MAHARSHI KARVE STREE SHIKSHAN SAMSTHA'S

COLLEGE OF COMPUTER APPLICATION FOR WOMEN, SATARA

[Faculty: B.C.A., B.A. & B.Com.]
Affiliated to SNDTWU, Mumbai

Criterion 3 – Research Innovations and Extension

3.2 Research Publications and Awards

3.2.1. Number of papers published per teacher in the Journals notified on UGC website during the last five years

- Any additional information

Shri N.B.Education Society's

Shri Venkatesh Mahavidyalaya, Ichalkaranji

organised

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on

"Advanced and Innovative Practices in Commerce & Management, Science & Technology, Humanities, Languages and Their Role in Achieving the Exponential Growth"

in collaboration with

Shivaji University Commerce & Management Teachers Association, Kolhapur

and

BVDU's Institute of Management and Entrepreneurship Development (IMED), Pune

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This is to certify that Dr. / Mr. / Ms. _Rajshree Shamrao Nikam_
of _College of Computer Applications for Women, Satara_
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16ᵗʰ February, 2019 at Shri. Venkatesh Mahavidyalaya, Ichalkaranji
and presented a paper entitled _Cloud Computing : Empowering the Education Sector_

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Convener
Shri. Venkatesh Mahavidyalaya,
Ichalkaranji

Dr. R. S. SALUNKHE
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Dr. S. S. VERNEKAR
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UPA NATIONAL PEER-REVIEWED E-JOURNAL

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ICT INTEGRATION IN EDUCATION-ONLINE COLLABORATIVE TOOLS TO MAKING TEACHING LEARNING PROCESS INTERACTIVE

TO BE PUBLISHED IN

A 'NATIONAL PEER REVIEWED INTERDISCIPLINARY e-JOURNAL' IN THE MONTH OF APRIL-2020

Dr. C. I. Gitte
(Executive Editor)

Prof. Akash Bele
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has attended / submitted paper / presented paper entitled

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In

NATIONAL CONFERENCE 2021
On
"Phygital: The Way Forward"

25th and 26th June 2021

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in the two days International Conference

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On

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Organized by

Departments of Economics, Sociology, Political Science, History and Geography

Saturday, 17th April 2021

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This is to certify that **NITA NAGESH BARGE** of **College of Computer Application for Women, Satara** has participated in the One Day Online National Conference on "Problems and Dimensions of Urban Transformation" as a Resource Person / Chair Person / Member of Organizing Committee. He / She has presented research paper entitled "शहरीकरणाचे सामाजिक अर्थिक परिणाम".

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He/She has Participated/Published/Presented a research paper entitled *Indian Health Care Industry: An Overview*

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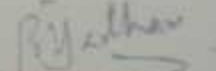
1919-2019

This is to certify that _Vaishali Rajpure_

of _College of computer Application satara_ participated in International

Interdisciplinary Conference on Recent Trends & Issues in Social Sciences & Commerce (RTISC19) organized on 19ᵗʰ and

20ᵗʰ December, 2019 at Dahiwadi College Dahiwadi and chaired a session / worked as a Resource Person / presented a

research paper entitled _The study of Human Capital Wastage in_
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This is to Certify that, Mr. / Mrs. / Prof. / Dr. _Anjali Chandrakant Salunkhe_

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held at, **Annasaheb Waghire College, Otur, on 31" January and 01" Febuary 2018.**

He / She presented a paper entitled "_Implication of Various Deposit schemes of Selected_

Mahila Co-operative Banks in western Maharashtra"

His / Her active participation in this seminar is deeply appreciated.

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by

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on

STUDY OF MINORITY LITERATURE

12th February, 2016

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This is to certify that Prof./ Dr./Mr./Mrs. **Bartakke   Kalyani   Jitendra**

of **Kanyashala Satara.** has participated as a Resource Person/

Chairperson / presented a paper entitled **Theme of Self-discovery in Anita Nair's 'The Better Man'**

in the National Seminar on "Study of Minority Literature" held at D.P. Bhosale College, Koregaon on 12th February, 2016

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Anita Nair's Mistress: A story Self-realization

Dr. Mrs. Kalyani Jitendra Bartakke
Asst. Prof., Dept.of English,
College of Computer Application for Women, Satara

Abstract :

The Self is a self-organizing, interactive system of thoughts feelings and aspirations which exemplifies the uniqueness of an individual. As all the human activities are centered on these endeavors in pursuit of the self, the quest and recreation. In Anita Nair's fictions, her characters have come out of their struggles in their identity crisis. Her novels explore the freedom of the woman to fulfill herself basically as a human being. The present article intends to explore the searching for the self and recreation of it, to redefine the role.

