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Research Papers

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A STUDY OF EMPLOYEES UNDERSTANDING REGARDING HRD IN INDUSTRIES

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ABSTRACT
HR Developmenthas been produced with regards to mechanical change and monetary advancement. Representatives in the associations would be stood up to with the need to reorient culture, considering and ideal models. HRD as a capacity and as a prime mover would need to center around this changing and developing part. There are not very many confirmations where esteems or hierarchical culture is straightforwardly connected to HR Development practices of the association. This examination endeavors to inspect the comprehension of HRD hones on mechanical culture of some driving private and open area enterprises in India. The investigation uncovered that the human asset advancement practices are a solid indicator of authoritative culture both in private area and open segment associations in India. There is adequate exhibit of significant connection between HRD practices and association culture.

Keywords: HR development, Industries, Employees perception, Awareness

INTRODUCTION
Human Resource Development (HRD) considered official, for instance, in classroom setting up, a school course, or a legitimate masterminded change effort. Or then again, Human Resource Development (HRD) can be easygoing as in specialist preparing by an executive. Sound affiliations place stock in Human Resource Development (HRD) and think about each possibility. Human Resource Development (HRD) is a system of making capacities, abilities, data and manners of people in an affiliation. The overall public wind up human resource exactly when they can perform legitimate activities. In like manner, Human Resource Development (HRD) ensures that the affiliation has such apt human advantage for achieve it's pined for goals and goals. Human Resource Development (HRD) gives the required learning and fitness in them through effective game-plan of planning and headway programs. Human Resource Development (HRD) is an essential bit of Human Resource Management (HRM) which is more stressed over getting ready and progression, employment masterminding and change and the affiliation headway. The affiliation needs to fathom the stream of HR and attempt to adjust to changing condition to send its HR satisfactorily and adequately. In addition, Human Resource Development (HRD) accomplishes this goal.

REVIEW OF LITERATURE
Larry's (1975) paper talks about that execution evaluation can fill in as a reason for compensation, progression choices, profession advancement and execution change. Three criteria for execution examination can be eminent: 1.The characteristic approach, 2.The set of working responsibilities approach and the goals approach-the most particular of the three methodologies. Customarily, administrators play out the examination obligations, peer assessments, representative advancements of chiefs or developments by destinations are accessible choices.

Arahunasi U.H (1992) expressed that ideal mentality of the workers towards the examination framework ought to be made, the execution examination (E.E.) framework ought to be dealt with as 'critical thinking' framework, each advancement ought to be made simply on execution premise, association must get the participative method of representatives the EE. Framework, preparing to evaluator and evaluate ought to be given about the EE. framework, appropriate input framework should be introduced for the workers, and great execution ought to be connected with unique augmentation, advancement and prizes.

Spree D. (1994) investigated that legitimate work force administration could be accomplished through assessment of exhibitions of library staff. Through assessment their aptitudes are displayed, positive and negative variables are watched and restorative measures could be presented on consistent premise.

Tripathi (1997) in his book specify that execution examination causes the administration to comprehend where their kin stand, what is being normal from them and what they are extremely contributing. Execution evaluation is considered as most urgent instrument of HRD; under this framework the execution of a representative is intermittently assessed in the light of the troubles look by the workers, alongside the acknowledgment of their development needs.

Stueart and Moran (2002) Conclude that no matter which method is utilized for performance appraisal, it should be important to remind that the content of performance appraisals should be kept confidential as the appraisals

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are very personal and only made accessible to those who have a legitimate reason, for example, the human resource department of an institution. The process is supposed to be a confidential so good documentation is needed to avoid any misunderstandings.However the feedback should be given to the individuals so that one can improve their weaknesses and thus become more motivated.

RATIONALE

HR Development is a procedure through which employees in an association are helped to understand their maximum capacity for their present and future employments. It includes long haul point of view which imagines change through association and responsibility for change by the members. HRD trusts that person in an association have boundless potential for development and advancement and that their potential can be worked through suitable and precise endeavors. Therefore this study helped in understanding the concept of HRD related to employees perception.

OBJECTIVES

- To analysis the employees' understanding of HRD and its benefits to industry and themselves.
- To understand the HRD as presented on the industry environment as per the employee's Perception.
- To study the factor affecting the HRD quality and employeesawareness outcomes.

RESEARCH METHODOLOGY

1. Research study: - The research study focuses the employees of Industries.
2. Data Collection: - Data were gathered from primary source by means of survey using structured questionnaires and random sample basis in India and from secondary published sources.
3. Sample Size: - Sample size was 800 customers; the primary data was collected.
4. Data Analysis: - Analysis had done by using meanvalue.

DATA ANALYSIS AND INTERPRETATION

1. Understanding of HRD Practices

HRD building in the Industries has changed with the globalization of organization or education. Aviation, Banking and Telecom industries are facing lot of challenges to process, manage and communicate knowledge about HRD in the dynamic industrial environment. The essential challenge related to development of these industries has to understand the process by which new HRD practices created. Effective knowledge creation depends upon the understanding of HRD by the employees and organization. Hence, there arises a need to integration between the HRD initiatives and vision along with mission of the industries. Effective sharing of HRD practices requires collaboration to enhance organizational learning in industries.

Responses of employees related to their understanding towards the HRD Practices by the Industries

Table No-1: Mean Values of Responses for understanding of employees towards HRD

Statement	Mean Value	Code in Chart 1
Awareness for the concept of HRD	4.3725	1
Organization establish specific department for employee welfare	4.2	2
Every employee gets benefit from that welfare department.	1.4375	3
Asked questions with welfare committee or contributed in discussions.	4.1715	4
Worked with other employees on during running welfare projects	3.6275	5
Awareness for different HRD practices	4.1	6
Managers provide information regarding employee welfare	1.8475	7
Discussed about career plans with a managers or advisors.	4.225	8
Discussed ideas and queries from counselors	3.3225	9
Worked with managers for activities other than work(committees, orientation, employee life activities)	3.905	10

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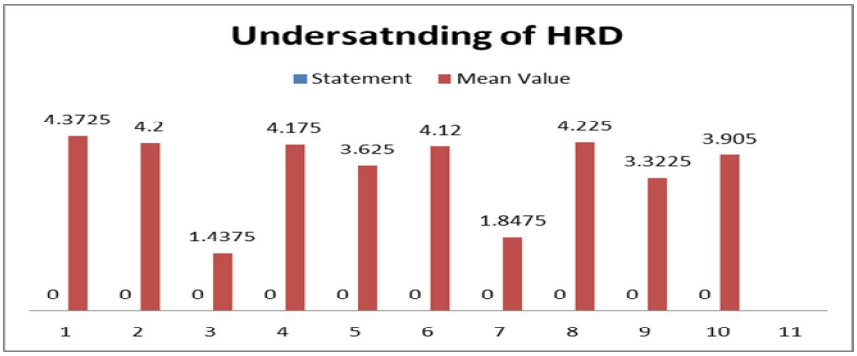

Chart No-1: Mean Value of Understanding HRD

From the above chart, it is revealed that most of the respondents are encourage by their industry to provide facility among employees from different economic, social, and racial or ethnic backgrounds and have done or do their plan for (field experience, internship, community service or volunteer work) from their industry. But it noticed that managers not providing proper information regarding development which provided by the industry to the employees.

2. Employees perception for HRD Environment

Responses of Employees' Perception on the HRD Environment

Table No-2: Mean Values of employees' Perception on the HRD Environment

Statement	Mean Value	Code in Chart 2
Simplicity and convenience.	4.2	1
Training and Learning instruction.	4.2	2
The clarity of HRD information.	3.5	3
Instruction, description, and example during training.	4	4
The clarity of learning activity process.	4.3	5
The clarity of industry objectives.	4.2	6
Benefits of HRD activities for self-learners.	4.3	7
If you could start over again, would you go to the same industry you are now working.	3.5	8
The related environment on employee support resources.	4.1	9
User account access system to log in to understand the provided information and knowledge of other departments.	4.3	10

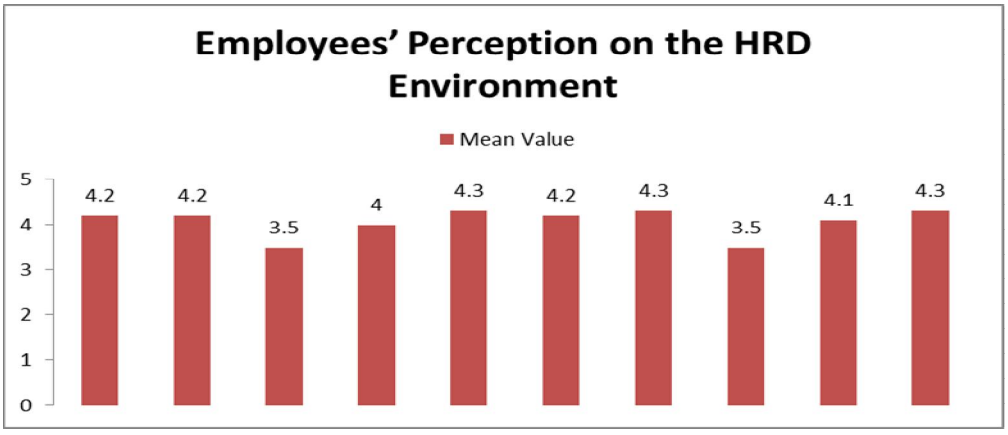

Chart No-2: Mean value for Employees' perception for HRD environment

From the above chart, it is revealed that most of the respondents are easily access their login account and motivated. Even though they improve their knowledge about company by operating new technology. They also get benefited by HRD activities through self- learning and also have clarity regarding learning process.

3. Factor affecting the HRD quality and Employees outcomes

HRD practices plan to build understood knowledge a lot of explicit for employee's development and welfare through the developmentdepartment. This can be one amongst the only most significant factors that have an effect on the transformation from educators' knowledge into learners' knowledge. The HRD system would conjointly obtain to form quality welfare scheme through the HRD practices to make employeesatisfaction.

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Responses of Student's towards the Factor affecting the HRD Quality and Employees Outcomes

Table No-3: Mean Values of Factor affecting the HRD Quality and Employee Outcomes

Statement	Mean Value	Code in Chart 3
The up to date of information	4.25	1
The clarity and reliability of the information	3.32	2
Accessibility of information	4.86	3
Simplicity of the information	4.27	4
Satisfaction on technological basis	4.17	5
Convenience of information using	4.15	6
Rapidity of using technique.	4.31	7
Accuracy of the system	1.55	8
Greater representative maintenance and responsibility.	4.1	9
Team advancement and inter term joint effort	4.3	10

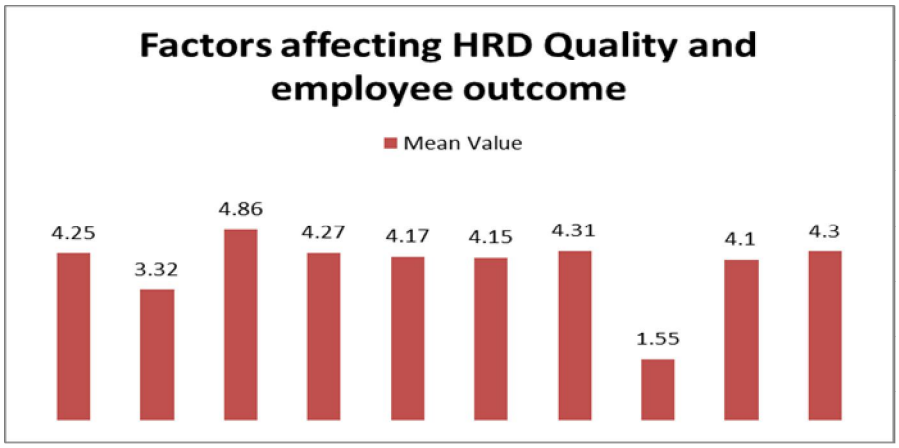

Chart No-3: Mean value for Factors affecting HRD quality and employee outcomes

From the above chart, it is revealed that most of the respondents are rapidly using technique, accessibility and simplicity of information and respondents updated regarding all the information.

FINDINGS AND DISCUSSIONS

1. To analysis the employees' understanding of HRD and its benefits to industry and themselves

Most of the respondents understand the term HRD and how it is applied in the industries in various ways. The perception of the employees regarding better working condition in industry unit, they had to get the deep understanding of the concerned department. Most of the respondents feel that their industries contributed to their knowledge, skills, and personal development. They feel so because the management and managers helped them at every level of their queries. The HRD practices facilities provided by industry or the managers helped them to understand the welfare concept better and this could motivate them to use their knowledge and work properly. Most of them are discussed ideas in industry and with workers, etc.) therefore, considered it as a big pathway of HRD.

Most of the respondents reveal that the examples and illustration given by their managers help them to grasp things better and understand it deeply. Their industries also emphasized the employees to spend significant amounts of time while working.This helps the employees to learn the work for long term and can apply it in their future. In most of the employees' reveals that HRD based on society and employee welfare, this shows that the management of industries in Aviation, Banking and telecom are utilizing the HRD department in their industrial work for practical learning.

Most of the respondents are working on a project that required integrating ideas or information from various source and it helps them to train employees for various things academically and practically respectively. Most of the respondents are happy with the industrial efforts in their personality development and career development and employee development with welfare schemes, which at the end help them to get better working environment.

They generally discussed about their career plans with a counselors or advisors provided by their industries. It helps them to move right direction in their career. Worked with colleagues to prepare assignments are daily routine of most of the respondents and it gives them the opportunity to share their view among themselves.

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It is also revealed that most of the respondents are encourage by their industry to provide facility among employees from different economic, social, and racial or ethnic backgrounds and have done or do their plan for (field experience, internship, community service or volunteer work) from their industry. But it noticed that managers not providing proper information regarding development which provided by the industry to the employees.

2. To understand the HRD as presented on the industry environment as per the employee's Perception

Most of the respondents are using the HRD resources in their industry and well aquatint with system. They are highly satisfied with the information manual of the industry; it provides all necessary external and internal information related to HRD practices. They are also highly satisfied with the External links to supported documents, which are provided by their respected trainers and it help them to enhance their knowledge. They also highly satisfied with the user account access system to log in to provided information in the web page, most of the industry has provide their employeesoutlook, where each managers and employee login is there. In outlookemployees records like attendance, assignment, presentation, work etc. have been maintained. This record can be seen any time by any of the user at their place and can monitor their performance.

Today most of the management of industries are themselves doing the development process and provide orientation with the help of their trainers to the employees. Private and public sector industrieshas added training and orientation program for employees and the most of the respondents are highly satisfied with the training and induction programs, the related context on support learning resources. With help of these facilities the management has find it more simple and convenient training and Learning instruction. They are also highly satisfied with the access account on internet by industry.

Most of the respondents seems to be highly satisfied with the clarity of industrial objectives, training activity process, suitability of the quantity, frequency, and length of time, appropriation for self-learning of the pre-post evaluation, clarity of the process of training activity determination, context appropriation for self-learner, Benefits of learning activities for self-learners, Participation between the employees and trainers on the training activities, Instruction, description, and example in the lessons. Overall they are highly satisfied with HRD environment provided by their industry and they revealed that they are highly benefited by using this application and it improves their learning outcomes.

More important is that when they are asked if you could start over again, would you go to the same industry you are now working and they response it positively it means they are satisfied with the HRD environment provided by their respective industry.

3. To study the factor affecting the HRD quality and employees awareness outcomes

From the above chart it is revealed that the important factor which affect the HRD quality and employees outcomes are accessibility of information which implies that the system should be user friendly and can easily access by the employees. Most of the respondents find rapidity of using technique is also plays a major role in the HRD quality as they are of opinion that technology have gave them practical exposure as per the nature of their work, which help them to find better training and development opportunities in future.

They find the rapidity of using,comprehension of system, benefits of the information in operation, simplicity of the information, Satisfaction on system overview, up to date of information,User's demand response of the information, managers interaction,Convenience of information using are also the very important factors which have an impact on the HRD quality and their outcomes.

The important factors as per the perception of the management and employees are technological system, Categorization of the information, rapidity of the using of technique, systematic and ordering information presentation and clarity and reliability of the information.

CONCLUSION

The present investigation was meant to examinations a portion of these HRDevelopment practices to discover which ones can help industries to battle the future difficulties based on the HRD practices factors. It has been watched that HR Development practices are given due thought in industries understudy as their mean scores were seen to be better than expected. This is a sound sign of the common HRDevelopment Practices which got a decent reaction from the respondents. In the event that these practices are preceded and improved in incline with the changing worldwide condition, some better outcomes could be unmistakably found in the business. In any case, there have been some basic zones of perception, which are a piece of HR Development Practices and are critical from HR Development point of view.

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GRAPHENE BASED ELECTRODE MATERIALS FOR SUPERCAPACITOR APPLICATIONS

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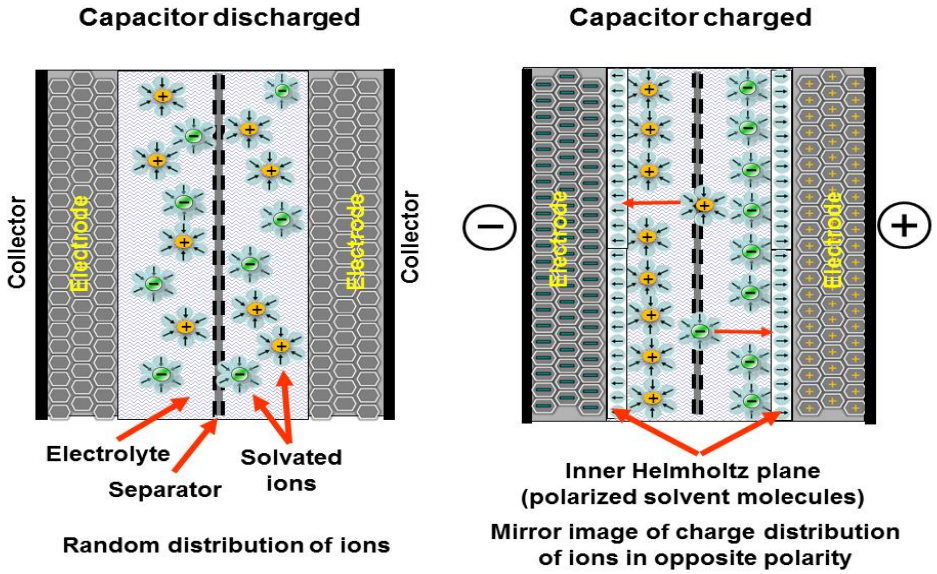
ABSTRACT
Graphene materials have gained importance in the construction of electrodes for supercapacitor applications due to their flexibility, tunable surface area, outstanding electrical conductance, chemical stability, excellent mechanical behaviour. Graphene possesses macro-structural complexicity of zero dimensional to three dimensions, which results in the form of graphene dots, particles, fibers, yarns, graphene layers, nanocomposites, foams and hydrogels. Extensive research is underway focussing on the modification of their structures at different dimensions. The emphasis is on developing of effective and low cost synthesis techniques and structural designing to gain good electrochemical performances. In this chapter, an effort is made to briefly compare and discuss the progress incurred with respect to graphene electrode materials for supercapacitor applications. Hope this Chapter can help the readers to understand supercapacitors and various methods of synthesis, to overcome the drawbacks so as to improve the material in design and device engineering in better manner.

Keywords: Graphene, supercapacitors, device engineering, metal oxides, electrochemical performance

1. INTRODUCTION
Nowadays there is enormous energy demand worldwide, which is mainly met by non renewable and non-ecofriendly fossil fuels. At the same time, the feeling of continuous depletion of fossil resources encouraging the researchers for developing new technologies. One has to either use the existing resources economically or go for finding higher efficacy. Recreation of clean and renewable energy sources and carriers including hydrogen storage, lithium batteries and supercapacitors are the key solution to replace conventional energy platform.

The above-mentioned unique characters and environment friendly nature made supercapacitors as alternative energy storage devices [1-3]. Exactly how these devices are working is originated from the capacitance in the form of electrical double layer storing charge at the surface. Based on energy storage mechanism, supercapacitors are classified as electric double layer capacitors (EDLCs) and pseudocapacitors [4]. In case of EDLCs, the capacitance is due to storage of charge at electrode-electrolyte interfaces. To achieve a high storage capacity, controlling specific surface area, pore size and enhancing conductivity are the best possible ways in EDLCs [5]. For pseudocapacitors, high energy storage capacity can be achieved by transferring the Faradic charges between electrode and electrolyte by reversible redox reaction. Figure1. schematically represents the supercapacitor types: (a) EDLC type; (b) pseudocapacitor type.



(a)

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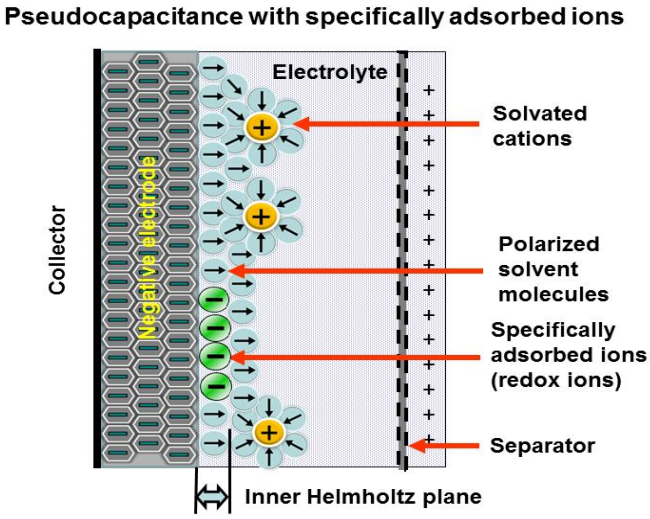

(b)

Fig-1: Schematic representation of supercapacitor types: (a) EDLC type; (b) pseudocapacitortype [source: En.wikipedia.org.wiki/supercapacitors].

1.1 Market aspects

Currently the market for supercapacitors may be limited but it will reach more than 40 billion dollars. Concomitantly, the cost per Farad for the capacitors is decreasing. The market forecast (2015-2020) regarding supercapacitors is shown below (Fig.2).

Fig-2: Supercapacitor market forecast (source Industry ARC Analysis and Expert insights, http://www.goggle.co.in/url)

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1.2 Parameters in supercapacitors

With regard to supercapacitors, two characters are very important which include their specific energy and power in addition to charge-discharge cycles, shelf life, as well as columbic efficiencies. The columbic efficiency (η) is used to check the stability by comparing the charging cycles and can be calculated using the below mentioned equation [6]:

$$\eta = \frac{t_D}{t_C} \text{ x } 100\% \qquad \text{Eq.(1)}$$

Where t_D and t_C are the discharge and charge times in seconds respectively. Moreover, energy and power densities are the two essential parameters to decide the electrochemical performances of electrode materials and the resultant cells. These can be obtained using the following equations [7,8]:

$$E = \frac{1}{2} C_S \left(\Delta V\right)^2$$

Eq.(2)

$$P = \frac{E}{t_D}$$

Eq.(3)

where *CS* and ΔV are specific capacitance in F g^{-1} and cell voltage in volts. For single electrode following relationship was used. [6]:

$$C_S = \frac{I}{(dV/dt)w} \qquad \text{Eq.(4)}$$

where *w* is the mass of cell, *I* is current in ampere and *dV/dt* is the voltage scanning rate of CV or the average voltage-shifting rate from the CP curves. Literature survey [9, 10] revealed that the commercially available products so far prefer organic electrolytes to obtain a wide range of voltage. Here, the emphasis was given to materials and manufacturing costs neglecting the flammability of the organic electrolytes [11, 12].

1.3 Materials for supercapacitors

Depending on the energy storage requirement and the magnitude of capacitance range, several materials have been used to construct supercapacitors. The most abundantly used material which caught wide market is carbon. It has more flexibility to be converted into different forms. The following Table lists selective materials used for the production of various types of supercapacitors.

Electric double layer supercapacitors	• Carbon aerogels • Activated carbon • Carbon fibers • Carbon nanotubes
Pseudo capacitors	• Metal oxides • Conducting polymers
Hybrid capacitors	• Carbon materials with conducting polymers • Carbon materials with metal oxides

Graphene, an allotrope of carbon has two-dimensional structure. The arrangement of carbon is in a single layer, with sp^2 hybridization creating a honeycomb structure. It should be of one atom thick in single layer. Other allotropes of graphene are graphite, charcoal, carbon nanotubes and fullerenes. In the present scenario, graphene is the most potential material in various research fields owing to many extraordinary properties. Being stronger than steel, it has theoretical specific surface area of about 2630 m^2/g along with a large nonlinear diamagnetism [13].

The graphene atomic structure examined by scanning probe electron microscopy (SEM), transmission electron microscopy (TEM) is shown in Fig. 3. The figure demonstrates "rippling" of the flat sheet, with one nanometer amplitude which is intrinsic because of instability of two-dimensional crystals [14-16]. Atomic resolution real-space images of isolated, single-layer graphene on SiO_2 substrates are also available in literature [16]. The stable structure of Graphene is mainly because of closely packed carbon atoms and s, p_x and p_y orbitals

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combination resulting into creation of σ-bond. The electron present in p_z orbital is responsible for π-bond, hybridize together to form the π- and π∗-bands resulting most of extra ordinary electronic properties [17, 18]. TEM studies showed faceting at defects in flat sheets and suggested the role for two-dimensional crystallization from a melt [19,20].

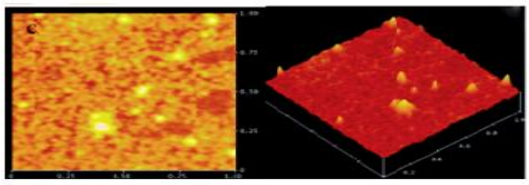

Fig-3: TEM and AFM Images of graphene (Source http://www.goggle.co.in/url)

These materials find applications as high performance structural nanocomposites because of light weight, high electrical and thermal conductivity, tunable surface area up to 2675m^2/g, strong mechanical strength, mechanical stability [21-23] in electronics, environmental protection, energy devices including both energy generation and energy storage systems [24-28]. Not only this, the above mentioned outstanding properties made graphene and graphene based materials more attractive for electrochemical energy storage and energy generation devices, few are mentioned here as fuel cells, supercapacitors, photovoltaic cells, solar cells as well as Li-ion batteries [1].

1.4 Methods for graphene production

1.4.1 Liquid phase and thermal exfoliation [29]

One of the well-known methods of synthesizing graphene is liquid phase and thermal exfoliation. This method is useful for synthesis of graphene in large quantity. In this method, graphite is converted into graphene flakes. Since the flakes are obtained in the form of multilayer, it is not possible to restrict the number of layers formed. This process introduces impurities into the graphene. Getting smaller platelets of graphene becomes easier when graphite is replaced by carbon nanotubes.

1.4.2 Synthesis on silicon carbide [30]

By sublimating Si atoms and allowing the other face of silicon carbide to be a thin surface, graphene layers can be produced. In this method, the number of graphene layers can be controlled so as to get superb properties versus its area. The drawback is the high cost of silicon carbide and enhanced temperatures to bring the phase conversion. Due to these factors, production is limited and it has not gained the popularity so far.

1.4.3 Chemical vapor deposition (CVD) [31]

Presently, CVD is gaining much popularity as a suitable method for the judicious production of graphene on pilot scale. In this process, a copper foil is used onto which gaseous carbon atoms are deposited. The deposited films are then transferred to a substrate, such as silicon. The method can be optimized to get defect free films. The quality of CVD graphene is suitable for use in flexible/transparent electronics, gas barriers, and anti-corrosion coatings including mechanically exfoliated platelets. Figure 4 gives an idea about different types of graphene, their quality and price in the market respectively.

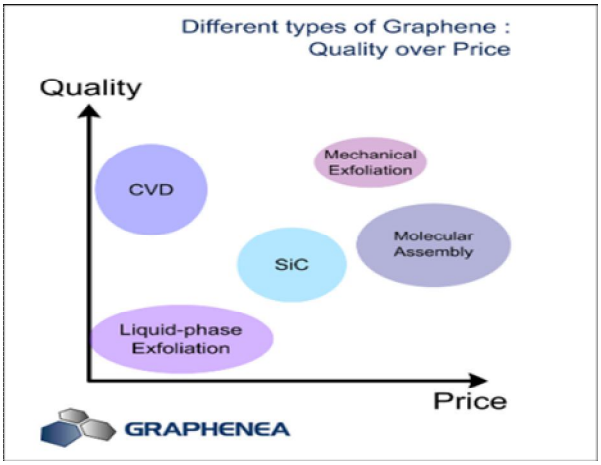

Fig-4: Quality vs price for different types of graphene(Source http://www.goggle.co.in/url)

Thin sheets are most suitable for energy storage devices applications. Graphene has been synthesized in the form of thin sheets by epitaxial growth and chemical vapour deposition over silicon carbide-metal surfaces [32, 33].

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1.5 Porosity of carbon nano-structured materials for electrodes

A prime factor to prove the electrode material as an excellent material is its pore size. Along with this, the material must have good fabrication quality and high electrical conductivity. Designing of devices with appropriate electron conductive strategy is also plays vital role. High conductivity plays a role in distribution and collection of electron current. In nano-structured carbon based materials, the electron transfer sites arose because of defect intensity, chirality and functional groups present on the surface. Impurities in metals can influence the kinetics of electron transfer in a complicated manner. A macrocrystalline phase with adequate d-spacing may have high charge accumulation abilities.

Graphene in the forms of free standing particles or dots, fibers (1D), films (2D) and foams as well as composites (3D) is available. Because of macro-structural complexity, these materials have been used as electrode material for energy storage devices. In this chapter, recent developments in the preparation methods, structures and their electrochemical behavior mainly in supercapacitor applications and effective methods to achieve high energy storage performance are discussed.

2. ELECTROCHEMICAL AND CAPACITIVE PROPERTIES

Zhang et al. [34] synthesized a new graphene-based electrode material for energy storage device applications. The electrode material was fabricated by anchoring carbon dots (CDs) on reduced graphene oxide (rGO). The electrochemical performance was studied by charge-discharge measurements using cyclic voltammetry and electrochemical impedance spectroscopy. The capacitance of rGO was improved by using an appropriate amount of CDs to the material. The CD/rGO electrode exhibited a good reversibility, excellent rate capability, fast charge transfer, and high specific capacitance. Based on the performances, the prepared composites were recommended as effective material for supercapacitor applications.

Using Hummer's modified method, Lu et al. [35] prepared graphene-based supercapacitors. These electrodes showed high stability and improved EDLC as well as energy density with fast life cycles due to enhanced ionic electrolyte accessibility in deeper regions. The capacitance and energy density values as 195 Fg^{-1} and 83.4 $Whkg^{-1}$ respectively achieved at a current density of about 2.5 Ag^{-1}, suggested stable and useful performances for fast charging-discharging applications. According to the authors, excellent results were mainly due to the porosity of wrinkled graphene. It was also observed that the retention of the capacitance was stable even after several cycles. The accessibility for ion diffusion and high conduction were increased because of the porous nature and highly reduced graphene.

Recently, Haung et al. [36] reported the uses of graphene dots as electrolyte material for solid supercapacitors. The authors proposed that graphene quantum dots (GQDs) with enough reactive groups such as -COOH and -OH served as electrolytes. GQDs were prepared through chemical oxidation of graphite oxide and GNSs which are exemplified electrode materials here were prepared through thermal expansion of graphite oxide powder. The improved ionic conductivity and ion-donating ability of the GQDs was achieved simply by neutralizing their acidic functional groups by KOH. As a result the capacitive performance and rate capability of the supercapacitors were greatly enhanced.

One more new step with respect to carbon quantum dots was the arrangement of carbon quantum dots into a layered carbon structure in order to obtain high density supercapacitor electrodes. Zhu et al. [37] have reported the self-arrangement of CQDs to form a layered structure at ice crystals-water interface with freeze- drying. When these layers interconnected each other, a free-standing CQDs assembly generated. Such CQDs, with proper package forms high density electrodes after annealation. These electrodes were demonstrated high volumetric and areal capacitance in aqueous electrolyte with a good rate capability.

3. FUNCTIONALIZED GRAPHENE-BASED NANOCOMPOSITES

A step ahead, Ramaprabhu et al. [38] synthesized graphene via hydrogen-induced exfoliation and further functionalized it with various metal oxide nanoparticles and polyaniline (PANI). Electrochemical performances of prepared graphene (HEG), metal oxide functionalized graphene and PANI-*f*-HEG nanocomposites were examined. A maximum specific capacitance 375 Fg^{-1} for PANI-*f*-HEG nanocomposites was found at the voltage rate of 10 mV/s.

4. ACTIVATED GRAPHENE-BASED CARBONS [39]

Ruoff et al. discussed in their article the functioning of electric double layer supercapacitors which stored the charge density through the physico-sorption onto porous electrodes. According to them during the synthesis itself utmost care was taken by controlling the structure and morphology of carbon electrode materials in order to get high surface area and efficient paths for ion diffusion. The macropores scaffolds were introduced by arranging graphene-based hollow spheres in order to integrate the mesopores obtained from chemical

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activation. Images of activated graphene based carbon for electrodes are shown in Fig.5. The area of pore structures was calculated using Brunauer–Emmett–Teller equation which gave the surface area value as 3290 m^2 g^{-1} which in turn provided a path for electrolyte ions to diffuse efficiently into the inner surfaces of bulk electrode particles.

