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ROLE AND FUNCTIONS OF STATISTICS**Yogita Shah and Pournima Ajajekar**Assistant Professor, P.E.S's Modern College of Arts, Science and Commerce, Ganeshkhind, Pune

INTRODUCTION

Statistics is in use from the time when man began to count and measure. In ancient days the role of statistics was limited to data collection and interpretation. The word statistics carries several meaning. Many times statistics is considered as statistical data, which contains numerical information of a characteristic under study. Indian statistician P.C.Malanobis, P.V.Sukhatme, V.S.Huzurbazar and C.R.Rao have made valuable contribution to statistics.

DEFINITION

"Bowley define statistics as a science of counting or statistics may be called as science of averages."

"Webster define statistics as the classified facts representing the condition of people in the state, especially those facts which can be stated in a table or tables of numbers or in any tabular or classified arrangements."

Statistics performs number of function such as:

- 1) Identifying the question.
- 2) Designing a study
- 3) Data collection
- 4) Analyze the data
- 5) Making conclusions and decision limitations.

FUNCTIONS OF STATISTICS

- 1) We can represent the things in their true form with the help of figures but without a statistical study, our ideas would be unclear or indefinite or doubtful. The facts should be given in a definite form. If the results are given in numbers, then they are more convincing.
- 2) The statistics are presented in a definite form so that the facts can be condensed into important figures. So statistics helps in simplifying complicated data to simple to make understandable. The data may be presented in the form of a graph, diagram or through an average.
- 3) Comparison is one of the main functions of statistics. After simplifying the data, it can be correlated as well as compared. The relationship between the two groups is best represented by certain statistical quantities like average or coefficients.
- 4) Statistical methods help to draw conclusions about the information they contain.
- 5) Statistics help us for predicting the future course of action of the phenomena. We can make future policies on the basis of estimates made with the help of statistics.
- 6) Statistical methods help in planning, controlling and decision making. With help of statistics we can frame favorable policies.

ROLE OF STATISTICS IN DIFFERENT FIELDS

- 1) **Government statistics:** The government uses statistics to measure going economic indicators that greatly affect business and industry.
 - i) CSO brings out monthly abstracts of statistics, statistical pocket book of the Indian Union, annual survey of industries.
 - ii) NSSO collects data regarding prices, wages, consumption, production, agriculture etc. NSSO conducts sample surveys in the registered industrial sectors.
- 2) **Marketing and sale forecasting statistics:** Companies can use statistics to measure market share and market potential. Also statistics are a core component of marketing research techniques.
- 3) **Insurance Statistics:** Life insurance companies rely on statistics to assess whether to give coverage and how much to charge. Life expectancy statistics help determine the cost of life insurance premiums. Life table or mortality rates play keyrole in life insurance policies. In order to decide the premium, insurance company has to use mortality rates which are determined using statistical methods.

- 4) **Economics:** Much of economics depends on statistics. Economist use statistics to collect information analyze data and test hypothesis. National income accounts are multipurpose indicators for the economist and administrator. Statistical methods are used for preparation of these accounts. Even relationship between supply and demand and import and export are found using statistical information.
- 5) **Astronomy:** Astronomy is one of the oldest branches of statistical study. It deals with the measurement of distance, size and density of heavenly bodies by means of by means of observations. During these measurements errors are unavoidable so most probable measurements are founded by using statistical methods.
- 6) **Banking:** Statistics play an important role in banking. The banks make use of statistics for a number of purposes. The banks work on the principle that all the people who deposit their money with the banks do not withdraw it at the same time. The bank earns profits out of these deposits by lending to others on interest. The bankers use statistical approaches based on probability to estimate the numbers of depositors and their claims for a certain day.
- 7) **Social Sciences:** Bowley says that “Statistics is the science of measurement of social organism, regarded as a whole in all its manifestation”. Statistics plays a vital role in social sciences. In social sciences we need to test association between two variables such as (i) education and criminality (ii) education and marriage adjustment score (iii) sex and education etc.
- 8) **Statistics and computer science:** Both are together useful in providing solution to the problems in various fields. Particularly whenever data analysis techniques are employed to large data, use of computer becomes indispensable. Conjectures supported by statistical data have sound ground of approval. Now-a-days several statistical software packages like MINITAB, MATLAB, SPSS, SAS etc. are used for data analysis.
- 9) **Education:** Statistical methods are useful to great extent in the field of research in education.
- 10) **Psychology:** In the field of psychology human traits are interrelated. The powerful technique of measuring such dependence is correlation. The use of statistics in this field is to a great extent.
- 11) **Medical Science:** In the field of medical sciences statistical methods are used to test various claims such as (i) whether growth of baby is normal, (ii) is a particular vaccine useful in controlling a particular disease? (iii) is there any correlation between age and BP? etc.
- 12) **Agriculture:** Analysis of agricultural experiments makes heavy use of statistical methods known as Design of Experiments. Main advantage of this statistical technique is testing the interaction effect. For example, the interaction effect of fertilizer and irrigation. Also effect of alkalinity of water, hardness, and impurities in the water on growth of plants which receives such water can be tested using statistical test.

