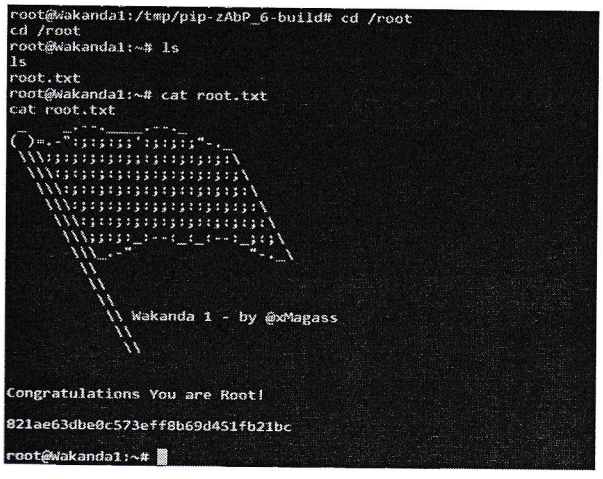

Fig. 4. Example of POC

challenge where the challenger is required gain the root access of the machine. Since the participant has no prior knowledge about the CTF it is called Boot2Root as the participant is required to search for vulnerabilities and exploits all by themselves. It is also considered as a black box testing as there is no knowledge about the background services running in the virtual machine. Internet access is provided so that the participant can look up in the internet and can search for possible exploits to exploit the services. After getting the root access of the machine the participant is required to traverse to the /root directory of the machine to obtain the last flag, with this the CTF is completed and the participant gains the knowledge about how to exploit the weakness of services and to secure them. Since all this is practically done by the participant the experience gained by the participant is real treasure as it can't be achieved by theoretical knowledge.

IV. EXPERIMENT

Although CTF can be used for learning purposes it is necessary to assess the difference between the knowledge and experience of the participant before and after the CTF. An experiment was conducted to gather the data on the Cyber Security awareness, we provided a quiz to 2 groups. 1st group contained people who have never studied cyber security and have basic technical knowledge, 2nd group contained people who have studied cyber security and have technical knowledge. Each group consists of 40 participants.

It was observed that response of group-2 was far better compared to the group-1. The experiment made it clear that the people who have no knowledge about cyber security are not aware about the importance of cyber security. The CTF will help people who have basic technical knowledge to improve their knowledge about Cyber Security and less prone to cyber-attacks.

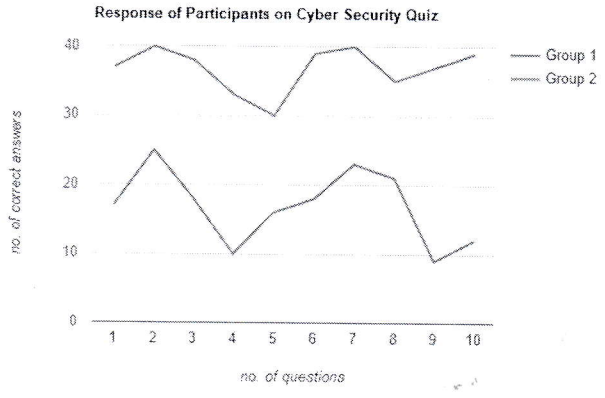

Fig. 5. Line Graph comparing Results

V. CONCLUSION

The main objective of this project was to spread awareness on Cyber Security through CTF, it was chosen because it was observed that gamification encourages people to keep pushing forward and keep them engaged even though the problem is challenging. Another reason is that complex concepts can be

taught through simple problems which are easy to understand and boosts the confidence.

The CTF also helps the people understand the real life scenarios and prevents them from falling victims to easy attacks with are seen daily in news like phishing scams, ransomwares, social engineering, etc. The experiment showed the improvement in knowledge about basic cyber security and helped the individual to avoid common mistakes to falling victim to such attacks. The overall experience has increased the awareness about the need of Cyber Security.

VI. SUGGESTIONS

As it was observed in the experiment phase that the CTFs can be intimidating at first to people with almost no technical knowledge. Hence it is necessary to first teach them the basic before making them go through the CTFs as it could backfire and make participant lose confidence. The CTFs are made challenging so as to increase the knowledge of the participant and to tackle this confidence is required, if the participant lose confidence they won't be able to solve the CTF. The most required thing is the ability to not to give up and keep pushing to achieve the goals.

ACKNOWLEDGEMENT

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A Review of Methodology Used in Content Based Image Retrieval

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***Abstract*-Image retrieval means to recover the original image from the reconstructed image, here in this paper we have discussed latest techniques in the field of image retrieval for image processing. Content Based Image Retrieval (CBIR) is one of the most exciting and fastest growing research areas in the field of Image Processing. The techniques presented are Boosting image retrieval, soft query in image retrieval system, content based image retrieval by integration of metadata encoded multimedia features, and object based image retrieval and Bayesian image retrieval system. Some probable future research directions are also presented here to explore research area in the field of image retrieval**

I. INTRODUCTION

AN image retrieval system is a computer system for browsing, searching and retrieving images from a large database of digital images. Most traditional and common methods of image retrieval utilize some method of adding metadata such as captioning, keywords, or descriptions to the images so that retrieval can be performed over the annotation words. Manual image annotation is time-consuming, laborious and expensive; to address this, there has been a large amount of research done on automatic image annotation. Additionally, the increase in social web applications and the semantic web have inspired the development of several web-based image annotation tools. In Boosting Image retrieval, the approach is predicated on the assumption that each image is generated by a sparse set of visual "causes" and that images which are visually similar share causes. There is a mechanism for computing a very large number of highly selective features, which capture some aspects of causal structure. At query time a user selects a few example images, and a technique known as "boosting" is used to learn a classification function in this feature space. In soft query in image retrieval system, the use of soft computing and user-defined classifications in multimedia database systems for content-based queries is explored. With traditional

database systems, objects/tuples are grouped into classes/relations using "hard" membership. Hence, the result of a query to obtain the members of a class is a fixed set. With multimedia databases, however, an object may belong to different classes with different probabilities ("soft" membership). The model is implemented by extending the traditional database query capabilities such that the result of a query depends on the user who submits the query. Content based image retrieval by integration of metadata encoded multimedia (image and text) features describes a new method for integrating multimedia text and image content features to increase the retrieval performance of the system. In object based image retrieval, a method is proposed to retrieve images based on the persons shown. The method aims at retrieving from images showing groups of people those in which the same persons are depicted as in the query image. It is experimentally shown that this aim is achieved for rather simple tasks and that improvements over baseline methods are possible for harder tasks.

II. CONTENT BASED IMAGE RETRIEVAL

Content- based image retrieval (CBIR), also known as query by image content (QBIC) and content-based visual information retrieval (CBVIR) is the application of computer vision techniques to the image retrieval problem, that is, the problem of searching for digital images in large databases.

"Content-based" means that the search will analyze the actual contents of the image rather than the metadata such as keywords, tags, and/or descriptions associated with the image. The term 'content' in this context might refer to colors, shapes, textures, or any other information that can be derived from the image itself. CBIR is desirable because most web based image search engines rely purely on metadata and this produces a lot of garbage in the results. The general image retrieval system (Fig. 1) consists of three main modules such as input module, query module, and retrieval module [2]. In the input module, the feature vector is extracted from input image. It is then stored along with its input image in the image database. On the other hand, when a query in the input module, the feature vector is extracted from input image. It is then stored along with its input image in the image database. On the other hand, when a query image enters the query module, it extracts the feature vector of the query image. In the retrieval module, the extracted feature vector is compared to the feature vectors stored in the image database. As a result of query, the similar images are retrieved according to their closest matching scores. Finally, the target image will be obtained from the retrieved images.

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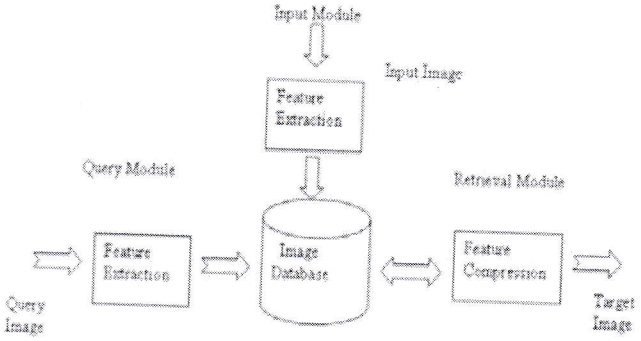

Fig. 1 Block diagram of image retrieval system

III. FEATURES OF CBIR

A. Feature Extraction

Feature (content) extraction is the basis of content-based image retrieval. In a broad sense, features may include both text-based features (key words, annotations) and visual features (color, texture, shape, faces). However, since there already exist, rich literature on text-based feature extraction in the DBMS and information retrieval research communities, we will confine ourselves to the techniques of visual feature extraction. Within the visual feature scope, the features can be further classified as general features and domain. The former include color, texture, and shape features while the latter is application-dependent and may include, for example, human faces and finger prints.

B. Color

The color feature is one of the most widely used visual features in image retrieval. It is relatively robust to background complication and independent of image size and orientation. In image retrieval, the color histogram is the most commonly used color feature representation. Statistically, it denotes the joint probability of the intensities of the three color channels. Swain and Ballard proposed histogram intersection, an L1 metric moments and color sets. To overcome the quantization effects, as in the color histogram, Stricker and Orengo proposed using the color moments approach [6], as the similarity measure for the color histogram. To take into account the similarities between similar but not identical colors, Ioka and Niblack et al. [5] introduced an L2-related metric in comparing the histograms. Furthermore, considering that most color histograms are very sparse and thus sensitive to noise, Stricker and Orengo proposed using the cumulated color histogram. Their research results demonstrated the advantages of the proposed approach over the conventional color histogram approach [6]. Besides the color histogram, several other color feature representations have been applied in image retrieval, including color. The mathematical foundation of this approach is that any color distribution can be characterized by its moments. Furthermore, since most of the information is concentrated on the low-order moments, only the first moment (mean), and the second and third central moments (variance and skewness) were extracted as the color feature representation. Weighted Euclidean distance was used to calculate the color similarity.