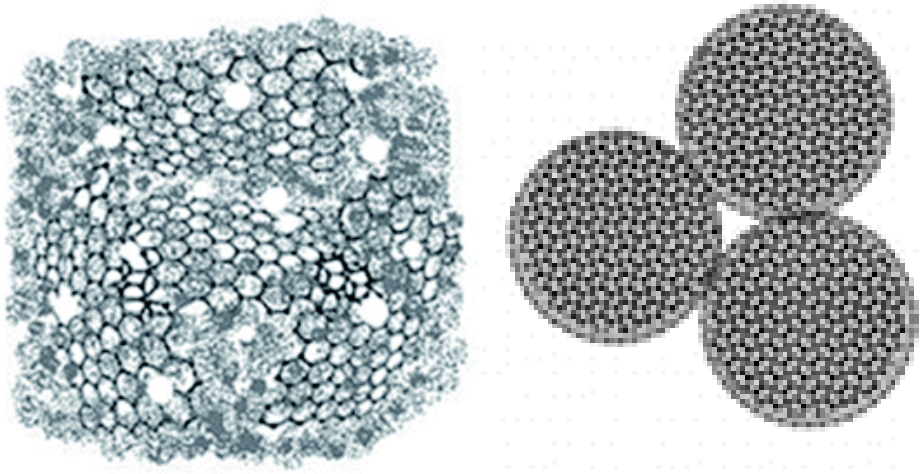

Fig-5: Images of activated graphene based carbon for electrodes (Source http://www.goggle.co.in/url)

5. GRAPHENE-BASED FIBERS

Fibers of graphene have received great importance in next generation supercapacitors applications because of their small volume, high flexibility and weave ability [40]. Carbon fibers, carbon nanotubes, graphene all can be converted into fibers and hybridized by adding selected electrically active component with Faradic pseudocapacitance such as metal oxide, hydroxides, polyaniline (PANI), poly 3,4-ethylenedioxythiophene(PEDOT), polypyrrole etc [41,42]. A solid electrochemical capacitor made up of fiber shaped rGO coated with gold wires was reported to exhibit a high specific capacitance of 101.9 μF cm^{-1} with a small capacitance loss even when bent to 120^o or twisted into S shaped structure. Meng et al. [40] developed graphene yarn supercapacitor, a lighter electrode material in which gold wires were replaced by rGO and a sheath of graphene was electrochemically deposited onto the graphene framework. Thus produced graphene fibers have the density 0.23 g cm^{-3}, lower than that of conventional carbon fibers and gold wire. The graphene yarns exhibited high electrical conductivity and considerable surface area due to 3D porous structure in addition of showing areal capacitance of 1.2-1.7mF cm^{-2}.

Cheng et al. [43] developed carbon nanotube-graphene hybrid fibers (CNT-G) by chemical vapour deposition of single carbon nanotubes on two dimensional graphene which exhibited an areal capacitance of 1.2-1.3 mF cm^{-2} with a stable cyclic voltammetry performance even after 200 bending cycles. In continuation, a review article enlightening the new potential advances in respect of the designing and uses of such fibers in supercapacitors has been published by Chen et al. [44].

With an idea of converting graphene material to a multi-dimensional material with many unique properties, Epstein et al. [45] made an attempt to fabricate the one dimensional graphene fiber utilizing ionic liquid coagulation and using functional diamines as cross-linkers to connect graphene oxide layers. The study indicated that these fibers will be a good candidate to replace energy storage devices for miniaturized portable electronic applications.

6. 3D GRAPHENE-BASED ARCHITECTURES

Three dimensional (3D) graphene based architectures (graphene aerogels, hydrogel, foams and sponges) are attracting immense attention of today's researchers. This is because these materials have structural interconnectivities as well as outstanding properties of graphene [46]. Several methods such as adding spacers [47, 48], crumpling graphene sheets [49] and preparing free standing structures [50] etc. have been employed so far for the synthesis of 3D graphene macroscopic structures. The materials with enhanced surface areas, hierarchical pores, high conductivity and robust structures [51-54] have been used as the ultimate materials to improve energy storage device performance and efficient in ion accessibility and its transport.

The graphene hydrogels with a well-defined cross-linked 3D porous structure (pore size from sub-micrometers to micrometres) and specific capacitance of about 240 F g^{-1} at a discharge current density of 1.2 A g^{-1}, in 1 M

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aqueous solution of H_2SO_4 has been reported by Shi's group [55]. Further, Xu et al. [56] developed graphene hydrogel thin film of 120 μm thickness which demonstrated excellent capacitive properties, cycling stability, and extraordinary mechanical flexibility. In addition, Ruoff's et al. [57] reported the usage of chemical activation of exfoliated GO for the production of a graphene-derived 3D network, which exhibited the surface area up to ~3100 $m^2 g^{-1}$. The hierarchical pores were responsible for high gravimetric (174 F g^{-1}) and volumetric (~100 F cm^{-3}) specific capacitances in the electrolyte. The performance was due to the large number of micro and mesopores which resulted into enhanced surface areas for the accumulation of charge.

Another special class of materials called aerogels with high-surface area has been obtained by sol-gel chemistry in which the liquid component of a polymer gel has been replaced with a gas. Recent researches are concentrated on manipulation of structure of carbon aerogels for a variety of applications. Zhang and co-workers [58] have prepared aerogels using dry carbon dioxide or freeze drying of graphene hydrogel precursors that were obtained from graphene oxide with L-ascorbic acid. In an extensive study, the same authors prepared graphene foams (GF) and reported an ultra-light 3D GF, exhibiting significantly high capacitance of 484 F g^{-1} [59].

7. 3D GRAPHENE-BASED SCAFFOLDS ARCHITECTURES

By all the above discussions it is almost proved that 3D graphene structures are efficient materials for the supercapacitors. In addition to this, very good scaffolds can be produced by these materials which are also useful for supercapacitors. The unique properties of these 3D architectures can help for ideal scaffolds to introduce nanoparticles of metal oxide or conductive polymers, to create efficient 3D graphene composite/hybrid electrodes [60-63]. Zhang et al. developed an easy approach to fabricate a honeycomb-like $CoMoO_4$–3D graphene hybrid (NSCGH) (NHC) electrode [64]. They reported specific capacitances were 2741, 1585, and 1101 F g^{-1} at current densities of 1.43, 22.85 and 85.71 A g^{-1} respectively.

The 3D network accommodating large active materials facilitates electron transport, and shortens ion diffusion paths due to porosity which in turn allows the migration of electrolyte ions. It has been reported [65] that approximately 9.8 mg cm^{-2} MnO_2 mass loading generated high capacitance.

Pertaining to conductive polymers, 3D graphene networks have been very promising materials as a host [66-68]. A maximum specific capacitance of the PANI/3D graphene electrode has been documented as high as ~1024 F g^{-1} at 10 mV s^{-1} scan rate, and ~1002 F g^{-1} at 1 mA cm^{-2} respectively, in 1 M H_2SO_4 [69]. Here the improvements in electrochemical performance and energy storage were due to the conducting, porous 3D graphene framework.

Polypyrrole-graphene 3D composite electrodes prepared by Chabi et al. [69] using both chemical and electrochemical deposition showed a high capacity of 660 F g^{-1}.

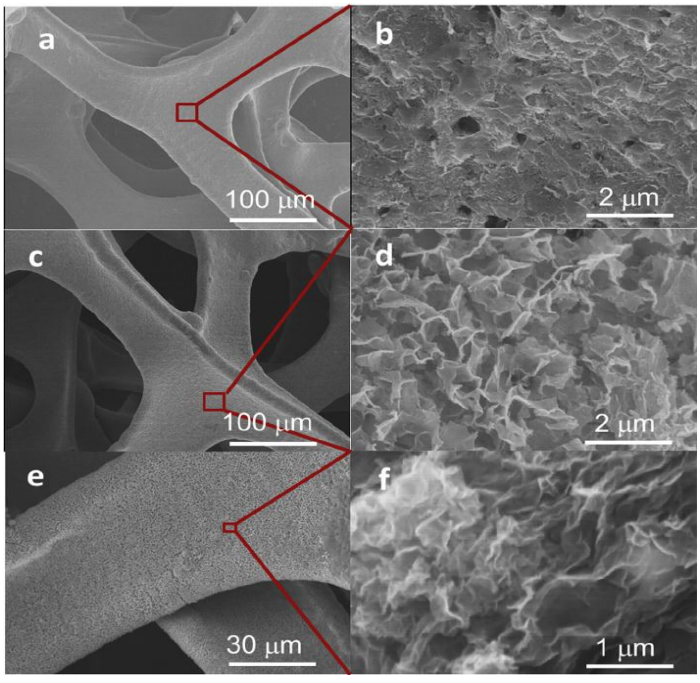

Fig-6: SEM images of interconnected 3D graphene foam –Ni metal based electrodes (Source http://www.goggle.co.in/url)

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In bare PPY electrode, performance significantly decreased after few cycles of charge–discharges due to the mechanical degradation of the electrode materials. SEM images of a good interconnected 3D structure of nickel-graphene foam showing integrity after thousands of charge discharge cycles are presented in Fig. 6.

8. METAL OXIDE BASED SUPERCAPACITORS

8.1 Manganese oxides-based supercapacitors

The capacitor performances of MnO_2 have become more popular since it was first reported by Lee and Goodenough [70], because of being cheaply available and acceptable performance in terms of capacitance [71, 72], as well as long-term cycle life [73]. Therefore, several attempts have been made for designing of manganese oxide and carbon as positive-negative electrode materials respectively to improve significantly the energy stored in devices without scarifying the power capability [74, 75]. However, Mn_3O_4 and its composites have been generally reported to possess excellent cycle stability and moderate specific capacitance [76-77].

Another work published by the same authors demonstrated that the Mn_3O_4 composite materials (Mn_3O_4/rGO) synthesized via microwave assisted heating (MAH) method resulting into the molecular clusters formation of manganese hydroxide onto graphene oxide (GO) surface showed good capacitance retention.

Binary MnOx nanowire composite materials were successfully plated onto various conductive substrates by anodic deposition under pulse-rest mode deposition [73]. It was noted that the MnOx deposits have large spherical grains, therefore preferably grown on the energy-favourable positions with each pulse-rest cycle.

Very recently, Hu et al. successfully achieved structural evolution in Mn_3O_4 via in-situ Raman spectroscopy [78]. The activation of prepared product in suitable electrolyte was found to start from the outermost layer of Mn_3O_4 surface and then steadily into the bulk. The electrochemically activated MnOx was found to be predominant amorphous-MnO_2 with minor hausmannite-Mn_3O_4 residual.

8.2 Vanadium oxide-based supercapacitors

Vanadium oxide has received a great deal of interests in aqueous supercapacitors due to its unique layered structure and multiple oxidation states which varies from +2 to +5 [79-81]. Several methods such as electrochemical deposition [82], hydrothermal synthesis [83], sol–gel method [84, 85] have been proposed for the preparation of vanadium oxides based supercapacitors. Among these, the electrochemical deposition [86] and the microwave-assisted hydrothermal synthesis [83] methods have been popular for potential fabrication of novel vanadium oxide structures which in turn enhanced the electrochemical performance.

Vanadium oxide with (3-D) network structure has been synthesized successfully with 25 mM $VOSO_4$ and 5 mM H_2O_2 as precursor at 0.7 Volts onto the graphite substrate by Hu et al. [87]. Because of the formation of a mixed meso and macro porous structure, it has proved itself as an excellent pseudo-capacitor. Moreover, the pores (Fig.7) enhance the electrolyte penetration along with the ion exchange of redox transitions resulting into high specific capacitance. It is a novel approach never found before.

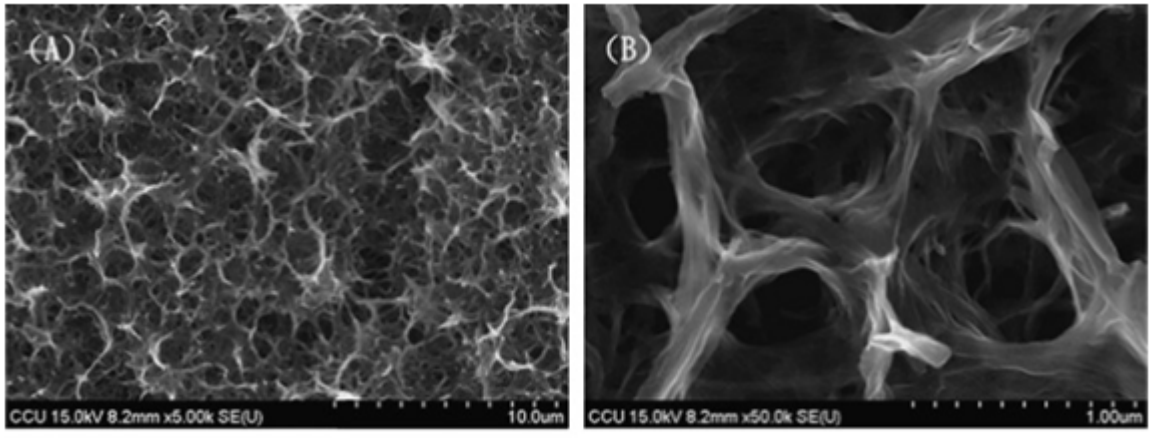

Fig-7: (A and B) Cross-section SEM images of a $VOx \cdot yH_2O$ deposit under (A) low and (B) high magnifications (Source http://www.goggle.co.in/url)

8.3 Ruthenium oxide-based supercapacitors

Ruthenium dioxide (RuO_2) is a promising metal-oxide based electrode material that has exhibited large pseudo-capacitance due to its outstanding stable structure, activeness, and ion adsorption pseudo-capacitance [88]. The commercially available ruthenium oxide-based supercapacitors are more expensive than manganese and nickel precursors [89]. The specific capacitance value exceeding 700 F g^{-1} is an excellent result to show redox

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transitions between various oxidation states [90]. RuO_2 also showed a high surface capacitance of about 150–260 μF cm^{-2}[91] which is ten times greater than that of carbon (ca. 20 μF cm^{-2}). The CV curve of RuO_2 in H_2SO_4 electrolyte reflected a potential of 1.4 V [92]. $RuO_2{\cdot}xH_2O$ annealed at temperatures around its crystalline temperatures usually exhibited the highest SC value [93, 94]. The hydrous ruthenium oxide ($RuO_2{\cdot}xH_2O$) electroplated onto a titanium substrate have shown the specific capacitance of about 100 F g^{-1} [95].

The $RuO_2{\cdot}xH_2O$ NPs prepared by hydrogen peroxide oxidative method have revealed good temperature resistance and rate-retention capability [96]. Further, the same was modified with cetyltrimethyl ammonium bromide for uniform dispersion and its annealing at 200 °C, has resulted in significant improvement in electrochemical performance. The sample with more annealing up to 300 °C, showed enhancement in specific capacitance by 1.6-fold in comparison to its counterpart.

9. TECHNOLOGY CHALLENGES AND FUTURE OUTLOOK

This Chapter mainly focus on research and developments inculcate in supercapacitor materials, various routes for their synthesis and present market aspects. This kind of effort is very much essential to pave the usage of supercapacitor energy storage devices in future. Present supercapacitor technology is yet to grow. It is little away from the ideal power and energy densities that are possible. The reasons are theoretical limits in energy storage devices and equivalent series resistance. Efforts are on to minimize these factors. Even researchers have synthesized highly concentrated colloidal suspension of carbon nanotubes to produce thin films and make use of these in supercapacitors. Another aspect from the materials point of view is the electrolyte, which always need optimization, because the resistivity of an electrolyte solution decreases the power density along with concentrations of ions present and applied voltage. To construct an efficient energy storage device, selection of material as well as method of construction plays vital role. One has to select the material and method in such a way that there is uniformity in electrical characteristics during the entire lifespan of the device. This is important in actual applications of supercapacitors due to the challenges ahead i.e., the requirement of high voltage. Therefore, supercapacitors are used in series configuration rather than in parallel arrangements. However, the variation in capacitance and leakage in devices have been major drawbacks of the entire arrangement.

10. CONCLUSION

Day by day our gadgets are becoming smaller but more powerful and thus requiring batteries small enough with sufficient capacity. As a result, past few decades have witnessed the explosion of research in this area, a good deal of which revolved around improving Li-ion batteries. The new “wonder materials” graphene has also been suggested as a possible key to the solution.

Today, graphene is ruling almost all research areas due to plenty of its applications. To mention a few, it has been used (a) in the form of a carbon fiber composites for the production of lighter aircraft and satellites, (b) to produce conductive materials, (c) to replace silicon in transistors, (d) for increasing the efficiency of electric batteries in the form of graphene powder and (e) in food preservation. Solar cells and displays, supercapacitors, medical implants, sports equipment, touch-screen devices, LCD's, OLED's are one or the other way used graphene. The IBM has already announced to launch a graphene-based transistor of 100GHz and 1THz processor in the market in near future.

Supercapacitors are already in use today, but typically in conjunction with traditional batteries, they have to give a quick burst of energy in applications. To fulfil, this device can gofrom fully discharged to fully charge with high magnitude in competition with Li-ion batteries.This is possible by the use of materials with high surface area. Graphene is an ideal material for energy storage and energy-efficient technology devices.

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STUDIES ON CONDENSATION OF EUGENOL WITH SOME INDOLE-3-ACIDS BASED COMPOUNDS

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ABSTRACT
In the present studies condensation of eugenol with some Indole acids (Indole-3-Acetic Acid, Indole-3-Propanoic Acid and Indole-3-Butyric Acid) using DMF as a solvents. The prepared compounds structure can be elucidated by some physico-chemical and Analytical techniques, FTIR, UV-Vis and ^{1}H NMR spectra and purity checked by GC. All prepared compounds are insoluble in water, but soluble in common organic solvents. They have high boiling point and they are stable in room temperature at open atmosphere.

Keywords: Eugenol, Indole-3-Acetic Acid, Indole-3-Propanoic Acid and Indole-3-Butyric Acid

INTRODUCTION

The growing importance of the 'Indole acids' in modern biochemistry is attributable to the recent observations about their biological activities such as antibacterial, antifungal, antiviral, antitumor, antitubercular, antiseptic activities[Poeggeler B, et al (1999), Liu & Nester(2006), Hunt et al(2011)]. A general studies of the structural and bonding features of various condensation of 'Eugenol' with 'Indole acids' can help better understanding of the compound life processes which involve similar system [Haissig & Davis(1994)]. 'Eugenol' possesses diverse pharmacological activities including choleretic, antibiotic and induces anesthesia activities. Similarly 'eugenol' exhibits diverse pharmacological activities as antistress, antiinflammatery, antipyretic, anticonvulsant and also anesthetic properties [Sen (1993), Gordon (1996), Wargovich et al (2001). 'Indole Acids' are the principle natural auxn. They were found to have excellent role as plant growth promoters. Anticancer property has been reported for the compound [Nordström et al(1991) and O'Brien & McCully (1981)].

In view of such overwhelming important of 'eugenol and Indole Acids', a studies of the condensation of Eugenol with Indole acids based compounds' are quite justified [Ross, (1973)]. In the present studies we are synthesized three new eugenol based derivative of indol-3-acids such as Eugenol-3-Indoleaceticacid, Eugenol-3-Indolepropanoicacid (EIPA) and Eugenol-3-Indolebutyricacid. IUPAC names of prepared compounds are 2-hydroxy-4-(prop-2-en-1-yl)phenyl 1*H*-indol-3-ylacetate, 2-hydroxy-4-(prop-2-en-1-yl)phenyl 3-(1*H*-indol-3-yl)propanoate and 2-hydroxy-4-(prop-2-en-1-yl)phenyl 4-(1*H*-indol-3-yl)butanoate. Prepared are investigated by some physic-chemical techniques, some spectral studies such as UV-Visible, FT(IR), PMR spectra. Prepared compounds purity checked by GC spectrophotometer instrument.

EXPERIMENTAL

All chemical used were of analytical reagent grade. Distilled water obtained from a glass distillation unit. All synthesized compounds electronic spectra recorded on JASCO V - 650 spectrophotometer, using methanol as solvents. Perkin – Elmer spectrum 100 model using for FT(IR) spectra in KBr discs. Brucker AV300 NMR spectrometer using PMR spectra for prepared compounds.

SYNTHESIS OF EUGENOL-3-INDOLEACETICACID (EIAA)

The Eugenol-3-Indoleaceticacid was prepared by the condensation reaction between 1.4g (8mmol) Indole-3-Acetic Acid and 3.30g (20mmol) of Eugenol in 50mL DMF with constant stirring. The reaction mixture was refluxed 4h, after completed of refluxing reaction mixture was cool and distilled all DMF by fractional distillation and collect the final product.

SYNTHESIS OF EUGENOL-3-INDOLEPROPANOICACID (EIPA)

The Eugenol-3-Indolepropanoicacid was prepared by the condensation reaction between 3.5g (18.5mmol) Indole-3-Propanoic Acid and 6.0g (40mmol) of Eugenol in 50mL DMF with constant stirring. The reaction mixture was refluxed 6h, after completed of refluxing, reaction mixture was cool and distilled all DMF by fractional distillation and collect the final product.

SYNTHESIS OF EUGENOL-3-INDOLEBUTYRICACID (EIBA)

The Eugenol-3-Indolebutyricacid was prepared by the condensation reaction between 3.5g (17mmol) Indole-3-Butyric Acid and 4.1g (27mmol) of Eugenol in 50mL DMF under stirring. The reaction mixture was refluxed 3h, after completed of refluxing, reaction mixture was cool and distilled all DMF by fractional distillation and collect the final product.

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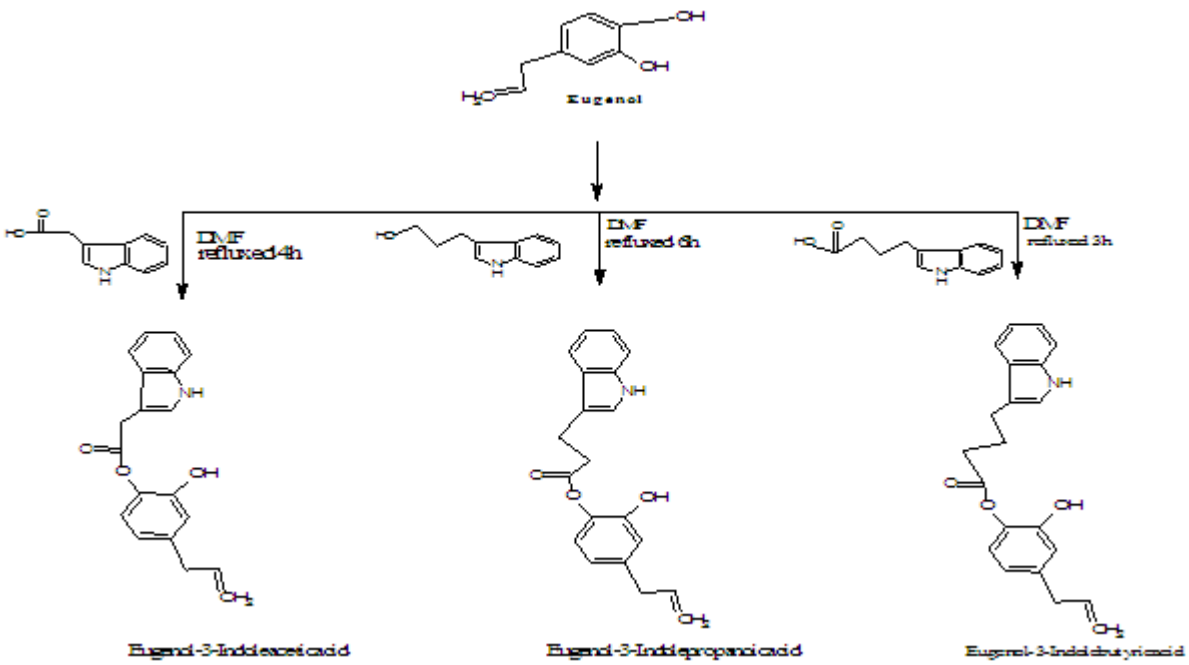

Figure-1: Reaction Scheme of condensation of eugenol with some Indole acids (Indole-3-Acetic Acid, Indole-3-Propanoic Acid and Indole-3-Butyric Acid)

RESULTS AND DISCUSSIONS

The reaction of eugenol with 1) Indole-3-Acid Acid gave as light brown; 2) Indole-3-Propanoic Acid gave as brown and 3) Indole-3-Butyric Acid gave as brown in color compounds respectively. The structures of prepared compounds elucidated on the basis of elemental analysis, FT(IR), PMR, electronic spectral data. The physical and analytical data of the all synthesized compounds listed in **Table-1.** Prepared compounds are stable at room temperature in open atmosphere and they have high boiling points (BP). They are insoluble in water and soluble in common organic solvents, such as Methanol, Chloroform, Acetone, Acetonitrile, DMF etc. Reaction progress analyzed by TLC, using Ethyl Acetate: Pet Ether (20:80) as a mobile phase. All synthesized compounds purity checked by GC instruments by standard procedure[Theresa,(2011)] purity of the prepared compounds is 96.39, 90.60 and 92.89% represented are EIAA, EIPA and EIBA respectively.

Table-1: Physical and Analytical data of Eugenol derivatives of Indol Acids

Comp	Color	Purity (by GC) %	B.P	Elemental Analysis			
				% C Found (Calcd)	% H Found (Calcd)	% N Found (Calcd)	% O Found (Calcd)
EIAA	Light Brown	96.39	172	74.75 (74.27)	5.58 (5.32)	4.56 (5.58)	15.62 (15.75)
EIPA	Brown	90.60	273	74.75 (72.83)	5.96 (5.55)	4.36 (4.40)	14.96 (14.00)
EIBA	Brown	92.89	199	75.20 (72.99)	6.31 (6.45)	4.18 (4.68)	14.31(13.99)

UV-Visible Spectra

The electronic spectrum of all synthesized compounds in methanol for the UV region reveals two high intensity bands in the region 330-339nm and 249 (**Table: 2**), these due to n → π* and π → π* transitions possible from the Carbonyl (>C=O) and Alkene (>C=C<) environments in the molecules [Alberto S., (2008)].

Table-2: UV-Visible data of Eugenol derivatives of Indol Acids in methanol

Compound	λnm	Transition
EIAA	330.50 249.60	$n\rightarrow\pi^*$ $\pi\rightarrow\pi^*$
EIPA	339.00 249.00	$n\rightarrow\pi^*$ $\pi\rightarrow\pi^*$
EIBA	339.80 249.40	$n\rightarrow\pi^*$ $\pi\rightarrow\pi^*$

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FT (IR) Spectra

A significant feature of the FT(IR) spectrum of EIAA, EIPA and EIBA are absence of band between 3400-3500cm^{-1} due to the υO-H vibration reported [Alberto S., (2008)] at 3450cm^{-1} in starting materials indicating a successful replacement of the Hydroxyl group by the ether group during condensation reaction. This observation also supported by, the new band observed at 1013-1072 in the all compounds, indication the –C-O- present in the prepared compounds. Three bands observed at 3229-3384cm^{-1}, 3154-3284cm^{-1} and 1605-1644cm^{-1}suggesting the –NH, =CH_2 and >C=O groups respectively, in the synthesized compounds. Important ir bands are listed in **Table-4.**

Table-4: Important IR bands (cm^{-1}) and their assignments for Eugenol derivatives of Indol Acids

Comp.	-NH	-CH_2-	=CH_2	Ar.ν(C-H)	>C=O	Ar ν(C=C)	>C=C<	-C-O-
EIAA	3229	2965	3154	3058	1605	1503	1590	1067
EIPA	3384	3069	3235	3060	1610	1442	1542	1013
EIBA	3380	3053	3284	3063	1644	1443	1589	1072

^{1}HNMR Spectra

^{1}HNMR spectra recorded in d_6 DMSO solvent and they are listed in **Table-5**. No any peak observed in the region12.00-13.00 ppm in prepared compounds, this is reported [Oyedemi et al, (2009)] at 12.53ppm of –OH group in eugenol, suggested that successfully replaced hydroxyl group to ether group by condensation process. The singlet observed at 11.49-11.79 ppm, is suggested to be due to –OH group of the eugenol derivatives and another singlet observed at around 9.92-10.04ppm, suggesting the tertiary amine group of the all compounds. A multiplet observed around 7.44-8.69 due to phenyl rings in the proposed compounds structure.

Table-5: ^{1}HNMR data of the Eugenol derivatives of Indol Acids in ppm

Comp.	-NH	-CH_2-	=CH_2	-CH=	Phenyl ring	-OH	-CH=
EIAA	10.04	4.98	2.15	3.56	7.60-8.57	11.79	3.56
EIPA	9.92	4.67	2.51	3.49	7.44-7.99	11.49	3.49
EIBA	9.94	4.55	2.51	3.34	7.58-8.69	11.50	3.34

CONCLUSION

Prepared compounds are insoluble in water but soluble in dilute alkali, common organic solvents. All complexes have high boiling points indicated that they are strongly bonded and they are stable at room temperature in open atmosphere. On the basis of spectral and analytical data, structures of the prepared compounds tentatively assigned below;

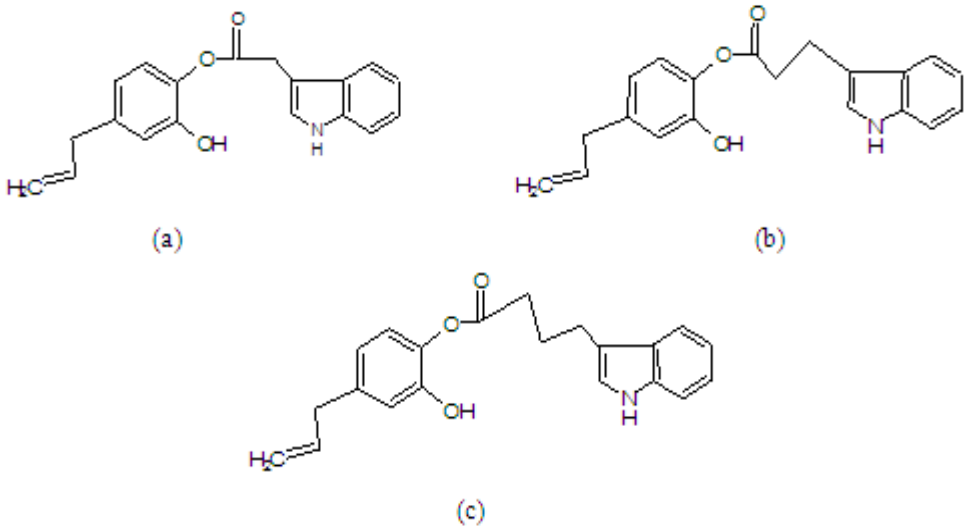

Figure-2: Proposed structures of prepared compound: (a) Eugenol-3-Indoleaceticacid, (b) Eugenol-3-Indolepropanoicacid (EIPA) and (c) Eugenol-3-Indolebutyricacid

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STRUCTURAL STUDIES OF NOVEL SYNTHESIZED COMPOUNDS FROM METHYLEUGENOL WITH VARIOUS ACID DERIVATIVES OF INDOLE

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ABSTRACT
In the present structural studies of methyleugenol derivatives of some Indole acids (Indole-3-Acetic Acid, Indole-3-Propanoic Acid and Indole-3-Butyric Acid) in DMF solvent. The structures of prepared compounds elucidated by some physical, chemical, and Analytical techniques (FTIR, UV-Vis and ^{1}H NMR spectra) and purity checked by GC. All prepared compounds are insoluble in water, but soluble in common organic solvents. They have high boiling point and they are stable in room temperature at open atmosphere.

Keywords: Methylugenol, Indole-3-Acetic Acid, Indole-3-Propanoic Acid and Indole-3-Butyric Acid

INTRODUCTION

The growing importance of the 'Indole acids' in modern biochemistry is attributable to the recent observations about their biological activities such as antibacterial, antifungal, antiviral, antitumor, antitubercular, antiseptic activities[Poeggeler B, et al (1999), Liu & Nester(2006), Hunt et al(2011)]. A general studies of the structural and bonding features of various condensation of 'Eugenol' with 'Indole acids' can help better understanding of the compound life processes which involve similar system [Haissig & Davis, (1994)].

Methyleugenol is a type of phenylpropanoid compound and the methylether of eugenol. Found in various essential oil e.g. *Artemisia Dracunculus, S-Aromaticum, Daucus Carota, M. fragrans* and also known as allylveratrol, important to insect behavior and pollution. Methyleugenol is produced by the methylation of eugenol [Burdock, (2005)]. Methyleugenol is most effective repelling and killing effects [Ngoh, (1998)] apart from larvicidal activities against *Spodopterlitura* [Bhardwaj et al, (2001)]. Methyleugenol is potent inhibitor of the enzyme acetylcholinesterase[Lee et al (2001)]. Most important role of methyleugenol is insect attractant formulation developed for oriental fruit flies (*B-dorsalis*) and melon flies (*B. Cucurbitae*) [Gomezand Coen, (2013)]. In 2006, methyleugenol was registered as an active pesticide ingredient in USA and generally recognized as safe. The major area of concern is the safety of natural products used in formulations and their precise mode of action.

In view the important of 'methyleugenol and Indole Acids', a studies of the condensation of methyleugenol with Indole acids based compounds' are quite justified [Ross et al, (1973)]. In the present studies we are synthesized three new methyleugenol based derivative of indol-3-acids such as Methyleugenol-3-Indoleaceticacid ($MEIA_2$), Methyleugenol-3-Indolepropanoicacid (MEIPA) and Methyleugenol-3-Indolebutyricacid (MEIBA). IUPAC names of prepared compounds are 2-hydroxy-4-(prop-2-en-1-yl)phenyl 1*H*-indol-3-ylacetate, 2-hydroxy-4-(prop-2-en-1-yl)phenyl 3-(1*H*-indol-3-yl)propanoate and 2-hydroxy-4-(prop-2-en-1-yl)phenyl 4-(1*H*-indol-3-yl)butanoate. Prepared are investigated by some physico-chemical techniques, some spectral studies such as UV-Visible, FT(IR), PMR spectra. Prepared compounds purity checked by GC spectrophotometer instrument.

EXPERIMENTAL

All chemical used were of AR grade. All synthesized compounds electronic spectra recorded on JASCO V - 650 spectrophotometer, using methanol as solvents. Perkin – Elmer spectrum 100 model using for FT(IR) spectra in KBr discs. Brucker AV300 NMR spectrometer using PMR spectra for prepared compounds. Purities of prepared compounds recorded on GC-Shimdzu-2014 instruments.

SYNTHESIS OF METHYLEUGENOL DERIVATIVES OF INDOLE ACIDS

The methyleugenol derivatives of Indole acids were prepared by the condensation reaction between 8mmol of Indol acids (Indole-3-Acetic Acid, Indole-3-Propanoic Acid and Indole-3-Butyric Acid) and 27mmol of Eugenol in DMF under stirring, refluxed 2h and after completed of refluxing, reaction mixture were cool and distilled all DMF by fractional distillation and collect the final product, purified in chloroform.