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ANALYTICAL STUDY OF LIGHT FIDELITY (LIFI)

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ABSTRACT

LI-FI is Abbreviation of Light Fidelity. It works similar to Wi-Fi but with higher security and higher data transmission speed. It provides the ability to transferring data through the light i.e. it uses LED's for visible light communication rather than radio waves. It provides security through rays of light which cannot pass through the walls. Also Li-Fi provides good bandwidth, efficiency and availability. In Li-Fi the rate of data transmission depends on flickering rate of LED's.

I. INTRODUCTION

Now a days it is need of new era to have internet network, this network can be wired or wireless. But considering today, there is more of scope for wireless networks since usage of portable devices such as mobile, laptops, tablets etc. Wireless communication can be done by using the Wi-Fi, Wireless LAN & Bluetooth and many more. But we eliminate Bluetooth due to its speed, Wi-Fi due to security, so solution to this problem is communication through visible light and named as Li-Fi. Li-Fi is Light Fidelity it is secure wireless connection. This Li-Fi term was introduced in 2011 by Mr. Harald Haas who is the professor of Mobile Communication. He is German Professor from University of Edinburgh.

Basically Li-Fi is wireless network that uses LED light i.e. Light Emitting Diodes for sending data. The idea behind the Li-Fi is introduce by the disadvantages of Wi-Fi. Wi-Fi uses radio waves that easily passes through the wall if it is not secure then it can be easily hacked. In Li-Fi light cannot passes through wall then it cannot be hacked by anyone. The data rate transmission is depends on flickering rate of light and this flickering rate is very high since human eyes cannot detect so provide high speed. Li-Fi provides speed of 224gb/s. Since access depend on area covered by the rays of light.

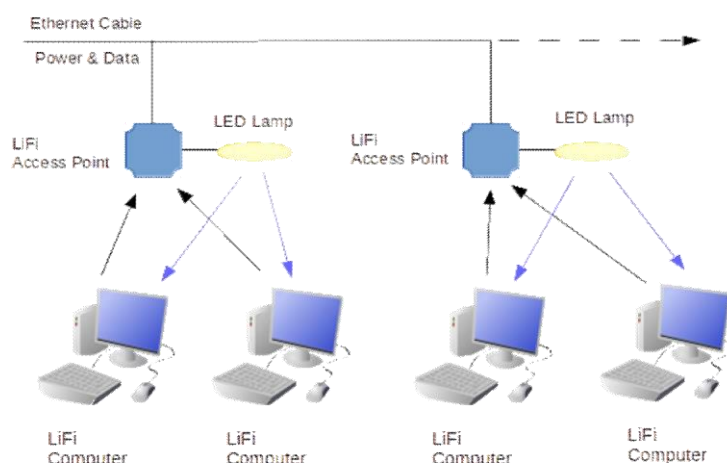


Fig. 1: Li-Fi Wireless Access Point System Could Work Using Room Lighting

II. VISIBLE LIGHT COMMUNICATION (VLC)

There may different choices of rays but they have some disadvantages.