C. Texture

Texture refers to the visual patterns that have properties of homogeneity that do not result from the presence of only a single color or intensity [4]. It is an innate property of virtually all surfaces, including clouds, trees, bricks, hair, and fabric. It contains important information about the structural arrangement of surfaces and their relationship to the surrounding environment [7]. Because of its importance and usefulness in pattern recognition and computer vision, there are rich research results from the past three decades. Now, it further finds its way into image retrieval. More and more research achievements are being added to it.

D. Shape

Shape is one of key visual features used by human for distinguishing visual data along with other features of color and texture. Compare with color and texture, shape is easier for user to describe in the query, either by example or by sketch. While for color and texture feature, the query is usually presented by example, because it is impractical for ordinary users to sketch a colored or a textured image as query. Many shape descriptors exist in the literature, however, most of these descriptors are not able to address varieties of shape variations in nature. As an shown in Figure 2, shapes of natural objects can be from different views of the same object, shapes can be rotated, scaled, skewed, stretched, defected and can be noise affected, etc. To address the complex variations of shapes, criteria are needed. It is generally recognized that an effective shape representation should be rotation, translation and scaling invariant. A shape representation should also be invariant or robust to affine and perspective transform to address the skew, stretching, and different views of objects. MPEG-7 has set six more criteria for shape description for online retrieval purpose:

- Good retrieval accuracy
- Compact features
- General application
- Low computation complexity
- Robust retrieval performance
- Hierarchical coarse to fine representation

According to these criteria, we investigate varieties of shape descriptors in this project.

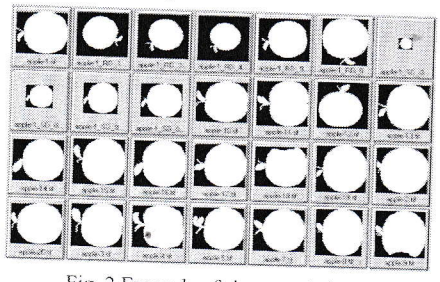

Fig. 2 Example of shape variations.

Generally, there are two groups of shape descriptors, i.e., contour-based shape descriptors and region based shape descriptors. The Contour shape descriptors only employ shape boundary information and capture shape boundary features. Region-based shape descriptors make use of all the pixel information across the shape region. In [ISO00], MPEG-7 has selected curvature scale space descriptors (CSSD) as contour-based shape descriptors and Zernike moments descriptors (ZMD) as region-based shape descriptors.

E. Color Layout

Although the global color feature is simple to calculate and can provide reasonable discriminating power in image retrieval, it tends to give too many false positives when the image collection is large. Many research results suggested that using color layout (both color feature and spatial relations) is a better solution to image retrieval. To extend the global color feature to a local one, a natural approach is to divide the whole image into sub blocks and extract color features from each of the sub blocks [1, 8]. A variation of this approach is the quad tree-based color layout approach [3], where the entire image was split into a quad tree structure and each tree branch had its own histogram to describe its color content. Although conceptually simple, this regular sub block-based approach cannot provide accurate local color information and is computation -and storage-expensive. A more sophisticated approach is to segment the image into regions with salient color features by color set back -projection and then to store the position and color set feature of each region.

The advantage of this approach is its accuracy while the disadvantage is the general difficult problem of reliable image segmentation. To achieve a good trade-off between the above two approaches, several other color layout representations were proposed.

F. Segmentation

Segmentation refers to the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze .Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Each of the pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristic(s). When applied to a stack of images, typical in Medical imaging, the resulting contours after image segmentation can be used to create 3D reconstructions with the help of interpolation algorithms like Marching cubes. The simplest method of image segmentation is called the thresholding method. This method is based on a clip - level (or a threshold value) to turn a gray-scale image into a binary image.

IV. DISCUSSION

As we can see from the above descriptions, many visual features have been explored, both previously in computer vision applications and currently in image retrieval applications. For each visual feature, there exist multiple representations which model the human perception of that feature from different perspectives. What features and representations should be used in image retrieval is application dependent. There is a need of developing an image content description (model) to organize the features. It will specify a standard set ofdescriptors (feature representations) that can be used to describe various types of multimedia information In soft query processing, the results reported are at the preliminary stages, in next stages investigation is required for alternative clustering and indexing techniques to reduce the complexity and storage requirements of our approach. Content based image retrieval by integration of metadata encoded multimedia features describes a new method for integrating multimedia text and image content features to increase the retrieval performance of the system.

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Web Based Online Examination and Assessment System

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Abstract: **This document will include all the features and processes needed to develop the system. This document includes specific information about the program objectives, program limits, program plan requirements, key program requirements, team development, potential project risks, planning, and storage and reporting of systemic reporting. The Online Examination Conducting System is very useful for the Educational Institute's to prepare for all exams, save time it takes to look at the paper and prepare the mark sheets. The E-Examination system will help the academy to test students and improve their skills. However, the disadvantages of the E-Examination system, it takes more time when the user prepares for the first test. And to take the exam we need a number of computers with the same number of students. Effective use of the E-Examination System, the coordinator can use the program to develop the tests as per their requirements, and to get better results in less time.**

Keywords: *E-Examination*

I. INTRODUCTION

This modern Internet Project is becoming a reality and the use of this is very popular and there is a huge worldwide expansion for educational purposes. The e-Examination program is easy to use, Exploring full features and flexibility, Examination web portal. Allows administrators and administrators to set different tests and queries used for enrolled students. The E-Examination System provides complete performance to judge and evaluate student performance skills. The E-Examination System is composed of Question Settings that are successfully integrated with a set of features. Using the various features of the E-Examination System the manager or coordinator can name the test, select the test and give the test questions.

Question sets will be based on the automated process and it is an important role in the random generation of unique question papers. The higher the number of questions the better the randomness is.

Use advanced judgment settings, including flexibility in the database of collected questions, skipping, and randomization and includes a timed response to perform online surveys. Assists in the design of a questionnaire based on a set of parameters. The E-Examination System automatically analyzes online type questionnaires. For feedback, the tests are evaluated together with the examination and the examiner will provide the results immediately. Maintenance of responses, scores, and results in the database. In addition to the questions already available in the question bank, the Administrator has the power to add more questions per subject.

The system should have built in security features to handle different security threats such as SQL crashes, cross write, spam writing.

The system entitled "Web Based Online Examination and Assessment System" is application software, which aims at providing services to the institutes and providing them with an option of selecting the eligible students by themselves.

A. Objectives

Online Examination System - e-Examination is the perfect end to end solution to cover all aspects of the online exam program.

The basic purpose of building this project is:

- Provides complete website solution, including member registration, administering tests, storing results. Full web management.
- The online test program can automatically add the marks given in each question to get the mark for the full test score.
- By using this feature queries can be selected from the query bank, as well as the queries in the Random Order.
- Include bulk product on purchase card, automatic calculation of shipping price, tax calculation and total inventory.
- In addition to the questions already available in the Question Bank, the Administrator has the power to add more questions per subject.
- The administrator has the ability to modify User-defined Queries and not Existing Queries in the Question Bank.
- Complete the web application based on the installation required to run the program on the client system.
- In our project coordinator can take a student test, enter a question set, and provide student sign-in after student enrollment.
- Student and member results should be maintained and can be obtained over time.

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- The question should give the answer type such as multiple choice right and single right answer. The test screen should provide options accordingly.
- The system should be able to calculate test marks and show the result immediately after completing the test; the student should check the correct answer to the question after completing the test.
- The system has a robust logical access control available, each user must be identified by the user's email id and the password verification policy is used to secure the test program.
- E-examination system Set the number of related administrative reports, Total number of students / members registered for the exam, no tests available, the test provided to the student.

B. Project Scope

The E-Examination System will give you permission to take and provide an e-Examination and to store information and provide various test reports. The main users of the E-Examination project are Student, Coordinator and system administrator.

From the perspective of the end user, the e-Examination System Project has three components that work with modules: Enhanced Coordinator modules for registration, testing, managing user profile, giving the student the authority to check, administer tests, question papers and view reports. The second operating module is a student module that provides testing, viewing the result, and registering for yourself. And the third operating module is the Administration to manage the Coordinator and Users, surveys, question papers and report reports.

C. Modules

Student Module:

Improved student interface to register, edit profile, login, select exams, offer exams, view test results, view answers to the following questions the modules are available to the student.

1: Home - The default homepage of the site. All links are available on this page.

2: Login - The student needs to sign in to view their profile account. If a student forgets their password they can get a new password from the Forget password link that sends them to their post id to get authentication. A new student can register for the exam by clicking the registration button on the site.

3: Register - A new student needs to register to give a test on this site. The student can enter all information such as email id, name, address, contact details and submit. The E-Exam system can verify information from a student's email id, it must be unique to each student. in order to sign in to the student of the e-survey program they need to enter the correct email id and password. The student needs to enter a valid email id because if he forgets the account password he will be sent to the email address that is registered in the e-exam system.

4: My Account - shows details of logged in students, pre-saved test results can be viewed here and other links like Edit Profile yourself, Logout form account and Change Password account.

5: Edit profile - The student can edit their profile such as personal information, home address, contact number, username however the student cannot edit their email address once they sign up.

6: Change Password - The student can change their account password from the password change link. The student must enter his old password to change the password with the new password for his account.

7: Login - By clicking this user logout link from this site every user returns to the login page.

8: Examination - The student can view the available test by selecting any exam from the list, system information showing such tests, test name, test description, complete questionnaire available, exam number questions, full time, passing marks.

9: Examination - Displays the examination page, the e-examination system automatically selects the question paper and shows it to each student. The student can read the questionnaire and select the appropriate answer from the question options, after completing the test e-test system immediately shows the test result and stores the test information on the system for future reference.