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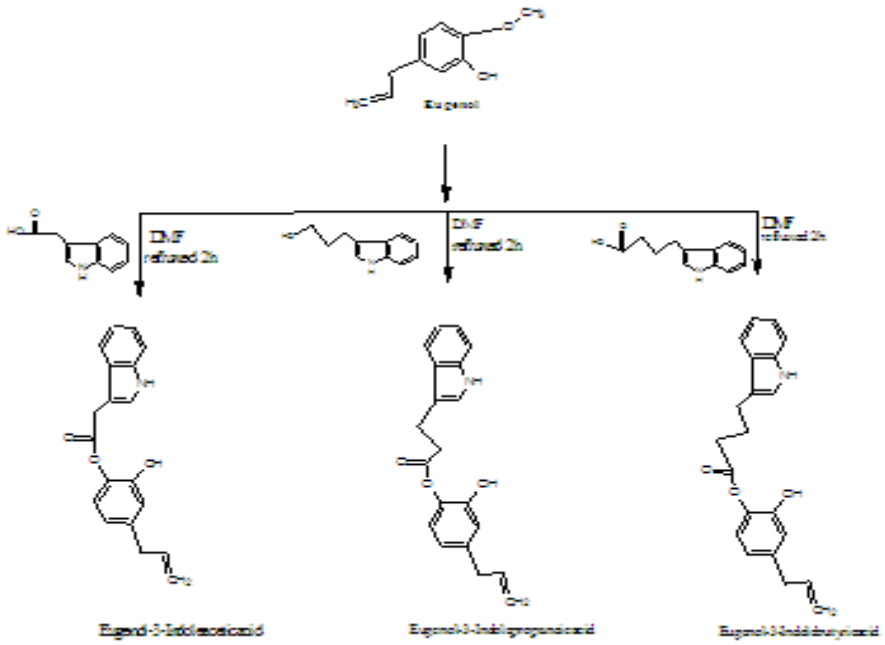

Figure-1: Preparation of methyleugenol derivatives of Indole-3-Acetic Acid, Indole-3-Propanoic Acid and Indole-3-Butyric Acid

RESULTS AND DISCUSSIONS

All the synthesized compounds are brown in color oily liquid compounds and structural elucidation of synthesized compounds on the basis of physical, chemical and analytical studies. The physical and analytical data of the all synthesized compounds summarized in **Table-1.** Prepared compounds are stable in open atmosphere and they have high boiling points, suggested they have high thermal stability. They are insoluble in water and soluble in common organic solvents. Purities of the prepared compounds checked by GC instruments by standard procedure [Theresa, (2011)], purity of the synthesized compounds is 96.39, 90.60 and 92.89% represented are $MEIA_2$, MEIPA and MEIBA respectively.

Table-1: Physical and Analytical data of Methyleugenol derivatives of Indole Acids

Comp	Color	Purity (by GC) %	B.P	Elemental Analysis			
				% C Found (Calcd)	% H Found (Calcd)	% N Found (Calcd)	% O Found (Calcd)
$MEIA_2$	Brown	98.42	268	74.75 (74.27)	5.58 (5.32)	4.56 (5.58)	15.62 (15.75)
MEIPA	Brown	98.77	280	74.75 (72.83)	5.96 (5.55)	4.36 (4.40)	14.96 (14.00)
MEIBA	Brown	98.96	284	75.20 (72.99)	6.31 (6.45)	4.18 (4.68)	14.31(13.99)

UV-Visible Spectra

The electronic spectrum of all synthesized compounds in methanol for the UV region reveals two high intensity bands in the region 249-339nm and 201-249 (**Table: 2**), these due to n → π* and π → π* transitions possible from the Carbonyl (>C=O) and Alkene (>C=C<) environments in the molecules [Alberto, et al; (2008)].

Table-2: UV-Visible data of Methyleugenol derivatives of Indol Acids in methanol

Compound	λnm	Transition
$MEIA_2$	249 201	$n\rightarrow\pi^*$ $\pi\rightarrow\pi^*$
MEIPA	249 201	$n\rightarrow\pi^*$ $\pi\rightarrow\pi^*$
MEIBA	339.80 249.40	$n\rightarrow\pi^*$ $\pi\rightarrow\pi^*$

FT (IR) Spectra

A significant feature of the FT(IR) spectrum of $MEIA_2$, MEIPA and MEIBA are absence of any band between 3400-3500cm^{-1} due to the υO-CH_3 vibration reported [Matsjeh et al, (2015)] at 3450cm^{-1} in methyleugenol indicating a successful replacement of the methoxy group by the ether group during condensation reaction. This observation also supported by, the new band observed at 1013-1072 in the all compounds, indication the -C-O-

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present in the prepared compounds. Three bands observed at 3314-3380cm^{-1}, 3270-3284cm^{-1} 3100-3202cm^{-1} and 1644-1658cm^{-1}suggesting the –NH, -OH, =CH_2 and >C=O groups respectively, in the synthesized compounds. Important ir bands are listed in **Table-4.**

Table-4: Important IR bands (cm^{-1}) and their assignments for Methyleugenol derivatives of Indol Acids

Comp.	-NH	-OH	-CH_2-	=CH_2	Ar.ν(C-H)	>C=O	Ar ν(C=C)	>C=C<	-C-O-
MEIA$_2$	3380	3284	3053	3200	3063	1644	1443	1590	1072
MEIPA	3314	3270	2902	3100	3045	1658	1442	1588	1013
MEIBA	3326	3275	3048	3202	3059	1649	1444	1589	1025

P**MR Spectra**

PMR spectra recorded in d_6 DMSO solvent and they are listed in **Table-5**. No any singlet peak observed in the region 3.7-4.5 ppm in prepared compounds, this is reported [Matsjeh et al, (2015)] at 4.2ppm of methoxy group in methyleugenol, suggested that successfully replaced methoxy group to ether group by condensation process. The singlet observed at 11.49-11.79 ppm, is suggested to be due to –OH group of the methyleugenol derivatives and another singlet observed at around 9.92-10.04ppm, suggesting the tertiary amine group of the all compounds.

Table-5: PMR data of the Methyleugenol derivatives of Indol Acids in ppm

Comp.	-NH	-CH_2-	=CH_2	-CH=	Phenyl ring	-OH	-CH=
MEIA$_2$	10.04	4.98	2.15	3.56	7.60-8.57	11.52	3.56
MEIPA	9.92	4.67	2.51	3.49	7.44-7.99	11.49	3.49
MEIBA	9.94	4.55	2.51	3.34	7.58-8.69	11.50	3.34

CONCLUSION

Prepared compounds are insoluble in water but soluble in dilute alkali, common organic solvents. All complexes have high boiling points indicated that they are strongly bonded and they are stable at room temperature in open atmosphere.

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SURVIVAL OF THE FITTEST: AN EXPLORATORY STUDY OF THE FITNESS SERVICES WITH A REVIEW OF CUSTOMER EXPECTATION AND SERVICE DELIVERY

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ABSTRACT
The changing aura of the fitness concerns in the country is giving rise to blooming sector in the cononomy with promising results. The existing large and messy sector requires to be organized with the new innovative techniques and contributions with the new budding start up's entering in. An attempt have been made in the same regard to conduct the survey for identifying the present status of the market, the challenges that lie in the terms of the service, market threats, customer expectation in order to further investigate and produce the set of readymade solutions to be applied in the future.

INTRODUCTION
Fitness, health and well being are the credentials associated with a healthy lifestyle. Usually, when we see a person in a good shape or body, we always consider the person to be physically fit and healthy assuming the uttermost well being of that person. However, being physically fit and healthy are completely two opposite concerns. The word 'fitness' means the ability of a person to perform the physical activities. This includes the strength of muscles, joints and ligaments, the strength of your endurance and the power in which the body is capable of moving. This does not mean health Anvekar, S. R. (2012). A person who is healthy may not be fit and vice-versa. As defined by World Health Organization (WHO), it is a "State of complete physical, mental, and social well being, and not merely the absence of disease or infirmity." Health is a dynamic condition resulting from a body's constant adjustment and adaptation in response to stresses and changes in the environment for maintaining an inner equilibrium of the body. In response to physical fitness and health, wellbeing acts as an umbrella and covers all the areas of health i.e. mental health, physical health, spiritual health, relationship health and so on! Basically, we can sum up the above discussion with the clear understanding that well being is the bigger set covering health and the health further considering physical fitness and health as a particular component in it.

In the contemporary times the importance of the physical health and fitness has gained an extreme momentum. If one look around them, we will find that the weight loss advertisements are everywhere and also the increasing number of the obesity and the diabetes cases are the reasons why health clubs and gym memberships are growing. Spending on gym was earlier seen as a luxury in India but now it is becoming a way of life.

Throwing light on the fitness sector in India, the fitness industry in India is controlled at variation point, with the high market division, amazing market potential and end to end overall growth. The sector has travelled a long journey from local 'akhadas' to wrestling now being the part of the international Olympics with actively taking part in it and winning medals for the country. Resistance training, aerobics, zumba, aerial yoga, Pilates, MMA, Kickboxing etc have become the fitness trends over a few years in India. The data shows that the total market for fitness is valued around Rs. 4670 Cr, growing at 17-19 per cent and is estimated to cross Rs 7000 crores by the end of the year. Modern retail is estimated at 28 percent of the total market and is expected to grow by 24-30 percent. More recently, it has been witnessed that small structures are making way for retailing in the gym business and the trend will only accelerate in the coming times with the entry of the global players, small start ups as well as the online business.

The fitness trend in India is a growing trend for the youngsters the reason for which can be traced from the trail of the bollywood industry where the actors started to work out to look good for their movies and thereby attract the audience. In return, the young generation of our societies who are the fans of these actors and who wish to look good at any cost wish to attain such looks as the actors they on the screen. A person cannot be fit in a day or in a month and it requires good training, proper training and adequate rest. The fitness centre's in India (usually those having low membership fees) employ inexperienced and not qualified trainers suggesting steroids or drugs to the clients hoping for the quicker results. The youngsters having no knowledge about these steroids and in the hope of right guidance fall in the trap of these steroids created by these unprofessional trainers without knowing its consequences in the long term.

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Considering the condition of the fitness sector in the country the research paper tries to explain the market and the level of the competition among the fitness centres in the country, the factors which make the customers buy or use these services of the fitness centre in the market. Also, a comparative analysis of the anytime fitness which are considered to be the leader in the sector of the fitness services and the competitors provided in the country in the terms of how successful they have been in order to provide the fitness services in the market.

LITERATURE REVIEW

Today fitness industry in India is going towards health, well-being, good looks and confidence. The market is looking up to India with today's fast and hectic lifestyles which allow a person to work out actively or follow a fitness routine Petajan, J. H., et.al.,(1996). As described by the PWC 5th Annual Wellness Conference: August 2013, 'The Indian fitness industry is going through a revolution spiked due to the increasing number of cases of obesity and diabetes. This is one of the reasons why health clubs and gym memberships are increasing. Also in tier 2, tier 3 cities, people are increasingly going for wellness and fitness.' These youngsters join health clubs wanting to look like the chiseled actors they see on the screen but end up being dissatisfied because of lack of knowledge. Considering, low gym membership many people workout at these local gyms which may or may not have qualified trainers. Most of the trainers are aware about these steroids and because of having fewer opportunities for them to make money in the industry; they recommend steroids to the youth. Every Bodybuilder uses these drugs to compete in the Bodybuilding competitions. Maybe that's the reason why bodybuilding is the only sport in INDIA that is not given so much value or publicized much and not given support by the government. For instance, a survey was conducted by ASSOCHAM has shown that about 78% of adolescents in urban India, who are keen to have a good body, consume atleast one dietary supplement such as pills, energy drinks, steroids and high protein supplements. Forty seven percent teenagers said they used protein powders, creatine, and amino acids to gain body mass. Around % said they used supplements such as fat burners, high-energy drinks, and caffeine pills to lose weight. The survey was conducted in Delhi-NCR, Mumbai, Haryana, Kolkata, Bangalore, Chennai, Hyderabad, Ahmadabad, Chandigarh, Jaipur and Lucknow among 2500 adolescents in the age group of 14-30 years. However, it was found that the consumption of dietary supplements was higher in Delhi-NCR, Mumbai followed by Haryana, Chandigarh, Hyderabad and Ahmadabad. Almost 85% of teenagers said their coaches and fitness trainer encouraged them to take supplements from them. According to health experts, most of the health supplements available in the market are laced with steroids. Use of steroid increases with age, especially among boys, with almost 45% of 12th grade males reporting steroid use. More than 75% steroid users said they are willing to take extreme risks to reach sports stardom or other althletic goals.

To give an illustration, the case of Kiran, 26 years old, resident of Cubbonpet in central Bengaluru and a contract driver with excise department, died at a private hospital. His mother Chandramma lodged a police complaint stating that the gym owner was responsible for her son's death. The gym is located in Kumaraswamy Layout. Police said initial investigations revealed that the instructor, who is running is himself not adequately trained. Kiran joined his gym and the instructor promised him a six pack in six months for a fee of Rs 25000. According to chandramma's complaint, Kiran was trained in January and in February he was asked to take steroids and also given some powder to consume. The youth is said to have taken steroid injections and consumed the powder by mixing it with milk; he was allegedly asked to do so by the gym instructor. Kiran took ill in early march 2017 and was taken to a few doctors who declined to treat him. He was finally admitted to a private hospital, where doctors told Chandramma that steroids had complicated his condition. Kiran breathed last on Tuesday. Acting on Chandramma's complaint, police sent Kiran's body to Victoria Hospital for post-mortem.

Above all, it seems pertinent to remember that "steroids should not to be taken by any person for enhancing his/her performance at a sport or to make a good physique because they can ruin the life of not only those using it but also of people around them.

DATA ANALYSIS

For the purpose of gathering the information about the fitness market and the level of the competition along with the factors affecting the sale and the purchase of these fitness services by the customers taking into account the comparative analysis of the anytime fitness which are considered to be the leader in the sector of the fitness services and the its competitors provided in the country the data has been collected. The data is basically primary data collected through the questionnaires having closed ended questions. Apart from the primary data the secondary data is being collected through the text books, journals, library & interest used for this study. A sample of 50 questionnaires has been used and the objective while sampling was to address more people to know regarding the popularity and the perception of customers towards fitness. The data so collected by the

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random sampling method with the help of the questionnaires is classified in an organized and systematic manner calculated into percentages organized and represented into the form of the tables, bar graphs and pie charts.

The analysis the SWOT analysis of the anytime fitness, Gold's Gym, snap fitness and the celebrity fitness has been done. However the sample so collected mainly represents the data in the favour of the anytime fitness as 50% of the sample population in its favour in contrast to the gold's gym consisting 30% and both the snap and celebrity accounting for 10% each respectively. The data so collected by the random sampling method with the help of the questionnaires is classified in an organized and systematic manner calculated into percentages organized and represented into the form of the tables, bar graphs and pie charts.

	ANYTIME FITNESS	**GOLD'S GYM**	**SNAP FITNESS**	**CELEBRITY FITNESS**
STENGHTS	• 24 Hours Access • Customer Service • Various Locations • Flexible Membership • Clean, tidy and hygienic • All age group • Versatile equipment and facilities • Personal trainers • 24/7 security monitoring • Secured access	• Top class facilities • Great Locations • Celebrity endorsements • Capital • Qualified Trainers	• Barriers of market entry • High growth rate • Reduced labor costs • Skilled workforce • Experienced business units • 24/7 Service	• Well maintained and modern gym equipment • Knowledgeable and friendly staff • Offers variety of classes such as kick boxing, yoga and body combat. • Personal training • Lockers • Sauna room • Located at exclusive mall
WEEKNESSES	• Small franchises • Over crowding • Unisex facilities □ • Secured card access	• Poor financial Management • Excessive focus on individual training • Underestimation of competition • Changes with time	• High loan rates are possible • Small business units	• Less no. of franchises • High rate of membership
OPPORTUNITIES	• More space • More equipment • Private bathroom • Advanced security Promotions/Advertisements	• Growing demand for fitness • Value-added services • Growing health concern	• Growth rates and profitability • New acquisitions • Growing demand • New markets	• Growth rates and profitability • Growing demand
THREATS	• Other gyms with better facilities • Other gyms offering PT sessions	• The threat of substitution	• External business risks • Growing competition • lower profitability	• The threat of substitution

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The data so collected by the questionnaire is used to draw interpretations regarding the age, gender, employment status, lifestyle, willingness to pay monthly for the gym membership, expectations regarding the facilities in the gym and source of awareness among the customers regarding the gym facilities and membership.

The data so collected clearly shows that earlier it was usually the male population who went for the physical fitness. However, in the contemporary times the growing lifestyle tends and looks in the perspective of women taking fitness and health seriously. If we consider the gym membership no lesser than male who account for 55% of the gym membership, 45% of the gym membership accounts for the female. Also, the fitness customers irrespective of the gender usually fall in the age group of 20 – 30 years ago as per the sample. More than 50% of the Indian population is below the age group of 25 which provide huge growth chances for the fitness industry in India. It was also very surprising to find that from the sample it was 48% of the students (studying full time) and 32% of the employed staff are going to the gym to stay fit and was the driving force for the fitness centres to grow.

The increasing health problems in todays's environment has made an impact on the changing lifestyle of people which can concluded from the statistics that about 5% of the sample population is active and they attend the health club or fitness more than three times a week. The data also shows that the willingness to pay usually ranges between Rs. 1500 – 2500 for the monthly gym membership for about 36 to 40% of the population. The market has a huge potential as more than 35% of the sample population are likely to purchase a gym membership and 28% are extremely likely to in the next three months. Most of the gyms today are not able to provide the services as expected by the customers because of the high maintenance of the gym, hiring certified fitness professionals. Regarding the gym facilities it can be easily derived that 50% of the sample population would like to join a gym or a health club having a good reputation in the market. Besides that 30% of the sample population would want the availability of good quality machines, equipments and weights which means the fitness centres or health club should maintain a good reputation in the market and have availability of good quality equipment to attract potential potential clients. The advertisements and the motivational videos over the social media are working miracles as more than 65% of the sample population get attracted towards a healthy lifestyle and started working out on the health clubs.

FINDINGS AND CONCLUSION

Through the theoretical and statistical data presented in this project we have successfully gathered the following key findings

- Fitness industry in India is largely an unorganized, fragmented and unstructured sector waiting o be consolidated into an organized entity.
- The majority of people who workout falls in the age group of 20 – 30 (years)
- Almost 45% of the populations purchasing a gym membership are women.
- Majority of the population is willing to spend Rs 1500-2500 on a gym membership on a monthly basis.
- There are a lot of competitors in the health club industry.
- Gym's today have to be careful regarding hiring certified fitness professionals and providing excellent services at the lowest possible cause to attract the people to gym.
- More of the employed workforce and the full time students are going to gym.
- People today are concerned about their health and want to look good i.e. they attend health club or fitness more than three times a week.
- Fitness centres or health club should maintain a good reputation in the market and have availability of good quality equipment to attract potential clients.
- The advertisements and the motivational videos over the social media are acting as the powerful magnets to attract people to the gym.
- Information about the strong points, hindrances and hidden opportunities of **Anytime fitness** and its competitors through the use of SWOT Analysis. Anytime fitness is one of the fastest growing 24/7 fitness centres and because of its better facilities it is acquiring the market share and increasing its reputation and brand name. The Primary strengths, weaknesses, opportunities and threats of all the health clubs in this sector of competition are nearly the same, but when it comes to market coverage; Anytime Fitness leads over

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its competitors by a decent margin. Gold's Gym is one oldest chain of health clubs set up in India but because of fall in the quality of its service due to high maintenance cost it is lagging behind.

Hence the above analysis provide us a tremendous amount of information regarding the trail of the growth of the fitness sector in the country growing from the akhadas to the representation in the Olympics and the improvement and the diversification in the form of the exercises growing from the traditional body building only available for the male population to the yoga, pilates, resistance training, kickboxing, aerobics also attracting a major share of the female counterpart. With the 50% of the population of the India below 25 years of the age provide a tremendous market of the fitness industry to grow. However, undoubtedly the fitness sector in the country is largely messy, uneven and shapeless sector waiting to be combined into an organized entity. Among the huge brand entities already existing in the market, Anytime fitness stands apart in the terms of its quality services and brand in comparison to its competitors. Thus, the need of the hour is to provide more diversified and need based quality services at the minimum monthly charges for the customers for the more output from the promising sector in the future.

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BUSINESS ANALYTICS APPLICATIONS FOR SMALL AND MEDIUM ENTERPRISES

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ABSTRACT
SMEs are increasingly relying on BI and analytics tools to monetize the data they generate. Business analytics applications will deliver a new edge for SMEs in the corporate world. SMEs are using BI for reporting, analysis and predictions. The adoption of BI can be seen in planning & execution, sensing response and making predictive analysis. Forecasting, BI and similar tools are vital for them to accurately make informed decisions. They seek assistance for IT, deployment and new technology adoption. MS Excel gives possible tools for building predictive forecasts. Flipkart is expanding its seller base and brand name across SMEs with the help of strong data analytics.

Keywords: Business Intelligence, Decision Making, Insight, Predictive Analytics, Small and Medium Enterprises.

INTRODUCTION
Multi National Companies (MNCs) are using Business Intelligence (BI) for increasing their business advantage. Recent trends make BI available to Small and Medium Enterprises (SMEs). Introduction of BI will become inevitable in SMEs. SMEs are increasingly relying on BI and analytics tools to monetize the data they generate. The desire for intelligence among SMEs is definitely on the rise. They gradually understand the value of clear results using information, integrated from various sources and presented as patterns & trends for easy interpretation and strategy formation.

BI TRENDS FOR SMES
Indian SMEs need to take faster strategic decisions based on analysis of large volumes of data. At present, the penetration of BI among SMEs is minimal. Forecasting, BI and similar tools are vital for them to accurately make informed decisions. SMEs are using BI for reporting, analysis and predictions. BI tools will empower SMEs with insight and foresight.

BI can be used in marketing, sales, human resources management, customer relationship management, search engine optimisation, web analytics and financial analytics. Everyone will become a data analyst, fast analysis is the key, data will become more visual and clouds being the new block are some of the trends in this field.

Providing fast answers on critical questions, empowering employees, saving time, intelligent audience targeting, identifying cost cutting areas, visual features and making cooperation easier are benefits of BI for SMEs. It costs a lot, sometimes it requires hiring big data experts and high maintenance costs for software are certain disadvantages of BI for SMEs.

They seek assistance for IT, deployment and new technology adoption. Building BI solutions in-house is limited among SMEs, since most of them do not have strong IT infrastructure. So, many software vendors are emerging as BI solution providers for SMEs.

However, a few SMEs have developed BI packages on their own or with the collaboration of software developing firms. Open source BI applications from Actuate, Pentaho, Jaspersoft etc. prove to be economic alternatives. But, it involves learning and experience.

ANALYTICS
Analytics is the combination of data processes by using statistical methods. Entrepreneurs need not know what it is; but it is their main business aiding computing tool. Business analytics applications will deliver a new edge for SMEs in the corporate world. SMEs will differentiate themselves using high performance business processes, derived from analytics.

Three categories of analytics are

i) Descriptive Analytics, which processes historical data to prepare useful information for further analysis.

ii) Predictive Analytics, which processes current data to predict the future.

iii) Prescriptive Analytics, which prescribes the best course of action for a given situation.

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PREDICTIVE ANALYTICS

Predictive data science offers a large body of algorithms from its constituent disciplines – data mining, statistics, mathematics, operations research, machine learning, modeling and artificial intelligence. Correlation analysis, regression analysis, cluster analysis, time series analysis, classification analysis and association analysis are commonly used predictive analytics techniques.

Predictive analytics captures relationships between explanatory and predicted variables from past occurrences and explores them to predict future outcomes. This helps SMEs watch their core business functions closely, since BI derives meaningful insights from their data, tracks business parameters and predicts the performance.

Predictive analytics has proved its worth in customer prediction, customer retention, sales forecasting, cross selling & business segmentation and production & capacity planning areas. SMEs can easily see the value in adopting BI. It can be seen in planning & execution, sensing response and making predictive analysis. SMEs will depend on BI interpretations, which are based on content, context and location.

MS Excel is not a direct predictive analytics tool; but it gives possible tools to make statistical determination to build predictive forecasts. Add-on tools like Solver, XLMiner turn MS Excel into full-fledged predictive analytics platform. Applications like SAS, R are available specifically for statistical analysis.

FLIPKART USES MARKET DATA ANALYTICS

Flipkart has signed a Memorandum of Understanding with Federation of Indian micro Small and Medium Enterprises (FISME), a body promoting SMEs and National Centre for Design and Product Development (NCDPD), a body promoting handicraft designs. This affiliation will enable 50,000 SMEs to become self-reliant, improve their living standards and scale up their businesses by providing them infrastructural support in data analytics, marketing and customer acquisition.

This move will help Flipkart in expanding its seller base and brand name across SMEs and become up-to-date with the changing requirements. With the help of strong data analytics, it is easier for sellers to improve their products and services, thereby attracting more customers. Analytics and marketing intelligence provided by Flipkart will assist FISME and NCDPD in deciding on right selling price, payment automation, proper packaging, transportation, brand building etc.

It will help SMEs in selling their products, creating huge employment opportunities and reducing the migration of rural population to urban areas. This affiliation will help entrepreneurs create products as per buyer requirements, grow as national level manufacturers and revolutionize manufacturing in India, encouraging entrepreneurship and developing the rural economy.

CONCLUSION

With BI insights and big data solutions, entrepreneurs will have significant advantage. The use of BI in SMEs will increase their efficiency. They are turning toward BI solutions to drive on a fast growth track. However, with aspirations of offering added business value to the customers and to deal with competitive challenges, SMEs are turning to business assessment and performance management solutions. Analytics improves number of small decisions in an organization. Analytics has the ability to predict the future for existence and sustainable growth of SMEs. By acting on the predictions produced, SMEs can apply their learning and modify everyday operations.

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A STUDY ON SMALL INDIGENOUS FRESHWATER FISH UNDER GENUS *PARAMBASSIS* BLEEKER, 1874, FROM PASCHIM MEDINIPUR AND JHARGRAM DISTRICT OF WEST BENGAL, INDIA

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ABSTRACT
Present study reveals the existence of three species of small, indigenous fish under genus Parambassis of family Ambassidae and order Perciformes from freshwater aquatic systems of Paschim Medinipur and Jhargram district of West Bengal. It is the first time study on the group from the study area. Taxonomy of the species as well as their geographical distribution and diversity is the prime interest of the work. A comprehensive zoogeography of the species in different revenue blocks of the districts has been recorded in details. Hence, the work is a documentation of macro faunal diversity at regional level for freshwater ecosystem of the study area.

Keywords: Regional, Diversity, Small, Fish, Parambassis.

INTRODUCTION
Small indigenous freshwater fish are often an important ingredient in the diet of village people who live in the proximity of freshwater bodies. Word 'Indigenous' means the originating in and characteristic of a particular region or country & native area. Small indigenous freshwater fish species (SIF) are defined as fishes which grow to the size of 25-30 cm in mature or adult stage of their life cycle (Felts et al, 1996). They inhabit in rivers and tributaries, floodplains, ponds, tanks, lakes, beels, streams, lowland areas, wetlands and paddy fields. These fish can live in a harsh environmental condition and able to reproduce and grow rapidly in favourable condition. These species are not only a source of vital protein to the rural poor but also a valuable source of micro-nutrients such as calcium, zinc, iron & fatty acids (Roos et al., 2007; Halwart 2008). Research has proved that the bioavailability of calcium from these small indigenous freshwater fish species is at par with that derived from milk (Ross et al., 2007). These species also can provide a source of supplementary income to rural households. Given the local demand for small indigenous fish species of freshwater origin, the FAO (1999) has also indicated the possibility of integrating such indigenous species into freshwater culture systems. Small scale aquaculture along with Indian major carps of *Amblypharyngodon mola*, *Puntius sophore*, *Osteobrama cotio*, *Cirrihinus reba*, *Labeo bata*, *Gudusia chapra* have been reported (Ayyappan and Jena J.K.2003, Roos et al 2003, Jena et al., 2008). In the Indian region out of 2500 species, 930 are freshwater inhabitants & 1570 are marine (K.C.Jayaram 2010). ZSI has recorded 2641 Pisces in 2012. A lot of works has been done in Northern region followed by southern region of India. Recent paper of Goswami et al., (2012) enlisted 422 fish species from north east India, belonging to 133 genera and 38 families. Rema and Indra (2009) have reported 667 species under 149 Genera of 35 families in southern region. 950 species of freshwater fishes have been found in India [Fishbase (ver.10/2015)]. If we look for the report from West Bengal, we see that a very few works has been done on freshwater fishes from the region.

In West Bengal 171 freshwater fish species was reported by Sen, 1992. After few years there were a wide change in number of fish species has been reported. Barman. R.P. 2007 recorded 239 freshwater species belonging to 147 genera, 49 families and 15 orders from West Bengal. 70 indigenous ornamental fish species belonging to 45 genera, 30 families and 9 orders were reported by Basu et al. (2012). All of these works are mostly based on indigenous ornamental freshwater fishes. But works on small indigenous freshwater fishes, other than ornamentals are scanty. So, the record of freshwater fish fauna of Paschim Medinipur and Jhargram are nil. Therefore, present work is the first attempt towards the recording of small indigenous freshwater fish fauna of the study area. The results presented here provide an insight to the regional macro-faunal diversity of the study area, and have established a baseline for future studies. Present paper is restricted only on the genus *Parambassis* and recorded three species namely *Parambassis baculis* (Hamilton, 1822), *Parambassis lala* (Hamilton, 1822) and *Parambassis ranga* (Hamilton, 1822) under family Ambassidae Klunzinger, 1870 from the site studied.

MATERIALS AND METHODS
Present study is mainly based on the specimen collected from different river, pond, bills applying different commercial fishing method throughout all the blocks of undivided Paschim Medinipur (22° 25'N 87° 19'E) during May 2013 to November 2015. Collection of fish fauna was done at early morning and specimens were immediately preserved in 2-4% formaldehyde and were brought to laboratory in preserved condition. Then fish specimen were washed and finally preserved in 4-6% formaldehyde. Body parts of all the specimen have been dissected and studied for identification under stereoscopic binocular microscope. In some cases additional

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important diagnostic characters are included. Identification of specimens has done on the basis of literature like Talwer and Jhingran (1991), K. C. Jayaram (2010) and Fishbas (2013). The detailed synonymies have been furnished to the genera and species and also their diagnosis, distribution, taxonomic remarks have been furnished. In addition an attempt has been made to include a comprehensive coverage of the references in reference section. For all citations of taxon author's name and year of publication has been given.

RESULTS

Systematic Accounts

Fishes under study are belongs to the class Actinopterygii. A brief account of its systematic position is given bellow

Kingdom : Animalia (Linnaeus, 1758)

Phylum : Chordata (Haeckel, 1874)

Class : Actinopterygii (Klein, 1885)

Order : Perciformes Bleeker, 1859.

Family : Ambassidae Klunzinger, 1870.

Genus *Parambassis* Bleeker, 1874

Bleeker (1874) created the genus based on the *Ambassis apogonoides* Bleeker, 1851 as type species for the genus . 18 species of Genus *Parambassis* has been found in the world and 7 species found in India. A brief history of the genus with special reference to Indian contribution has been given below.

1975 *Parambassis* Guha and Talwar, *J. Inland Fish. Soc. India*, 8:76.

Type species: *Ambassis apogonoides* Bleeker, 1851, *Natuurkundig Tijdschrift voor Nederlandsch Indië* v. 2 (no. 2): 193-208.

Type locality: Bandjarmasin, Borneo, Indonesia.

Diagnosis of the Genus: Body elongate and compressed. Snout pointed. Villiform teeth present in jaw. Among the jaws, outer row of jaw is slightly enlarged. Supraorbital edge smooth, with 1-2 spine present posteriorly. Posterior portion of interoperculum is denticulate. Present of large scale. Lateral line has 30 scales. Cheek has 6 rows of transverse scale.

Key to the species

1. Gill rankers on lower limb of first arch 12-18 2

   Gill rankers on lower limb of first arch 21-25, body depth 41.7-43.4% SL

   ..... *Parambassis* ranga

2. Body with three longitudinal bands along side, second spine of dorsal fin is very elongated ..... *Parambassis lala*

   Body with only a silvery lateral band on side, second spine of dorsal fin is not so elongated ..... *Parambassis baculis*

Remark: Three species *Parambassis baculis, Parambassis lala* and *Parambassis* ranga has been recorded from the study area.

Parambassis baculis (Hamilton, 1822)

Parambassis baculis was originally described as *Chanda baculis* (Hamilton, 1822) from North- eastern part of Bengal. A brief history of the species with special reference to Indian contributions has been given below.

1875 *Ambassis baculis* Day, *Fishes of India*: 51, pl. 15, fig. 1; Day, 1889, *Fauna Br. India*, Fishes, **1**:485.

Type species: *Chanda baculis* Hamilton-Buchanan, 1822, *Fish Ganges*, pp. 112, pl. 22, fig. 7.

Type locality: North-eastern parts of Bengal.

Materials Examined: 5 female (2.3cm– 3.2 cm), 2 male (2.4cm- 3.0cm), RNLK/ZOO/FISH/39, Sabong (Mohar), Paschim Medinipur, West Bengal, 21.05.2013, B. Paul.

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Fig-1: *Parambassis baculis* (Hamilton, 1822)

Diagnosis of the species: Body small and compressed. Mouth oblique, lower jaw intruded when mouth closed. On the lower arm of first arch of gillrakers are about 11. Scales are small. Lateral line has 90 scales. Cheek has 7 rows of transverse scale. Fin formula- D VI+I 12-13; P i 11-12; V I 5; A III 12-13.

Distribution: India: It has been found in India (Arunachal Pradesh, Assam, Bihar, Karnataka, Tripura, Uttar Pradesh and West Bengal).

Paschim Medinipur: During the present study the species has been found in Sabong block of Paschim Medinipur.

Elsewhere: Myanmar; Bangladesh.

***Parambassis lala* (Hamilton, 1822)**
Parambassis lala was originally described as *Chanda lala* (Hamilton, 1822) from Gangetic provinces. A brief history of the species with special reference to Indian contributions has been given below.

1875 *Ambassis ranga* Day, *Fishes of India*: 51; Day, 1889, *Fauna Br. India*, Fishes, **1:** 485.

1935 *Ambassis lala* Innes, *Exotic Aquarium Fishes*: 445.

Type species: *Chanda lala*, Hamilton, 1822, *Fishes of Ganges*: 114, Pl. 21, fig. 39.

Type locality: Gangetic provinces.