1. Gamma rays are harmful for human.
2. X-rays affects human body.
3. UV rays are dangerous for human body.
4. Radio waves can passes through wall so security issue arises.



Fig. 2: Different rays

Hence visible light is better choice for communication. Data communication is done through visible light and this visible light ranges from 400 to 800 THz (780-375nm). Visible light refers to an illumination of source (light bulb) which in addition sends information using the same light signal.

VLC = Illumination + Communication

Visible light uses fluorescent lamps and photodiode. To transmit the signal it uses fluorescent lamps and to receive signal from light uses photodiode. Avalanche photodiode is for sensitive response and image sensor for image acquisition and data reception.

III. CONSTRUCTION

The basic elements of Li-Fi are:

1. Bright LED light which work transmission source
2. Silicon photodiode for receiving source

LED light generate the integration of 0's and 1's by the "ON" and "OFF" activity of LED. Flickering speed of LED can generate data as LED's are source to generate data. High speed transmission upto 100 Mbps and can be used as fast speed network, multiplexing.

Li-Fi source contains 4 parts.

- i. LED Bulb
- ii. Radio Frequency Power amplifier
- iii. Printed Circuit Board
- iv. Enclosure

Printed Circuit Board handles electric input and output of light, microcontroller manage its functioning. A radio-frequency signal is produced by the solid state PA and which is combine into an electric field. The high energy in the electric field vaporizes the contents of the bulb to a plasma state at the bulb's centre, this controlled plasma generates an intense source of light.

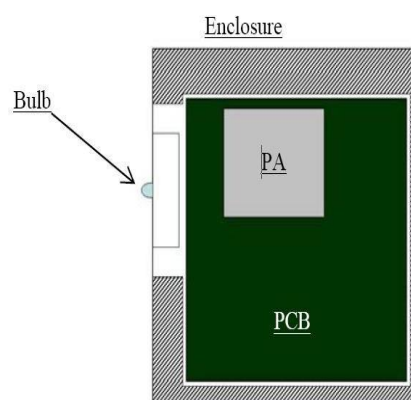


Fig. 3 : Block diagram of LIFI source contains 4 parts

Bulb is embedded in dielectric material. Dielectric material serves two purposes, acts as waveguide for Radio Frequency energy transmitted by PA and also it acts as electric field concentrator that focuses energy bulb. Energy from dielectric field rapidly heats material in bulb which release light of high asperity and spectrum.

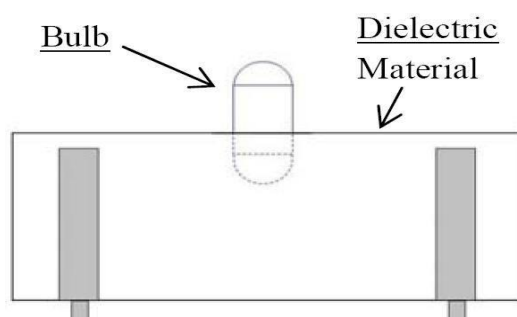


Fig. 4: Bulb sub-assembly of LIFI

This mechanism is robust without typical degradation and failure of materials involved.

IV. WORKING

The working of Li-Fi is done by using the Light Emitting Diodes (LED) that is it uses white LED's which generate high brightness by applying constant current. The logic behind the working of Li-Fi is simple and easy to understand. If the LED bulb is switched ON then digital 1 is passed and if LED bulb is switched OFF then digital 0 is passed. Due to the switch ON and OFF activity of LEDs gives an opportunity of sending data through the light. In working of Li-Fi, light emitter is placed and LED

and photo detector is placed next to light emitter. When LED is ON the photo detector transmit binary 1; and a binary 0 when the LED is OFF.