Management and Coordination module:

Administrative Module used to enter and edit test information, question papers, maintain user interface and view user feedback; The Coordinator module is used for student evaluation but the coordinator can enter the email test program after the administrator's permission. And the coordinator cannot view the active user and the user's response. cannot remove the user from the system. The management module and coordinator module will include the following features:

1: Log in - Log in to the admin and coordinator page. All managers and administrators are identified by a username, password. The director and coordinator can create new question banks.

2: Users - Displays a list of locally registered users. 3: Testing - Enter to edit test information.

4: Bank Question - Keep a bank of questions for the selected exam, the Administrator can add the exam, edit the question and exam answers.

5: Results - Display the list of test results.

6: Login - By clicking this link user sign in from this site the entire user period will be reset to the default value.

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Both of these ideas for the operation of the e-examination system will be presented as the first version of the e-Examination application for the e-system is released.

II. SYSTEM DESIGN

A. System Architecture

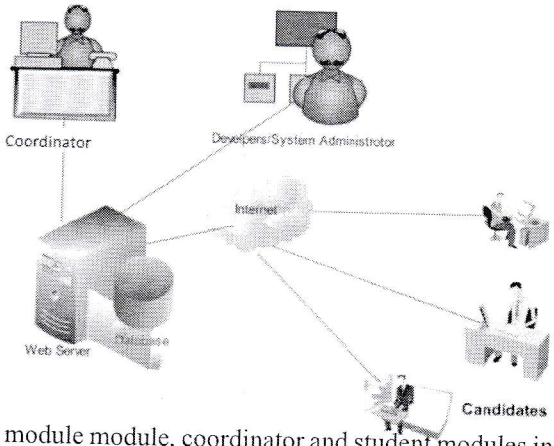

Figure 1 : System Architecture

The module module, coordinator and student modules include their part of the tasks in the e-Examination exam. The e-test startup was done by ADMIN, which provides valid accountcredentials to users. The administrator adds the registered user information to the test program database and updates it or removes it as needed. The consultant submits the questions to the E-Examination question paper in a clever way. Query numbers are automatically generated. Complete student results can be viewed by the exam coordinator and the administrator at any time after completing the exam. Only the student logs in to attend the exams and after completing and submitting the exam the result is immediately produced.

A. Data Flow Diagram

Data flow diagram (DFD) uses the smallest number of initial signals to represent the project performance and flow data between different project tasks. The flow diagram of the data presented in B below illustrates the relationship between entities in the e-test system. The business "STUDENT" may provide a test after accessing the system. The business "COORDINATOR" can upload questions that the student will answer to the test database using the query format, set test commands and configure the appropriate options or set of test questions options. The business "ADMINISTRATOR" is responsible for the login, coordinator and password setting of the users of the e-examination system. The business "SERVER" is responsible for validating users of the program and also provides a time zone for testing. The system hides the student at the end of the exam period

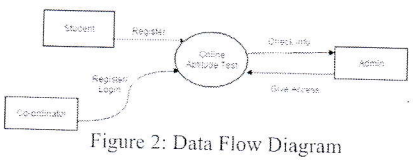

Figure 2: Data Flow Diagram

Algorithm:

Step 1: Student Identification: The program will assess student identity through enrollment before entering the exam conducted by the consultant. This will also determine if the student is eligible for the exam.

Step 2: Domain Login Coordinator: The student will log into the link domain with the username and password provided by the domain login administrator (Ex: username: Textech, Password: Textech).

Step 3: Special entry for the test: The user needs to write a username and password. if the user id and password are correct the student is able to give the test.

Step 4: Offer the Exam: The student will complete the exam set up in the desktop system window (Online Exam)

Step 5: Internet Examination Coordinator Password: Coordinator password is provided by the administrator to the administrator who successfully enters the test program. This gives them access to pose questions.

Step 6: Random questions and results: The questions are given to the learners from time to time, the student submits the answers to the server; once the user's time has been completed, the test plan shows the test result immediately.

Step 7: Finish.

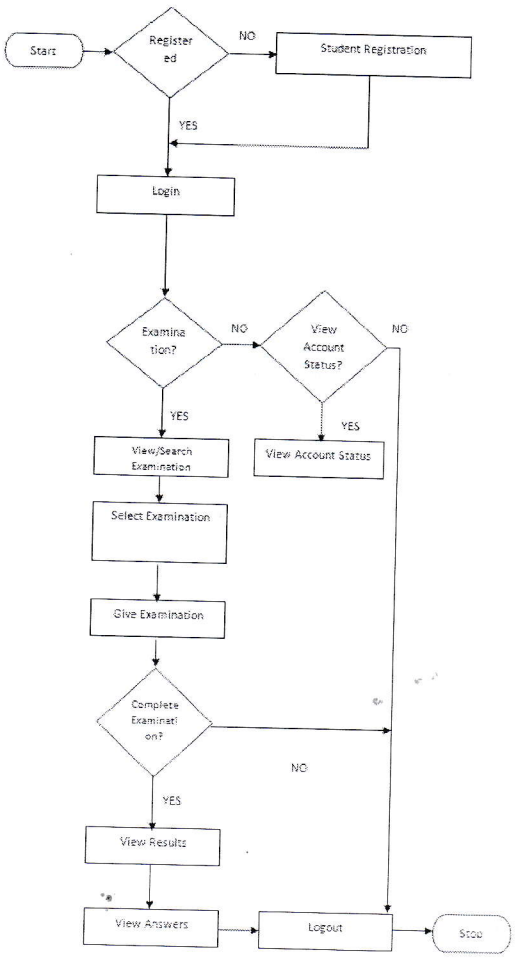

Figure 3: C Flow Chart

CONCLUSION

This Web app provides an online testing ground. It saves time as it allows the number of students to give the test at one time and shows the test results upon completion of the test, so there is no need to expect the result. Auto-generated by server. The Director and Coordinator reserves the right to create, edit and delete test papers and queries for it. The user can sign up for the system test, log in and provide the test with their specific id, and can see the results.

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Ensuring Data Storage Security in Cloud Computing

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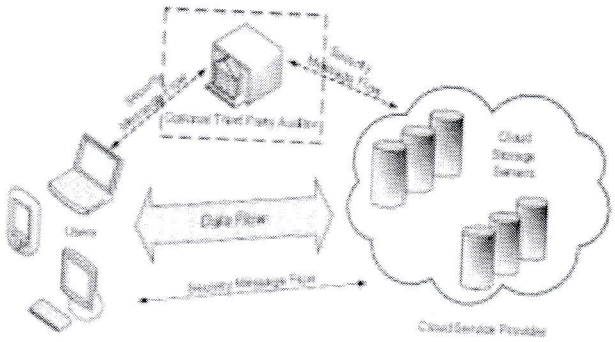
***Abstract*: Cloud computing has been envisioned as the next-generation architecture of IT enterprise. In contrast to traditional solutions, where the IT services are under proper physical, logical and personnel controls, cloud computing moves the application software and databases to the large data centers, where the management of the data and services may not be fully trustworthy. This unique attribute, however, poses many new security challenges which have not been well understood. In this article, we focus on cloud data storage security, which has always been an important aspect of quality of service. To ensure the correctness of users' data in the cloud, we propose an effective and flexible distributed scheme with two salient features, opposing to its predecessors. By utilizing the homomorphic token with distributed verification of erasure-coded data, our scheme achieves the integration of storage correctness insurance and data error localization, i.e., the identification of misbehaving server (s). Unlike most prior works, the new scheme further supports secure and efficient dynamic operations on data blocks, including: data update, delete and append. Extensive security and performance analysis shows that the proposed scheme is highly efficient and resilient against Byzantine failure, malicious data modification attack, and even server colluding attacks.**

SYSTEM ARCHITECTURE



Existing System:

From the perspective of data security, which has always been an important aspect of quality of service, Cloud Computing inevitably poses new challenging security threats for number of reasons.

1 . Firstly, traditional cryptographic primitives for the purpose of data security protection can not be directly adopted due to the users' loss control of data under Cloud Computing. Therefore, verification of correct data storage in the cloud must be conducted without explicit knowledge of the whole data. Considering various kinds of data for each user stored in the cloud and the demand of long term continuous assurance of their data safety, the problem of verifying correctness of data storage in the cloud becomes even more challenging.

2 . Secondly, Cloud Computing is not just a third party data warehouse. The data stored in the cloud may be frequently updated by the users, including insertion, deletion, modification, appending, reordering, etc. To ensure storage correctness under dynamic data update is hence of paramount importance.

These techniques, while can be useful to ensure the storage correctness without having users possessing data, can not address all the security threats in cloud data storage, since they are all focusing on single server scenario and most of them do not consider dynamic data operations. As an complementary approach, researchers have also proposed distributed protocols for ensuring storage correctness across multiple servers or peers. Again, none of these distributed schemes is aware of dynamic data operations. As a result, their applicability in cloud data storage can be drastically limited.

Proposed System:

In this paper, we propose an effective and flexible distributed scheme with explicit dynamic data support to ensure the correctness of users' data in the cloud. We rely on erasure correcting code in the file distribution preparation to provide redundancies and guarantee the data dependability. This construction drastically reduces the communication and storage overhead as compared to the traditional replication-based file distribution techniques. By utilizing the homomorphic token with distributed verification of erasure-coded data, our scheme achieves the storage correctness insurance as well as data error localization: whenever data corruption has been detected during the storage correctness verification, our scheme can almost guarantee the simultaneous localization of data errors, i.e., the identification of the misbehaving server(s).

1. Compared to many of its predecessors, which only provide binary results about the storage state across the distributed

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servers, the challenge-response protocol in our work further provides the localization of data error.

2. Unlike most prior works for ensuring remote data integrity, the new scheme supports secure and efficient dynamic operations on data blocks, including: update, delete and append.

3. Extensive security and performance analysis shows that the proposed scheme is highly efficient and resilient against Byzantine failure, malicious data modification attack, and even server colluding attacks.