Materials Examined: 16 female (2.1cm – 3.6 cm), 9 male (2.4cm- 3.8cm), Gopiballavpur I (Gopiballavpur) , Paschim Medinipur, West Bengal, 07.03.2014, B. Paul ; 8 female (2.3cm – 3.7 cm), 6 male (2.4cm- 3.6cm), Gopiballavpur II (Tapsia, Andharia) , Paschim Medinipur, West Bengal, 29.10.2013, B. Paul; 12 female (2.8cm-4.0cm), 7 male (2.3cm- 3.9cm), Keshiary (Bhasra), Paschim Medinipur, West Bengal, 26.10.2013, B. Paul ; 9 female (2.4cm-3.2cm), 4 male (2.1cm- 3.7cm), Jhargram (Lodhasuli, Sardhia), Paschim Medinipur, West Bengal, 09.09.2013, B. Paul ; 9 female (2.8cm-3.8 cm), 10 male (2.0cm- 3.9cm), Binpur I (Lalgarh), Paschim Medinipur, West Bengal, 14.09.2013, B. Paul.

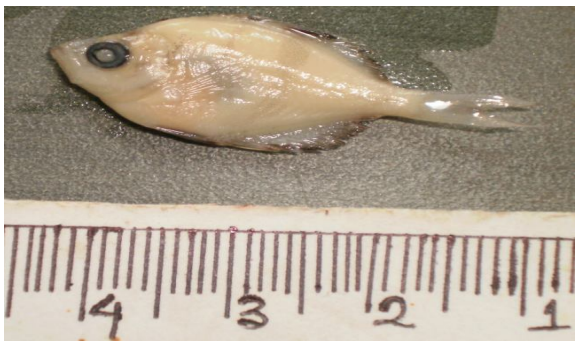

Fig-2: *Parambassis lala* (Hamilton,1822)

Diagnosis of the species (Plate V, Fig. 3): Body small and almost rounded. Mouth is oblique. On the lower arm of first arch number of gillrakers are 16. Second spine of dorsal fin very elongated. Scales is minute, Lateral line with 85- 90 scales. Cheek has 7 rows transverse scale. Body is orangish-yellow with three longitudinal bands extending dorsoventrally. Fin formula- D VII+I 11; P i 10; V I 5; A III 13.

Distribution: India: It has been found in India (Assam, Bihar, Orissa, Tripura and West Bengal).

Paschim Medinipur: During the present study the species has been found in Chandrakona II, Keshiary, Jhargram, Gopiballavpur I, Gopiballavpur II, Garbrta III, Binpur II blocks of Paschim Medinipur.

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Elsewhere: Myanmar.

Remarks: Lateral line absent in some specimen. Lateral line scale vary from 85 -90. A spot present on the base of caudal fin. Caudal fin directed downwards.

***Parambassis ranga* (Hamilton, 1822)**
Parambassis ranga was originally described as *Chanda ranga* (Hamilton,1822) from freshwater of all parts of Gangetic provinces. A brief history of the species with special reference to Indian contributions has been given below.

1875 *Ambassis ranga* Day (Pratim) *Fishes of India*: 51, Pl. 14, fig. 6; Day (Pratim), 1889, *Fauna Br. India*, Fishes, **1:** 485.

Type species: *Chanda ranga* Hamilton,1822, *Fishes of Ganges* : 113, 371, pI. 16, fig. 38.

Type locality: India: fresh waters of all parts of the Gangetic provinces.

Materials Examined: 8 female (2.1cm – 3.6 cm), 3 male (2.3cm- 3.4cm), Gopiballavpur I (Gopiballavpur) , Paschim Medinipur, West Bengal, 07.03.2014, B. Paul; 7 female (2.3cm – 3.7 cm), 6 male (2.3cm- 3.9cm), Gopiballavpur II (Tapsia, Andharia) , Paschim Medinipur, West Bengal, 29.10.2013, B. Paul ; 7 female (2.9cm -4.9 cm), 5 male (2.7cm- 3.6cm), Pingla (, Gobordhanpur), Paschim Medinipur, West Benal, 28.05.2013, B. Paul .

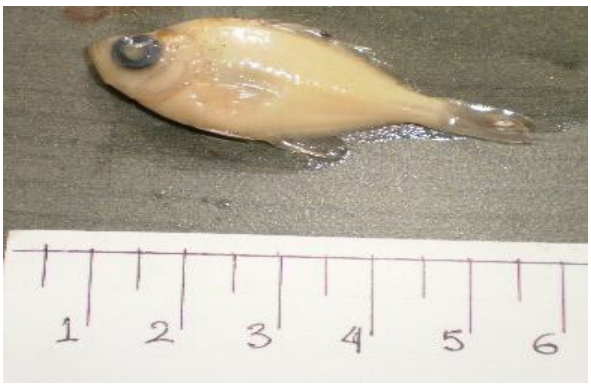

Fig-3: *Parambassis ranga* (Hamilton,1822)

Diagnosis of the species (Plate IV, Fig. 1): Body stout, deep & compressed. One or two serration found at the angle of pre-opercular hinge region. Mouth is oblique. 21-25 gillrankers found in lower arm of first arch. Scales are small. Lateral line with 47-63 scales. Cheek with 7 rows transverse scale. A broad lateral silvery stripe present on the body. A dusky spot present on shoulder. Fin formula- D VII+I 11-14; P i 11-12; V I 5; A III 13-15.

Distribution: India: It has been found in India (Bihar, Jharkand, Madhya Pradesh, Maharashtra, Orissa and West Bengal).

Paschim Medinipur: During the present study the species has been found in Gopiballavpur I, Gopiballavpur II, Pingla blocks of Paschim Medinipur.

Elsewhere: Malaysia; Myanmar; Nepal; Pakistan; Bangladesh; Cambodia.

CONCLUSION
These three indigenous fishes under study are regarded as food fish (Chuno mach). Present author is suggesting *Parambassis lala* as an ornamental fish for its shiny body colour. *Parambassis lala* is a near threatened category and remaining two are least concern category as per IUCN (2010 ver. 3.1). It is difficult to estimate the population density of such fishes as these are not commercially marketed. Local survey reveals that the population is rapidly depleted. Research on the group is urgently needed to rescue these valuable natural resources. Captive breeding is being suggested as an effective measure for sustainability of these species.

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HUMAN RESOURCE DEVELOPMENT PRACTICES IN TELECOM SECTOR AMONG PUBLIC AND PRIVATE SECTOR: A COMPARATIVE STUDY

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ABSTRACT
Telecom industry considered largest as well as fastest developingindustryrelated to goods and services among public and private sector. The developingsignificanceregarding thissegmentbecomes morefocused areato study by researcher.The centralaimof currentstudy is to docomparative study among public and private sector of telecom industry considering the practices of HR Development (HRD). The Scholar conducted analysisto understand the criteriafor studyingconcept of HRDevelopment practices in telecom industry. A reviewof feedback form has been developed and orderedby employees of telecom industry at managerialand executive level from the selected sectors of telecom industry. This research explained the environment and practices adopted by telecom industry related toHR Development and provide suggestions to advance the leap of related practices when they require developing and improving the system.

Keywords: Telecom industry, Public and Private sector, Performance Appraisal, HR Development, Recruitment and selection

INTRODUCTION

HR Development (HRD) considered being the portion of social ability supervision that principally achieves the motive of organizing and enhancement of the workers in particular organization. Human ability enhancement integrates formulating societyaccording to the focused motive, generous likelihoods to absorb original talents, appropriating resources those consider valuable intended to the worker's assignments and selected other influential movements. Advancement of human resource considered essential for particular association that influence need for self-motivated and advance situated. Human Resource has limitless prospective abilities as these other than different assets. The prospective can be operated impartial by assembly surroundings that can constantly identify, bear to outward, maintenance and consume the abilities relating to person.

Human Resource Development (HRD), move further to construct agenda for making particular surroundings. A few Human Resource Development (HRD) approaches have been made starting late to play out the above endeavor in perspective of particular principles. This unit gives a perception of the possibility related to Human Resource Development (HRD) system, correlated devices along with the shifting utmost reaches of Human Resource Development (HRD).

Human Resource Development (HRD) has been characterized by different researchers in different ways. A portion of the vital meanings of Human Resource Development (HRD) are as per the following:

- According to Leonard Nadler, "Human Resource Development (HRD) is a progression of sorted out exercises, led inside a particular time and intended to deliver social changes."
- Agreeing with M.N. Khan, "Human Resource Development (HRD) is the crosswise over of expanding information, capacities and constructive work mentalities surprisingly working at all levels in a business undertaking."

REVIEW OF LITERATURE

Neville's (1982) study found that human resource is fully responsible to direct library service to users and to maintain a balanced organizational set up and further found that complicated organizational set up limits the services delivery function.

Pugliese (1985) stresses that; there is need of an excellent management application for libraries, especially the management of human resources. The study further focusedon library's personnel program involving the identification and forecasting of staffing needs of the organization along with the requirements of the employees in relation to their work and work environment.The survey reveals the fact that only few library administrators have been prepared for management, especially in HRM and he argues the need of accreditation of HRM education in USA.

Smith (2006) expressed that motivation behind his examination needs to analyze about prospective regarding utilization for benchmarking about HRDevelopmentpracticearound LIS area. The investigation analyzes the measurements which might be valuable in benchmarking HRD on the potential for the application movement in

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library and data segment. The discoveries of this examination uncover that HRD benchmarking can possibly turn into a great apparatus in guaranteeing unrivaled and enhancing HRD rehearse in the LIS part.

Rao and Rao (2007) investigate the idea of HRDevelopment Departments along withpracticesrelated to India. That examination covers hypothetical structure for HR Development, standards of HRD, capacities and usage of different HRD subsystems. Endeavors are made to assess the HRD structures, frameworks, abilities and culture by a group of specialists into 12 corporate associations.

RATIONALE

The examination on Human Resource Development in remedial, protection and telecom facility, under present situation of telecom industry in nation is basic to comprehend facilities telecoms display HRDevelopment rationality, practice and result with a view to offer recommendations for detailing of right reasoning and routine with regards to HRDevelopmentfor telecom facility. The present investigation has been attempted in perspective of the non-attendance of precise concentrated regarding the matter.

OBJECTIVE

- To compare the HRD practices between public and private sector of telecom industry.

HYPOTHESIS

$H_0$1: There is no significance difference in recruitment and selection practices between private and public sector of telecom industry

$H_0$2: There is no significance difference in training and development practices between private and public sector of telecom industry

$H_0$3: There is no significance difference in performance appraisal practices between private and public sector of telecom industry

$H_0$4: There is no significance difference in employee empowerment practices between private and public sector of telecom industry

$H_0$5: There is no significance difference in motivational practices between private and public sector of telecom industry

RESEARCH METHODOLOGY

The examination is exact in nature consequently; the work is to a great extent in light of essential information. Information has been gathered with the assistance of a study poll in English in view of the rules of the model survey with a few changes, directed among the representatives of the chose organizations in public and private sector of Telecom Industry. Auxiliary information is likewise utilized for alluding the applied viewpoint and writing audit gathered from different sources like distributed books, diaries, magazines, periodicals, examine studies, work led regarding the matter and sites. Independent sample t test used for the hypothesis testing in SPSS software.

DATA ANALYSIS AND INTERPRETATION

$H_0$1: There is no significance difference in recruitment and selection practices between private and public sector of telecom industry.

Group Statistics

Table No-1

Sector	Mean	Std. Deviation
Public	**2.14**	0.872
Private	**2.23**	0.841

Table No-2

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	Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	**Sig.**	T	Df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	Lower	Upper
Equal variances assumed	2.152	**0.183**	0.303	82.557	0.324	-0.2	0.134	-0.356	0.127
Equal variances not assumed			0.357	128	0.378	-0.2	0.125	-0.321	0.117

Interpretation: At the point when the recruitment and selection practices was examined concerning Private and Public division of telecom Industry, the estimation of criticalness for area was observed to be .183, as indicated by table no. 2; which is more than the centrality estimation of .05 which implies that the null hypothesis is rejected. There is hugeness contrast found in recruitment and selection practices in public and private sector in telecom. The recruitment and selectionpractices are marginally higher in private area as the mean of fulfillment of is observed to be 2.23 and the mean of recruitment and selection practices of public part is 2.14 on the grounds that at time of recruitment and selection private division branch administrator give need for the neighborhood workers though public sector branch supervisor offers need to those applicant who are from out of the city, so that at the season of advancement they can move to alternate urban areas.

$H_0$2: There is no significance difference in training and development practices between private and public sector of telecom industry

Group Statistics

Table No-3

Sector	**Mean**	Std. Deviation
Public	**3.42**	0.961
Private	**4.01**	0.503

Table No-4

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	**Sig.**	T	Df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	Lower	Upper
Equal variances assumed	0.24	**0.753**	3.964	148	0	0.497	0.125	0.249	0.744
Equal variances not assumed			0.787	148	0.433	0.094	0.12	-0.143	0.331

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Interpretation: At the point when the training and development practices was dissected as for Public and private division of telecom industry, the estimation of centrality for part was observed to be .753, as indicated by the table no. 4; which is more than the hugeness estimation of .05 which implies that the null hypothesis is rejected. There is hugeness distinction found in training and development in public sector and private in telecom in light of the fact that the coach of private area is in branch from last such a large number of years, the most seasoned representative of that branch is giving the preparation to their workers so the workers get steady touch in mentor and out in the public branch the specialists call from head office time to time and he gives the preparation to representatives.

$H_0$3: There is no significance difference in performance appraisal practices between private and public sector of telecom industry

Group Statistics

Table No-5

Sector	**Mean**	Std. Deviation
Public	**2.352**	1.235685026
Private	**2.355**	1.145280502

Table No-6

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	**Sig.**	T	Df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	Lower	Upper
Equal variances assumed	0.976	**0.712**	2.975	128.55	0.004	0.556	0.187	0.186	0.926
Equal variances not assumed			2.872	148	0.005	0.556	0.194	0.173	0.939

Interpretation: At the point when the performance appraisal practices were discover in telecom part of public and private division in regard of telecom industry, the estimation of criticalness was observed to be 0.712, as indicated by table no.6, which is more prominent than the noteworthiness estimation of 0.05 which implies that null hypothesis is acknowledged. So it might be presume that there is no essentialness contrast in performance appraisal practices in regard to public and private area in telecom industry. So results recommend that performance appraisal practices are same in telecom part in broad daylight and private. The performance appraisal is utilized for the advancements, enhance correspondence and discover the necessities of preparing and improvement. The private area is happier with the execution examination framework on the grounds that the advancement chances are higher in private.

$H_0$4: There is no significance difference in employee empowerment practices between private and public sector of telecom industry

Group Statistics

Table no-7

Sector	**Mean**	Std. Deviation
Public	**1.531**	1.03455313
Private	**1.859**	0.72581317

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Table No-8

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	**Sig.**	T	Df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	Lower	Upper
Equal variances assumed	14.27	**0.141**	2.434	88.958	0.017	-0.381	0.157	-0.693	-0.07
Equal variances not assumed			2.642	148	0.009	-0.381	0.144	-0.667	-0.096

Interpretation: At the point when the employee empowerment practices were discover in broad daylight and private part in regard of telecom industry, the estimation of essentialness was observed to be 0.141, as indicated by table no. 8,which is more noteworthy than the noteworthiness estimation of 0.05 which implies that null hypothesis is acknowledged. So it might be infer that there is no centrality distinction in worker strengthening practices in regard to private and public sector. So results recommend that worker strengthening practices are same in telecom industry.

$H_0$5: There is no significance difference in motivational practices between private and public sector of telecom industry

Group Statistics

Table no-9

Sector	**Mean**	Std. Deviation
Public	**3.06**	0.986
Private	**3.82**	1.145

Table No-10

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	**Sig.**	T	Df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	Lower	Upper
Equal variances assumed	4.582	**0.01**	1.517	148	0.131	0.269	0.177	-0.081	0.62
Equal variances not assumed			1.604	91.37	0.112	0.269	0.168	-0.064	0.602

Interpretation: At the point when the motivational factor was dissected concerning telecom industry, the estimation of essentialness for was observed to be .01, as indicated by table no. 5.68 which is littler than the criticalness estimation of .05 which implies that the null hypothesis is rejected. So it might infer that there is huge distinction in motivational practices of public and private sector of telecom industry. So results propose that the motivational practices are better in private sector of telecom industry in light of the fact that if private sectors give motivational preparing along motivators which helps representatives for working productively and adequately.

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FINDINGS AND DISCUSSIONS

- The recruitment and selection practices are somewhat higher in private sector as the mean of fulfillment of is observed to be 2.23 and the mean of recruitment and selection practices of public sector is 2.14 on the grounds that at time of recruitment and selection private sector branch chief give need for the neighborhood workers though public sectorbranch administrator offers need to those applicant who are from out of the city, so that at the season of advancement they can move to alternate urban areas.
- There is hugeness contrast found in training and development practices in part of public and private in telecom on the grounds that the mentor of private division is in branch from last such a significant number of years, the most established representative of that branch is giving the preparation to their workers so the representatives get consistent touch in coach and out in the public sector the specialists call from head office time to time and he gives the preparation to representatives.
- The performance appraisal practices are same in telecom division in public and private sector. The performance appraisal is utilized for the advancements, enhance correspondence and discover the requirements of preparing and improvement. The private area is happier with the execution examination framework on the grounds that the advancement chances are higher in private.
- The employee empowerment practices are same in telecom industry. A pioneer considering inspecting about shoulder of individuals is nominal in excess of a minder. Give your specialists reasons and opportunity to reach out without any other individual and even lead others. They may waver, yet they'll take in an impressive measure and amass the respect of their accomplices while intending to be mind-blowing empowering pioneers themselves sooner or later and the agents who are from private region need to work more because of competition, in this manner get the thought snappier as diverge from open part.
- The motivational practices are better in private part of telecom industry in light of the fact that if private banks furnish motivational preparing alongside motivators which helps representatives for working proficiently and adequately.

CONCLUSION

The present investigation was meant to examinations a portion of these HRD practices to discover which ones can help the telecom business among Private and public sector to battle the future difficulties based on these factors: Recruitment and determination, Training and Development, Performance Appraisal, Employee strengthening and Motivational Practices. It has been watched that HR Development practices are given due thought in the Telecom Sector understudy as their mean scores were seen to be better than expected. This is a sound sign of the common HRDevelopment Practices which got a decent reaction from the respondents were Recruitment and choice, Training and Development, Performance Appraisal, Employee strengthening and Motivational Practices. In the event that these practices are preceded and improved in incline with the changing worldwide telecom condition, some better outcomes could be unmistakably found in the telecom business. In any case, there have been some basic zones of perception, which are a piece of HR Development Practices and are critical from HR Development point of view.

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ANALYSIS OF CUSTOMER SATISFACTION OF SELECTED PRIVATE SECTOR BANK OF AHMEDABAD REGION

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ABSTRACT
This paper try to explore how much customers are satisfied with the service given by the private bank and how customer's satisfaction influence quality of services given by banks. Now day's customer count as a key element of any industry or business so we can say that for any long term relationship customer satisfaction is very important. In this competitive market every bank try to give best to customer for win customer loyalty, so every banks try new scheme and services to make their customer satisfied. Private banking sector and especially new generation private banks are very popular towards their services so this study tries to find out which are main aspects for customer satisfaction. To achieve this result we used basically primary data. In primary data a structured questionnaire prepared which includes 13 key elements of banking services. Total 600 sample size taken for three different private banks. For the analysis frequency analys is adopted to investigate the relationship between demographical variable and satisfaction variable. The findings support the positive relationship between satisfaction variable and demographical variable and conclusion is customer are satisfied with the services given by these banks.

Keywords: Customer satisfaction, private banks, demographical variable, industry, customer loyalty.

INTRODUCTION
An incorporated monetary foundation is especially fundamental in fortifying and comply economic development for any country. A well working monetary division encourages proficient intermediation of money related assets. The more successful cash related structure is, in resource time and in its portion, the more vital is its duty to banking related achievement. The trading of benefits by gaining and advancing is basic to any economy. Without these trades the level of financial development can't be upheld; work and compensation can't be made.

Many individuals are having buying power now and need the utilization to be delayed to future which is conceivable through savings .Other individuals who hope to have buying power in future need it to be progressed which is conceivable through borrowings. To begin with classification expects some reward for such deferments and the second classification is set up to pay some cost for such headway. Here emerges the budgetary market to satisfy the requirements of both the classifications. In this way, money related market assumes a noteworthy part in the preparation and portion of investment funds.

PRE- LIBERALIZATION PERIOD
In pre-liberalization period India confronted numerous progressions. In spite of the way that there was a vital advancement of Indian Banking in the midst of what's more, right away after the Second World War it was not adequate to meet the requirements of such an immense country like India with a considerable people and unfamiliar resources. The imposition of social control did not change the position as expected. Sectors demanding priority such as Agriculture, Small scale: Industries and Export-Imports were not receiving attention due to them from bank.

POST LIBERALIZATION PERIOD
The nationalization of the business banks was a "transformation" in the Indian dealing with a record system. It was a "significant" and weighty event ever. This agitation did not just suggest a difference in the proprietorship. of these banks yet it was the beginning of a sorted out endeavor to use a basic bit of the cash related framework for the country's monetary progression. Following the Nationalization Act of 1969 and the nationalization of 14 biggest business banks raised the general population area banks offer of store from 31% to 86%. The further nationalization of six more banks in 1980, raised the public sector banks' share of deposits to 92%.

The 14 bank nationalized in 1969

1. Central Bank of India
2. Indian Overseas Bank
3. Bank of Maharashtra
4. Bank of Baroda

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5. Dena Bank
6. Union Bank
7. Punjab National Bank
8. Allahabad Bank
9. Syndicate Bank
10. United Bank of India
11. Canara Bank
12. UCO Bank
13. Indian Bank
14. Bank of India

The banks nationalized in 1980

1. Andhra Bank
2. Corporation Bank
3. New Bank of India
4. Oriental Bank of Commerce
5. Punjab and Sindh Bank
6. Vijaya Bank

PRIVATE BANKING SECTOR

Private Sector Banks are those Banks which are possessed by the private players. The private division assumed a vital part in the advancement of joint area bank's changes in India. In 1951, there were in every one of the 556 private division banks, of which 474 were nonscheduled and 92 were scheduled. From that point forward, the quantity of open division banks is expanding while those of private area banks are diminishing. Private segment banks incorporate Indian and foreign banks.

As of March 31, 2009, the Indian banking system comprised 30 public sector banks, 10 new private sector banks, 14 old private sector banks, 30 foreign banks, 90 Regional Rural Banks (RRBs), 4 Local Area Banks (LABs), 2170 urban cooperative banks, 31 state co-operative banks and 371 district central co-operative banks.

LITERATURE REVIEW

Analyzing consumer loyalty with benefit quality in life coverage administrations (Masood H. Siddiqui and Tripti Ghosh Sharma, 2016). In each organization consumer loyalty is critical and in a roundabout way identified with productivity, in this examination the principle point was to research client recognition for benefit quality and for the protection area. With the assistance of SERVQUAL Model information was gathered and the respondents are allover India. It was discovered that Agent and administration quality some were impact the client which appears in positive development and contrast with a decade ago India see development in Insurance Sector. Different things like value observation, exchanging cost, specific insurance agency and so on may examine in for additionally inquire about.

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DR. SNEHALKUMAR H MISTRY(2013), Banking area is wide India and when we taking about consumer loyalty its in every case exceptionally intriguing to investigate about it with connection of saving money part same in this paper MEASURING CUSTOMER SATISFACTION IN BANKING SECTOR: WITH SPECIAL REFERENCE TO BANKS OF SURAT CITY. For this investigation 120 client from various banks are taken as test and utilized SERVQUAL display (in an altered frame) taken. From Analysis it was discovered that a client

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gives second significance to responsiveness of bank representatives. It incorporates different criteria like, speediness in giving administration, readiness to help clients and so on. Client gives third inclination to affirmation factor, it incorporate criteria like wellbeing of exchange, consistency in benefit and so forth.

Karjaluoto (2002), in his paper made an attempt to determine those factors that influence the formation of consumer attitude toward electronic banking. The author studied that how attitude towards technology in general impact on consumer behavior in an IT environment. The author identified the beliefs, attitudes and intention of consumer towards e-banking by means of 30 in-depth interviews and a mailed questionnaire in Finland. The results of the study indicated that educated and relatively wealthy segment use more electronic banking services. The author also recognized that a negative attitude toward technology, valuing personal service and demographic characteristic were found to be the most substantial barrier in adoption of electronic banking in Finland.

Pallav Sikdar and Amresh Kumar (2015) try to investigate "Online banking adoption: A factor validation and satisfaction causation study in the context of Indian banking customers" for this study five-factor online banking adoption model has been used and reliability test also has been done. The sample size was 280 customers from different selected banks of India. A structured questionnaire was prepared and filled by the customers. Main four factors considered for this research is Trust, Usage Constraint, Ease. As we see in the findings Trust and Ease are relatively weak according to overall customers point of view. This digital world E-banking is considered as one of the important service and this paper trys to fill the gap between customer adaptations E- banking to proposed model.

Logasvathi Murugiah and Haitham Ahmed Akgam (2015) attempt to investigate about "Customer Satisfaction in the Banking Sector in Libya" for this research basically primary data collection method was used and well-structured questionnaire was prepared. Total sample was 150 bank customers of Libya. Two main variable of this study is customer loyalty and service quality and the other factor was security, these factors are considered main influencing factor towards customer satisfaction. There is positive relationship between customer loyalty and services provided by Libyan banks but customers are not really happy with security features of banks.

H.Saduman Okumus and Elif Guneren Genc (2013) in there paper the try to find customer satisfaction towards "Interest free banking in Turkey" as they saw rapid growth in interest free banking in turkey so they try to find out the factors according to customer point of view and how much they are aware of it. Based on 281 sample it uncovers that the greater part of the respondents give the most elevated significance to religious conviction as main consideration for making choice of a bank to manage. In light of our observational discoveries; we additionally recorded a low level of consumer loyalty on the predetermined number of branches, the accessibility of an extensive variety of credits with ideal terms and high administration commission and expenses.

RESEARCH METHODOLOGY

These study presents ask about plans and methodologies have been used by the examiner in this examination. It's united the issue proclamination, investigate targets, hypothesis definition, test depiction, frequency analysis and data gathering techniques estimation of variables. The reliabilities, validities of measures and factor examination are furthermore given toward the end periods of this segment.

SAMPLING

Considering the titled of the study "ANALYSIS OF CUSTOMER SATISFACTION OF

SELECTED INDIAN PRIVATE SECTOR BANKS" for this total 600 sample size was taken from selected four private banks. The choice of bank depended on their quality in the market and fame, accessibility of information about different parameters and so forth.

1. HDFC bank
2. ICICI bank
3. Axis bank
4. Yes bank
5. Induslnd bank
6. Federal bank

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RESEARCH DESIGN

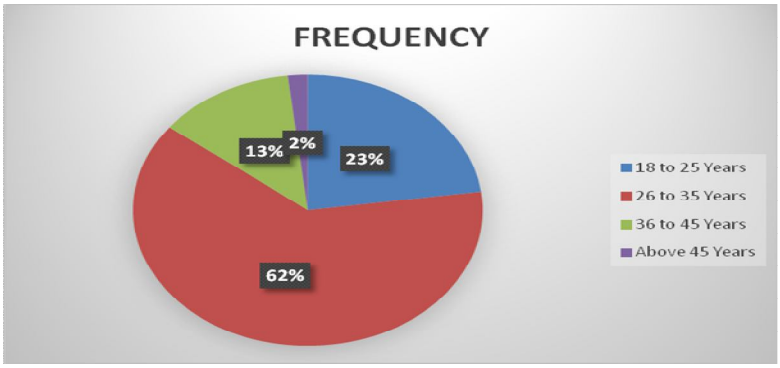
To achieve the target of this research primary data was used and structured questionnaire prepared and distributed to customers who have account in selected private banks. As customers of various age groups and income level have different requirements from the bank it was thought appropriate to go in for Stratified Sampling in the second stage of sampling. Total 300 questionnaires were distributed and all fully filled and fit for further data analysis were collected from the banking customers holding different account (saving, current, credit, and other deposits) and maintaining average account balance group from Ahmedabad city. The participants were from different age, gender, education, income, and occupation group. In the investigation Frequency, Percentage, used to discover the general customer loyalty of various chosen banks.

DATA COLLECTION AND ANALYSIS

1. AGE OF THE RESPONDENTS

Table-1

VARIABLE	FREQUENCY	%
18 to 25 Years	137	23%
26 to 35 Years	376	63%
36 to 45 Years	76	13%
Above 45 Years	11	2%
TOTAL	**600**	**100%**

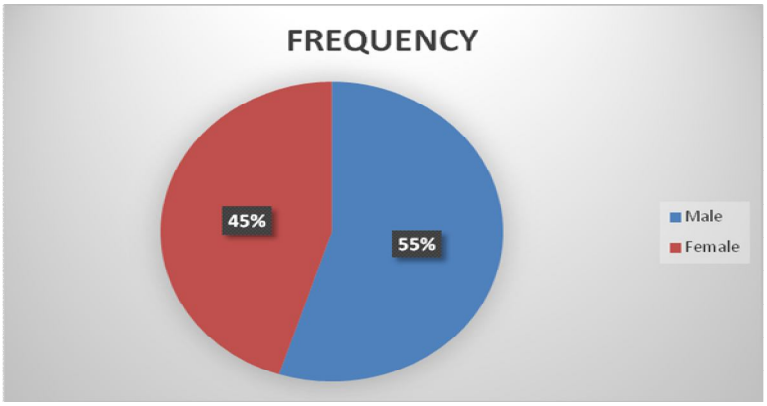


Interpretation: From the above table it can be seen that 23% of the respondents are between age group of 18 to 25 years, more than 60% of the respondents are between age group of 26 to 35 years. 13% of the respondents are between age group of 36 to 45 years while only 2% of the respondents are above 45 years.

2. GENDER OF THE RESPONDENTS

Table-2

VARIABLE	FREQUENCY	%
Male	330	55%
Female	270	45%
TOTAL	**600**	**100%**



Interpretation: From the above table it can be seen that 55% of the respondents are Male and, 45% of the respondents are Females.

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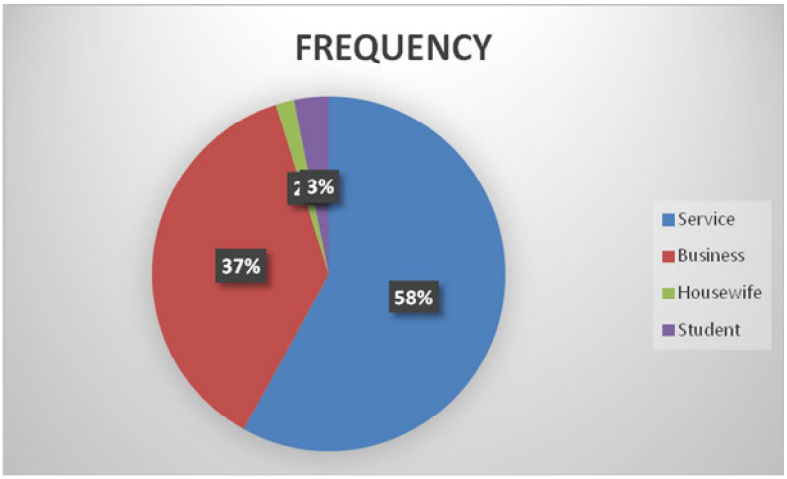
3. OCCUPATION OF THE RESPONDENTS

Table-3

RVARIABLE	FREQUENCY	%
Service	348	58%
Business	223	37%
Housewife	10	2%
Student	19	3%
TOTAL	**600**	**100%**

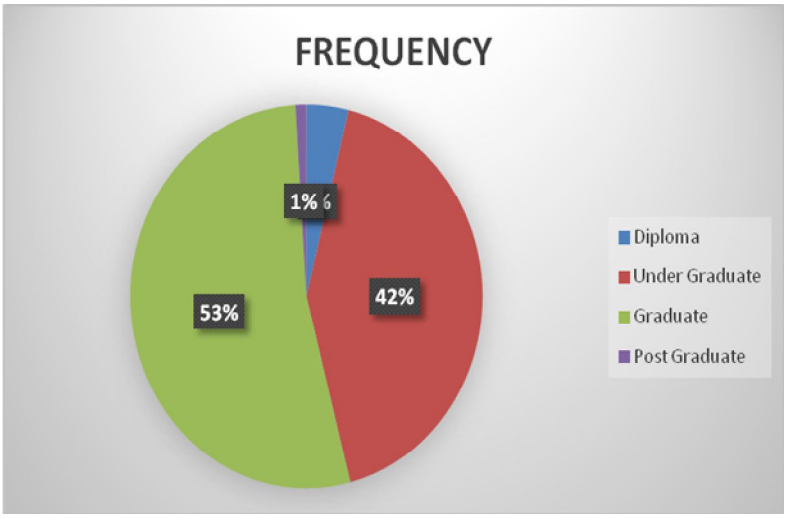


Interpretation: From the above table it can be seen that 58% of the respondents are in service sector, 37% of respondents are belong to business other 3% respondents are students and last remaining 2% respondents are housewife's.

4. EDUCATION OF THE RESPONDENTS

Table-4

VARIABLE	FREQUENCY	%
Diploma	23	4%
Under Graduate	253	42%
Graduate	318	53%
Post Graduate	6	1%
TOTAL	**600**	**100%**



Interpretation: From the above table it can be seen that 58% of the respondents are in service sector, 37% of respondents are belong to business other 3% respondents are students and last remaining 2% respondents are housewife.