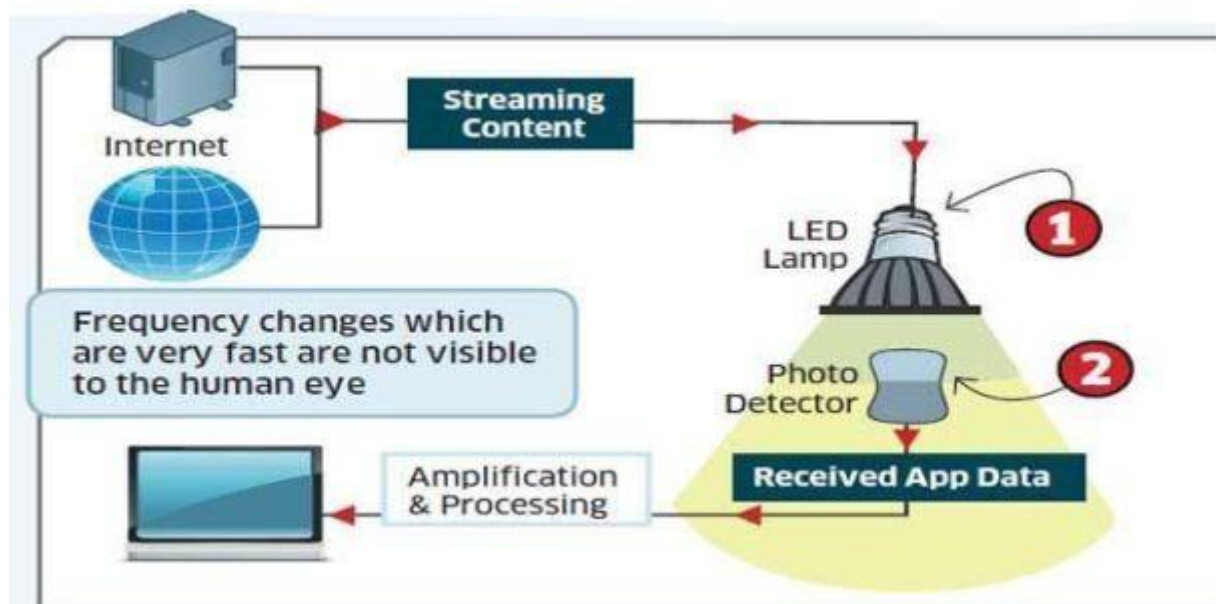


Fig. 5 : Block diagram of Li-Fi system

In above figure 5 block diagram of Li-Fi system the data can be converted in from light by the flickering rate of LED at which the LEDs switch ON and OFF to generate different strings of 0s and 1s. The asperity of LED is modulated very fast so that human eye cannot notice, so the light looks constant to human eye.

The ON and OFF switching action of LED bulb which looks invisible human eye that enables data transmission using binary codes:

LED switching ON is consider as logical '1' and switching OFF is consider logical '0'. By

Varying the rate at which LEDs switch ON and OFF, by using different combinations of digital 0s and 1s the data can be converted in form of light. This system uses quick pulses of light to transmit data wirelessly so this term is called as Communication through Visible Light, though it is called as "Data Transmission Though Light".