MODULES

1. Client Module:

In this module, the client sends the query to the server. Based on the query the server sends the corresponding file to the client. Before this process, the client authorization step is involved. In the server side, it checks the client name and its password for security process. If it is satisfied and then received the queries form the client and search the corresponding files in the database. Finally, find that file and send to the client. If the server finds the intruder means, it set the alternative Path to those intruder.

2. System Module:

Representative network architecture for cloud data storage is illustrated in Figure 1. Three different network entities can be identified as follows:

- **User:**

Users, who have data to be stored in the cloud and rely on the cloud for data computation, consist of both individual consumers and organizations.

- **Cloud Service Provider (CSP):**

A CSP, who has significant resources and expertise in building and managing distributed cloud storage servers, owns and operates live Cloud Computing systems,.

- **Third Party Auditor (TPA):**

An optional TPA, who has expertise and capabilities that users may not have, is Trusted to assess and expose risk of cloud storage services on behalf of the users upon request.

3. Cloud data storage Module:

Cloud data storage, a user stores his data through a CSP into a set of cloud servers, which are running in a simultaneous, the user interacts with the cloud servers via CSP to access or retrieve his data. In some cases, the user may need to perform block level operations on his data.. users should be equipped with security means so that they can make continuous correctness assurance of their stored data even without the existence of local copies. In case that users do not necessarily have the time, feasibility or resources to monitor their data, they can delegate the tasks to an optional trusted TPA of their respective choices. In our model, we assume that the point-to-point communication channels between each cloud server and the user is authenticated and reliable, which can be achieved in practice with little overhead.

4. Cloud Authentication Server:

The Authentication Server (AS) functions as any AS would with a few additional behaviors added to the typical client-authentication protocol. The first addition is the sending of the client authentication information to the masquerading router. The AS in this model also functions as a ticketing authority, controlling permissions on the application network. The other optional function that should be supported by the AS is the updating of client lists, causing a reduction in authentication time or even the removal of the client as a valid client depending upon the request

5. Unauthorized data modification and corruption module:

One of the key issues is to effectively detect any unauthorized data modification and corruption, possibly due to server compromise and/or random Byzantine failures. Besides, in the distributed case when such inconsistencies are successfully detected, to find which server the data error lies in is also of great significance

6. Adversary Module:

Security threats faced by cloud data storage can come from two different sources. On the one hand, a CSP can be self-interested, untrusted and possibly malicious. Not only does it desire to move data that has not been or is rarely accessed to a lower tier of storage than agreed for monetary reasons, but it may also attempt to hide a data loss incident due to management errors, Byzantine failures and so on.

On the other hand, there may also exist an economically motivated adversary, who has the capability to compromise a number of cloud data storage servers in different time intervals and subsequently is able to modify or delete users' data while remaining undetected by CSPs for a certain period. Specifically, we consider two types of adversary with different levels of capability in this paper:

Weak Adversary: The adversary is interested in corrupting the user's data files stored on individual servers. Once a server is comprised, an adversary can pollute the original data files by modifying or introducing its own fraudulent data to prevent the original data from being retrieved by the user.

Strong Adversary: This is the worst case scenario, in which we assume that the adversary can compromise all the storage servers so that he can intentionally modify the data files as long as they are internally consistent. In fact, this is equivalent to the case where all servers are colluding together to hide a data loss or corruption incident.

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Good Teachers are worth more than thousand books, we have them in Our Department

Abbreviations

OOPS→Object Oriented ProgrammingConcepts
TCP/IP→TransmissionControlProtocol/Internet Protocol
JDBC™ Java Data Base ConnectivityEIS™ Enterprise Information SystemsBIOS™ Basic Input/Output System
RMI™ Remote Method Invocation
JNDI™ Java Naming and Directory InterfaceORDBMS ™ Object Relational DatabaseManagement System
CSP™ Cloud Service Provider (CSP)J2ME™ Java 2 Micro Edition

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Impact of Ethical Leadership on Innovative Work Behavior –A conceptual framework

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Abstract: **Innovative Work Behavior forms an important source for gaining competitive advantage and its development gives a commanding challenge which is faced by several organizations. In this paper positive impact of Ethical Leadership (at individual and collective levels) is pro-posed to positively impact Innovative work Behavior by employing the theory of decom-posed planned behavior. We argue that Ethical Leadership with its attention on Fairness , Power sharing, Role Clarification, People Orientation, Integrity, Ethical Guidance and Con-cern for sustainability positively strengthens an individual's positive job attitudes, subjective norms and perceived behavioral controls by affecting the underlying behavioral, normative and control beliefs. In proposing a holistic and multi-level framework linking EL (at individual and collective levels) with Innovative Work Behavior, this paper contributes to both, Positive attitudes and EL literatures. Besides that the components of Ethical Leadership are high-lighted, also a comparison of it with other leadership style has been made. Such article be-comes important at a time when ethical practices or their absence seems to be increasingly prevalent in many organizations' execution and hampering growth of innovation. At the end we have discussed the theoretical and practical implications of the proposed model.**

Key words: Decomposed theory of planned behavior, Ethical leadership, Innovative work behavior.

INTRODUCTION

Recent past provides plethora of cases of unethical practices carried out by various firms. There has been an increase in the significance attached to corporate social responsibilities and business ethics due to which leaders are required to act ethically more than ever . As a result, ethical leadership has become an area of interest for both academicians and practitioners in the past decade. One questionthat is frequently inquired by managers, students, and the general public at large is that what impact does leadership have on the behavior of the followers?

In the existing literature a huge number of scholars have theoretically and empirically investigated its impact on employees' work attitudes and behavior and established that ethical leadership was an ef-fectual predictor of Organisation commitment, innovative work behavior, job satisfaction and organi-zational citizenship behavior (Brown et al. 2005, Brown and Trevino˜o2006) however the relationship of ethical leadership on employee outcomes still remains unexplored. Ethical leadership has been pre-sented as a unique leadership construct previously (Brown et al., 2005), but till date only few empirical studies have explored the relationship between ethical leadership and positive job outcomes, the construct being relatively new. Empirical investigation on ethical leadership is still in its nascent stage, a number of significant questions remain unanswered. This research bedrocks on - What are the components of Ethical Leadership and how does it relate to important employee behaviours? Brown and Treviño (2006b) put forward it as a boulevard of future research. In light of the above, the main purpose of this research is to shed light on the construct of ethical leadership by reviewing the relevant literature, and put forward how it relates to Innovative Work Behaviour .

In this paper the focus is on the various aspects affecting IWB by proposing a linkage between Ethical Leadership (at individual and organizational levels) and intentions to innovate. The article is organized as follows-The first section deals with the prominent literature on EL and IWB highlighting components of EL and differentiating it with other forms of leadership. The next part delineates the Decomposed Theory of Planned Behavior as the basis to investigate the relationship between EL and intentions to innovate. Later on, a set of propositions have been framed based on conceptual frame-work. The end section presents a compendium of the key contributions ,arguments and a discussion of possible ways forward.

RESEARCH GAPS

In particular, this study examines two research gaps: the first gap is that Ethical leadership as a poten-tial predictor has received very little attention; there is need to highlight its components, second very little emphasis has been placed on examining the relationship of Ethical leadership on Innovative work behavior. To this end, we may need an integrated approach, wherein both Ethical leadership and Innovative work behavior are part of. This study endeavors to bridge these gaps by proposing a mod-el, employing the theory of decomposed of decomposed planned behavior where both Ethical leader-ship and innovative work behavior are considered.

OBJECTIVES

- The objectives of the paper include providing components of the construct of Ethical Leadership,
- Second objective is to describe an ethical leader's personality also differentiating it from other forms of leadership.
- Furthermore objective is to present a model showcasing the positive impact of Ethical Leadership (at individual and collective levels) on the intention to innovate by employing the theory of decomposed planned behavior

LITERATURE REVIEW

Ethical Leadership

Leadership can be defined as an art of making a follower do the things, activities, as per the goals set by the leader. Hence the role of leaders involve directing the individual's behavior towards a desired goal. Leaders differ based on the individual leadership style that develops from individual's personality characteristics. The literature indicates that there are personal qualities such as integrity , honesty which are significant to perceptions of leadership effectiveness. For instance survey research has as-sociated perceived leader effectiveness with perceptions regarding the leader's honesty, trustworthi and integrity (Posner & Schmidt, 1992, Kouzes & Posner, 1993, Den Hartog et al., 1999). Spiritual values and practices related to leadership effectiveness. The Leadership Cognitive trust has been linked with effective approaches of leadership as well (Dirks & Ferrin, 2002). Building on this, Tre-viño et al. (2003) carried out an exploratory research premeditated to recognize what the term ethical leadership means to immediate observers of executives. In the course of structured interviews with twenty senior executives and twenty compliance officers in a multiple industries, the researchers asked informants to imagine about an ethical leader to whom they were well-known, and answer the broad questions related to the characteristics, behaviors, and motives of that leader.

Leading ethically is about enquiring and asking questions about what is right and what is wrong, for-mulating an approach of conduct and setting the example for followers and others about the appropri-ateness or wrongness of particular actions. Ethical leadership as described by Brown et al. (2005) dif-fers from other forms of leadership such, such as transformational (Burns, 1978), authentic (Luthans & Avolio 2003), and spiritual (Fry, 2003) leadership. Without a doubt all of these forms of leadership consist of attributes such as fairness, integrity, trustworthiness, concern for others etc. However, these attributes show only a part of ethical leadership. A second significant feature of ethical leadership, termed by Treviño et al. as the moral manager, highlight more on the transactional efforts to influence follower's ethical behaviour. Brown et al. (2005) presented a new conceptualization of ethical leader-ship and identified three important building blocks of ethical leadership. The building blocks are-1.Being an example of ethicality. 2. Treating people with fairness and 3. Managing the morality. The first two premises are revealed in being the moral person component of ethical leadership in which ethical leaders have enviable qualities such fairness and trustworthyness. The last building block deals with the component of being moral in which ethical leaders support normative behavior and put off unethical behavior done by their subordinates (Brown and Treviño 2006a).