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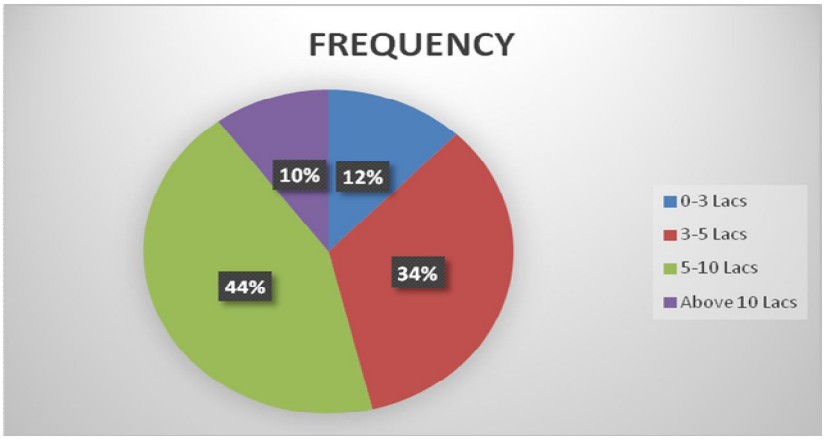
5. ANNUAL INCOME OF THE RESPONDENTS

Table-5

VARIABLE	FREQUENCY	%
0-3 Lacs	73	12%
3-5 Lacs	204	34%
5-10 Lacs	262	44%
Above 10 Lacs	61	10%
TOTAL	**600**	**100%**

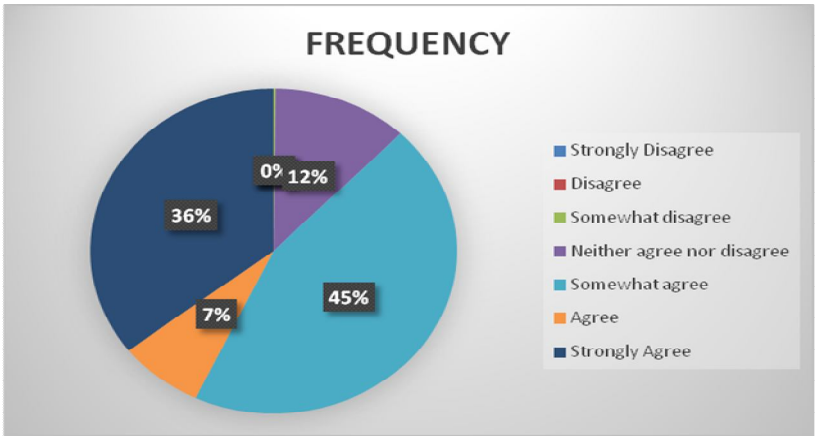


Interpretation: From the above table it can be seen that 44% of the respondents have income between 5L to 10 lakh. 34% of respondents have income between 3L to 5lakh. Other than that 12% of respondents below 3 lakh and 10% of respondents have more than 10lakh income.

6. BANKING COMPANIES WILL HAVE MODERN LOOKING EQUIPMENT

Table-6

VARIABLE	FREQUENCY	%
Strongly Disagree	0	0%
Disagree	0	0%
Somewhat disagree	1	0%
Neither agree nor disagree	72	12%
Somewhat agree	269	45%
Agree	45	8%
Strongly Agree	213	36%
TOTAL	**600**	**100%**



Interpretation: From above the table we see that 36% strongly believed that banking companies will have modern looking equipment. 45% somewhat agree other than that 12% neither agree nor disagree and 7% only agree with the statement.

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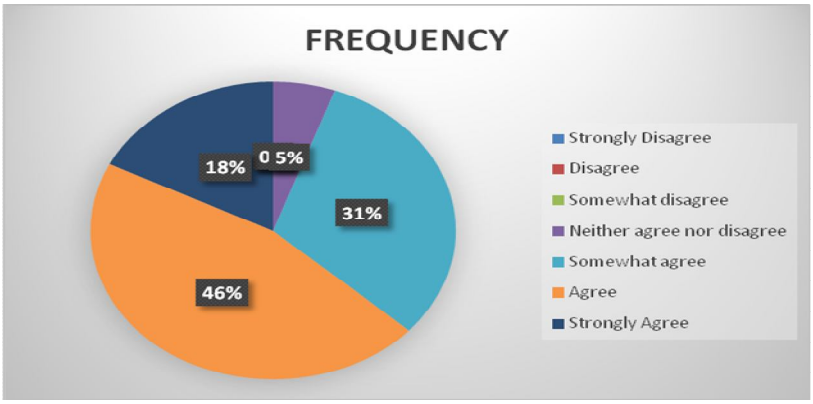
7. WHEN A CUSTOMER HAS A PROBLEM, BANKS SHOW A SINCERE INTEREST IN SOLVING IT.

Table-7

VARIABLE	FREQUENCY	%
Strongly Disagree	0	0%
Disagree	0	0%
Somewhat disagree	0	0%
Neither agree nor disagree	33	6%
Somewhat agree	187	31%
Agree	274	46%
Strongly Agree	106	18%
TOTAL	**600**	**100%**

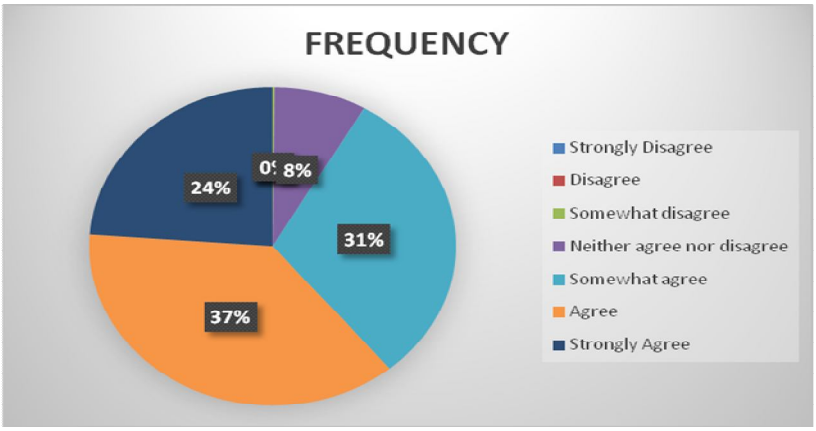


Interpretation: From above the table we see that 18% strongly believed that banks customer has a problem, show a sincere interest in solving it. While only 31% somewhat agree other than that 5% neither agree nor disagree and 46% only agree with the statement.

8. BANKS WILL INSIST ON ERROR FREE RECORDS.

Table-8

VARIABLE	FREQUENCY	%
Strongly Disagree	0	0%
Disagree	0	0%
Somewhat disagree	1	0%
Neither agree nor disagree	49	8%
Somewhat agree	184	31%
Agree	223	37%
Strongly Agree	143	24%
TOTAL	**600**	**100%**



Interpretation: From over the table we see that 24% firmly trusted that the banks will insist on error free records. While just 31% somewhat agree other than that 8% neither agree nor disagree and 37% just agree with that.

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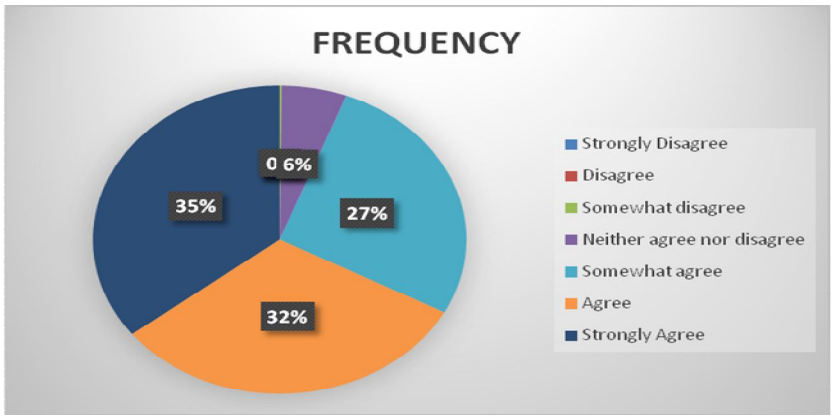
9. EMPLOYEES OF BANKS WILL ALWAYS BE WILLING TO HELP CUSTOMERS.

Table-9

VARIABLE	FREQUENCY	%
Strongly Disagree	0	0%
Disagree	0	0%
Somewhat disagree	1	0%
Neither agree nor disagree	34	6%
Somewhat agree	162	27%
Agree	190	32%
Strongly Agree	213	36%
TOTAL	**600**	**100%**

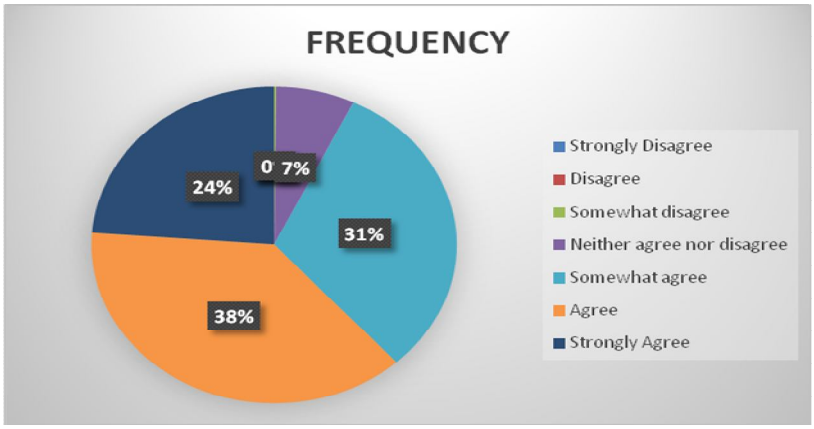


Interpretation: From over the table we see that 35% firmly trusted that the Employees of banks will always be willing to help customers. While just 27% somewhat agree other than that 6% neither agree nor disagree and 32% just agree with that.

10. THE BEHAVIOR OF EMPLOYEES IN BANKS WILL INSTILL CONFIDENCE IN CUSTOMERS

Table-10

VARIABLE	FREQUENCY	%
Strongly Disagree	0	0%
Disagree	0	0%
Somewhat disagree	1	0%
Neither agree nor disagree	42	7%
Somewhat agree	187	31%
Agree	227	38%
Strongly Agree	143	24%
TOTAL	**600**	**100%**



Interpretation: From over the table we see that 24% firmly trusted that the behavior of employees in banks will instill confidence in customers, While just 31% somewhat agree other than that 7% neither agree nor disagree and 38% just agree with that.

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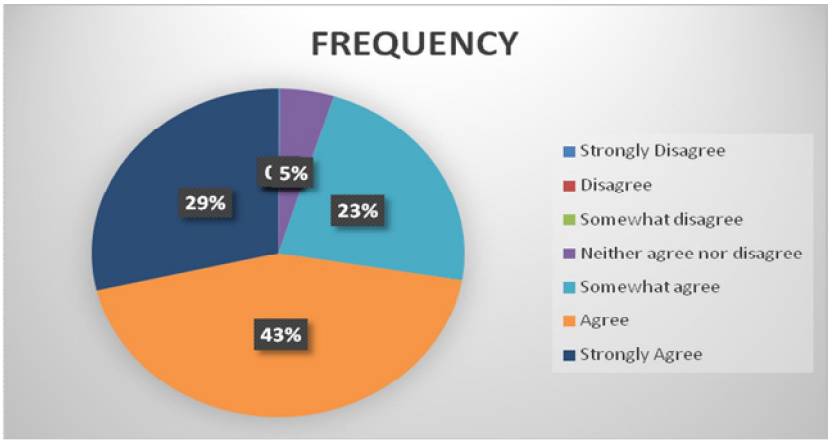
11. CUSTOMERS OF BANKS WILL FEEL SAFE IN TRANSACTIONS.

Table-11

VARIABLE	FREQUENCY	%
Strongly Disagree	1	0%
Disagree	0	0%
Somewhat disagree	0	0%
Neither agree nor disagree	28	5%
Somewhat agree	137	23%
Agree	262	44%
Strongly Agree	172	29%
TOTAL	**600**	**100%**

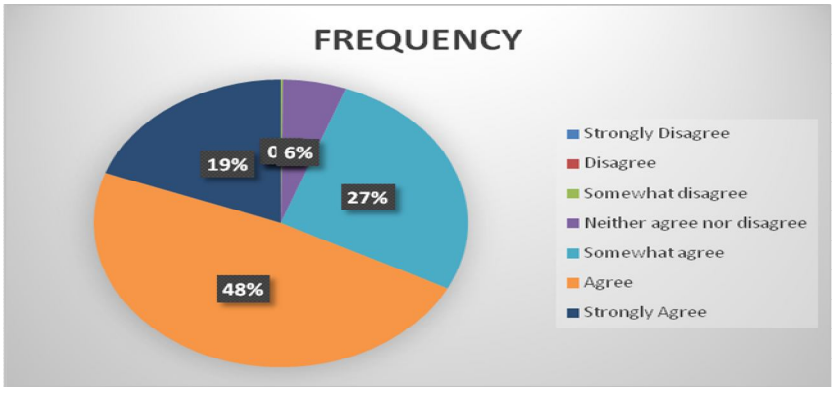


Interpretation: From over the table we see that 29% firmly trusted that the customers of banks will feel safe in transactions, While just 23% somewhat agree other than that 5% neither agree nor disagree and 43% just agree with that.

12. EMPLOYEES OF BANKS WILL HAVE THE KNOWLEDGE TO ANSWER CUSTOMERS' QUESTIONS

Table-12

VARIABLE	FREQUENCY	%
Strongly Disagree	0	0%
Disagree	0	0%
Somewhat disagree	1	0%
Neither agree nor disagree	33	6%
Somewhat agree	161	27%
Agree	289	48%
Strongly Agree	116	19%
TOTAL	**600**	**100%**



Interpretation: From over the table we see that 19% firmly trusted that the employees of banks will have the knowledge to answer customers' questions. While just 27% somewhat agree other than that 6% neither agree nor disagree and 48% just agree with that.

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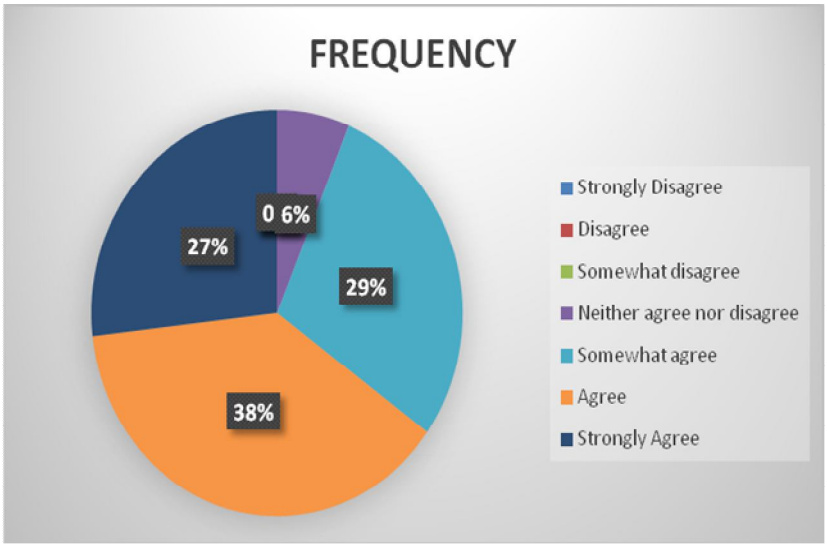
13. BANKS WILL HAVE OPERATING HOURS CONVENIENT TO ALL THEIR CUSTOMERS

Table-13

VARIABLE	FREQUENCY	%
Strongly Disagree	0	0%
Disagree	0	0%
Somewhat disagree	0	0%
Neither agree nor disagree	38	6%
Somewhat agree	172	29%
Agree	229	38%
Strongly Agree	161	27%
TOTAL	**600**	**100%**



Interpretation: From over the table we see that 27% firmly trusted that the Banks will have operating hours convenient to all their customers. While just 29% somewhat agree other than that 6% neither agree nor disagree and 38% just agree with that.

CONCLUSION

According to the survey customer are satisfied with the services which are provided by the banks. The demographical variable is significantly correlated with the different aspects like bank has modern looking equipment; Banks will have operating hours convenient to all their customers, customer has a problem, banks show a sincere interest in solving it etc. In this male customer are more than female customers and other hand most of the customer fall 5 lakh to 10 lakh income level. There is 58 %b of customer who belongs to show service as occupation. This shows that except business man people who are from job are also prepare private banks. Now days customer more influenced by different services because in this digital world different banking options and services are needed. So banks have to work on their security features because customers find this is main factor and private banks provide less security. Bank like Yes bank and Indulnd bank customers find less according to security point of view. Other than that HDFC bank, ICICI bank and Axis banks are more trustable bank because they have transparent banking policy, working hours, and modern equipment's.

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SYNTHESIS AND ANTI-MICROBIAL ACTIVITY OF NOVEL 3- (BENZYLIDENEAMINO)-2,7-DIMETHYL-5,6,7,8 TETRAHYDROBENZO[4,5]THIENO[2,3-D]PYRIMIDIN-4(3H)-ONES

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ABSTRACT
A series of novel 3-(benzylideneamino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one derivatives were synthesized, purified by column chromatography and characterized by spectroscopy like 1H-NMR, 13C-NMR and Mass and Elemental analysis. They were evaluated for their anti-bacterial and antifungal activity. Novel compounds were found to have excellent activity with respect to Furacin and Itraconozole drugs.

Keywords: 3-(benzylideneamino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-ones, Anti-fungal activity, Anti-microbial activity, Minimal Inhibition Concentration (MIC).

I. INTRODUCTION
Man is closely influenced by the activities of microorganisms. Control of microbial population is necessary to prevent transmission of disease, infection, decomposition; contamination and spoilage caused by them, man's personal comforts and convenience depend to a large extent on the control of microbial population. Some studies on 3-amino-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one came out with interesting pharmacological properties particularly anti-bacterial activity. Considering the results and structures of Schiff's base of 3-amino-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one from literature survey, we synthesized, purified and characterized the series of different kinds of novel 3-(benzylideneamino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo [4,5] thieno[2,3-d]pyrimidin-4(3H)-one. The anti-microbial and antifungal activity of these compounds on gram positive and gram negative bacterias along with one fungal stain with respect to Furacin and Itraconozole drugs were evaluated as minimum inhibitory concentration.

II. RESULTS AND DISCUSSION
Figure 1 shows the examples of commercially available antibacterial agents with thiophene and pyrimidine core structures. The names of the drugs are Methaphenilene (1), Tiagabine (2), Brodiprim (3) and Pyrimethamine (4).

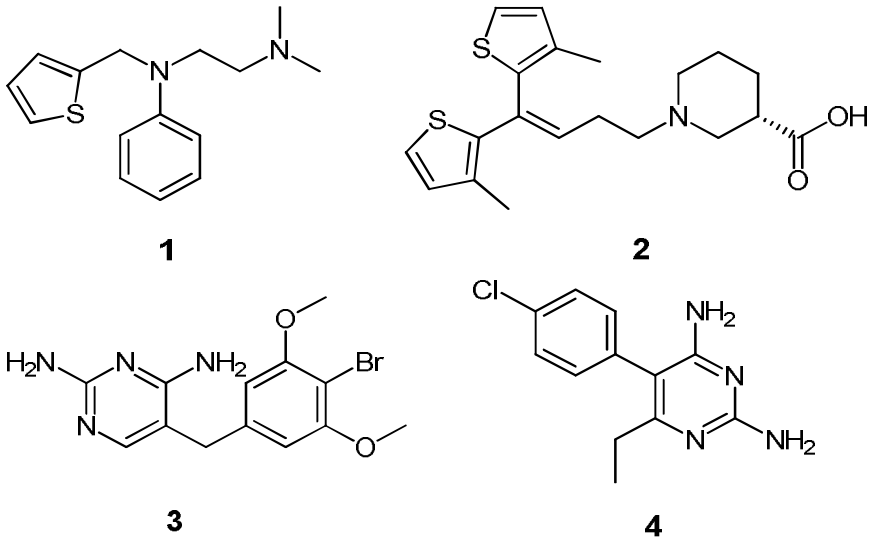

Figure-1: Examples of commercially available antibacterial agents with thiophene and pyrimidine core structures

Intermediate 1 was synthesized by the well known Gewald reaction between 4-methylcyclohexanone, ethylcyanoacetate and sulphur powder using morpholine as a base. Intermediate 2 was obtained by the acetylation of Intermediate 1 using acetic anhydride. Intermediate 3 was prepared by the reaction between Intermediate 2 and hydrazine hydrate. Target compounds (4a-t) were obtained by the reaction between intermediate 3 and different aromatic aldehydes (Schiff's base formation).

Scheme 1 shows the reaction scheme for the synthesis of target compounds (4a-t) after 4 steps. The reagents and conditions are also mentioned below the scheme.

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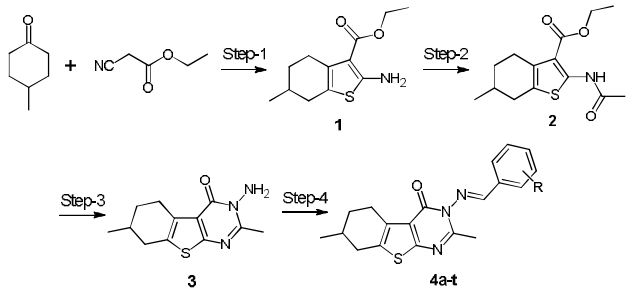

Scheme 1 Reagents and Conditions (1) S, Morpholine, Ultrasound irradiation, rt, 1h; (2) Ac2O, Reflux,3h; (3) NH2NH2, EtOH, Reflux, 16h; (4) Aromatic Aldehyde, AcOH, MeOH, rt, 2-5h.

For evaluation of antibacterial activity in our case, we have used Staphylococcus Aureus and KL.Pneumoniae from gram positive group of bacteria along with Escherichia Coli and Pseudomonas Aeruginosa from gram negative group of bacteria. We have used the Broth dilution method to evaluate the antibacterial activity. It is one of the non automated in vitro bacterial susceptibility tests. This classic method yields a quantitative result for the amount of antimicrobial agents that is needed to inhibit growth of specific microorganisms.

Minimal inhibition concentration was measured by micro broth dilution method. Mueller Hinton Broth was used as nutrient medium to grow and dilute the drug suspension for the test bacteria. Inoculum size for test strain was adjusted to 108 Cfu (Colony Forming Unit) per millilitre by comparing the turbidity. DMSO was used as diluent /vehicle to get desired concentration of drugs to test upon standard bacterial strains. Following common standard strains were used for screening of antibacterial and antifungal activities which are given in Table 1. The strains were procured from Institute of Microbial Technology, Chandigarh.

Table-1: Standard strains used for the specific bacterial species

E.Coli	P.Aeruginosa	KL.Pneumoniae	S.Aureus
MTCC443	MTCC1688	MTCC109	MTCC96

Methods used for primary and secondary screening are given below. Each synthesized drug was diluted obtaining 2000 microgram/ml concentration as a stock solution.

Primary screen: In primary screening 1000 microgram/ml, 500 microgram/ml and 250 microgram/ml concentrations of the synthesized drugs were taken. The active synthesized drugs found in this primary screening were further tested in a second set of dilution against all microorganisms.

Secondary screen: The drugs found active in primary screening were similarly diluted to obtain 200 microgram/ml, 100 microgram/ml, 50 microgram/ml, 25 microgram/ml, 12.5 microgram/ml and 6.25 microgram/ml concentrations.

Reading Result: The highest dilution showing at least 99 % inhibition zone is taken as MIC. The result of this is much affected by the size of the inoculum. The test mixture should contain 108 organisms/ml.

Minimal Inhibition Concentration (MIC) of each sample in (µg/ml) on two gram positive bacteria Staphylococcus Aureus and KL.Pneumoniae and two gram negative bacteria Escherichia Coli and Pseudomonas Aeruginosa with compare to standard drug Furacin along on one fungal strain P.Marneffei with compare to standard drug Itraconozole are given in Table 2.

Table-2: Minimal Inhibition Concentration (MIC) of each sample in µg/ml

Sr. No.	Compound Code	E. Coli	P. Aeruginosa	KL. Pneumoniae	S. Aureus	P. Marneffei
1	4a (CYTH-1)	25	25	25	50	100
2	4b (CYTH-2)	25	50	25	50	100
3	4c (CYTH-3)	50	50	50	25	250
4	4d (CYTH-4)	50	50	50	12.5	500
5	4e (CYTH-5)	25	12.5	25	25	500
6	4f (CYTH-6)	25	50	12.5	50	50
7	4g (CYTH-7)	12.5	25	25	50	100
8	4h (CYTH-8)	50	50	50	25	250
9	4i (CYTH-9)	50	50	25	25	250
10	4j (CYTH-10)	50	25	50	25	100
11	4k (CYTH-11)	25	25	25	50	50

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12	4l (CYTH-12)	50	50	50	100	500
13	4m (CYTH-13)	12.5	25	25	25	100
14	4n (CYTH-15)	50	50	100	100	250
15	4o (CYTH-16)	25	25	50	50	250
16	4p (CYTH-17)	12.5	50	25	25	250
17	4q (CYTH-18)	12.5	25	12.5	25	50
18	4r (CYTH-19)	25	25	25	50	100
19	4s (CYTH-20)	25	50	25	50	50
20	4t (CYTH-22)	25	50	25	25	100
21	Furacin	25	25	50	50	-
22	Itraconozole	-	-	-	-	100

*Yellow highlighted values in above table indicate good activity.

III. CONCLUSIONS

As a conclusion 3-(benzylideneamino)-2,7-dimethyl-5,6,7,8 tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one derivatives were successfully synthesized, purified by recrystallizaion and confirmed by spectroscopy like 1H-NMR, 13C-NMR, Mass and Elemental analysis. Moreover, the anti-bacterial and anti-fungal activities of these compounds were evaluated on Staphylococcus Aureus and KL.Pneumoniae from gram positive group of bacteria along with Escherichia Coli and Pseudomonas Aeruginosa from gram negative group of bacteria as compare to standard drugs Furacin and Itraconozole.

We can conclude from the Table 2 that the minimal inhibition concentration (MIC) of Furacin against E.Coli and P.Aeruginosa species is 25.0 µg/ml; against KL.Pneumoniae and S.Aureus is 50.0 µg/ml. The minimal inhibition concentration (MIC) of Itraconozole against P.Marneffei species is 100 µg/ml. Compounds 4a, 4e-g, 4k, 4m, 4o-t showed excellent activity against E.Coli, P.Aeruginosa, KL.Pneumoniae and S.Aureus. Compounds 4a-b, 4f-g, 4j-k, 4m and 4q-t showed excellent activity against P.Marneffei. All the synthesized compounds except 4n showed excellent antimicrobial and antifungal activities as compare to standard drugs.

EXPERIMENTAL SECTION

A. Methods and Materials

Melting points were determined in open capillaries and are uncorrected. 1H-NMR spectra were determined on Bruker 400MHz avance III at ambient temperature in DMSOd6 or CDCl3 using tetramethylsilane as an internal standard. 13C-NMR spectra were obtained with proton decoupling on Bruker 400MHz avance III and were reported in ppm with residual solvent. Electron spray ionization (ESI) mass spectra were obtained on GCMSQP2010 mass spectrometer. The reagents were all of analytical grade or chemically pure. All chemicals were purchased from commercial source and used without further purification. The reactions were monitored by TLC using Merck Kieselgel 60 F254 plates and visualized under UV light at 254 nm. Column chromatography was generally performed on silica gel (60-120 mesh size).

B. Synthesis

1. Ethyl 2-amino-6-methyl-4,5,6,7-tetrahydrobenzo [b] thiophene-3-carboxylate

An equimolar mixture of elemental sulfur (6.3 g, 0.19 mol) and morpholine (17.1 g, 0.19 mol) was stirred at 25 °C for 15-20 min. until the sulphur was completely dissolved. To it 4-methylcyclohexanone (22.0 g, 0.19 mol) and ethyl cyanoacetate (22.0 g, 0.19 mol) were added. The reaction mixture was subjected to ultrasound irradiation for 1h. After completion of reaction which was monitored by TLC, the reaction mixture was cooled to room temperature and the solid residue was collected, recrystallized from EtOH to afford Intermediate 1 as white solid (30.0 g). Yield: 64%; 1H-NMR (400MHz, DMSOd6): δ 0.97-0.99 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.23-1.27 (t, 3H, J = 7.2 Hz, -CH3 attached to -CH2); 1.28-1.30 (m, 1H); 1.73-1.76 (m, 2H); 2.01-2.07 (m, 1H); 2.45-2.51 (m, 2H); 2.73-2.78 (m, 1H); 4.11-4.17 (q, 2H, J = 5.4 & 12.6 Hz, -OCH2); 7.21 (s, 2H, -NH2). Elemental analysis for C12H17NO2S Calculated: % C, 60.22; % H, 7.16; % N, 5.85; Found: % C, 60.18; % H, 7.13; % N, 5.86

2. Ethyl 2-acetamido-6-methyl-4,5,6,7-tetrahydrobenzo [b] thiophene-3-carboxylate

Intermediate 1 (10.0 g, 0.04 mol) was added to 50 mL of acetic anhydride at room temperature. The reaction mixture was refluxed for 3h. After completion of reaction which was monitored by TLC, It was poured in to ice crushed water. The solid separated was filtered, washed with water and dried under vacuum to give Intermediate 2 as pale yellow solid (8.0 g). Yield: 68%; 1H-NMR (400MHz, DMSOd6): δ 1.00-1.02 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.29-1.32 (t, 3H, J = 7.0 Hz, -CH3 attached to -CH2); 1.31-1.33 (m, 1H); 1.79-1.82 (m, 2H); 2.14-2.19 (m, 1H); 2.21 (s, 3H, -COCH3); 2.56-2.62 (m, 2H); 2.64-2.88 (m, 1H); 4.24-4.30 (q,

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2H, J = 6.8 & 14.0 Hz, -OCH2); 10.95 (s, 1H, -NH). Elemental analysis for C14H19NO3S Calculated: % C, 59.76; % H, 6.81; % N, 4.98; Found: % C, 59.71; % H, 6.78; % N, 5.02

3. 3-amino-2,7-dimethyl-5,6,7,8-tetrahydrobenzo [4,5] thieno [2,3-d]pyrimidin-4(3H)-one

Intermediate 2 (8.0 g, 0.03 mol) was dissolved in 40 mL of EtOH at room temperature. To it 40 mL of hydrazine hydrate was added and the reaction mixture was refluxed for 16h. After completion of reaction which was monitored by TLC, The solid separated was filtered, washed with EtOH and dried under vacuum. The crude product was purified by recrystallizaion in EtOH to give Intermediate 3 as off white solid (4.8 g). Yield: 67.8%; 1H-NMR (400MHz, DMSOd6): δ 1.03-1.05 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.34-1.41 (m, 1H); 1.84-1.88 (m, 2H); 2.28-2.35 (m, 1H); 2.53 (s, 3H, -CH3 attached to -C); 2.69-2.82 (m, 2H); 3.01-3.09 (m, 1H); 5.80 (s, 2H, -NNH2). Mass: 249 m/z. Elemental analysis for C12H15N3OS Calculated: % C, 57.81; % H, 6.06; % N, 16.85; Found: % C, 57.78; % H, 6.05; % N, 16.87

4a. 3-((3-chlorobenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-1)

Intermediate 3 (0.4 g, 1.6 mmol) and 3-chlorobenzaldehyde (0.225 g, 1.6 mmol) were dissolved in 5.0 mL of MeOH at room temperature followed by the addition of 1.0 mL acetic acid. The reaction mass was allowed to stir at room temperature for 2-5h. After completion of reaction which was monitored by TLC, The solid separated was filtered and washed with MeOH. The crude product was purified by recrystallizaion in EtOAc to give 4a as off white solid (0.3 g). Yield: 50%; M.p 158-160°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.41-1.48 (m, 1H); 1.91-1.99 (m, 2H); 2.34-2.41 (m, 1H); 2.60 (s, 3H, -CH3 attached to -C); 2.80-2.89 (m, 2H); 3.16-3.21 (m, 1H); 7.40-7.45 (t, 1H, J = 7.8 Hz, ArH); 7.49-7.52 (m, 1H, ArH); 7.70-7.72 (d, 1H, J = 6.2 Hz, ArH); 7.91-7.93 (m, 1H, ArH); 8.97 (s, 1H, -N=CH). Mass: 371 m/z. Elemental analysis for C19H18ClN3OS Calculated: % C, 61.36; % H, 4.88; % N, 11.30; Found: % C, 61.33; % H, 4.89; % N, 11.27

4b. 3-((2,5-dimethoxybenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-2)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 2,5 dimethoxy- benzaldehyde (0.266 g, 1.6 mmol), 4b was obtained as off-white solid (0.33 g). Yield: 52.4%; M.p 162-164°C. 1H-NMR (400MHz, CDCl3): δ 1.08-1.10 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.39-1.48 (m, 1H); 1.90-1.99 (m, 2H); 2.35-2.42 (m, 1H); 2.55 (s, 3H, -CH3 attached to -C); 2.80-2.90 (m, 2H); 3.19-3.24 (m, 1H); 3.82 (s, 3H, -OCH3); 3.83 (s, 3H, -OCH3); 6.89-6.91 (t, 1H, J = 8.8 Hz, ArH); 7.07-7.10 (dd, 1H, J = 3.2 & 9.2 Hz, ArH); 7.68-7.69 (d, 1H, J = 3.2 Hz, ArH); 9.13 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): δ 21.50, 22.50, 25.32, 29.28, 30.57, 33.28, 55.87, 56.13, 76.73, 77.05, 77.37, 110.32, 112.67, 121.12, 121.19, 131.52, 132.41, 152.89, 153.55, 154.32, 155.38, 160.85, 164.50. Mass: 397 m/z. Elemental analysis for C21H23N3O3S. Calculated: % C, 63.45; % H, 5.83; % N, 10.57; Found: % C, 63.41; % H, 5.80; % N, 10.55

4c. 3-((3,4-dimethoxybenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-3)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 3,4-dimethoxy- benzaldehyde (0.266 g, 1.6 mmol), 4c was obtained as off-white solid (0.32 g). Yield: 50.8%; M.p 154-156°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.42-1.47 (m, 1H); 1.91-1.99 (m, 2H); 2.35-2.42 (m, 1H); 2.58 (s, 3H, -CH3 attached to -C); 2.80-2.89 (m, 2H); 3.17-3.23 (m, 1H); 3.96 (s, 6H, -OCH3); 6.93-6.95 (d, 1H, J = 8.0 Hz, ArH); 7.31-7.34 (dd, 1H, J = 1.8 & 8.2 Hz, ArH); 7.57 (d, 1H, J = 2.0 Hz, ArH); 8.69 (s, 1H, -N=CH). Mass: 397 m/z. Elemental analysis for C21H23N3O3S Calculated: % C, 63.45; % H, 5.83; % N, 10.57; Found: C, 63.42; % H, 5.8; % N, 10.55

4d. 2,7-dimethyl-3-((3-nitrobenzylidene)amino)-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-4)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 3-nitrobenzaldehyde (0.242 g, 1.6 mmol), 4d was obtained as pale yellow solid (0.26 g). Yield: 42.6%; M.p 180-182°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.43-1.48 (m, 1H); 1.92-1.98 (m, 2H); 2.36-2.42 (m, 1H); 2.64 (s, 3H, -CH3 attached to -C); 2.81-2.87 (m, 2H); 3.16-3.21 (m, 1H); 7.68-7.72 (t, 1H, J = 8.0 Hz, ArH); 8.18-8.20 (d, 1H, J = 8.0 Hz, ArH); 8.37-8.41 (dd, 1H, J = 2.4 & 8.0 Hz, ArH); 8.74-8.75 (t, 1H, J = 3.6 Hz, ArH); 9.24 (s, 1H, -N=CH). Mass: 382 m/z. Elemental analysis for C19H18N4O3S Calculated: % C, 59.67; % H, 4.74; % N, 14.65; Found: % C, 59.62; % H, 4.75; % N, 14.66