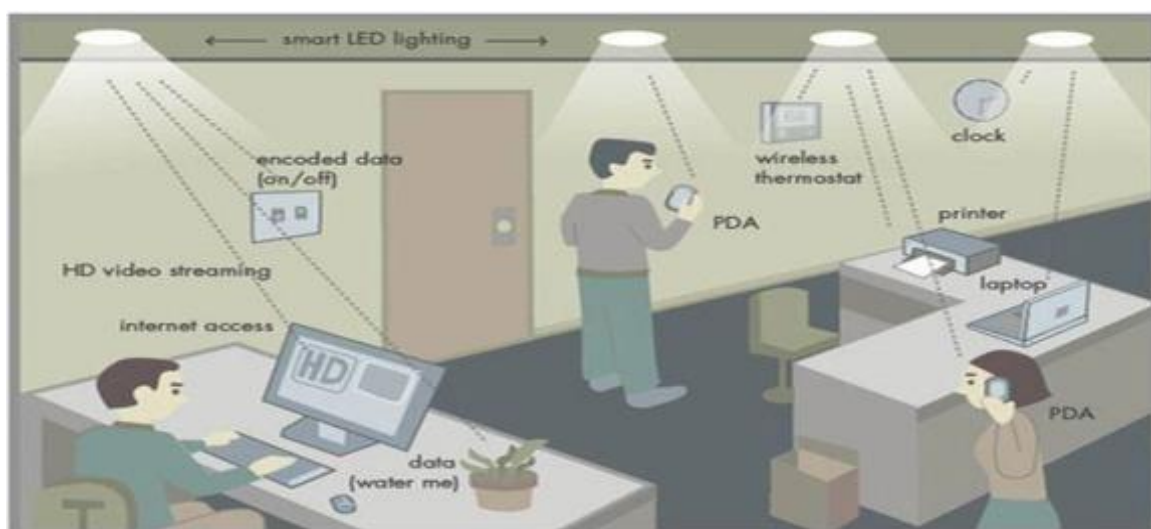
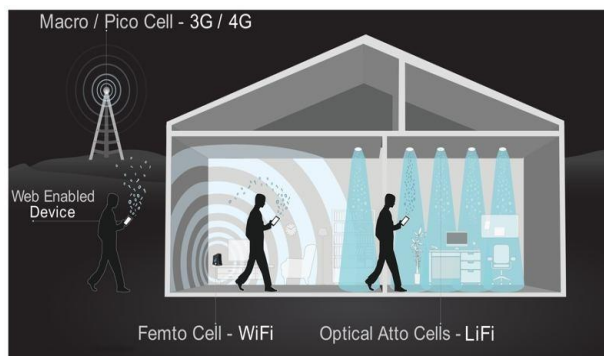


Fig. 6 : Li-Fi system in a small area

In above figure 5 show the Li-Fi system in small geographical area in this there are persons in office uses the Li-Fi system in room. In this room the Smart Li-Fi LED is used, the light of LEDs is falls down due to that they can use wireless transmission of data. The area covers LED light only that much area is used for wireless transmission.

V. APPLICATION AND ADVANTAGE

1. Secure: In Li-Fi data Transmission done by using light and this light cannot travel through wall or door so this make more secure it means Li-Fi cannot be hacked. Range of Li-Fi is limited to device in room.



2. Medical Application: In operation theatres Wi-Fi is deny because of radiation. Use of Wi-Fi at hospital create barrier for the signal of medical equipment's. So it may causes dangerous for patient's health. To overcome this problem Li-Fi can be used.



3. Underwater Application: We can use Li-Fi underwater were Wi-Fi fails because radio waves cannot travel through water. Therefore it is useful for military / navigation.



4. Traffic Management: Li-Fi can be used in traffic management. The LED of Li-Fi can contact with LED of vehicles to handle the traffic. LED of vehicles can awake to driver, when other vehicles are near so it can reduce the number of accident.



5. Airlines: In airlines we can use Li-Fi system. Wherever we are travelling from airways we suffer from many problems because the whole airline system communication is done by using radio waves so overcome this problem we can use Li-Fi.



VI. CONCLUSION

From the above study we can conclude that Li-Fi is forthcoming and developing technology which is challenging for different technology. In practically if we use Li-Fi system then every blub can be used as hotspot. Li-Fi can provide high speed and can be wireless so it is beneficial in many ways. This technology can overcome the shortage of radio frequency bandwidth. Li-Fi can be implemented to various stages and various platforms of human life.

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Organizational Climate – A Tool for Employee Motivation

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Abstract

Research on the relationship between 'organizational climate and work motivation' has been gaining momentum in the past two decades. This research uses the 'Three Needs Theory' by David C. Mc Clelland (1975) and the survey instrument based on "Motivational Analysis of Organisation – Atmosphere (MAO-A)" by Udai Pareek to examine the influence of organizational climate on work motivation and the operational effectiveness of the organization. The survey was carried out in a renowned auto parts manufacturing company in South India. The climate was studied based on six dimensions namely achievement, expert influence, control, dependency, extension and affiliation for five organisational processes including problem solving, conflict management, communication, decision making and trust among employees. The research identifies the dominant and back-up motive prevalent in the organization. The paper investigates the extent to which the prevalence of a specific motive in the organization satisfies a particular need of the employee, which ultimately affects the level of the organization's effectiveness in that function.