Ethical leadership is also expected to have an effect on subordinates in the course of social exchange processes (Blau, 1964). Social exchange stands on the norm of reciprocity (Gouldner, 1960), which states that if one exchange partner does something beneficial for the other, that generates a responsibility to give in return good faith behavior. Ethical leadership is different from other forms of leader-ship .One way it diverges from other leadership styles is that while some theories of leadership such as transformational leadership contain an ethical component the focus on ethics is subsidiary and de-notes only one aspect of the leadership style. In disparity, the focus of ethical leadership is solely and explicitly on the ethical aspect of leadership. One more way in which ethical leadership differs from related leadership constructs is that it emphasizes not only the traits such as integrity, concern for oth-ers, being just etc of ethical leaders it also draws on social learning theory (Bandura, 1977, 1986) which states that people learn from modeling the behavior of attractive role models.

Dimensions / Components of Ethical Leadership

Literature review of the ethical leadership suggests that there are several dimensions of ethical leader-ship behaviour in context within the organizations. For considering dimensions we have set up on work by Brown and Treviño and others as the conceptual bases for differentiating these behaviors. Three di-mensions of ethical leadership (i.e., fairness, power sharing, and role clarification) were distinguishedby De Hoogh and Den Hartog (2008) this related the content dimensions by Brown et al. (2005). Be-sides fairness, power sharing and role clarification, we have also included people oriented behavior, in-tegrity, ethical guidance, and concern for sustainability as other dimensions found in the ethical leader behavior literature. Considering the work of De Hoogh and

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Den Hartog (2008), we have included the first three dimensions as fairness, power sharing and role clarification. Which are also reflected in the work by Brown et al. (2005).

Fairness is considered an imperative form of ethical leader behavior. Ethical leaders treat others in fair manner. They do not practice favoritism and are trust worthy and honest. They are also responsible for their own actions (Brown et al., 2005; Treviño et al., 2003). Secondly power sharing is also an ethical leader behavior. Ethical leaders involve subordinates while taking decisions and also listen to their ideas. Resicket al. (2006) mentions empowering the employees which is also an aspect of ethical leader-ship. Similarly, Brown et al. (2005) suggest that ethical leaders provide followers with voice. Sharing power give the subordinates more control(Yukl, 2006). Thirdly ethical leaders are considered to be transparent and indulge in open communication (Brown et al., 2005). Similar to this DeHoogh and Den Hartog (2008) refer to the significance of transparency in clarifying performance goals and expectations and mark role clarification as a very essential component of ethical leadership.

Conceptual background also highlights ancillary ethical leader behaviors.-One of the important one is developing a true concern for people or being people oriented. This aspect is one of the most frequently mentioned facet of ethical leadership in the qualitative study of Treviño et al.'s (2003) People-oriented feature of Ethical leaders is also described by Resick et al. (2006). It is all about sincerely caring about, giving respect and assisting subordinates where possible making it sure that their needs are fulfilled (Treviño et al., 2003). Leaders attaining their promises practice integrity and are fair with consistent be-havior. Ethical guidance refers to the way in which leaders impart about ethics at the same time encour-age and also reward ethical conduct among employees. Concern for sustainability is concerned with en-vironmental orientation that encloses the way the leaders handle sustainability issues, making sure other members in the environment develop consider the repercussions of actions way above the self-interest and caring about the welfare of the society.

Table I, summarises Ethical Leadership is as comprising seven dimensions, namely - Being Fair , Pow-er sharing, Role Clarification, Employee Orientation, Integrity, Ethical Guidance and Working for sustainability.

Table 1 : Components of Ethical Leadership taken from Literature

ETHICAL LEADERSHIP COMPONENTS	EXPLANATION
Being Fair	Not practicing favoritism, and treating others in a right way by making fair choices
Power sharing	Increasing subordinates role in decision making and listening to their suggestions, ideas and concern
Role Clarification	Clarifying about the responsibilities, what is expected and being clear of performance goals
Employee Orientation	Caring about, respecting and supporting followers
Integrity	Keeping promises and being Consistent with the words and actions.
Ethical Guidance	Communicating regarding explaining ethical rule promoting and rewarding ethical conduct
Working for sustainability	Taking care of the environment and stimulating recycling.

Transformational, spiritual, and authentic leadership-Similarities and Differences with Ethical Leadership

This section includes a brief discussion of majorly three types of leadership styles that seem to over-lap the ethical leadership realm - First is Transformational, second spiritual and third authentic theory of leadership .

Transformational Leadership- Bass (1985) suggested that based upon the motivation transformation-al leaders could be either ethical or unethical. Bass & Steidlmeier (1999) further distinguished be-tween authentic and pseudo transformational leadership styles. There is overlap between Transforma-tional leadership and ethical leadership relating their center of attention on personal characteristics. Both type of leaders concern about others, act always considering their moral principles high , take care of the ethical results of their decisions, and act as ethical role models for others. Theory and re-search suggests that ethical leadership and transformational leadership are dissimilar constructs (Brown et al., 2005; Treviño et al., 2003). Authentic leaders are the ones who are profoundly con-scious of how they think and act, also are conscious of their own and others' moral perspective, sub-ject knowledge, and strengths.

Authentic leadership

Similar to the transformational leadership authentic leadership emerge coincide with ethical leader-ship predominantly in the area of individual features. Both the authentic as well as ethical leaders share social motivation. Both are reasonably leaders with principles who think about the ethical out-comes of their judgements.

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Spiritual leadership

Spiritual leadership encompasses "the values, frame of mind, and behaviours that are considered necessary to inherently inspire one's self and others to develop a sense of spiritual survival through call-ing and membership" (Fry, 2003). Spiritual leadership is also explained as direction taking place when an individual who is a leader signifies spiritual values such as integrity, humility and honesty, creates ones own self as an example of somebody who can be true hearted , relied upon, and praised of .

Table 2 : Comparison of EL with other leadership styles

TYPE OF LEADERSHIP	CLOSENESS WITH ETHICAL LEADERSHIP I.E SIMILARITY	DISTINCTION FROM LEADERSHIP
Transformational Leadership	Showing concern for subordinates Being Ethical at the time of making decisions Honesty/Integrity Being. A role model	Increasing subordinates role in decision making and listening to their suggestions, ideas and concern
Authentic Leadership	Concern for others Ethical decision making Honesty/ Integrity Role modelling	Authentic authenticity and self -awareness
Spiritual Leadership	Concern for others Honesty/ Integrity Role modelling	Spiritual leaders highlight visioning, hope/faith; workas vocation

Innovative work behaviour

Innovative work behaviour can be elucidated as the creating, introducing and applying the new ideas inside a work role, group or organization. Furthermore, he recommended that the Innovative work behaviour process consists of three main behavioural phases: idea generation, idea promotion, and idea realization (Janssen ,2004) .In order to begin innovation, employees can come up with novelideas by indulging themselves in several acts to look for opportunities, seek the performance gaps, and build useful way outs (Axtell et al., 2000). Discontinuities and incongruities may be the source of new ideas - things that do not fit into a regular pattern for example the problems occurring in existing working methods or the needs of customers that remain unfulfilled. Employees can play valuable role in the innovation process by engaging in the implementation phase demonstrating application-orient-ed behaviour, ex: employees who have a strong personal commitment to a particular idea may be able to convince others of its value. Employees can also devote reasonable effort in initializing, testing and commercialising an idea. Several studies have inspected the role of a leader and organizational cli-mate in controlling the innovative behaviour of the employees (Oldham & Cummings, 1996). The studies established that when the climate of the organization and the style of the leader appear to be psychologically empowering for the employees , innovative work behaviour gets encouraged (Mar-tins & Terblanche, 2003).

THEORY AND PROPOSED MODEL

In literature, the intention to innovate is explained keeping the basis of the theory of reasoned action (TRA) which is a socio-psychological theory put forward by Ajzen and Fishbein (1975). The theory stands on the assumption that real behaviour is anticipated by the behavioural intention (BI) of the ac-tion (Pavlou & Fygenson, 2006). Willingness to carry out the action and the extent of efforts an individ-ual puts in while performing the action refers to the Intention of an individual . Behavioural intention (BI) is influenced by the attitude towards the behaviour of interest as well as by the subjective norms (SN) of the referent group (Bock et al., 2005). As per Ajzen (1991), some behavioural beliefs that an individual has about the attributes of the behaviour or its outcomes affect the attitude towards that be-haviour . The more the value an individual gives to the upshot of the behaviour stronger would be the behavioral beliefs.

Subjective norms are operated by the normative beliefs (Chennamaneni et al., 2012), that hold an indi-vidual's beliefs regarding the support or opposition applied by the important individuals or groups to perform the behaviour in focus (intention to innovate in this case) (Ajzen, 1991). The influence of each normative belief gets enhanced by an individual's motivation to act in accordance with the reference in question. The subjective norm (SN) is directly proportional to the sum of the resulting products across the salient referents' (Ajzen, 2002).TRA was reassessed , later it got transformed to the theory of planned behaviour (TPB) by addition of a third predictor to Behavioural Intention, which is perceived behavioural control (PBC) to defeat the vo-litional assumption building foundation for TRA. PBC means an individual's 'perception of the control over performance of a behaviour' (Ajzen, 2002). According to Taylor and Todd (1995) the decomposed theory of planned behaviour (DTPB) decomposes attitude, subjective norms and PBCs in order to high-light the related behavioural, normative and control belief structures that lay down the foundation of them. We have used DTPB because it focuses on specific beliefs structures and considers the effects of their crossover , which will build up the descriptive potential of our proposed model.

In the following section, we have proposed a conceptual framework linking Ethical Leadership with In-tention to innovate (see Figure 1). It is maintained that EL (at individual and collective levels) through-Fairness, Power sharing, Role Clarification, People Orientation, Integrity, Ethical Guidance and Con-cern for sustainability strengthen the underlying belief structures towards innovating.