4e. 2,7-dimethyl-3-((3,4,5-trimethoxybenzylidene)amino)-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-5)

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According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 3,4,5-trimethoxy- benzaldehyde (0.314 g, 1.6 mmol), 4e was obtained as off-white solid (0.35 g). Yield: 51.5%; M.p 184-186°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.40-1.50 (m, 1H); 1.91-1.99 (m, 2H); 2.35-2.43 (m, 1H); 2.58 (s, 3H, -CH3 attached to -C); 2.81-2.90 (m, 2H); 3.17-3.23 (m, 1H); 3.94 (s, 6H, -OCH3); 3.95 (s, 3H, -OCH3); 7.14 (s, 2H, ArH); 8.76 (s, 1H, -N=CH). Mass: 427 m/z. Elemental analysis for C22H25N3O4S Calculated: % C, 61.81; % H, 5.89; % N, 9.83; Found: % C, 61.8; % H, 5.85; % N, 9.81

4f. 3-((4-(dimethylamino)benzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-6)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 4-(dimethylamino) benzaldehyde (0.239 g, 1.6 mmol), 4f was obtained as off-white solid (0.29 g). Yield: 47.5%; M.p 196-198°C. 1H-NMR (400MHz, CDCl3): δ 1.08-1.10 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.41-1.48 (m, 1H); 1.89-1.99 (m, 2H); 2.34-2.41 (m, 1H); 2.55 (s, 3H, -CH3 attached to -C); 2.79-2.99 (m, 2H); 3.08 (s, 6H, -N(CH3)2); 3.18-3.24 (m, 1H); 6.70-6.72 (d, 2H, J = 8.8 Hz, ArH); 7.74-7.76 (d, 2H, J = 8.0 Hz, ArH); 8.52 (s, 1H, -N=CH). Mass: 380 m/z. Elemental analysis for C21H24N4OS Calculated: % C, 66.29; % H, 6.36; % N, 14.72; Found: % C, 66.3; % H, 6.35; % N, 14.69

4g. 3-((2-chlorobenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-7)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 2-chlorobenzaldehyde (0.225 g, 1.6 mmol), 4g was obtained as off-white solid (0.31 g). Yield: 52%; M.p 166-168°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.42-1.47 (m, 1H); 1.90-1.99 (m, 2H); 2.35-2.42 (m, 1H); 2.59 (s, 3H, -CH3 attached to -C); 2.80-2.90 (m, 2H); 3.18-3.24 (m, 1H); 7.37-7.41 (m, 1H, ArH); 7.46-7.48 (m, 2H, ArH); 8.21-8.23 (d, 1H, J = 7.6 Hz, ArH); 9.39 (s, 1H, -N=CH). Mass: 371 m/z. Elemental analysis for C19H18ClN3OS Calculated: % C, 61.36; % H, 4.88; % N, 11.30; Found: % C, 61.34; % H, 4.83; % N, 11.32

4h. 3-((2-chlorobenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-8)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 2,4-dichlorobenzaldehyde (0.28 g, 1.6 mmol), 4h was obtained as off-white solid (0.33 g). Yield: 50.8%; M.p 194-196°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.42-1.47 (m, 1H); 1.90-1.99 (m, 2H); 2.35-2.42 (m, 1H); 2.59 (s, 3H, -CH3 attached to -C); 2.80-2.90 (m, 2H); 3.17-3.23 (m, 1H); 7.35-7.38 (dd, 1H, J = 2.0 & 8.6 Hz, ArH); 7.46-7.49 (d, 1H, J = 11.2 Hz, ArH); 8.14-8.17 (d, 1H, J = 8.4 Hz, ArH); 9.39 (s, 1H, -N=CH). Mass: 405 m/z. Elemental analysis for C19H17Cl2N3OS Calculated: % C, 56.16; % H, 4.22; % N, 10.34; Found: % C, 56.12; % H, 4.19; % N, 10.3

4i. 3-((2-chlorobenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-9)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 3-hydroxybenzaldehyde (0.196 g, 1.6 mmol), 4i was obtained as off-white solid (0.27 g). Yield: 48.2%; M.p 202-204°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.42-1.49 (m, 1H); 1.92-1.95 (m, 2H); 2.35-2.42 (m, 1H); 2.54 (s, 3H, -CH3 attached to -C); 2.81-2.90 (m, 2H); 3.20-3.24 (m, 1H); 6.95-6.99 (m, 1H, ArH); 7.25-7.33 (m, 1H, ArH); 7.32 (brs, 1H, ArH); 7.46 (brs, 1H, ArH); 8.64 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): δ 21.46, 22.40, 25.30, 29.23, 30.49, 33.28, 114.73, 120.55, 121.05, 121.80, 129.96, 131.37, 133.22, 152.66, 155.68, 156.81, 161.31, 169.03. Mass: 353 m/z. Elemental analysis for C19H19N3O2S Calculated: % C, 64.57; % H, 5.42; % N, 11.89; Found: % C, 64.54; % H, 5.4; % N, 11.88

4j. 3-((2-hydroxybenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-10)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 2-hydroxybenzaldehyde (0.196 g, 1.6 mmol), 4j was obtained as off-white solid (0.28 g). Yield: 50%; M.p 156-158°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.41-1.49 (m, 1H); 1.92-1.98 (m, 2H); 2.35-2.42 (m, 1H); 2.59 (s, 3H, -CH3 attached to -C); 2.81-2.87 (m, 2H); 3.16-3.21 (m, 1H); 6.97-7.01 (t, 1H, J = 7.6 Hz, ArH); 7.05-7.07 (d, 1H, J = 8.4 Hz, ArH); 7.36-7.38 (d, 1H, J = 8.0 Hz, ArH); 7.44-7.48 (t, 1H, J = 7.6 Hz, ArH); 8.91 (s, 1H, -N=CH); 10.08 (s, 1H, -OH). 13C-NMR (400 MHz, CDCl3): δ 21.46, 22.67, 25.25, 29.23, 30.47, 33.25, 116.21, 117.52, 119.93, 120.97, 131.52, 133.29, 133.55, 134.65, 151.76, 155.15, 160.17, 160.87, 171.38. Mass: 353 m/z. Elemental analysis for C19H19N3O2S Calculated: % C, 64.57; % H, 5.42; % N, 11.89; Found: % C, 64.56; % H, 5.46; % N, 11.82

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4k. 3-((4-methoxybenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-11)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 4-methoxybenzaldehyde (0.218 g, 1.6 mmol), 4k was obtained as off-white solid (0.33 g). Yield: 56%; M.p 170-172°C. 1H-NMR (400MHz, CDCl3): δ 1.08-1.10 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.39-1.50 (m, 1H); 1.91-1.97 (m, 2H); 2.34-2.41 (m, 1H); 2.56 (s, 3H, -CH3 attached to -C); 2.80-2.89 (m, 2H); 3.18-3.23 (m, 1H); 3.88 (s, 3H, -OCH3); 6.97-7.00 (d, 2H, J = 8.8 Hz, ArH); 7.83-7.85 (d, 2H, J = 8.4 Hz, ArH); 8.73 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): δ 21.50, 22.51, 25.32, 29.27, 30.56, 33.28, 55.50, 114.37, 121.11, 125.14, 130.83, 131.45, 132.50, 153.04, 155.62, 160.85, 163.21, 167.21. Mass: 367 m/z. Elemental analysis for C20H21N3O2S Calculated: % C, 65.37; % H, 5.76; % N, 11.44; Found: % C, 65.4; % H, 5.71; % N, 11.38

4l. 2,7-dimethyl-3-((2-nitrobenzylidene)amino)-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-12)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 2-nitrobenzaldehyde (0.242 g, 1.6 mmol), 4l was obtained as pale yellow solid (0.27 g). Yield: 44.3%; M.p 174-176°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.39-1.50 (m, 1H); 1.91-1.98 (m, 2H); 2.35-2.42 (m, 1H); 2.59 (s, 3H, -CH3 attached to -C); 2.81-2.87 (m, 2H); 3.16-3.21 (m, 1H); 7.70-7.74 (t, 1H, J = 8.0 Hz, ArH); 7.78-7.82 (t, 1H, J = 7.2 Hz, ArH); 8.16-8.19 (d, 1H, J = 8.0 Hz, ArH); 8.19-8.22 (d, 1H, J = 7.6 Hz, ArH); 9.46 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): 21.46, 22.53, 25.26, 29.24, 30.50, 33.25, 121.07, 124.88, 128.14, 130.16, 131.61, 132.28, 133.02, 133.98, 148.57, 152.86, 155.31, 160.92, 164.42. Mass: 382 m/z. Elemental analysis for C19H18N4O3S Calculated: % C, 59.67; % H, 4.74; % N, 14.65; Found: % C, 59.61; % H, 4.75; % N, 14.63

4m. 2,7-dimethyl-3-((4-nitrobenzylidene)amino)-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-13)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 4-nitrobenzaldehyde (0.242 g, 1.6 mmol), 4m was obtained as pale yellow solid (0.29 g). Yield: 47.5%; M.p 210-212°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.40-1.51 (m, 1H); 1.92-2.05 (m, 2H); 2.35-2.42 (m, 1H); 2.64 (s, 3H, -CH3 attached to -C); 2.80-2.89 (m, 2H); 3.16-3.21 (m, 1H); 8.04-8.07 (d, 2H, J = 8.8 Hz, ArH); 8.32-8.35 (d, 2H, J = 9.2 Hz, ArH); 9.30 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): 21.45, 22.73, 25.32, 29.23, 30.48, 33.25, 121.12, 124.12, 129.39, 131.60, 133.31, 138.70, 149.84, 153.27, 155.74, 160.76, 162.58. Mass: 382 m/z. Elemental analysis for C19H18N4O3S Calculated: % C, 59.67; % H, 4.74; % N, 14.65; Found: % C, 59.62; % H, 4.76; % N, 14.6

4n. 3-((3-methoxybenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-15)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 3-methoxybenzaldehyde (0.218 g, 1.6 mmol), 4n was obtained as off-white solid (0.34 g). Yield: 57.6%; M.p 180-182°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.42-1.47 (m, 1H); 1.91-1.98 (m, 2H); 2.35-2.42 (m, 1H); 2.59 (s, 3H, -CH3 attached to -C); 2.81-2.88 (m, 2H); 3.17-3.23 (m, 1H); 3.87 (s, 3H, -OCH3); 7.09-7.12 (m, 1H, ArH); 7.39-7.41 (m, 2H, ArH); 7.48 (brs, 1H, ArH); 8.87 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): δ 21.49, 22.56, 25.32, 29.26, 30.54, 33.27, 55.44, 122.29, 119.16, 121.12, 122.33, 129.94, 131.52, 132.70, 133.90, 153.07, 155.53, 159.92, 160.85, 167.22 Elemental analysis for C20H21N3O2S Calculated: % C, 65.37; % H, 5.76; % N, 11.44; Found: % C, 65.32; % H, 5.77; % N, 11.39

4o. 2,7-dimethyl-3-((4-methylbenzylidene)amino)-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-16)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 4-methylbenzaldehyde (0.192 g, 1.6 mmol), 4o was obtained as white solid (0.35 g). Yield: 62.5%; M.p 168-170°C. 1H-NMR (400MHz, CDCl3): δ 1.08-1.10 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.40-1.49 (m, 1H); 1.90-1.99 (m, 2H); 2.34-2.43 (m, 1H); 2.43 (s, 3H, -CH3 attached to phenyl ring); 2.57 (s, 3H, -CH3 attached to -C); 2.79-2.89 (m, 2H); 3.17-3.22 (m, 1H); 7.27-7.29 (d, 2H, J = 8.0 Hz, ArH); 7.76-7.78 (d, 2H, J = 8.4 Hz, ArH); 8.81 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): 21.51, 21.79, 22.53, 25.33, 29.26, 30.55, 33.27, 121.11, 128.94, 129.66, 129.86, 131.47, 132.56, 143.31, 153.08, 155.55, 160.84, 167.50. Mass: 351 m/z. Elemental analysis for C20H21N3OS Calculated: % C, 68.35; % H, 6.02; % N, 11.96; Found: % C, 68.28; % H, 6.04; % N, 11.9

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4p. 2,7-dimethyl-3-((4-fluorobenzylidene)amino)-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-17)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 4-fluorobenzaldehyde (0.199 g, 1.6 mmol), 4p was obtained as white solid (0.34 g). Yield: 59.6%; M.p 218-220°C. 1H-NMR (400MHz, CDCl3): δ 1.08-1.10 (d, 3H, J = 6.4 Hz, -CH3 attached to -CH); 1.40-1.49 (m, 1H); 1.90-1.98 (m, 2H); 2.34-2.41 (m, 1H); 2.58 (s, 3H, -CH3 attached to -C); 2.80-2.88 (m, 2H); 3.16-3.21 (m, 1H); 7.15-7.20 (m, 2H, ArH); 7.87-7.92 (m, 2H, ArH); 8.89 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): 21.48, 22.55, 25.31, 29.25, 30.52, 33.26, 116.35, 121.08, 128.92, 131.09, 131.47, 132.77, 153.02, 155.54, 160.84, 164.12, 165.78. Mass: 355 m/z. Elemental analysis for C19H18FN3OS Calculated: % C, 64.21; % H, 5.10; % N, 11.82; Found: C, 64.15; % H, 5.12; % N, 11.75

4q. 3-((3-bromobenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-18)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 3-bromobenzaldehyde (0.296 g, 1.6 mmol), 4q was obtained as white solid (0.36 g). Yield: 53.7%; M.p 158-160°C. 1H-NMR (400MHz, CDCl3): δ 1.09-1.11 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.41-1.48 (m, 1H); 1.91-1.99 (m, 2H); 2.35-2.41 (m, 1H); 2.60 (s, 3H, -CH3 attached to -C); 2.80-2.89 (m, 2H); 3.16-3.21 (m, 1H); 7.34-7.38 (t, 1H, J = 8.0 Hz, ArH); 7.65-7.68 (m, 1H, ArH); 7.74-7.77 (d, 1H, J = 8.0 Hz, ArH); 8.07-8.08 (t, 1H, J = 2.0 Hz, ArH); 8.96 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): 21.48, 22.65, 25.31, 29.25, 30.51, 33.26, 121.09, 123.13, 127.82, 130.43, 131.09, 131.54, 132.90, 134.73, 135.25, 153.14, 155.55, 160.81, 164.94. Mass: 415 & 417 m/z. Elemental analysis for C19H18BrN3OS. Calculated: % C, 54.81; % H, 4.36; % N, 10.09; Found: % C, 54.83; % H, 4.3; % N, 10.03

4r. 3-((4-bromobenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-19)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 4-bromobenzaldehyde (0.296 g, 1.6 mmol), 4r was obtained as white solid (0.35 g). Yield: 52.3%; M.p 218-220°C. 1H-NMR (400MHz, CDCl3): δ 1.08-1.10 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.40-1.50 (m, 1H); 1.90-1.99 (m, 2H); 2.34-2.42 (m, 1H); 2.58 (s, 3H, -CH3 attached to -C); 2.80-2.89 (m, 2H); 3.16-3.20 (m, 1H); 7.61-7.64 (d, 2H, J = 8.4 Hz, ArH); 7.74-7.76 (d, 2H, J = 8.0 Hz, ArH); 8.94 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): 21.49, 22.60, 25.32, 29.25, 30.52, 33.26, 121.09, 127.23, 130.14, 131.51, 131.61, 132.28, 132.87, 153.07, 155.56, 160.82, 165.54. Mass: 415 & 417 m/z. Elemental analysis for C19H18BrN3OS. Calculated: % C, 54.81; % H, 4.36; % N, 10.09; Found: % C, 54.78; % H, 4.31; % N, 10.05

4s. 2,7-dimethyl-3-((3-methylbenzylidene)amino)-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-20)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 3-methylbenzaldehyde (0.192 g, 1.6 mmol), 4s was obtained as white solid (0.33 g). Yield: 59%; M.p 184-186°C. Elemental analysis for C20H21N3OS Calculated: % C, 68.35; % H, 6.02; % N, 11.96; Found: % C, 68.31; % H, 6.05; % N, 11.88

4t. 3-((3-ethoxy-4-hydroxybenzylidene)amino)-2,7-dimethyl-5,6,7,8-tetrahydrobenzo[4,5]thieno[2,3-d]pyrimidin-4(3H)-one (CYTH-22)

According to the procedure used to prepare 4a, starting from Intermediate 3 (0.4 g, 1.6 mmol) and 3-ethoxy-4-hydroxybenzaldehyde (0.266 g, 1.6 mmol), 4t was obtained as off white solid (0.34 g). Yield: 53%; M.p 192-194°C. 1H-NMR (400MHz, CDCl3): δ 1.08-1.10 (d, 3H, J = 6.8 Hz, -CH3 attached to -CH); 1.42-1.45 (m, 1H); 1.46-1.50 (t, 3H, J = 7.0 Hz, -CH3 attached to -OCH2); 1.90-1.97 (m, 2H); 2.05-2.41 (m, 1H); 2.56 (s, 3H, -CH3 attached to -C); 2.80-2.89 (m, 2H); 3.17-3.22 (m, 1H); 4.16-4.22 (q, 2H, J = 7.0 & 13.8 Hz, ArH); 6.31 (brs, 1H, -OH); 6.98-7.00 (d, 1H, J = 8.4 Hz, ArH); 7.25-7.28 (m, 1H, ArH); 7.52-7.53 (d, 1H, J = 1.6 Hz, ArH); 8.63 (s, 1H, -N=CH). 13C-NMR (400 MHz, CDCl3): 14.77, 21.51, 22.48, 25.31, 29.27, 30.55, 33.27, 64.72, 109.6, 114.49, 121.08, 124.74, 125.4, 131.44, 132.57, 146.34, 150.22, 152.87, 155.57, 160.86, 168.02. Mass: 397 m/z. Elemental analysis for C21H23N3O3S. Calculated: % C, 63.45; % H, 5.83; % N, 10.57; Found: % C, 63.39; % H, 5.8; % N, 10.51

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ECONOMIC ANALYSIS OF BILATERAL TRADE: A CASE STUDY OF INDIA AND IRAN

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ABSTRACT
India and Iran have long history of socio-cultural and trade relation. In the present day world, both countries are of utmost importance for each other given the political and economic situation of present times. While Iran can provide India safe and easy access to Afghanistan and Central Asia, India can provide market for Iran's huge oil reserves given the sanctions imposed by west and U.S.A. The aim of this paper is to analyze the trend and composition of trade between two countries given the Iran's necular programme and sanctions imposed by USA.

Keywords: India, Iran, Bilateral trade, Trend, USA, Oil reserves.

INTRODUCTION
India and Iran have centuries old socio-cultural and trade relations traceable to ancient India. Indus valley civilization was contemporary with the proto-Elamite and Elamite civilizations in ancient Iran. The Indus people have socio-cultural and trade links with people of ancient Iran. The ancient Vedic religion and religion of ancient Iran (Zoroastrianism) had many similarities. During the Maurya Empire in India trade expanded sharply due to introduction of coinage in Iran. During the eleventh century and afterwards , poets, artists and religious scholars from Iran came to settle in India and consequently along with Islam, art and architecture of Iran had a great influence on every walk of Indian society.(Nehru 1992)

Iran in the gulf region and India in south Asia are two major economies of present day world. Both countries have good political as well as economic relations. Like many developing countries both have tried to get benefit from industrial developed countries. However after Islamic revolution Iran has established increased trade links with developing economics due to boycott by U.S.A and other western countries. Two way trade between India and Iran had increased substantially during the immediate years of revolution. At that time Iran was anxious to promote trade with India and other developing countries in order to reduce its dependence on the U.S.A. and other western countries and meet shortages arising out of sanctions imposed by them during the hostage crisis. India and Iran set up a joint commission in 1983 with a desire to increase their trade relations. In the joint commission meeting all the issues related to bilateral trade are discussed. The 18th session of joint commission meeting (JCM) was held in Delhi on 28 December 2015. Both sides expressed satisfaction at the growing bilateral interaction in diverse areas.

In past few years both countries are working towards managing its economic and energy cooperation under the shadow of U.S and European Union sanctions. Both countries have been working towards building regional transport network-international north-south corridor which will connect south, central and west Asia to Europe for regional economic development.(Meena Singh Roy).

Despite all diplomatic, political, economic and technical developments, and affords by both countries to improve bilateral relationship, a stable and long-lasting strategic cooperation could not be materialized. The most important factor affecting the whole Iranian foreign relations for more than a decade is its nuclear programme. With the change in Iran's position on the nuclear issue from co-operation to confrontation with the United States and Europe from 2005 onwards, there occurred significant changes in Iran–India relations too. India due to international compulsions voted against Iran two times in the Board of Governors of the International Atomic Energy Agency (IAEA) in September 2005 and February 2006. In response, Iran warned to reconsider economic cooperation with India (BBC, 2005). Furthermore, the negotiations over the project for transit of Iranian liquid natural gas (LNG) to India through Pakistan known as 'the Peace Pipeline' could not be completed. In Afghanistan as well, India showed less interest to continue cooperation with Iran and acted more in coordination with the United States. Though India and Iran continued to cooperate in economic and trade realms, however due to the nuclear dispute and the rise in the level of tensions between Iran and the West, what could be a strategic partnership never materialized.

REVIEW OF LITERATURE
Rakesh Mohan Joshi (2010), Iran is one of the leading producer and exporter of oil in the world while as India is dependent on imports to meet its demand for oil. This offers trade complementary between, as Iran can supply oil to India and reduce its dependence on Saudi Arabia and India can provide secure market for Iran's oil. India's dependence on oil imports has increased with passage of time leading to its trade deficit with Iran.

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As per report of **ASPEN Institute India**, India's foreign policy should be formulated in such a way that its interests in Middle East should be well-served. A balance should maintained in relation with Iran and U.S.A. As Iran provides way to Afghanistan and Central Asia , special attention need to be given to relationship with Iran keeping in view sanctions of U.S.A and other Western countries an Iran.

Fathipour G (2013), India and Iran can increase their trade relations based on their comparative advantage which will be beneficial for both these economics. Both the countries should focus on expanding their bilateral relationship and should formulate trade and economic policies in such a way that will help in expansion of their bilateral relationship.

Dr Rogburamapatrumi, India has to cooperate with Iran to meet energy requirements and have easy accessibility to Afghanistan and Central Asia. However relationship with U.S.A is of equal importance. India has to formulate policies in such a way so that energy requirements are meet and relation with U.S.A should also continue smoothly.

Roshandeln Jalil, Stability in the Middle East and Indian subcontinent is important to all countries including USA. A stable and strong Iran can help contribute to thus stability .The Iran-India AGREEMENT OF 2003 has been hailed for contributing to peace and stability .The implementation of agreement will encourage India Iran and Pakistan to cooperate in such a way to enhance regional security .U.S.A and other countries should welcome such agreement that improves world peace and stability rather than fanning the flames of competition and conflict.

Behura (2015), Chabahar port can be used for both oil and non-oil trade. Moreover Iran govt. offers various investment incentives from which India can get benefit .It also provides India safe and easy access to Afghanistan and Central Asia. Through the development of Chabahar port, India can boost not only its image as a proactive regional power but will also maximize its financial and strategic gains.

OBJECTIVES

- The magnitude of trade between India and Iran
- To analysis the trade trends since 1988 to 2016
- To analysis the composition of India Iran in the said period.

SOURCES OF DATA

The current study is generally based on secondary sources. Data and information from secondary sources may be collected by consulting various relevant journals , studies conducted by various donor and development agencies, export statistics published by Export promotion bureau and EXIM Bank, Economic Review, World development indicators, Ministry Of Commerce , GOI etc.

India-Iran Trade

India and Iran signed MOU worth USD 195 million for development of Chabahar port on 6 May 2015. This port holds immense strategic and economic significance for both countries. India will get easy and safe access to Afghanistan and central Asia and Iran will get market for its huge oil reserves. Both countries have strong commercial, energy, cultural, economic and people to people links. They hold regular bilateral meetings on economic and trade issues within the framework of India-Iran joint commission meeting. The 18th session of the India-Iran joint commission was held in New Delhi on December 28, 2015.In the joint commission meeting, External affairs minister of India mentioned that India considers Iran as an important partner and expressed satisfaction at the growing bilateral ties. She underlined the efforts underway to enhance the bilateral economic cooperation in energy, infrastructure, trade and commerce. The Iranian side suggested participation of India's public and private sectors in development of Chabahar port and Chabahar free trade zone (FTZ) and in setting up industrial units in the FTZ.

Composition of India's foreign trade

Exports from India has remained concentrated in few products including vegetables, animals , chemicals, textiles & clothing, machines & electronics , metals etc. The main exporting products in 1988 were primarily products who were contributing about one-third of total exports to Iran. As can be seen from table 1. Vegetables were contributing about 60% of total share and food products about 12%, thus both contributing about 72% of total share. However their combined share decreased from 72% to 6% in 2000.The contribution of non-primarily products which include chemicals and metals was meager 1.43 in 1988 which has increased to 47.02% in 2000. Thus there is diversion from primary to manufactured goods which is a positive development from India's point of view. From 2000 commodity composition have shown increasing share of vegetables,

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textiles and clothing and decreasing share of chemicals and metals as is shown in table 1. As India faces trade deficit with Iran, it should try to increase its export base and minimize its trade deficit. In recent year's Indian exports to Iran have not only increased in size but also getting diversified by exporting new commodities and thus increasing and diversifying its market share in Iran.

Table-1: Composition of exports (in percentage share)

Name of commodity	1988	1995	2000	2005	2010	2016
Vegetable	59.07	22.39	4.72	2.70	18.74	30.97
Chemicals	1.48	18.54	29.94	13.54	26.83	20.97
Textiles and clothing	1.25	0.83	5.50	4.77	6.91	12.91
Mach. & Elec.	3.94	6.76	6.35	9.29	9.21	9.29
Metals	0.95	4.43	17.08	26.85	25.85	7.77
Plastic or Rubber	0.11	5.03	7.72	3.84	2.63	4.66
Animals	7.07	1.62	4.99	1.43	2.17	2.14
Wood	0.08	0.26	2.35	0.71	0.74	2.06
Fuels	0.03	0.80	NA	31.58	1.26	1.29
Food Products	12.72	11.45	2.44	1.92	2.06	1.07
Transportation	12.45	2.39	2.74	1.74	12.73	2.66
Miscellaneous	0.16	4.63	1.02	0.90	1.04	2.92

Sources: calculated by authors from WITS (world integrated trade solution)

India mainly depends on Iran for its energy requirements as is clearly visible from table 2 that fuels were contributing more than one third of share of imports during the study period (1988-2016). However with passage of time India's imports from Iran has diversified as can be seen in table 2 .Like export's Indian imports from Iran has not shown any constant trend with fuels always dominating the import's. While fuel imports have decreased from 84.68% in 1988 to 72.89% in 2000, the combined share of chemicals and metals have increased from negligible level to 15.97% in 2000.However from 2000 share of fuels and chemicals have again increased from 72.89% and 8.53% to 82.15 % and 13.09% respectively. The share of minerals and metals has decreased from 4.20% and 7.44% to a negligible level.

Table-2:Composition of imports (in percentage share)

Name of commodity	1988	1995	2000	2005	2010	2016
1)Fuels	84.68	72.19	72.89	1.72	86.03	82.15
2)Minerals	11.21	5.50	4.20	7.78	4.15	0.53
3)Vegetables	4.12	3.56	4.83	12.63	0.58	1.38
4)Chemicals	NA	10.61	8.53	30.08	6.85	13.09
5)Metals	NA	5.52	7.44	42.22	0.75	0.63
6)Plastic or Rubber	NA	0.59	0.17	1.50	1.35	1.49

Sources: calculated by authors from WITS (world integrated trade solution)

Bilateral trade trend

India's bilateral trade with Iran has not shown a clear trend over the time period. Before 2003 agreement, exports from India to Iran was almost constant around 1 per cent growth rate. However during this period, imports were increasing at a tremendous rate due to increasing energy requirements of India. Before 2003 India faces trade deficit as shown in figure 1. However during 2001-2005, Indian exports were more than Indian imports which resulted in trade surplus. The main cause of this trade surplus was low percentage of imports as shown in table 2. From 2006 onwards growth of imports went around 4 % while as exports remain at very low rate which resulted in huge trade deficit. Indian import's from Iran has increased from 239.338 lakh US dollars in 1989 to 702.36 lakh US dollars in 2000 and further to 8253.71 lakh US dollar in 2016, while as exports to Iran has increased from 81.504 lakh US dollars to 187.336 lakh US dollars in 2000 and further to 2412.53 lakh US dollar in 2016. Thus it is clear that exports to Iran are increasing at a slower pace than imports from it which is main reason for huge trade deficit. From 2005 to 2010, imports from Iran increased at faster rate due to increased energy requirements which is clearly visible from figure 1. However in 2010 due to 4^{th} round of sanctions on Iran due to its necular programme India under international obligations curbed trade activities with Iran. In 2015 Iran and p5 +1 countries signed agreement on Iran's necular programme by which Iran agreed to curb its necular programme and western countries agreed to lift economic sanctions on it. From 2015 trade between two countries have again started increasing at smooth pace.

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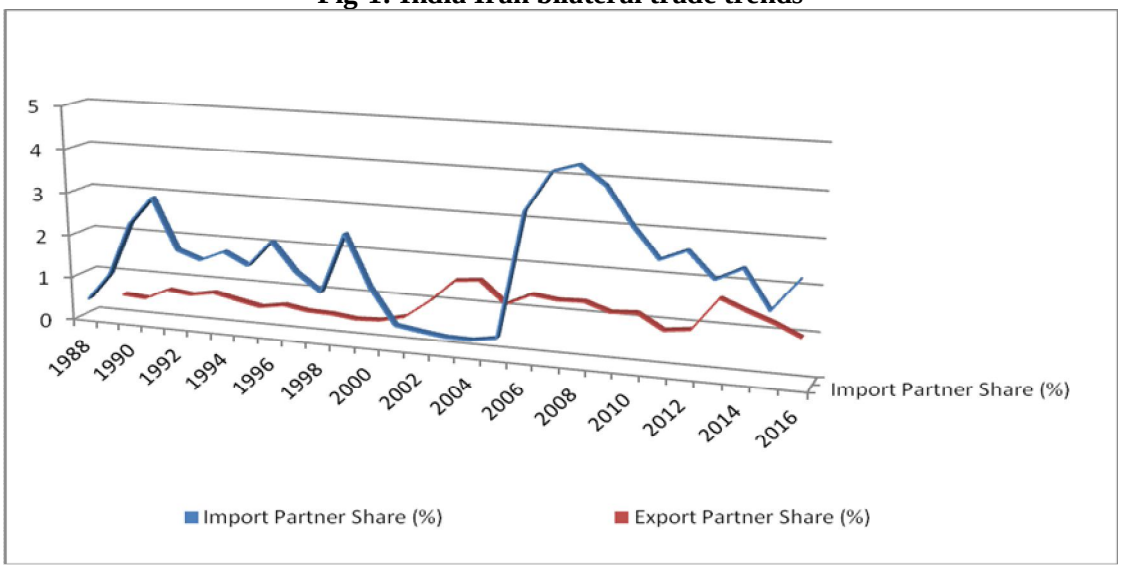
Table-3:India –Iran bilateral trade trend

Year	India's imports from Iran(US 1000$)	Import's partner share	Annual growth rate	India's Exports to Iran(US 1000$)	Export partner's share	Annual growth rate
1989	239338.48	1.102	1.702614002	81504.64	0.4325	-0.047905984
1990	560710.72	2.356	1.342752072	77600.08	0.6858	0.58197641
1991	584988.544	2.9985	0.043298305	122761.496	0.6173	0.041462048
1992	444411.053	1.8175	-0.240308109	127851.439	0.7182	0.249136914
1993	378729.184	1.6252	-0.147795309	159703.952	0.5953	-0.018518565
1994	534416.064	1.865	0.411077061	156746.464	0.4876	-0.013839623
1995	582072.64	1.5907	0.089175044	154577.152	0.5825	0.261279241
1996	859993.419	2.1988	0.477467518	194964.953	0.4935	-0.119357129
1997	632165.056	1.5259	-0.264918728	171694.496	0.479	-0.073605248
1998	474165.312	1.1177	-0.249934321	159056.88	0.4143	-0.038356624
1999	1258224.225	2.5159	1.653556034	152955.995	0.4423	0.224775204
2000	702360.922	1.3267	-0.441783978	187336.71	0.5772	0.351980431
2001	266942.274	0.5268	-0.619935754	253275.566	0.9824	0.943279009
2002	254158.441	0.4424	-0.047889878	492185.091	1.5043	0.814338434
2003	267688.555	0.3696	0.053234958	892990.327	1.5612	0.326999102
2004	355924.745	0.3596	0.329622572	1184997.362	1.0692	-0.094522532
2005	644172.181	0.4573	0.809855005	1072988.411	1.3344	0.507322903
2006	5918056.375	3.3208	8.18707226	1617340.007	1.2648	0.140923016
2007	9165576.891	4.192	0.548747817	1845260.439	1.2844	0.265896343
2008	13791494.41	4.3684	0.504705549	2335908.441	1.1026	-0.165597345
2009	10591666.75	3.9758	-0.232014571	1949088.204	1.1385	0.287401099
2010	11078291.75	3.165	0.045944137	2509258.295	0.8167	-0.018716206
2011	11488127.69	2.4844	0.036994507	2462294.501	0.8883	0.044608494
2012	13349275.04	2.73	0.162006151	2572133.75	1.6143	1.112604243
2013	10031594.89	2.1525	-0.248528863	5433900.674	1.387	-0.189474633
2014	11246347.17	2.4482	0.121092637	4404314.338	1.1827	-0.290044124
2015	6225320.61	1.5932	-0.446458435	3126868.843	0.9267	-0.228450222
2016	8253714.509	2.3139	0.325829628	2412534.962		

Sources: calculated by authors from WITS

Fig-1: India Iran bilateral trade trends



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CONCLUSION

Both Iran and U.S.A are important for India from strategic and economic point of view. India wants to have good relations with both countries. Relationship with U.S.A is important for India given the new threats and challenges in South Asia. However U.S.A should not create in hurdles in way of relationship between India and Iran. Iran is equally important for India given its increasing energy requirements. The above analysis shows that trade between India and Iran has increased over the years. Indian demand for oil has increased at a faster pace given its rapid economic development. Given the Iran's necular programme and inward looking policy of Trump. Administration, India and Iran should try to expand their bilateral relationship. India can provide stable market for Iran and Iran can provide oil to India at reasonable price. However given the trade deficit, India should try to diversify its export basket and should export goods with comparative advantage to minimize trade deficit. It should also diversify its import of oil. Thus given the present economic conditions, bilateral trade between two countries is highly significant and offers win-win situation for both countries.