Keywords: Organizational Climate; Work motivation; Operational Effectiveness; Three Needs Theory; MAO-A.

1. INTRODUCTION:

Climate seems to play a very important role in determining how people behave in an organisation. The term "organisational climate" is defined by Litwin and Stringer (1968) as "a set of measurable properties of the work environment, based on the collective perception of the people who live and work in the environment and demonstrated to influence their motivation and behaviour." As an everyday term, it describes the way it feels to work in an organisation. People use "climate" as a phrase to describe the overall "tone" or "work atmosphere" of an organisation.

Different climates attract and motivate different kinds of employees by subtly or blatantly defining the "rights and wrongs" and "dos and don'ts" for each organisational member. If people perceive that certain kinds of behaviour will be rewarded, they will be motivated to engage in those behaviors. Similarly, if there is a feeling that other behaviors are punished ("that's not done around here"), these will be avoided. Just as societies have distinct cultures and climates, organizations have their own unique cultures and climates which influence the actions, emotions, and cognitions of their members (Kopleman, et al, 1990).

The influence of an organisations climate on employee behaviour extends beyond the implementation of proposed change, and has been demonstrated by numerous studies on all aspects of employee behaviour (Drory, 1993; Witt, 1993; Strutton, Toma & Pelton, 1993) The study of climate is important because it has a major influence on human performance through its impact on individual motivation and job satisfaction. It does this by carrying certain kinds of expectancies about what consequences will follow from different needs. Thus organisational climate provides a type of work environment in which individuals feel satisfied or dissatisfied. Since the satisfaction of individual goes a long way in determining his efficiency, organisational climate can directly relate with his performance in the organisation.

This paper investigates the extent to which the prevalence of a specific motive in the organization satisfies a particular need of the employee, which ultimately affects the level of the organization's effectiveness in that function.

2. REVIEW OF LITERATURE

The organizational climate questionnaire formulated by Litwin and Stringer's (1968) covers nine dimensions of the concept of organizational climate namely structure, responsibility, reward, risk taking, support, warmth, standards, conflict and identity [8]

Moran and Volkwein (1992) examined the concept of organizational climate under four dimensions, namely, cultural, perceptual, structural and interactive

Schneider, Brief and Guzzo (1996) define the four dimensions of organizational climate as 'nature of interpersonal relationships, nature of hierarchy, nature of work and focus on support and rewards. These dimensions are mainly considered to be employee perceptions of organizational procedures, operations and practices [14]

Chung-Jen Chen, Jing-Wen Huang.(Apr 2007) in their paper have observed the effects of organizational climate and structure on knowledge management from the social interaction perspective. They have found that innovative and cooperative climate is positively related to social interaction and that social interaction is positively related to knowledge management. These empirical evidences indicate that social interaction plays the mediating role between organizational climate, organizational structure, and knowledge management [3]

John Hafer, George G Gresham.(Jan 2008) have identified the influence of organizational climate variables on the components of market orientation namely intelligence gathering, intelligence dissemination and response implementation. The climate variables taken into consideration are top management emphasis, top management risk aversion, interdepartmental relation, interdepartmental connectedness, formalization, centralization, reward system orientation, organizational commitment and esprit de corps [7]

Bruce Cooil, Lerzan Aksoy, Timothy L Keiningham, Kiersten M Maryott (Feb, 2009) in their study have illustrated the Multivariate Partial Least Squares(MPLS) approach to measure climate. MPLS provides three interpretable factors of climate - Overall Organizational Climate, Self-Efficacy Versus Leader's Efficacy, and Personal Empowerment Versus Management Facilitation that predict employee retention, customer satisfaction, and scaled revenue [2].

2.1 Dimensions of organizational climate and motivation

A person's behavior is the result of several factors or motives. Knowledge of the typical primary motivators of behavior in a work setting can help managers and consultants to deal more effectively with people

McClelland, Atkinson, Clark and Lowell (1953) suggested three important motives (achievement, affiliation and power) and elaborate methods for measuring them. McClelland subsequently demonstrated the importance of the achievement motive for entrepreneurship and marketing (McClelland and Winter, 1971) and of power as a motivation in management (McClelland,1975; McClelland and Burnham,1976). Litwin and Stringer (1968) used the three motives of achievement, affiliation and power in their study of organizational climates and organizational behavior.