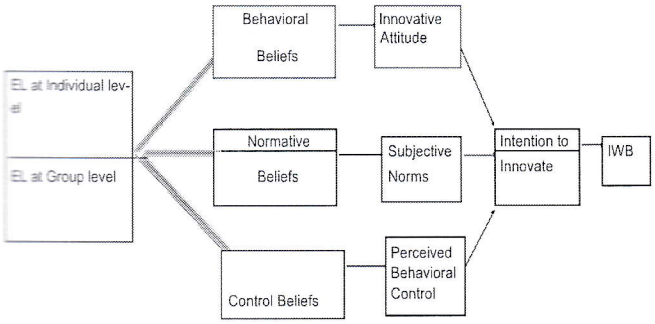

Figure 1 : Conceptual Framework outlining the Impact of EL on IWB employing DTPB (The aim is to explore the relationships marked in 'Blue lines'.The Linkages that are marked in 'solid lines' have been accepted and established earlier.)

Source: Authors' own.Several studies have empirically shown the existence of a positive relationship between ethical leadership and innovation behavior. Consistent to that are the findings of Kalshoven, Hartog, and De Hoogh (2011) who found that ethical leadership plays a very critical role in inspiring the behaviour of the employees towards being more innovative and did re-establish the encouraging impact of ethical leadership in modifying employees' outlook and attitude in a positive way in the workplace. The posi-tive relationship between ethical leadership and innovative behavior has lead to several suggestions such as when ethical leaders draw attention on the outcomes of job, encourage open communication, promote people to be creative, give job autonomy, offer opportunities for workers to put across their views and contribute their opinions (Brown & Trevi~no, 2006), the followers respond by innovative behavior in the workplace. Hence the following hypothesis have been formulated-

Hypothesis 2: ***Ethical leadership will be positively related to innovative work behaviour.***

- ***The dimensions of El at individual level and group level will positively affect the behavioral beliefs underpinning attitude for Innovation.***
- ***The dimensions of El at individual level and group level will positively affect the normative beliefs un-derpinning attitude for Innovation.***
- **The dimensions of El at individual level and group level will positively affect the control beliefs underpinning attitude for Innovation**

DISCUSSION AND IMPLICATION

The study is an attempt to propose an extension of ethical leadership literature into creating intention to innovate. A model has been proposed highlighting the role of ethical leadership in influencing innovative behaviour of employees. Innovation bills up the basis of an organization's success and performance, which resides with the employees. To succeed designing of systems and processes is necessary for organization, for this they need innovative workforce. Leaders high on ethical grounds tend to view life from a larger perspective marked by unity and bonding with all. This type of leaders tend to transcend the 'me' and 'them' distinction and show more helping behaviors (innovative in our case) that give them joy, fulfillment and connectedness with others. At a collective level, Ethical Leadership linchpin on positive organizational values such as mutuality, humanism , respect for others, which develop an environment and experience of meaningfulness, connectedness to each other and companionship. In order to facilitate innovative behaviorleaders must enrich experience of employees by providing them an environment established by values like respect ,a sense of higher purpose, trust, humility, etc.

We encourage researchers to test the proposed framework empirically and further explore the proposed linkages in greater depth. A scale to measure Ethical Leadership in Indian context needs to be developed to to differentiate between leaders on ethical grounds. There is need to further assess different ways in which ethical leader behavior can be perceived as effective and how they can leave lasting and positive impact on followers and eventually the organization. Even though the significance of ethics and ethical leadership is well comprehended and unquestionable, there is a requirement for policy measures for not only hiring ethi-cal leaders but also promoting ethical leadership among employees. For it at the time of recruitment and selection only the ethical back ground could be utilized as an explicit criterion for assessing the potential candidates. In order to advance professionals for their future role as ethical leaders, there should be training on ethical leadership for the heads of departments and team leaders. Ethics should be one of the compo-nents of the training modules and courses. Besides it even the orientation ,induction, and socialization of new employees must strongly have an ethical orientation. For inculcating organizational value system role modeling, mentoring and frequent interaction with seniors could be encouraged . For the creation of ethical climate social learning theory could be applied by strategies such as mentoring, and ethics training.

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Big Data Security: Issues and Solutions

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Abstract: **As we all know that the 21 century is the century of Big Data. This data is the raw material for the production of immense social and economic values. This leads to the massive increase in data storage and data mining. Increasing number of people, sensors and devices are the main causes for big data. This data creates the great value for the innovation, productivity, efficiency and growth of the global economy. But on the same time this data generates a "data deluge" which generates the privacy concerns; as a result it creates a backlash dampening the economy of the data and the innovation. So to maintain the privacy of individual and the production of the data we need to create some advanced policies which can effectively work on big data, because the policies or algorithms which we have are not so much advanced that they can deal with that much amount of data on timely basis. This paper presents the privacy issues which come across dealing with big data and suggests few ways to protect the data-intensive information systems.**

Keywords: Sensitive Information Anonymization Security Analytics.

INTRODUCTION

The term 'Big Data' means dealing a large amount of data which is generated very rapidly. The main cause of this is the high uses of social media platforms and the smarts devices. According to a research that is done by IBM, we create 2.5 quintillion bytes of data with the help of handheld devices, Mobile/ online social networks and machine- to- machine communication in one day. According to this we have created 90% of the whole data present over world-wide in last 2 years [9]. It is next to impossible to store, capture, process that much of data with the previous storage devices and the main objective is also not maintained i.e. to maintain the privacy and security of data. After storing the data in the database the accessing and retrieval of metadata from the database is not so easy. The use of existing mining tools take so much time and time is major concerned in today's world.

The big data is basically characterized by the "3V" – volume, velocity and variety of data [1]. In this the velocity says captures the huge amount of data that is generated by individuals and organization in efficient manner. Velocity says that the data is captured, shared and accessed in a high speed manner. Variety says that an escalation of new data types from mobile sources, online sources and machine devices are integrated into traditional transactional data types. So the major challenges are to maintain the 3 Vs of the big data. Along with these a major concern is to maintain the privacy and security of the data because everyone wants that his or her privacy will maintained throughout the entire cycle of data processing.

Big Data Security and Privacy

Big data is a new challenge for the persons or the system which makes decision on the basis of that data. The amount of data that is generated by our electronic devices like Smartphone, social media networks, sensor-driven devices, generated in our daily life is very high. This is done because the big data is mostly the collection of variety of data types including audio, video, text and imagery. Social media platforms, instagram images, professional photographs, aerial imagery and satellite imagery captured by devices like Unmanned Aerial Vehicles (UAVs), videos from tv channels, youtube videos and video apps and other channels are the main cause of Big Data.

If we are thinking about the storage and preserving point of big data, than it will become a problem because we don't have so smart devices and algorithms which can deal with this amount of data which is generated every seconds. On the other point, organized big data collected from various sources like social media, websites, GPS and more will help to identify various social- economic problems [2] and also helps in providing effective solutions and measures [3]. Thus, big data is considered as the extra ordinary resource which offers unique opportunities for all the peoples. Metadata of the big data also have the capabilities to reveal the sensitive information about people's personal lives, political preferences, religion and their sexual orientation. With the help of metadata we can find the time of access any webpage their IP addresses, location etc... This will make the problem of privacy for the governments collecting data [6]. The gathering and access of metadata will reveal the identity of person, which makes a point of concern to human rights and fundamental freedoms. Both the metadata and big data have the capability to retrieve the sensitive information of individual and have the control to use their information.

Big Data Nature

Big data have velocity and huge volumes; it is very difficult to protect all the data. If we adding security layers to the data than it may slow down performances and affect dynamic analysis of the system. Thus, accessing and controlling the big data are two big security problems [4]. It is difficult to handle data management and classification of big digital sources. Big data needs more security investments. Mostly the big data is stored and transferred among various clouds and distributed

worldwide systems. Sharing of data many networks will increase the risk of security.

Privacy requirements in big data

In the introduction section we have discussed about the 3Vs of big data. These are the challenges which we have to overcome to make big data secure. But now the big data faces a new challenge regarding privacy and security. If the data is not authentic, than the knowledge gets from that data become useless [5]. Now, a new V is addressed i.e. "veracity" to find out the security challenges in big data. The security of big data is now in earlier state so we focus on the privacy of big data in this article and we find some of the privacy requirements on data analytics. In the above paragraph we clear that big data is useful for measuring the economic and social problems, and we already aware that the misuse of this data may generate privacy concerns. Thus the privacy preserving techniques are developed as soon as possible and as deep as possible to balance the uses of big data and the privacy concerns of an individual are also maintained.

Privacy requirements at the time of collection

The big data collection is done universally, so there is a great chance of eavesdropping of the data and the data is incidentally leaked at the time of generation [9]. We all must aware that maximum part of big data is personal, if the collected data is sensitive and personal, than we must restrict the data with some physical protection methods as well as some cyber security techniques are also provided to maintain the integrity of that data before its storage.

Privacy requirements at the time of storage

After implementing the security at the time of collection our next step is to secure storage of the data. The security on the storage time is more essential than the collected time because at the time of collection with the help of eavesdropping the data of one person is hacked or changed but if an attacker attack on the storage than the attacker retrieve the sensitive information of thousand people in a single time once it is successful [9]. Therefore, to maintain the confidentiality of the data we have to apply physical security on the storage and as well as the cyber security.

Privacy requirements at the time of processing

Processing of any data is the key element, in big data the big data processing is the key element. As we know that the big data helps in economic and social growth and technical innovations. The big data mining processing needs some new techniques which can increase the efficiency of the processing. But the problem is that maintaining the privacy and efficiency of processing of data is very challenging. We can not sacrifice the privacy of data for the fast processing of the data. We have to protect individual sensitive information and also ensure the efficiency of data at the same time. Thus, big data sharing becomes the challenge in the field of big data. The only solutions for that are to make advanced algorithms and more focus on privacy preserving techniques [9].

Privacy preserving techniques may be a solution for this problem but with the privacy preserving techniques there is a problem if we increase the privacy of the data than the utility of the data is decreases, means the utilization of data is decreases, and if we can not use the data than it becomes useless to us.