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APPLICATIONS OF QR CODE IN LIBRARY AND INFORMATION SERVICES

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ABSTRACT
The Quick Response codes are two dimensional images which have the potential to revolutionize the way libraries deliver instruction, connect patrons to information about library materials, and market their services. The article is aimed at identifying the key case studies from the available literature and sharing some of them which can be implementable in Indian Library System. This article also describe in detail the process of creating QR code, QR code accessibility, application of QR code in libraries and highlights the new ideas to enhance access to library resources.

Keywords: QR Code, QR code generator, Process, Library Information Services, cons and pros, OPAC; Mobile

1.0 INTRODUCTION
Quick Response is a bi-dimensional code composed by black and white pixels into a squared matrix, containing information to be enjoyed with the help of smart phones or similar devices. Scanning the code, which is usually printed on newspapers, posters, or captions, and processing it with ad-hoc software, users can obtain additional information and data on objects or services without extra searches. Considering the widespread circulation of mobile devices (such as smart phones) among users, many libraries are experimenting the usage of the QR to deliver library services in a friendly and quick way. The Library are using the QR code to give their users access to guides, manuals, library map, audio and video files.

Fig-1: Version 4 (33×33). Content: "Version 4 QR Code, up to 50 char"

2.0 CONCEPT OF QR CODE
A QR code is the abbreviation for quick response code, which is a machine readable optical label with information on the associated item or product. In barcodes, information is coded in one direction or one dimension only. On the other hand, in a two dimensional code, which the QR code is, information is coded in two directions: horizontally and vertically. It can be read easily and is capable of holding a great deal of information.

QR codes are ubiquitous as marketing and information-provision tools. They appear on products ranging from candy bars to laundry detergent, on T-shirts and soft drink cups, in magazine advertisements, and elsewhere. Libraries and academic institutions have started to place these small codes on websites, in print literature, and in other physical locations where they may entice patrons and visitors to seek additional information about programs or services. The first object of implementation of QR codes as a means of connecting course content of the resources available with library sector.

3.0 QR CODE STANDARDS
There are several standards that cover the encoding of data as QR Codes:

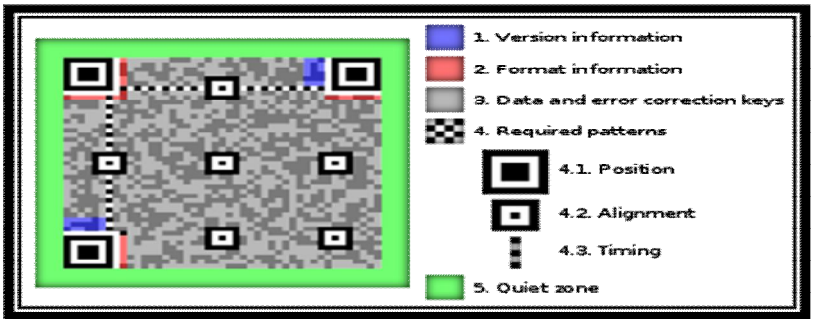

Fig-2: QR Code Standards

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- October 1997 – AIM (Association for Automatic Identification and Mobility) International[7]
- January 1999 – JIS X 0510
- June 2000 – ISO/IEC 18004:2000 Information technology – Automatic identification and data capture techniques – Bar code symbology – QR code (now withdrawn) Defines QR code models 1 and 2 symbols.
- 1 September 2006 – ISO/IEC 18004:2006 Information technology – Automatic identification and data capture techniques – QR code 2005 bar code symbology specification (now withdrawn)[8] Defines QR code 2005 symbols, an extension of QR code model 2. Does not specify how to read QR code model 1 symbols, or require this for compliance.
- 1 February 2015 – ISO/IEC 18004:2015 Information – Automatic identification and data capture techniques – QR Code barcode symbology specification Renames the QR Code 2005 symbol to QR Code and adds clarification to some procedures and minor corrections.

4.0 EXAMPLES OF QR CODES IN LIBRARY

There are several reasons to believe this may be the time to prepare for mainstream use of QR codes in the library information services, and for any academic institutions to start implementing this technology. The number of smart phones and Internet-enabled cell phones user in this country is increasing rapidly. Marketing data says we should expect smart phones to be in the hands of half of all India in few years.

QR codes are a convenient way to add the virtual to the physical to provide useful content, often at the time of need. QR codes are also gaining traction in much of India. QR codes are a low-threshold technology. Low-cost, easy to implement, and easy to use, they are a technology that provides a lot of bang for the buck. In this section we are illustrated some examples of QR code practices by the libraries as given below.

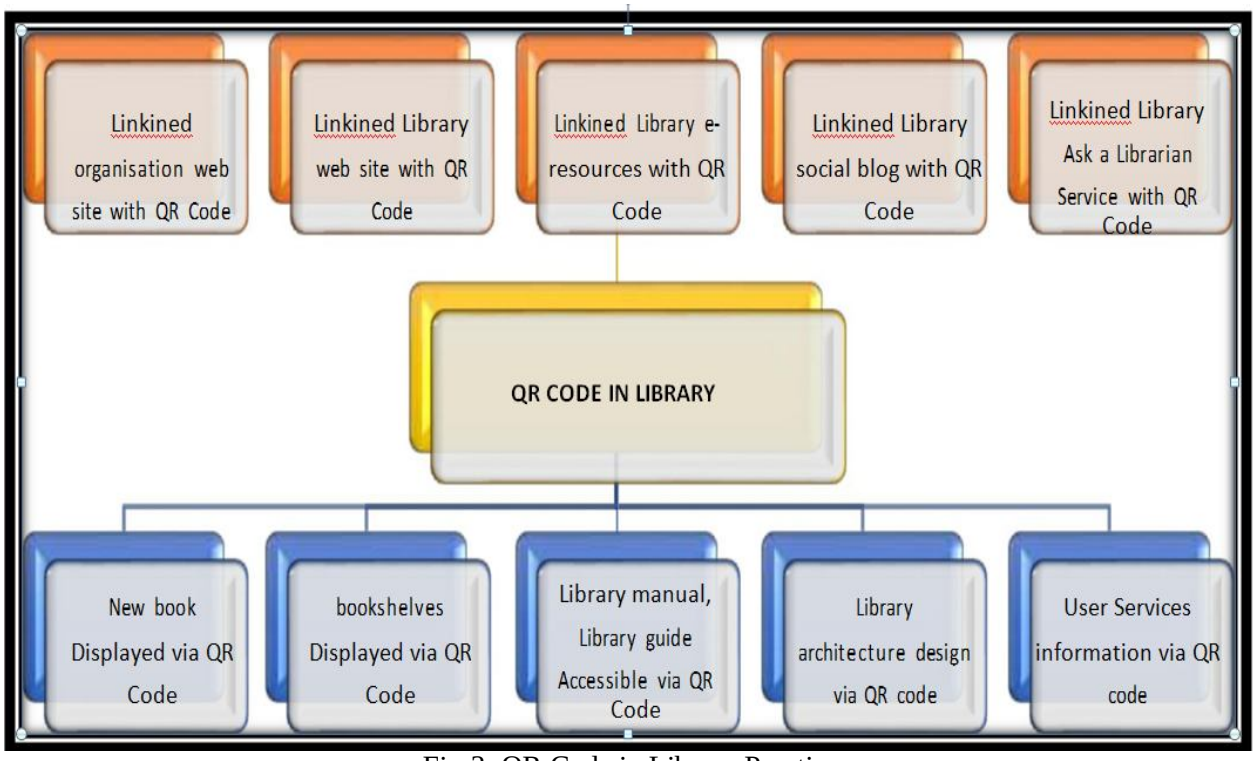

Fig-3: QR Code in Library Practice

The QR Code can be also implemented for various issues like,

- Link patrons directly to mobile resources, such as apps.
- Propel patrons into a chat session with the roving technology support team.
- Connect patrons to mobile-optimized instructions for a circulating projector.
- Provide contact information for both individuals and the library.
- Connect patrons to more information about the various pieces of artwork that are housed in the library.

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5.0 WORLDWIDE SCENARIO OF QR CODE IN LIBRARY

There are several reasons to believe this may be the time to prepare for mainstream use of QR codes in the world, and for academic institutions and libraries to start implementing this technology. Libraries using the QR Code technology to integrate library some examples herewith.

Name of the Library	QR Code in Library Practices
Boise State University's Albertsons Library	Uses QR codes to link to its mobile website in its blog and main Twitter page. There is also an informative research guide about QR codes--what they are, how they are being used in Albertsons Library, tips on creating effective codes, and recommended QR code readers/scanners.
Brigham Young University's Harold B. Lee Library	Uses QR codes for its library audio tour, for Group Study Room on-the-spot reservations http://lib.byu.edu/sites/qrcodes/) and for event poster information download.
Half Hollow Hills Community Library	Uses datamatrix codes on end stacks to lead patrons to subject guides on the web.
ACU Library	Uses mobile tags in library exhibits to link to songs, videos, websites, and realtime searches of our library catalog. It's a good way to incorporate electronic media with physical items and to make the display more engaging.
Bath University Library	Library is adding QR codes to catalog records to offer patrons basic info about an item (including location and call number).
Biblioteca Rector Gabriel Ferraté. Universitat Politècnica de Catalunya (BRGF)	Uses QR Codes to provide additional information on promotional posters and on the web pages, to provide username and password to users who subscribe to the CLIC Area service (a computer classroom), to generate reminders of reservations of the group study rooms library, to fill the suggestion forms or to enrich the contents of the library's jazz collection. at http://www.youtube.com/watch?v=OQj3kD0F2uI to know more about one of the QR applications at the BRGF.
Lafayette College Library	Used QR codes for their 2010 Open House event geared to first year students, "Where in the Library is Carmen Sandiego: An Interactive Mystery Game". Students had to collect QR coded-clues from librarians stationed throughout the library.
RMIT University Library	Used QR codes for a contest it was running.
Ryerson University Library and Archives	Using QR codes in its library catalogue and for downloadable audio tours.
Sacramento Public Library	Offers a QR code to patrons that will load the library's text message reference service info into the patron's phone. The code can be found on the Text 4 Answers page of the library website and the library's blog. More info at The Civil Librarian.
University of Huddersfield Library	University of Huddersfield Library is using them for linking to text messaging reference service, videos,

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	contact info, and, in the catalogue records, providing basic info about items. See Andrew Walsh's presentation, "QR codes, text a librarian, and more..."
The San Diego State University Library	Catalog, on is using QR Codes in its library staff directory pages and on research guides.
Emily Carr University of Art + Design Library	Is using QR codes in displays and signage
Contra Costa County Library	Is using QR codes on popular books to recommend further reading.
George Fox University Libraries	Are using QR codes on DVDs and audio books to point users to video trailers, on doors for room reservations and more - see our flickr set of examples.
Syracuse University Learning Commons Library	Is using QR Codes on their bookmarks, tabletop signs, and on the flyer advertising their virtual tour - see our set on Flickr.
UC Irvine Libraries	Is running a pilot with QR codes in the stacks. The Arts section directs QR code users to LC arts classification system to aid browsing the physical book collections. The Math section uses QR codes embedded in the stacks to direct users to the Springer mathematics e-book collections.
Marathon County Public Library (MCPL)	Uses QR codes on posters and other print media to connect customers to search results for related items in the library catalogue (i.e. for book clubs, author visits, etc. ... links to the item(s) in question)
Southwest Iowa Library Service Area (SWILSA)	Has begun a "shared" list of readalikes for various popular authors. A sheet of codes, formatted for label stickers, is available to print and attach to shelves near those authors' books.
Tompkins County Public Library	Is using QR codes to advertise its downloadable eBook service, themed booklists and its social networking sites. Our QR code guide contains basic information and examples of our work.

6. CONCLUSION

QR Code is an innovative technology for the libraries helps to the information professional to integrate bi-dimensional code composed of black and white pixels into a squared matrix, containing information to be enjoyed with the help of smart phones or similar devices. This research paper analyse structures of QR code and process how it is work? A library user can easily get information regarding library collection, e-resource, library web site, Web-OPAC in a user-friendly environment. Number of libraries adopted this technological code to spread information worldwide. Library information professional using this technology without any dependency. Many QR code generator also available to generate QR Code for library collection, architecture design of library building, e-books, visiting cards, bookmarks, user manual or blog.

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THE RELATIONSHIP BETWEEN HUMAN RESOURCE PERFORMANCE RATIOS AND KEY FINANCIAL PARAMETERS – A CASE STUDY OF SELECTED PHARMACEUTICAL COMPANIES OF NSE

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ABSTRACT
The success of any organization depends on how well the resources has been utilised. The resources in the sense both internal and external. The growth of service sector organizations has given much importance for the employees who were working in the company. The presence of quality employees makes all the difference in the performance of the organization. The competitive firms always try to grab the intellect personnel from the other firms in order to get the advantage. Similarly the pay given to those employees will be relatively high. As all the companies wants to generate the higher level of profits they are interested in knowing the relationship between the employees and the income earning capacity of the firm. The main objective of the paper is to study the relationship between the human resources and the company's performance.

The study uses the secondary sources of data i.e. the published annual reports of 5 companies for the past 5 years. And the technique used for analysis is regression which is applicable for the comparison of data. The study is important for both internal and external stakeholders of the company for the decision purposes.

Keywords: Human Resource Performance Ratios, Key financial parameters like Return on Capital Employed, Return on Equity, Net Profit Margin, and Revenue.

INTRODUCTION
A Nobel Prize winner in the field of economics by name Gary S Becker, has claimed that "the basic resource in any company is the people. The most successful companies and the most successful countries will be those that manage human capital in the most effective and efficient manner". It is agreed that accounting the human capital is difficult. Because valuing the human resources is very difficult. As the world economy has been shifting from an industrial economy to an information based economy as a result of the internet and other new technologies, human resources are becoming more important.

Flamholz states that Human Resource Accounting (HRA) has main roles like, to encourage decision makers to accept HRA and to provide firms with information concerning the cost of employees. The main aspects of HRA are measuring and reporting on investment related to employees and value generated by them.

The companies which are into service sector has invested heavily on human resources and wanted to know whether they are able to generate the required level of income.

LITERATURE REVIEW
A research paper titled "Human Resource Accounting and Firm Performance" by P.O. Okpako, E.N. Atube & O.H. Olufawoye has revealed that HRA variables impacted positively to the level of firm performance. This paper conducted a survey on 7 companies quoted on the Nigeria Stock Exchange. This study adopted the principle component analysis to quantify the responses obtained so as to obtain a series which captured the composite value of the component of HRA variable. (OKPAKO, ATUBE , & OLUFAWOYE , 2014)

A study conducted by Ezejiofor Raymond Asika, John-Akamelu Racheal Chitom, and Iyidiobi Felicia Chelichi on "Appraisal of Human Resource Accounting on Profitability of Corporate Organization" determines the extent at which increase in staff salary has affected organizational profitability. To ascertain if the increment in staff has contributed positively on organizational profitability & to evaluate the extent at which staff retirement benefits has effect on organizational profitability. The study revealed that increase in staff salary has positive effect on organizational profitability, also that level of increment in staff has influence on organizational profitability. The other finding of the study was that staff retirement benefits have positive effect on organizational profitability. (Racheal Chitom, Chelichi, & Asika, 2017)

A Research paper titled "The Relevance of Human Resource Accounting to Effective Financial Reporting" by Ishola Rufus Akintoye has discovered that human resource has a positive effect on the profit and capital employed by the bank, lending credence to the findings of Ashton, that there is association between components of intellectual capital and firm-and market level financial outcomes. This view was also supported by his own work during 2003 that the published Financial Statements may be incomplete without accounting for human resources. (Akintoye , 2012)

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A research by Ogbodo, C.O. and Egbunike, F.C. on "The Relationship between Human Resource Performance Ratios and Financial Performance of Nigerian Firms" was carried out to contribute to the field of intangible assets by the firm. The growth and development of research into soft factors such as environmental, social, community and employee related aspects etc. has been slow. This research work is done to contribute to this stream of research. (C.O. & F.C. , 2016)

As per the literature review it is clear that Human Resource Accounting is one of the factor which influences the firm's performance. Based on these literature review the current research work is conducted to find whether there is any relationship exists between the human resource accounting ratios and the firm's performance.

OBJECTIVES OF THE STUDY

1. To examine whether a relationship exists between human resource performance ratios and Return on Capital Employed.
2. To predict the relationship between human resource performance ratios and Return on Equity.

HYPOTHESIS

H1: there is no significant relationship between Human Resource Performance Ratios and Return on Capital Employed.

H2: there is no significant relationship between Human Resource Performance Ratios and Return on Equity.

SIGNIFICANCE OF THE STUDY

The current study is very helpful for the employees and management. The reason being that it reflects the strategic competitive importance of human resources and also helps in earning credibility for the firm. Through this study the researcher is trying to show the link between human resource and financial performance. The researcher is of the opinion that the companies with quality and stable personnel is likely to improve on financial performance and ultimately maximize shareholder's wealth.

As per Okpala and Chidi (2010) 'a well-developed system of human resource/ capital accounting could contribute significantly to internal decision by management and external decision by investor'.

RESEARCH METHODOLOGY

The present research study is the descriptive and ex-post facto research design. For this the researcher is relied on secondary data sources. Secondary data was obtained from annual reports of top 5 pharmaceutical companies listed on NSE. For getting the conceptual base of the study secondary data like journals, magazines, published PhD thesis, articles in journals etc. were taken.

ANALYSIS AND DISCUSSION

The technique which is used for the analysis is correlation model. This study requires two variables.

Independent Variables

a. Revenue per Employee (RPP): - Revenue/Number of Employees

Revenue per employee is a measure of how efficiently a particular company is utilizing its employees. Generally it could be understood that if a company is able to generate high revenue per employee it is good for the company. The reason being, the company is utilising its human resources to its optimum extent.

b. Net Income per Employee (NIPE): - Net Income/Number of Employees.

This is a company's net income or net profit divided by the number of employees.

Dependant Variables

a. Return on Capital Employed: - this is the ratio of profit before interest & Taxes and capital employed. Capital employed is the owners fund and long term loans & Debentures less fictitious assets and non-operating assets.

Therefore ROCE = (Profit before interest & Taxes/capital employed) X100

b. Return on Equity: - this is the ratio of net profit after interest, taxes and preference dividend with that of equity shareholder's funds.

Therefore ROE = (Net profit after interest, Taxes and preference dividend/equity shareholder's funds) X 100

THE TOOLS AND TECHNIQUES OF ANALYSIS

The ratios selected to highlight the Human Resource Performance are Revenue per Employee and Net Profit per Employee. The researcher has considered only two key financial parameters for comparison. They are Return

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on Capital Employed and Return on Equity. To check the hypothesis correlation technique is used. The various parameters which is mentioned in the above paragraph are analysed in the following tables.

Table-1: the ratios selected for the study

Human Resource performance ratios:	
Revenue Per Employee (₹. In crores)	RPE
Net Profit Per Employee (₹. In crores)	RPPE
Key Financial Performance Ratios:	
Return on Capital Employed (in %)	ROCE
Return on Equity (in %)	ROE

ANALYSIS AND INTERPRETATION OF DATA

Financial information of top five pharmaceutical firms for the past five years from March 2014 to march 2018 was taken for analysis. This has provided a panel data set of observations. Through MS- Excel the data has been analysed.

DESCRIPTIVE STATISTICS OF PANEL DATA

The following table shows the mean and standard deviation of the data which is collected.

Table-2: Descriptive statistics of secondary data

	N	**Sum**	**Mean**	**Standard Deviation**
Gross Revenue	25	3664157	732831.3	1060595
Net profit	25	654111.3	130822.3	196303
No. of Employees	25	85860.8	17172.16	7465.951

TEST OF HYPOTHESIS

H1: there is no significant relationship between Human Resource Performance Ratio and Return on Capital Employed.

The results of the test are shown in the table below.

Table-3: Table showing correlation between HRP ratio and ROCE

Name of the Company	**Correlation Between Revenue per employee and ROCE**	**Correlation Between Net Income per employee and ROCE**
Sun Pharma	0.18	0.50
Cipla	-0.98	0.95
Lupin Laboratories	-0.44	0.15
Dr. Reddy's	0.95	0.63
Piramel Enterprises	0.82	0.92
	0.10	**0.63**

From Table No. 3 the following observations could be made. The correlation between Revenue per employee and ROCE is positive for three companies and negative for two companies i.e., for Cipla and Lupin Laboratories. There is a positive correlation between Net Income per Employee and ROCE. In aggregate Human Resource performance Ratios (Revenue per employee and Net income per employee) is positively correlated with ROCE. The correlation between Net Income per employee and ROCE is highly positive. The correlation between Revenue per employee and ROCE is less positive. Therefore null hypothesis is rejected.

H2: there is no significant relationship between Human Resource Performance Ratios and Return on Equity.

The results of the test are shown in the table below.

Table-4: Table showing correlation between HRP ratio and ROE

Name of the Company	**Correlation Between Revenue per employee and ROE**	**Correlation Between Net Income per employee and ROE**
Sun Pharma	0.30	0.50
Cipla	-0.94	0.97
Lupin Laboratories	-0.53	-0.06
Dr. Reddy's	0.99	0.72
Piramel Enterprises	0.79	0.97
	0.12	**0.62**

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It is clear form table No.4 that the correlation between revenue per employee and ROD for Sun Pharma, Dr. Reddy's and Piramel Enterprises are positive. But for Cipla and Lupin Laboratoreis it is negative. The aggregate value of correlation is positive but it is less. The same table shows that correlation between net income per employee and ROD for Lupin Laboratories is negative and for the rest it is positive. Finally it could be identified that human resource performance ratios is positively correlated with ROE.

The correlation between net income per employee and ROE is highly positive. The correlation between revenue per employee and ROE is less positive. Therefore the null hypothesis is rejected.

Hypothesis one revealed that there is a significant relationship between Human Resource Performance Ratios and Return on Capital Employed, while, hypothesis two revealed that there is a significant relationship between Human Resource Performance Ratios and Return on Equity. Similar study by Ogbodo, C.O. and Egbunike, F.C. also found a positive relationship between human resource performance ratios and financial performance ratio.

SUMMARY OF FINDINGS

The results of the secondary data could be summarised as follows

1. There is a significant relationship between Human Resource Performance Ratios and Return on Capital Employed.
2. There is a significant relationship between Human Resource Performance Ratios and Return on Equity.

CONCLUSIONS & RECOMMENDATIONS

This study was undertaken to find out the relationship between Human Resource Performance ratios & Key Financial Performance Ratios of top 5 listed Pharmaceutical companies in India. Human Resource is the major asset required for organizational survival & growth. In India many of the companies do not recognise human resources as an asset. But in recent years the companies have started to recognise it as an asset.

In India the development of research into human resources it is very low. The reason being valuing human resources as an asset is not mandate. The current study is a step ahead to contribute to this stream of research. Based on the research the following recommendations are made.

1. Disclosing human resource values in the annual report: Annual report is a medium of communication between the company and its stakeholders. So they should disclose both financial and non-financial information which fulfil the company's objectives. Firm should disclose qualitative measureable values of human resources to make stakeholders to relay on such figures so that they can compare across firms. This is required when performance is to be linked to this quality.
2. Valuing Human Resources as assets should become mandate. The uniform format to compute the value of human resource should be developed.

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.A STUDY OF READERS' PERCEPTION ON SCIENCE PUBLISHED IN NEWSPAPERS OF NAGALAND

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ABSTRACT
Science communication is an important aspect where scientific ideas, thoughts are transferred to common man through media to generate scientific attitude. Scientific attitude is the backbone of any developed society. Though media has great potential to harness scientific understanding among the masses, how far they are doing it is the prime concern.

Taking only newspaper readers, the study is based on the concept of science communication where readers are asked to give responses on how they consider about the science items published in the newspapers. Responses from the readers are collected and analyzed to know about the impact of newspapers on readers. The study is an analysis of readers' perception on science items published in newspapers in Nagaland.

The study reflects that readers are not getting expected content. In presentation the contents lack interesting features to attract the readers though in the credibility scale the newspapers enjoy a positive response.

Keywords: Newspapers, Perceptions, Readers, Science Communication, Science Items

INTRODUCTION
Communicating scientific knowledge to the mass is an important aspect for media. The process of transmission of scientific facts, ideas to the common mass is called science communication which is getting significance day by day. Science communication is defined as the use of appropriate skills, media, activities and dialogue to produce awareness, interest, opinion and understanding of science, its content, processes and social factors (Burns, O'Connor, & Stocklmayer, 2003). Modern scholars view science communication as a complex and contentious topic that encompasses a spectrum of issues from the factual dissemination of scientific research to new models of public engagement whereby lay persons are encouraged to participate in science debates and policy.

Nelkin (1990) states that for people, "the reality of science is what they read in the press. They understand science less through direct experience or past education than through the filter of journalistic language and imagery". By framing issues in specific ways, media can influence not only what issues that are presented to mass audiences, but also how these are perceived, and what importance the public should attach to them (Durrant, Wakefield, McLeod, Clegg-Smith, & Chapman, 2003).

Media has a pivotal role in shaping public understanding of science and imparting scientific knowledge which can lead to development of scientific attitude. Newspaper performs an important service in communicating the information to public. Newspaper articles serve as "filters" for technical information by translating it into language that the average lay person can understand and making it accessible to the public. Journalistic decisions on what information to publish, how to slant it, and who to consult for interpretation or reaction, set the tone and boundaries of what reaches the consumers. Though the rise of television and internet pose a threat to the newspaper, still newspaper always attracts people because of its beauty of reading, flexibility of use, consistency, involvement, credibility and creativity.

In a study by A. F. Simon (1997), it is found that an increase in the news-coverage of natural calamities and disasters influence the behaviour of private US citizens, resulting in a remarkable rise in donations by them. In short, news coverage and its intensity have a direct effect on its readers, influencing and changing their attitudes. The role of media is very important in informing the public about early-stage science policy debates and avenues for public involvement, potentially raising awareness and participation (Bubela, et al., 2009). With improved public engagement efforts on the part of scientists and their organizations, the communication initiatives are to be guided by careful formative research, using a diversity of media platforms and audiences to facilitate conversations (Nisbet & Scheufele, 2009).

The presentation is very important in communicating any science message. Information in science communication should be provided with exploratory bent of mind in clear, eye catching manner without any technological jargon so that common man can understand (Dutta & Ray, 2011). Since the target people are the common mass who are mostly from non science background, presentation has to be made using appropriate tools like proper diagrams, graphs etc (Goh, Pomsagun, Tissier, Dennison, Kremer, & Weichselgartner, 2008).

With a strong impact of newspapers in growing demand for information, a well prepared science items can influence the common mass in creating awareness on important science issues.

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METHOD OF STUDY

With samples from towns of Nagaland, the study analyzes the perception of readers on science items published in daily newspapers accessible in Nagaland.

The study is based on closed ended questionnaires covering 3 towns of Nagaland i.e. Dimapur, Kohima and Mukokchung. A total of 360 questionnaires are distributed of which, 291 are found to be valid. Since the study is related with readers' perception on science items published in newspapers, only literate populace are selected for the study.

FINDINGS & ANALYSIS

A. Demographic Profile: Out of 291 respondents, 114 (39.17%) are female and 177 (60.82%) are male and no transgender (0%) was in the said study. There were 157 (53.96%) Students, 35 (12.02%) Service holders, 26 (8.93%) were Housewives, 12 (4.12%) were Retired personnels and 61 (20.97 %) were having Business. In the Age Group, 157 (53.96%) were belong to 18-25 years of age group, 87 (29.9%) were belong to 26-35 years, 35 (12.02%) were belong to 36-45 years, 3 (1.03%) were belong to 46-55 years and 9 (3.09%) were belong to 56-65 years. There was no respondents whose age in beyond 65 years.

B. Discussion: On media habits regarding newspapers, the findings reveal that majority of the respondents i.e. 212 (72.73%) are spending less than an hour time on newspapers. 63 respondents (21.82%) are spending between half an hour to one hour and 16 respondents (5.45%) are spending more than one hour in reading newspapers. Only 8 respondents (2.63%) spend more than two hours in reading newspapers.

Table-A: Distribution of Respondents' Topics of Interest in Science Content in the newspapers

Topic	Mean	SD
General Science	4.11	.95
Health/Medical	3.77	.94
Environment	3.96	.93
New Technology	4.38	.84
Agriculture	3.06	1.00
Computers	3.84	.98
Universe/cosmos	3.24	1.20

Note: N= 291, 5-point scale (Very much=5, Much=4, Normal=3, Little=2, Not at all=1)

Source: Primary data from the responses of readers

The table A reveals the interested topics of the readers regarding science content in the newspapers. It is found that most of the respondents are interested in science related topics. At the top there is of New Technology (mean= 4.38) where majority are interested. Since now a day there is increasing demand as well as popularity of new technical devices, the readers have developed interest in this topic. Second is the General Science (mean=4.11) where readers are interested. General Science means any science related information. Environment (mean= 3.96) is also another interested topic of readers which is closely followed after General Science. It is followed by Computers, Health/Medical and Cosmos related topics whose means are 3.84, 3.77 and 3.24 respectively. Surprisingly, though Nagaland's majority population is related with agriculture, it is not much interested topic of the respondents. With mean value as 3.06, Agriculture is the least interested topic of the respondents.

Table-B: Distribution of Respondents' Perception of Presentation of Science Content in Newspapers

Presentation of Science Content	No. of Respondents	Percentage
Interesting	49	16.84
Difficult to understand	25	8.45
Dull/boring	90	30.93
Too many technical words	33	11.27
Can't say	94	32.39
Total	291	100.00

Source: Primary data from the responses of readers

Table B comprises of the perception of presentation of science contents in newspapers. It is evident from the table that 90 respondents (30.93%) find it boring which is a matter of concern. While 49 respondents (16.84%) perceive it as interesting which is good, 33 respondents (11.27%) think it has too many technical words. 25

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respondents (8.45%) find science content as difficult to understand and 94 respondents (32.39%) have chosen the option of can't say.

So it is clear that majority of the respondents are not happy with the presentation of the newspaper content. While only 49 respondents find published science items interesting, 148 respondents (cumulative) find them as either difficult to understand or dull, or having too many technical words. It implies the science contents are not published as attractive feature and the science messages may not attract the readers to induce desired positive change.

Table-C: Distribution of Respondents' Perception of Credibility of Science Content in Newspapers

Credibility of Science Content	No. of Respondents	Percentage
Very much	12	4.23
Much	139	47.89
Average (so-so)	82	28.17
Not much	57	19.72
Not at all	0	0
Total	291	100.00

Source: Primary data from the responses of readers

Table C shows how much credibility the readers have on the science contents. Credibility is an important factor in making any change of behaviour. For any effective communication, there has to be credibility in the content. Here, 139 respondents (47.89%) show credibility at much level, 82 respondents (28.17%) show it in average, 57 respondents (19.72%) find not much credibility and 12 respondents (4.23%) find very much credibility of science contents.

It is seen that newspapers enjoy a significant level of credibility as majority respondents choose positive scores. It also implies the impact of newspapers can have on the readers.

Table-D: Distribution of Respondents' Perception of Clarity of Science Content in Newspapers

Clarity of Science Content	No. of Respondents	Percentage
Always	28	9.72
Often	97	33.33
Sometimes	133	45.83
Rarely	24	8.33
Never	8	2.78
Total	291	100.00

Source: Primary data from the responses of readers

Table D depicts the responses of perception on clarity of science content published in the newspapers. It reveals how often readers get clarity in understanding science contents. It can be seen that readers responses are distributed among the extreme ends, having majority i.e. 133 respondents (45.83%) view clarity of science content as sometimes. 97 respondents (33.33%) believe they find clarity often and 28 respondents (9.27%) find clarity always. On the other hand, 24 respondents (8.33%) rarely find clarity and 8 respondents (2.78%) never find any clarity in science contents of newspapers.

Table-E: Distribution of Respondents' Reasons for Understanding Science Items published in newspapers

Understanding Science Items when	No. of Respondents	Percentage
Interested	180	61.97
Photos	53	18.31
Easy to understand	41	14.08
Good presentation by newspaper	25	8.45
Total	299	103

Source: Primary data from the responses of readers

Table E depicts the distribution of respondents' reasons for understanding science items published in newspapers. Since one respondent may have multiple reasons, here total number of respondents' reasons is more than the actual total number of respondents i.e. 291. Hence, the percentage is also more.

It is clear from the table that 180 readers (61.97%) which is also majority, believe that when they get their interested topics on newspapers, then they can understand more of the science content. 53 (18.31%) readers

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believe that they understand because of photos, 41 (14.08%) readers believe that their understanding depend on 'easy to understand' topics and 25 (8.45%) readers are of the view that their understanding of science content is based on the overall good presentation of the newspapers.

It is evident that majority readers understand science contents when they get topics of their interest. Also, the photographs are another good reason to make the readers understand science topics.

Table-F: Distribution of Respondents' Response on the Approach of Scientific Content in newspaper

Approach of Scientific Content	No. of Respondents	Percentage
For common people	86	29.57
For scientific personnel	66	22.54
Can't say	139	47.89
Total	291	100.00

Source: Primary data from the responses of readers

Table F comprises of the responses on approach of scientific content in newspapers. 86 respondents (29.58%) find science content as easy to understand for common people, but 66 respondents (22.54%) think it is only for scientific personnel. 139 respondents (47.89%) are not able to say anything on the topic.

It is found that there is mixing responses from readers in this respect. There is also a probability that people from non science background find the science contents published in newspapers only '*for scientific people'*, making it difficult to understand for common mass.

Table-G: Distribution of Respondents' Perception of Relevance of Science Content in Newspapers in day-to-day life

Relevance of Science Content	No. of Respondents	Percentage
Very much	33	11.27
Much	107	36.62
Average (so-so)	57	19.72
Not much	94	32.39
Not at all	0	0
Total	291	100.00

Source: Primary data from the responses of readers

Table G presents the perception of readers' relevance of science items in day to day life. However, we can see that the responses presents touch the two extremes rather closely. While 107 respondents (36.62%) find much relevance of science content published in science contents, 94 respondents (32.39%) find just the opposite, i.e. not much relevance. 57 respondents (19.72%) mark it as average and 33 respondents (11.27%) find very much relevance of science contents in the newspapers.