Although McClelland's study of achievement and affiliation motives proved to be rather simple variables, power motive is rather a complex one. According to him (McClelland, 1975), the desire for power contains three different elements:

- The need to control others (personalized power)
- The need to make an impact on others
- And the need to use power to do something for other people and groups, for instance, organizations (socialized power)

It is helpful to make clear distinctions between these three. Control seems to focus on keeping track of developments according to an agreed, and on being informed about ‘how things are going’. This seems to be an important need or motive in managerial behavior. Mehta (1994) has proposed the concept of social achievement motive. The so – called socialized dimension of power (reflected in the use of power for the benefit of others) seems to be a separate need or motive. Pareek (1968a, 1968b) suggests that this need is important for social development and calls it extension motive.

The essence of McClelland’s Three Needs theory is that employees needs satisfied by a responsive organizational climate can create work motivation and job satisfaction [1]

The six primary needs or motives for understanding organizational climate that have been identified by Udai Pareek (2002) are achievement, affiliation, influence, control, extension and dependence. The motives are measured based on five organizational processes namely problem management, conflict management, communication, decision-making and trust.

All these motives can be used to explain the behaviour of people in organizations. However, each of these motives can have two dimensions: approach and avoidance. Atkinson(1953) suggested the concept of avoidance behaviour in discussing the achievement motive. It was further elaborated by several authors (Birney and Burdick,1969; Heckhausen,1967) and ‘fear of failure’ emerged as an important component of the achievement motive, distinct from ‘hope of success’, the other component. Much research has been done on fear of failure, which has been found to be dysfunctional although it is related to the achievement motive. The concept of approach versus avoidance is also applicable to components of other motives. [16].

Table 1 : Approach and avoidance aspects of motives.

Motive	Approach (hope of)	Avoidance (fear of)
Achievement	Success	Failure
Expert influence	Impact	Impotence
Control	Order	Chaos
Extension	Relevance	Irrelevance
Dependence	Growth	Loneliness
Affiliation	Inclusion	Exclusion

The behaviour of a employee can thus be analysed not only in terms of six primary motives but also from the perspective of (positive) approach or (negative) avoidance, reflected by hope or fear, respectively.

An employees’ effectiveness may result from the existence or absence of a particular motivation or from the extent of the approach or avoidance dimension of a particular motivation.

3. OBJECTIVE

The purpose of this article is to identify the type of organizational climate prevailing at a renowned auto-parts manufacturing company in south India and the influence of organizational climate dimensions and needs of the employees on motivation. To gain a deeper knowledge of the exact nature of influence, the relationships between organizational climate variables and the motivational components are studied based on McClelland’s Three Needs Theory

4. METHODOLOGY

The non-probability convenient sampling approach is adopted for this study. The subjects in the population do not have any probabilities attached to their being chosen as the sample subjects. The sample consists of 109 employees from two branches of the company. The data thus collected is primary in nature.

Prior to this a secondary research was done through available online resources. The instrument for data collection is adapted from “Motivational Analysis of Organisation – Atmosphere” by Udai Pareek [16]. Out of the 120 items, 60 items had been chosen one for each of the 5 organisational processes, for each of the six motives and each of the 2 orientations (approach and avoidance). $5 \times 6 \times 2 = 60$. The respondents were asked to rate each item on a five point itemized rating scale ranging from 1- not at all true to 5 – almost always true. High internal consistency (alpha reliability coefficient of 0.91) and construct validity have been established for this instrument.

The six dimensions used to measure climate are categorized under the three needs proposed by McClelland.

Need for Achievement (nAch) – Achievement and Dependency

Need for Power (nPow) - Control and Expert influence

Need for Affiliation (nAff) - Affiliation and Extension

5. ANALYSIS

5.1 Operating Effectiveness Quotient (OEQ)

The Operational Effectiveness Quotient (OEQ) of a function is the level of the organization’s effectiveness in that function. It indicates the percentage of the potential that is being used effectively in a particular function.