Solutions to Privacy issues of big data:

In the previous section we have seen that there are three phases in which we have to maintain the privacy. First at the time of collection of data we have to maintain the integrity of the data, second is at the time of storage of data because the attacker wants to always attack on the storage of the data, and lastly we have to maintain privacy at the time of processing of the data.

Use of trustworthy source of network:

As we already discus that the big data is generated with the use of electronic devices like mobiles, laptops, etc. and all the data is generated electronically, means all the data is online. So first think you have to take care of that you will connect too trustworthy source of network or not, the use of public networks will increase the risk of the privacy breach of your data.

Data Cryptography:

To maintain the confidentiality of the data at the time of storage, data encryption is a common solution. But the traditional encryption techniques are not applicable to that huge amount of data. So many researchers and scientist are working to making some advanced encryption techniques for big data encryptions.

Homographic cryptography can be used for the encryption of data because it enables even computation on encrypted data. This technique ensures the confidentiality of the data [7].

In homographic cryptography MapReduce is a problem, so to handle this problems a new solution is required [8]. In the distributed environments to ensure the performance of cryptographic solution a new approach is suggested termed as CBHKE (Cloud Background Hierarchical Key Exchange). This solution is more secured than (IKE and CCBKE) [10]. This technique CBHKE is based on an iterative strategy to AKE (Authenticate Key Exchange) by two phases (layer by layer). However, we need new approaches and techniques with enhanced performance to improve the encryption of big data sets on distributed systems.

Data Anonymization of Personal and Sensitive Data:

If the big data contains the personal records and if we want to publish it for any kind of research than we have to maintain the privacy of every individual because no one wants to disclose his or her private or sensitive information. Privacy preserving is a technique by which we display our data in such a way so

that any attacker can not identified a person and its sensitive attribute. It is a recognized technique to protect the privacy of data across the distributed system and clouds. There are so many models which are used under this technique are: K-anonymity, sub-tree data anonymization, l-diversity, m-invariance and t-closeness.

In these techniques sub tree technique is the latest one because it works on two different methods. One is Top-Down Specialization (TDS) and the on=other one is Bottom-Up generalization (BUG) [11]. However these two methods are not sufficient. There is a lack of data utility or performance when we used those in certain anonymization parameter. They are not applicable when we applied anonymization on Big Data.

In order to improve the anonymization techniques, that can work efficiently on big data [11]. A hybrid approach is required, in which we combines the TDS and BUG techniques. This hybrid technique is suitable for use case parameter. Thus with the help of hybrid technique the efficiency, scalability and the performance is enhanced on the huge databases [11]. It is also adopted by new programs to handle MapReduce paradigm.

Currently there are so many programs or algorithms are designed to enhance the performance of the existing privacy preserving techniques to protect the privacy on the large data sets.

CONCLUSION

Big data applications provide many interesting opportunities in many sectors. So the amount of data that is generated is increases day by day. There are many big challenges come in the field of big data at the time of collecting, storing and processing. The biggest challenge is the maintaining the security and privacy of that huge amount of data. In this paper we have mentioned some of the issues which are comes in all the three phases i.e. (collecting, storing, processing). We have also described some basic solutions and recommendation. Because maintaining the security of large databases are next to impossible, so instead of providing security to the data we can protect the data values and their key attributes. Meanwhile if we are capable to preserve the privacy of the data than it is also a big achievement because by doing this the attacker can not misuse the data. This does not mean that there is no need to work on security of the data, we have to generate some algorithms and tools which are capable of providing security of the data as well as the performance of the system is also maintained, because from the existing security tools if we improve the security and privacy of the data the performance of the system is break down and the data utility is also decreases.

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Pedal Powered Water Filtration System

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Abstract: **This paper focuses on the look of a pedal powered water apparatus which might be utilized in rural areas for the filtration of water at tiny scale. It works on the principle of alternate compression and relaxation of tube resulting in negative pressure in the tube and creating a seal between suction and discharge side of the pump. Upon restitution of the tube a powerful vacuum is created drawing water into the pump and also the roller passes on the length of the tube entirely press it and pushing the water through the filter wherever sorption takes place to purify the water. Thus, making water purified without the help of the electricity. The proposed design consist of a peristaltic pump powered by pedaling, a filter and a flexible tube. This setup is optimized in such a way that it is user friendly and produce no pollution. Additionally reduces the general price employed in transporting and sanitizing drinkable water.**

Keywords—RO, PVC, TDS etc.

INTRODUCTION

Various statistics show that there area unit several villages in Asian country that don't have the power of unpolluted and safe water which is as a result of they lack correct supply for the aim of filtered water and one major source is electricity. Water can contain many impurities, chemicals and various bacteria's. Such contaminants will cause serious health problems and so is completely unsafe for drinking people have to be compelled to walk miles simply to achieve a supply of water which is not essentially portable.

Thus, the pedal powered water apparatus could be a good step towards serving to people to induce pure water while not abundant source. The pedal powered filter works principally on energy so scaling down the necessity of electricity for the method of water filtration that build it additional helpful for the areas where electricity is still a major issue. Pedaling is free from pollution, therefore it's Associate in nursing eco-friendly system and at the side of that it conjointly offer healthy exercise. The most objective of this water apparatus is to supply clean water by the suggests that of changing the pedal energy into helpful energy which may be used to purify water. It primarily consists of a positive displacement pump (peristaltic pump).A peristaltic pump could be a sort of positive displacement pump used for pumping a range of fluids. This peristaltic pump is positioned in such the simplest way that the shaft of the pump will be driven with the assistance of pedals, therefore utilizing pedal energy. It can be used not only to purify water but also for irrigation purposes & always possess a positive impact on health. The Reverse osmosis filter is used which purifies the water to a greater extent & further more filters which help purify it more. Further filters include sediment filter & activated carbon filter. The experimental investigation can be carried out at different rpm which can be helpful in determining the adequate flow rate required & therefore, the amount of power required. Thus, manual power can be harnessed to purify water & make it suitable for drinking purpose.

LITERATURE SURVEY

Literature survey is usually based on what earlier progress has been done on this system and by closely studying it, whatfurther modification can be done to improve the output.

Vishal Garg et. al (2013) worked on to reduce the effect of water pump by using belt drives in bicycle. Belt drive is better way for transmission of power from pedal to the shaft of centrifugal pump.

Dhruv Duggal et al., (2014) worked on the enhancement of "Bicycle operated pump filter". Their main objective was to pump the water with the help of centrifugal pump for the purpose of irrigation. By pedaling the bicycle at particular rpm water can be lifted to a certain height, thus can also be used at places where water is present at lower ground levels. Physical parameters were determined using various calculations.

Sanjay N. Havaldar et. al (2016) prepared the design of pump filter by taking mathematic modeling into consideration. They emphasized on the selection of materials based on the dependent variables like flow rate, speed and

power. Frictional head loss was included to find out the nature of flow, turbulent or laminar. Forces were resolved to calculate the exact power required to overcome the friction. Designing by such parameters gave the delivery by pump and thus an estimate time to filter the water.

Pratik S. Nagrare et. al (2017) created the design of a filter operated by pedaling the pedals attached on a frame by using the principle of Bernoulli. The design was optimized such that it's a stable frame rather than a bicycle so that there would be no mechanical disturbances during the filtration process.

WORKING PRINCIPLE

In Pedal power-driven water apparatus, mechanical power is transmitted to the shaft, and also the shaft is connected to pump that is mounted on bicycle. Therefore the ability is transmitted to the peristaltic pump. The attachment of the peristaltic pump helps to form the specified quantity of pressure, additionally referred to as pressure, by reducing pressure on the other aspect. This pressure helps water to move forward & go through the semi permeable membrane. The smaller impurities that can't be separated via sedimentation filter within the tank itself, are going to be separated with the assistance of this membrane. Further, the water goes to sediment filter that will increase it purity level additional. The remaining impurities may be removed with the assistance of carbon filter. Carbon filtering is a method of filtering that uses a bed of activated carbon to remove contaminants and impurities, using chemical adsorption. Sedimentation & normal filtration are important processes required before reverse osmosis purification as they remove comparatively larger particles which can damage the semi permeable membrane. The smaller & lesser the amount of impurity interacting with RO membrane, the longer is the life of the membrane which increase the efficiency, effectiveness & life of the system. After passing through all the filters, pure water is hold on for drinking in another instrumentation, which might be used for drinking purpose. Or, if we have a tendency to take away filter assembly, this method also can be used for irrigation purpose.. Water stored in containers can be pressurized with the help of pump attached to the sprocket & directly being able to be watered in field as enough pressure has been generated with the help of pump. Thus, this model of water setup will facilitate to resolve the drinking downside within the rural areas that are still lacking the right electricity offer.

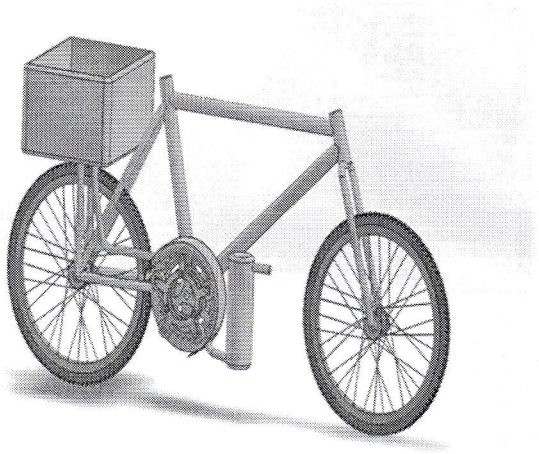
FILTER

A. **Activated carbon filter:** It uses the phenomena of adsorption. The water flowing through it contains impurities which are harmful for us. The impurities in the low pressure water are adsorbed on the surface of the activated carbon. The large extent provided by the every particle activated charcoal additionally removes smells in water and makes cloudy water clear by removing color inflicting compounds within the water. While going through the activated carbon filter, each water molecule gets sufficient space for adsorption. Pedal powered water filtration system lowers down the turbidity & the TDS value under the acceptable range. Equations

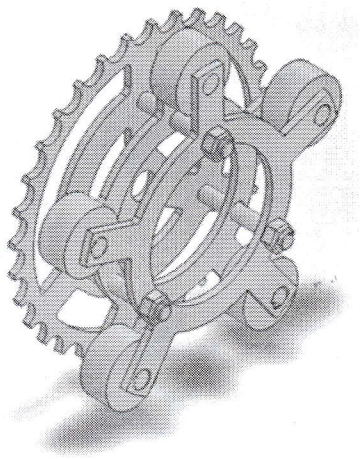
B. **Sedimentation Filter: :** It is used to reduce the turbidity of the water. Is consists of suspended solids, such as silts, sand or clay. All the insoluble impurities get separated by this filter. The word "data" is plural, not singular.