Figure-A: Distribution of Respondents' Topics of Interests of Science Content in the Newspapers

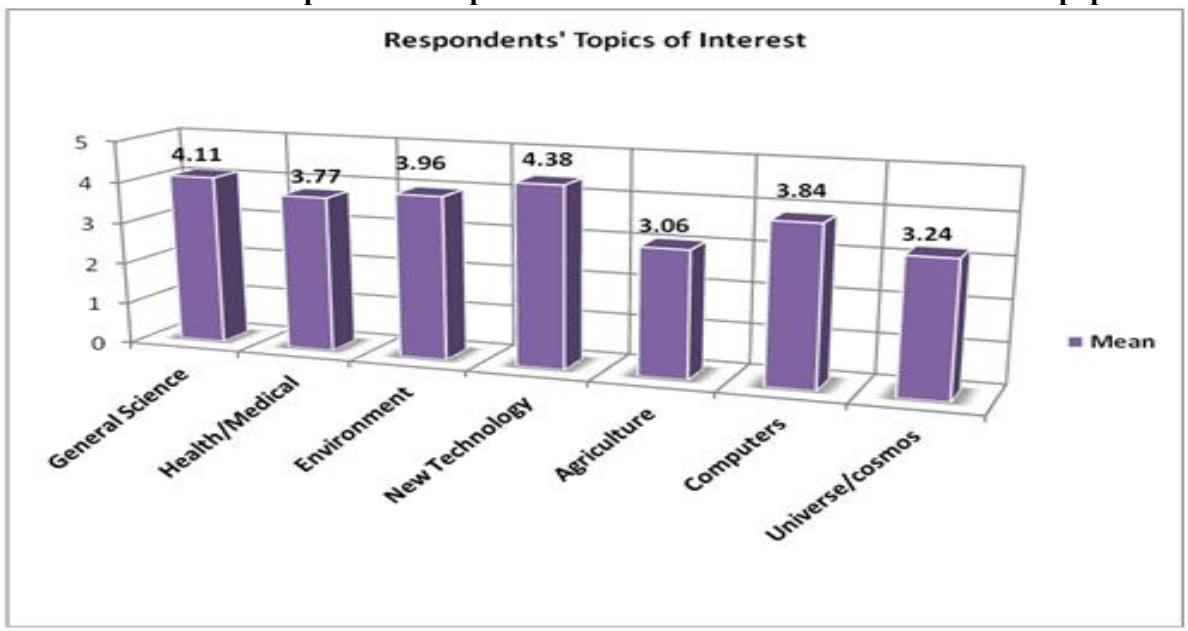

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Figure-B: Distribution of Respondents' Perception of Presentation of Science Content in Newspapers

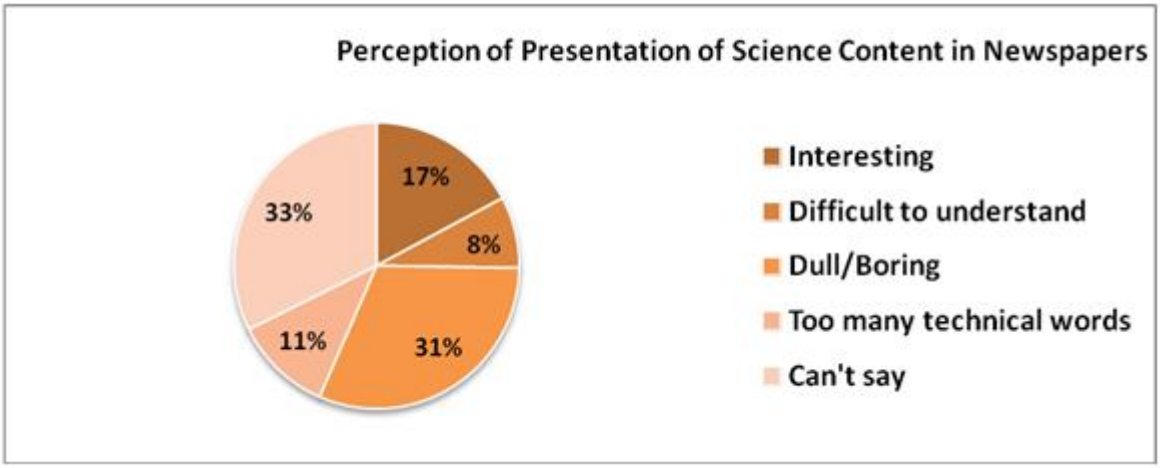

Figure-C: Distribution of Respondents' Perception of Credibility of Science Content in Newspapers

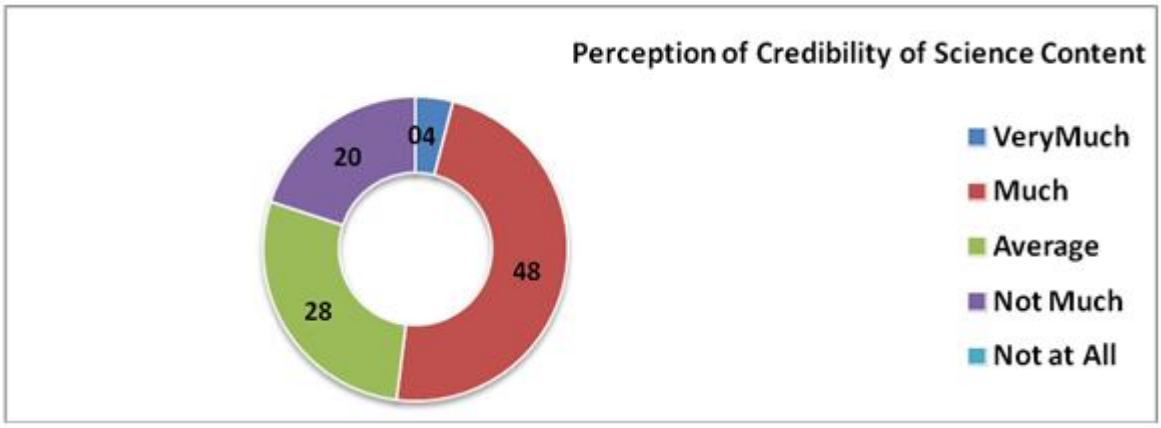

Figure-D: Distribution of Respondents' Perception of Clarity of Science Content in Newspapers

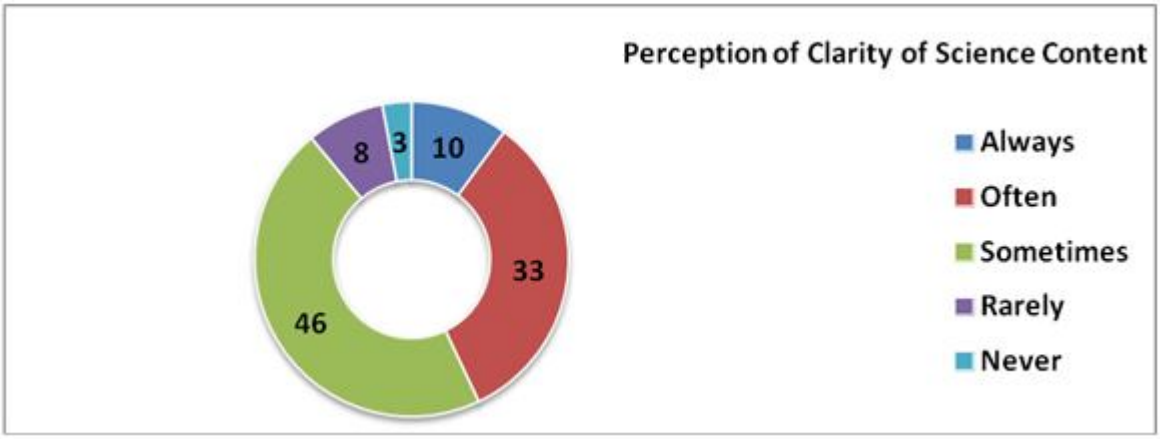

Figure-E: Distribution of Respondents' Reasons for Understanding Science Items published in newspapers

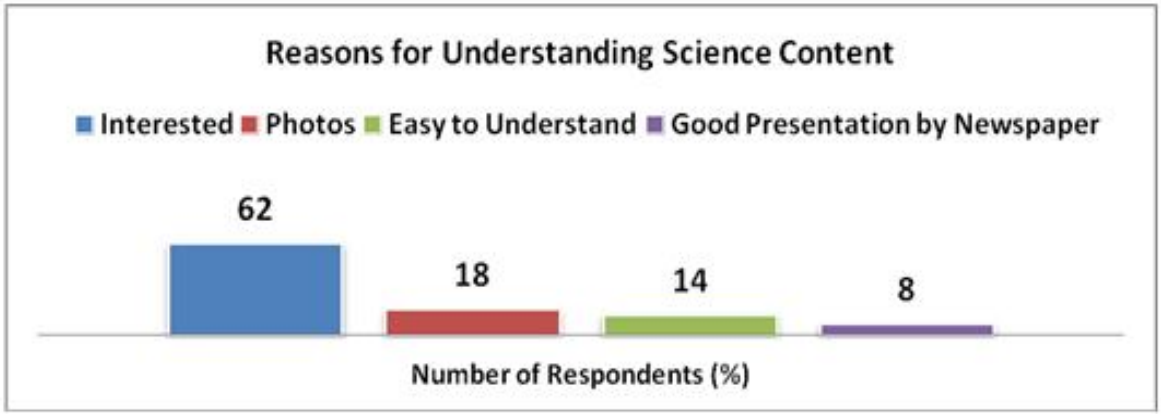

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Figure-F: Distribution of Respondents' Response on the Approach of Scientific Content in newspaper

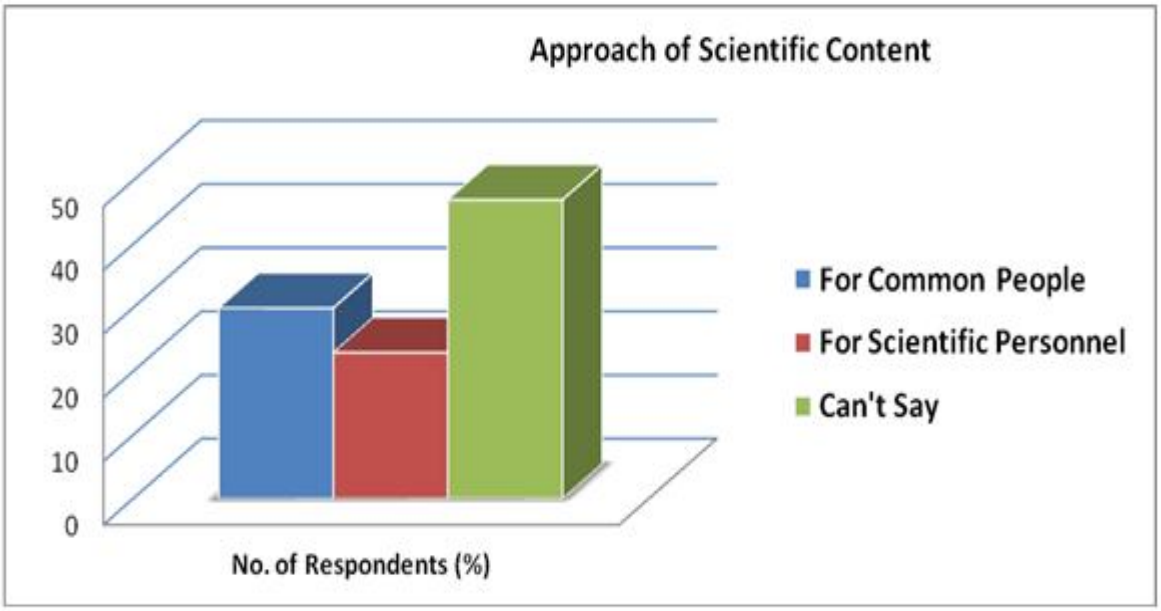
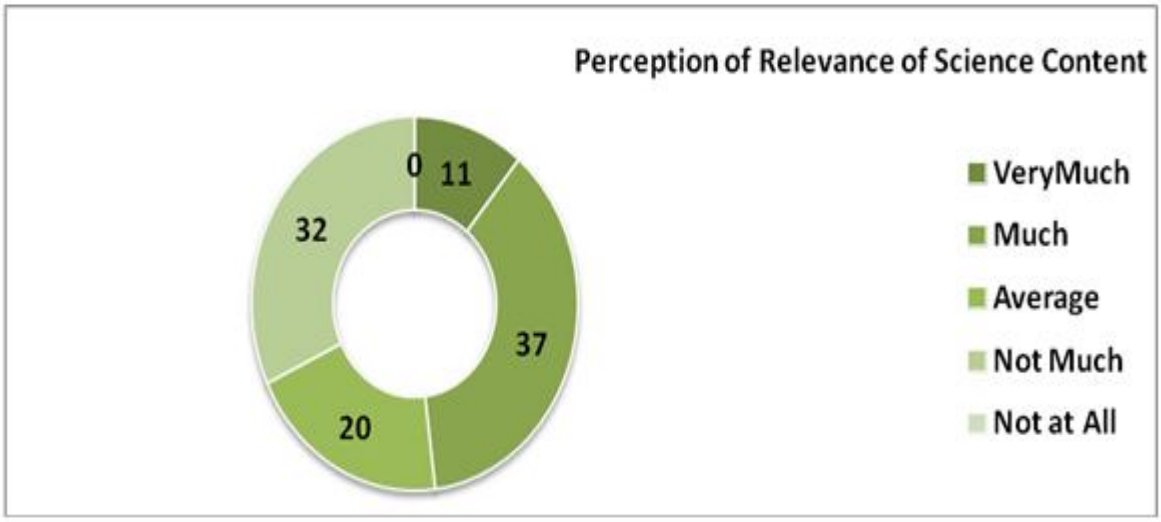


Figure-G: Distribution of Respondents' Perception of Relevance of Science Content in Newspapers in day-to-day life



CONCLUSION

Society is riddled with many gifts of science from the beginning of the civilization. This makes knowing and understanding of science by common mass very crucial. Many a time people need to make decision, choices based on scientific understanding. Issues like GMO, nuclear proliferation and sustainability, green house effect etc. still need explanation to the common people as it is directly related to them and the policy of the state as well. In this perspective science communication is the only way to generate understanding and develop consensus.

The readers' survey reflects that newspapers enjoy a good amount of trust which is the strength of the medium. Publishing science items in newspapers can leverage the process of science communication spreading scientific understanding among the common mass. However, presentation of science is very important in print media unlike other types of media. Science items need to be presented with proper photos, diagram without any jargon make it more appealing. It is to be communicated with proper language and based on truthful source for greater benefit. For this there should have awareness at the editorial and journalistic level of newspapers so that they can understand its importance. Editors should take initiative to publish more science in the newspapers for betterment of society. There should be designated space in the newspaper and staff in the office to look into matters of science items to be published. The journalists who are responsible for science items should be preferably the people with science background. As readers' understanding is based on their interested topics, newspapers should focus on different interests of the masses. The topics also have to be relevant to the day to day life of readers which also make it attractive to the readers.

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EXEMPLIFYING THE MOTIVATING FORCE OF MEDIEVAL INDIAN ECONOMY WITH SPECIAL EMPHASIS ON AGRICULTURAL ADVANCEMENT IN THE CONTEMPORARY TIME

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ABSTRACT

Economy is the backbone of any civilization, state, culture or society. It is the most vital factor for sustenance of any physical or material entity in the world. Infact, without surplus economy, it is impossible to establish any civilization, state or an empire. Since the ancient time, whether, it was Indus Valley Civilization or the emergence of Mahajanapadas, economy had been the most crucial factor for the sustenance all throughout the journey. Medieval India was no different from any phase of the history or present, in this context. Battles and wars in history have been the centre point of discussion. But the most important point to note is that quest of catering wealth and flourishing one's own regime by that wealth was the reason behind those expeditions and annexations. To win any war, better warfare techniques and weapons were needed which could only be bought by money. In medieval times, agriculture was the most important aspect of economy and rulers paid prime attention towards this sector. But, the irony was that, that they focussed more on revenue appropriation by any means over the land and the produce. They did not maintain their energy over the innovation in technique and technology for enhancing the production and towards the welfare of the peasants. For more revenue generation, expansion of agricultural land was adopted. Greater the land under cultivation, greater will be the revenue assessed. During the time of crisis like famine, drought or flood, there was mechanism of rehabilitation, resettlement and restoration of the losses. This shows that medieval economy was also a welfare economy. Canals and lakes were also built for irrigation.

Economy and tax structure was entirely based on the teachings of Islam. Tax was progressive and not exploitative. Vulnerable sections were exempted from giving tax. Currency system was flexible and monetized. Mercantilist structure was well developed in the period. Inland trade was quite active and cloth of cotton were traded prominently. Foreign trade also garnered a huge income. Ship and boat building was also one of the main bussiness. This trade also gave boost to communication and navigation which resulted in more foreign trade in Asia as well as in Europe. With flourishing trade and economy, insecurity of corruption and plunder also rose. To defend this, rulers regulated the market and adopted stringent means. In South India, trade of horses in Vijayanagara Empire was one of the main bussiness in contemporary times. Since, the South Indian states were settled beside the sea shore, that is why they got valuables from sea in the form of beads and precious stones which they traded with foreign community. Craftsmanship was one of the important components of economy. Artisans made potteries and utensils of royal as well as of common use. Pitlooms and drawlooms were the major breakthrough in the weaving and textile sector. Karkhana or workshop for making royal items were different from those of common people. Overall, the economy of medieval times was good in some aspects and miserable in others.

Keywords: Economy, Medieval, Agriculture, Trade, Revenue.

FULL PAPER

Considering the agriculture which was the most important source of the livelihood and the backbone of Indian economy, a favorable ratio of land to man that is availability of land for cultivation was in surplus than the people present there. [i]Economic thought of medieval India was concerned with the solution of economic problems, the stability of economic life and with the maintenance of the economic structure as based on spiritual values rather than with the formulation of economic principles and theories. Innovation in the field of agriculture was not much and rulers wanted the productivity to be increased to a very large extent. This was possible only through the expansion of land under cultivation, so, forest land and the barren land were made productive enough to be taken under cultivation. [ii]During the medieval age our country was famous for her fabulous wealth. The story of India's enormous riches tempted Mahmud of Ghazni and his plundering hordes to invade the prosperous capitals of her kingdoms and sack her temples. One can easily believe from the contemporary accounts of the vast plunder acquired by Muhammad bin Qasim in Sindh and Multan and Mahmud of Ghazni in Hindustan proper- coined and uncoined money, precious stones of various kinds and a variety of other goods valued at cores of rupees- that the stories were not fairy tales and had foundation in fact. [iii]The coinage of the Sultans of Bengal is unique among all the Indian sultanate coinages in being a primarily monometallic one based on the silver tanka. This coin denomination, which lasted almost 350 years, when it was replaced by the rupee, was in turn based on the tola of 11 grams. At times, state did not have enough money to pay the officials of administration, so, rulers gave them the land to cultivate in lieu of their service.

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AGRICULTURE: BACKBONE AND LIFELINE OF ECONOMY

[iv]Indian people were mainly depended on the agriculture for the subsistence and their primary needs. This has led to the expansion in agriculture but people were involved in fulfilling their needs and that is why innovation was absent in the agricultural sector. Process of cultivation was expanded to tribal, backward and outskirts of the main habitation. [v]The system which was established by the Sultans in the Muslim period in India, king stood at the top of all the affairs and decision of king was supreme despite of all the recommendations of council of ministers and the intelligentsia. There were variety of food crops, cash crops, vegetables, cereals, pulses and specially spices. Double cropping, three crops harvesting, crop rotation, use of manures of good quality specially organic manure, range of devices for irrigation and harvesting led to enhanced production and convenience in the agricultural process. Sugarcane was the most grown cash crop in Mughal times. [vi]Economy of the Mughal empire was mainly concerned about the prosperity of elites and then the common people but few regimes were exceptions. [vii]Any account of the economic conditions in the medieval items would be incomplete without acquiring an insight into the existing economic structure of the society. Broadly speaking the medieval society consisted of three classes. At the top was a small group of enormously wealthy nobles and high officials who enjoyed certain privileges and rights which were beyond the reach of an ordinary citizen. These officials and nobles mainly hailed from high caste. These officials has enormous wealth at their command and spent it lavishly on items if luxury. They used costly dresses and lived in big mansions. They also had a large array of servants at their command. The middle class mainly consisted of professionals teachers, maids, merchants and important clerks. Bengal produced the finest quality of sugarcane. Bayana near Agra, Uttar Pradesh and Sarkhej near Ahmedabad, Gujarat produced the best quality of Indigo. Cotton, opium and silk were also among the cash crops which were grown very enthusiastically in contemporary times as the cash crop. Sericulture which was not widespread during the times of Sultans, was widespread during the times of Mughals, which is evident from the different styles of cotton and silk clothes. [viii]Private traders earned huge profit but the practices of corruption were also evident without which this was not possible. Opium was produced in Bihar and Malwa region of the best quality. Tobacco cultivation was introduced by Portuguese in India during their emergence in sixteenth century and soon it became widespread in the given period. Surat and Bihar became major tobacco producing centre. Potato, chillies and tomato came into existence in the region in late medieval period. [ix]Nut is like a man's head; for it has something like two eyes and a mouth; and within, when green, is like the brains. Upon it too is a fibre like hair. From this they make cords with which they sew their vessels together, instead of iron nails. They also make great rope for their anchors out of it. The properties of this nut are, to nourish and quicly to fatten the body, to make the face red and greatly to stimulate to venery. [x]The introduction of the spinning wheel enhanced production, while markets, created by the ruling class of the Sultanate, increased demand. Technological advancement resulted in a significant increase in the number of skilled artisans caste rules became more flexible as a larger number of the lower castes now took to weaving as a profession. Thus, technological advancement changed the economic scenario and which in turn changed the social structure.

ROLE OF TECHNOLOGY

[xi]Technology in medieval India was very much imported from the Persian side through the invaders as their men got involved in various activities in order to get settle. They used Persian wheel for agriculture, iron plough and multiple cropping systems. Advent of charkha and spinning machine gave huge impetus to weaving and textile industry. Persian horses and iron weapons of extraordinary quality gave an extra edge to the warfare techniques. [xii]Medieval embroideries show variation in stitch width, the number of stitches per cm as well as in the type of stitches applied it is not possible to be exact in the estimate of the amount of yarn used for the different patterns. Still, with the variety of the stitch types seen on the same shoes in the medieval assemblage, an average of 50 cm yarn for each 10 cm stripe of unspecified embroidery stitch should be a quite realistic estimate for the amount of yarn used.

METHODS OF REVENUE APPROPRIATION

[xiii]Iqtas stood for a revenue assignment as well as an administrative charge, and the muqtis or walis or holders of iqtas were also governors. The iqtas were constantly transferred from one person to another, a practice which makes the conventional English rendering of iqta as fief particularly misleading. Besides the troops maintained by the muqtis out of the revenue of their iqtas, the Sultan had his own personal troops called qalb. In the thirteenth century men of the royal cavalry were paid by assigning them revenues of villages around the capital and in the doab country. These assignments too were termed iqtas; but these tended to become semi-permanent and even hereditary. Major part of the crop produce was appropriated as the tax during Mughal period. Indian feudalism from top or centralized feudalism exploited peasantry to a considerable extent. [xiv]Khalisa land were solely appropriated by the Sultan's central treasury. The institution of khalisa system of cultivation helped the Sultanate cushion against uncertain food supply from the remote countryside. Agricultural land was not allowed

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to operate free of levy. It came under iqta assignment, and the assignees, known as muqtis. Khalisa was that part of the land over which revenue was appropriated which was transferred directly into the state treasury. Jagir was that land over which revenue appropriated was taken by the officials called Jagirdars. Jagirdars collected tax from Jagirs in lieu of their civil and military service to the state but they did not own the Jagir. Watan Jagirs were the land of Rajputs who accepted the suzerainty of Mughal rulers. They collected revenue from Watan Jagirs, but they were not subject to any promotion, demotion and transfer. Sher Shah Suri classified land into three categories on the basis of fertility, namely good, middling and the bad. Average of produce of good, middling and bad land was calculated. Then, one third of the average was levied by the state as standard revenue demand. Nearly, 3/4th of the share of total crop was levied in a different form of taxation. This led to the resentment and demotivation among peasants, which in turn promoted lack of innovation and technology disadvancement in agricultural productions. During the reign of Akbar, land was classified into four categories on the basis of continuity and discontinuity of cultivation, namely, Polaj that was land which was cultivated annually, Parati or Parauti that was land which was cultivated at alternate years. This helped in regaining the fertility of the land. Chachar, that was land which was cultivated after two to three years and Banjar, that was land which was cultivated after five or more years. Polaj, Parati, Chachar and Banjar were further subdivided into good, middling and bad. 1/3rd to 1/5th of the average of total produce was levied as revenue. Zabti or Bandobast Arazi or Ain-i-Dahsala or Todarmal's Bandobast was the system which was popular in Allahabad, Malwa, Kashmir and Delhi region. Later, during the time of Jahangir, this method was widespread in Bengal and Gujarat. Average of produce of last ten years was multiplied with the average of price of last ten years. This resultant amount was levied as revenue. [xv]Patterns and trend of agriculture were depended solely on the space provided to the cultivators or the common man by the ruling authority. If the tax levied was less then cultivators worked more enthusiastically and innovatively but if the regime was tough then the production process became stagnant. [xvi]Religion also decided the economic condition of the state as people were orthodox and believed in superstition among all the spheres of the life. Batayi or Bhaoli was the mode of revenue collection which was further sub-divided into three categories those were Khet Batayi, in which revenue was appropriated on the standing crop in the field, Lank Batayi, in which revenue was appropriated on the crop which has been harvested and brought to the thresh floor, Raas Batayi, in which revenue was appropriated on threshed crop. In Raas Batayi, husk and chaff was separated from grain and then, revenue was collected from husk and chaff along with the actual produce. Kankoot system of revenue appropriation was also popular and was the most advanced system in which revenue was appropriated only from grain and not over the husk considering that state will collect the husk anytime when it will be needed in any amount. Nankar system was there for the zamindars in which officials collected revenue in lieu of their civil and military service towards the state, else state set their land free from revenue appropriation. [xvii]It is difficult to establish a definite co-relationship between production and feudal rent. The private ownership in agricultural land was there. The state had proprietary right over certain fields; received revenue from the peasants as the wages for the protection is afforded to the people, and further assumes that agricultural land generally belonged to him who cultivated it. [xviii]Kamal Kishor Das had a different notion as compared to the Irfan Habib over the agriculture and the society in medieval India. According to Irfan Habib, society was stratified but Kamal Kishor Das had a different vision.

[xix]Economy of medieval India evolved systematically and not rapidly. Spices like pepper, turmeric, cardamom, saffron, betel-leaf, clove etc. were some of the important spices produced by the medieval Indian farmers.

ROLE OF IRRIGATION IN THE ECONOMY

Means and methods of irrigation were various as climate was not that supportive and favorable. Rain, wells, river, tanks, canals, lakes, dams and water reservoirs along with other techniques for water harvesting were used to fulfill the requirement of cultivation and irrigation. Madag lake, Dhebar, Udaisagar, Rajasamand and Jaisamand, Balsan and Mansagar etc. played a crucial role in irrigation in contemporary times. Wells were all over the country, acting as common source of irrigation and all other petty activities of household. Persian wheel, imported entity from north-west, was a water lifting device of this period. A gear mechanism, rim of wheel and garland of pots facilitated the functioning of water lifting. Cultivators were given a document by the state known as patta or the title deed which gave all the details of the various categories of land held by the cultivator and rate of land revenue paid by him on various crops. Deed agreement called as Qabuliat, which states that cultivator made a promise to pay a particular amount of revenue, cultivators were also required to pay certain additional charges, so that cost of assessment and collection of revenues should be met. [xx]There were petty shops and the system of banking through moneylenders was also evolving. Economy was booming and India had a considerable say in the international trade. [xxi]The jajmani system, that is, the position and role of rural handicraftsmen, has been extensively studied by sociologists, though it has till now received scant attention from historians.

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INLAND AND FOREIGN TRADE

[xxii]The economic history of the medieval times indicates clearly that the state workshops and the private industrial units were important constituents of medieval Indian economy. Their working as two cogs of the same wheel might correspond to mixed economy in modern terminology but the economy was traditional. Increase imports of cotton piece goods from India by England, but also enriched that country by the goods of high quality. India was deficient in gold and silver mines. Diamond mining was carried out prominently at Golconda. Biragarh in Berar, Panna in Madhya Pradesh, Khokhra in Chotanagpur were the main production centres of Diamond. Khetri in Rajasthan was the main centre for copper production at that time. Pit loom and draw loom were introduced during fifteenth century. Block printing was also introduced during the medieval period. Royal workshop was another unit of production of the crafts apart from the dadni system of production in which required raw materials were provided to the artisan and money in advance was provided by the merchants who traded in those commodities. After the production of the finished goods, merchants collected the finished goods and sold the product in the market. India was having well established network of external as well as internal trade during this time. The internal trade developed at local and regional level because of the development in transportation sector. Since, the transportation in sea was also developing and the manufacturing of ships and boats was very much in business. India traded with China, Arab, Egypt, Central Asia, Afghanistan. [xxiii]From Sultanate to the Mughals, foreign trade especially import of horses was done at a large scale.nIndia had its overseas trade with Persian Gulf, South China Sea, Red Sea and the Mediterranean. Due to the advent of various companies of colonial powers like Portuguese, British, Dutch and French intensified trading activities in the Indian subcontinent. Commercial activities like money lending, insurance and the brokerage that is the act of mediation was also in existence at a wide scale. Important inland trade centers at this time were Delhi, Agra, Lahore, Multan, Bijapur, Hyderabad, Patna, Cochin, Calicut, Hugli, Dacca, Murshidabad, Satagaon, Patna etc. Surat and Ahmedabad were also famous centers of inter-regional trade. [xxiv]No source of contemporary time mentions the import of silken stuffs from overseas during the sultanate period. Some of the minimum prices quoted, such as that of khazz of koila or mashru are so low as to exclude any suggestion of long distance travel in the medieval Indian period. Cultivators during the period while setting for the monsoon season, remained busily engaged for around ten months straight and the poppy cultivation was introduced by some unidentified agency. [xxv]Land has continued shaping the economy of India from times immemorial. However, records highlighting land use/land cover type changes through time are not available in a systematic manner.

[xxvi]Coins were made up of gold, silver, copper and bronze. But, the coins of gold were mostly in circulation in the southern India and were used in northern India in special occasions and ceremonies. Foreign trade was very much in practice and India imported items like silk, camphor, porcelain materials, cloves, sandalwood, wax, items of luxury like utensils made up of costly materials from China and South Asia. [xxvii]Shipping was the main activity boosting the foreign trade of the state and this only facilitated the foreign exchange along with the exports. India also imported horses from Bahrin, Muscat, Aden, Persia. Indian exports included spices, aromatics, beads, precious stones, cotton cloth, ivory and semi-precious stones. Mercantile community included sarrafs, brokers, hundi, insurance and this system was well established for obvious reasons. [xxviii]The Muslim rulers used to have a number of slaves for their personal service. Sometimes some of these slaves were even more dearer to the Sultan than his sons. Lanepoole has remarked that while a brilliant ruler's son is apt to be a failure, the slave of a real ruler of men have often proved the equals of their masters. Medieval Indian economy was progressive in some sense and somewhat steady in other sense. There were innovations when it comes to textiles, handicrafts, weaving, spinning and building infrastructure for agriculture but stagnancy could be seen in agricultural sector in terms of traditional methods of cultivation and production. This stagnancy was due to the regressive tax structure and no motivation was provided to the peasants regarding ownership and profitable measures. [xxix]Muslims in Indian economy were not given extraordinary favours which was evident from the tax structure. Hindus and Muslims were not discriminated on any basis and economy was the main priority. [xxx]It will appear that many of the problems coming in the way of the progress of agriculture at present had been identified and tackled much more effectively in the past. [xxxi]Appearance of Islam seriously diminished the volume of European commerce. The two religions across the Mediterranean being unfriendly, the free flow of commerce between the areas on its two sides was severely affected. The Arabs created difficulties for th[1]is trade in the early years of the expansion of Islam. [xxxii]The legacy of the Indo-Muslim frontier, the medieval Indian economy, and new connections with Europe helped to create conditions favorable to the rise of an imperial state in North India. These conditions by no means assured that such a state would arise, or that it would be ruled by

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the Timurids. The Mughal empire was the product of a prolonged political struggle whose outcome was in large measure due to the abilities and good fortune of its founders and builders. The two founders of the Mughal empire, Babur and his son and successor, Humayun, eventually won a bitter struggle with the Afghans for supremacy in northern India.

[xxxiii]These spurts of inflation ruined Akbar's rational system of land revenue assessment and of carefully graded salary scales for the hierarchy of imperial officers. Just as the higher nobility of Spain felt the pinch of declining real incomes, the Mughal mansabdars found it difficult to make both ends meet. Instead of revising Akbar's system, however, his successors merely adjusted it in a piecemeal fashion. The very rationality of the system thus proved to be a handicap. Inflationary pressure and increasing government expenditure led to a stepping up of the land revenue demand. [xxxiv]The policies of Sultans in medieval India were stringent and gave impetus to their lavish lifestyle. Sultans lived luxuriously and levied tax at a high rate from peasants. Although, tax policies changed with time but tax structure was somewhat regressive. Alauddin Khalji followed the policy of market control to the policy of checks and balances through multiple spy system. There were many loopholes in the system to propogate corruption. To avoid these conditions provisions of punishment were very strict.

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Sillick, T. J., & Schutte, N. S. (2006). Emotional intelligence and self-esteem mediate between perceived early parental love and adult happiness. *E-Journal of Applied Psychology, 2*(2), 38-48. Retrieved from http://ojs.lib.swin.edu.au/index.php/ejap

- **Unpublished dissertation/ paper:**

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- **Article in newspaper:**

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Holloway, M. (2005, August 6). When extinct isn't. *Scientific American, 293*, 22-23.

- **Website of any institution:**

Central Bank of India (2005). *Income Recognition Norms Definition of NPA.* Retrieved August 10, 2005, from http://www.centralbankofindia.co.in/ home/index1.htm, viewed on

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