Operating Effectiveness Quotient (OEQ) as proposed by Udai Pareek (2002) [] is calculated and the OEQ profile is prepared for the entire company

The motive with the highest OEQ value is the dominant atmosphere and the next highest is the back-up one.

Table 2 : MOA – A Profile

ORGANISATIONAL PROCESSES					
MOTIVE	Managing problem	Managing Conflicts	Communication	Decision making	Trust
Achievement +	4	4	4	4	4
Expert influence+	4	4	4	4	4
Control+	4	4	4	4	4
Dependency+	4	4	4	4	4
Extension+	4	4	3	4	4
Affiliation +	3	3	4	3	4
Achievement -	3	3	3	4	3
Expert influence-	4	3	3	4	4
Control-	2	4	3	2	3
Dependency-	4	2	3	4	3
Extension-	3	3	3	3	4
Affiliation -	4	3	3	4	3

OEQ values

OEQ of Achievement	- 57.7
OEQ of Expert Influence	- 53.6
OEQ of Control	- 62.5
OEQ of Dependency	- 57.6
OEQ of Extension	- 56
OEQ of Affiliation	- 50

From the OEQ values of the various motivational aspects it is evident that **control** is the dominant atmosphere with a value of 62.5 and the next highest, **achievement** with a value of 57.7 is the back-up one. The climate of the organization is characterized by control and achievement motives.

Table 3 : Pearson correlation among the motives

MOTIVES	Achievement	Dependency	Expert influence	Control	Affiliation	extension
Achievement	1	.669**	.629**	.614**	.510**	.623**
Dependency	.669**	1	.574**	.650**	.433**	.603**
Expert influence	.629**	.574**	1	.574**	.154	.404**
Control	.614**	.650**	.574**	1	.401**	.409**
Affiliation	.510**	.433**	.154	.401**	1	.541**
Extension	.623**	.603**	.404**	.409**	.541**	1

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation among the motives achievement and dependency (0.669) is higher compared to their correspondence with other motives. Similarly expert influence and control (0.574); affiliation and extension (0.574) have a significant positive correlation.

Table 4 : Prevalent motivational needs

NEEDS	MOTIVES	MEAN
Achievement	Achievement, Dependency	3.76
Power	Expert influence, control	3.78
Affiliation	Affiliation, Extension	3.59

6. DISCUSSION

The OEQ values illustrate the climate of the organization. The dominant control motive prevalent in the organization shows that the employees are characterized by a concern for orderliness; an urge to monitor events and to take corrective action when needed and a need to display personal power.

Their concern for excellence and setting challenging goals and attempting to achieve these goals is evident from the back up achievement motive pervasive in the company.

Table 4 reveals that the need for power stands as the primary motivating factor closely followed by the need for achievement. The need that acts as a motivating force varies from individual to individual. In this case, majority of the employees who have nPow are motivated more followed by employees with nAch.

A linear relationship is identified among the motives and their corresponding need for motivation. This is evident in the dominance of nPow. Even though the OEQ value of expert influence is fairly lesser than the rest of the motives, the OEQ value of control being the highest of all makes the organization, motivate employees with nPow better than the others. Similarly, the OEQ values of affiliation and extension are comparatively lesser and therefore the motivational levels of employees with nAff is low.

The organizations has been divided into subsystems (departments) and the climate prevailing in each subsystem is identified which further enhances the researcher's ability to identify the levels of each of the three needs being satisfied.

In general, any organization could employ the MOA-A organizational climate instrument to match the needs of the employees with the organizational climate to increase motivation levels.

7. FUTURE RESEARCH

Apart from the three needs, there are various other external and internal factors that influence the motivation levels of an employee. The organizational climate dimensions must encompass the various personal characteristics, situational factors and other components that have a greater impact on the motivational levels of the employees. Future research studies should investigate the relative contribution of organization climate with other moderating factors in influencing employees' motivational components.

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