DESIGN & COMPONENTS

This is the main assembly in which the whole procedure is carried out that is collection of dirty water unsafe for drinking in the chamber provided, flow of the water to the peristaltic pump, filtration of water and finally collection of safe drinking water in another chamber provided.



The attachment designed is in such a way that it works as peristaltic pump thus creating a negative pressure in the tubes so that water can flow through the filters to the chamber where the cleaned water is stored.



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PARTS	MATERIAL	DIMENSIONS	QTY.	COST OF MATERIAL
Bins	Plastic	(400x300x300) mm	2	200/-
Tubing	PVC tube	Length – 3m 0.5 inch or 12.5mm Bore size - 3	1	450/-
Frame	Cast Iron	(2x2)ft	1	300/-
Attach ment	Steel	(230x4 5)mm	1	300/-
Filter	Ultrathin polyamide carbon filter	--	1	1000/-

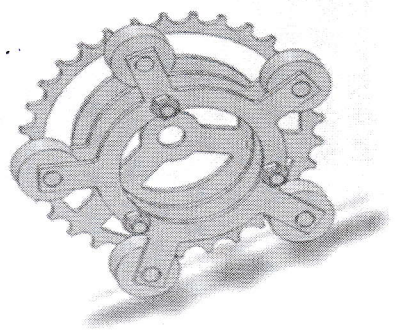
MATERIAL SELECTION

1. PLASTIC BINS: Bins are to be used to store the waste and clean water respectively. Plastic bins are considered best because of their light weight. Hardened plastic is used so that it could resists any jerks.

2. TUBE: Tube are the essential part of the assembly as it acts as a medium to carry the water. The dirty water in the bin flows through the tubes to the peristaltic pump which further creates pressure in the tube by squeezing it and forcing the water to flow through the tubes to the filter and then to the bin where clean water is stored. PVC tube is used for the purpose because it is abrasion and crush resistant.

3. FRAME: A frame acts as the rigid body which holds the whole assembly. Therefore, it should have a high strength and should be able to withstand the impact of pedaling. Also the frame provides the user a sitting arrangement.

4. PERISTALTIC PUMP ATTACHMENT: This attachment is fixed with the pedal shaft and has a circular body. It contains five rollers which will rotate inside the circular body of the attachment, therefore steel is chosen for this purpose.



1. *FILTER:* For proper filtration of the water and keeping the pressure created in the pump in mind ultrathin polyamide filter is used which sediments out the impurities and pass it through a membrane to pass pure water.

Estimated Material cost:

LABOUR COST (cost including welding of frame and attachment and tightening through nuts & bolts)
= 1600/-

TOTAL COST = Material Cost + Labour Cost

= 2250/- + **1600/- = 3850/-**

ANALYSIS:

Part	Approximate Dimension
Width of frame	2 feet
Height of frame	2 feet
Diameter of tube at inlet	12.5 mm
Diameter of tube at outlet	12.5 mm
Length of tube required	2800 mm
Area of cross section of tube	490.6 mm^2
Diameter of the impeller	230 mm
Diameter of the rollers of the attachment	45mm

Dimensions of bin:

Part	Dimensions
Length	400 mm
Breadth	300 mm
Height	300 mm
Draft Angle	7°

$Q_a = C_d \times Q_t$

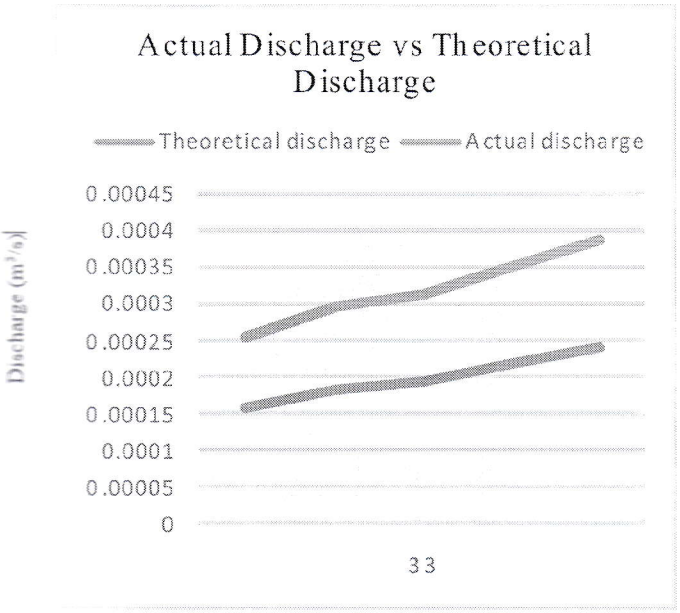
Where, Q_a= Actual Discharge, Q_t = theoretical discharge, C_d= Coefficient of discharge

Velocity of flow = $\frac{\pi DN}{60}$ m/s

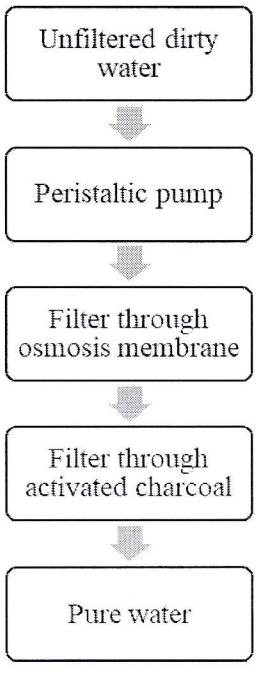
Where D = diameter of the impeller, N = speed of the impeller

In general, coefficient of discharge is taken as 0.62

Speed of impeller(RPM)	Actual discharge	Theoretical discharge	Velocity at outlet (m/s)
27	0.000097	0.000157	0.325
31	0.000113	0.000183	0.373
33	0.000120	0.000194	0.397
37	0.000135	0.000218	0.445
41	0.000149	0.000241	0.493



PROCESS FLOW CHART:



RESULTS AND DISCUSSION

The whole research sums up that the pedal powered water filtration system proofs to be very advantageous to be used mainly in rural areas. Creating an efficient filtration process to purify water without the use of external electricity. The TDS value as measured earlier before filtration was improved after filtration and lies in the range acceptable for drinking purpose. The pH level considerably improves, being checked after filtration .And the visible symptoms such as colour and odour of the water improves.

Its purifying capacity is maximum and generally takes 15-20 minutes of pedaling time to purify the water stored in the bin. Lifetime of the filter is vast but for suitable working, membrane should be changed within 20 days depending on the quality of unfiltered water.

TDS LEVEL before filtration - 1000
TDS LEVEL after filtration – 400
pH level before filtration – 8.5
pH level after filtration – 7.1

Rural areas can have the facility of getting filtered water by the pedal powered system at a minimal cost which can be afforded even by low classes. Problem of lack of electricity and money is overcome by the system.

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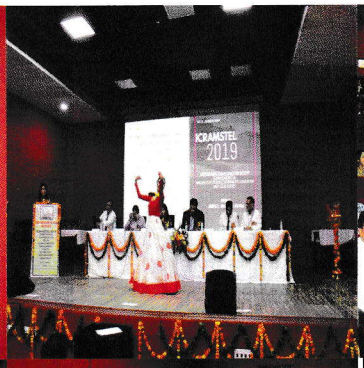
NOTES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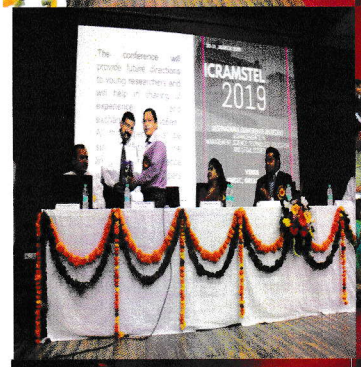
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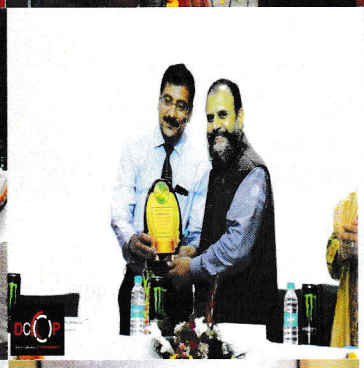

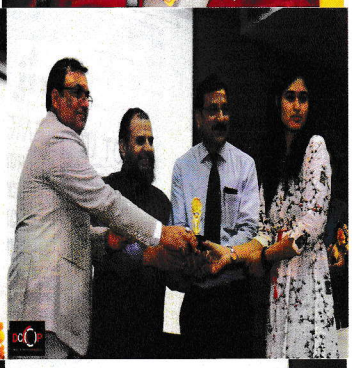

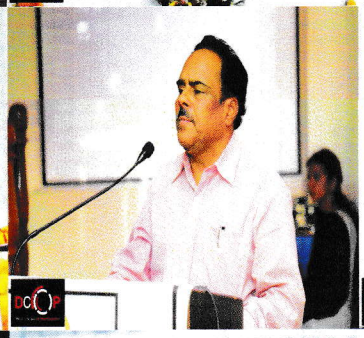



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