Keywords : *self-realization, identity crisis, self, oppression,*

Anita Nair, a versatile woman novelist,was born on 26th January, 1966 in Mundakottakurissi near Shornur in Kerala. She is one of the most emerging post-colonial novelist of modern India, presents her characters in search of their own self. She is a bestselling author of fiction and poetry, her novels. Her novels The Better Man and Ladies Coupe have been translated into 21 languages. The awareness of 'self' is an essential aspect of the personal life of a man or woman, in case of women, especially in Indian social life, it is difficult for them to realize their 'self'. For ages, they have been subjugated by the male beings, and the social as well as cultural practices have suppressed their identity. Anita Nair has shown this through her novels.

Man expresses the awareness of the self through his spontaneous expression and the tendency he shows through his purposive action in life. Ester Fialova (2011:45) says:

> "There are two aspects to the expression of a dynamic personality an individual grows, develops and slowly builds a concept about his or her self."

The tragic heroes in the ancient Greek tragedy appear to be plagued by the question about their self, their anxiety about their very existential status. They were involved in their quest about the self, their personal life and their place in the society. The Greek tragic heroes consulted the Delphic oracle when they were upset by the question of their existence.

how they came into this world, the cause of their Being. As man is a social animal, his Being acquires meaning in relation to his social environment, his past, present and what his future is going to be.

Anita Nair, in her fiction, presents her male and female protagonists trying to express their 'self', their hopes and fears, the goals they would like to achieve, their joys and sorrows as they try to look for meaning of their life. Her protagonists are mostly women, who suffer physically and psychologically in their family set-up. They are frustrated, disappointed or sometimes they suffer a sense a guilt (like Mukundan in *The Better Man*). Like Mukundan, the female protagonists in Anita Nair's fiction also struggle to achieve their individuality and actualization of their self. Her characters appear to strive for the expression of their self while struggling to fulfil their obligations to the family, their daily life influenced by ups and downs, victories and failures.

In *Mistress*, Anita Nair presents the story of women and men who experience emotional crisis as a result of betrayal, disappointment and shame or the feeling of guilt. In a patriarchal society, a woman's life is controlled by the moral and social code, of the father or the husband, and flouting of this code can result into tragedy. There are nine chapters of the novel divided into three books, and the nine chapters represent nine elements of the 'Rasas' from the Indian classical poetics, which are Srirangam, Hasyam, Karunam, Raudram, Verram , Bhayanakam, Beebhalsam, Adbhutam, and Shaantam which describe the prominent emotional state in the life of the characters portrayed.

In the first part of the novel, the writer presents the ghettoed life of the Arab women in Arabipattanam in the Southern India, where the Muslim women are restricted to the narrow passage ways at the back of the main road, and the women are supposed to use a side door or a back door of the kitchen. They come across no strangers and they are not supposed to venture out of the narrow street. The strangers also are not allowed to use the narrow street. But, Saadiya, the youngest in the family, hankers after freedom beyond the walls and the narrow street. Muslim women living in this ghettoed life are doubly oppressed by patriarchy and the Muslim socio-religious practices. They are not sent to school and, economically, they are entirely dependent on the male members of the family. Saadiya has reading skill, as the Muslim women are allowed to learn only reading. There is thus, gender

discrimination imposed by the religion. Women in Aravipattanam are not permitted to go out of the four walls. They have to cover their face fully except their eyes. But men were free to go anywhere. There was sea-shore and Saadiya could hear the roar of the waves, but she and the other women were not allowed to go.

Saadiya's tragic story is the result of her quest for freedom. She breaks the laws prescribed for women by the strict Muslim community. It is her 'self' which longs for freedom and she is curious to know what lies beyond the walls. Saadiya's story is her longing for self-realization. She is unquenchable curiosity to know what lies beyond the walls. All her actions are motivated by her longing for freedom and curiosity of what lies beyond. This leads to her first disobedience of her father's authority. She craves for her self-hood and transgressions her father's order.

Saadiya's father, Haji Najib Masood, was one of the religious leaders and he was very strict. Saadiya, being the youngest of the family, ventures about in the street, and her curiosity drives her beyond the narrow street and into the common alley. This is her first disobedience, flouting the restrictions imposed by her father, who later punishes her. She is subjected to the ire of her father, who brands her with a hot iron rod. She not only crosses the narrow alley, but also removes her blackfold of cloth covering her face, and ventures into the common alley. Here she comes across Sethu watching her naked face. Saadiya blushed, and Sethu was naturally, struck by her beauty and youth. Saadiya, who hardly knew anything about other people and their religion, named Sethu 'Hamid' and fell in love with him. This was her second transgression. She calls Sethu Malik as she is not aware of existence of any religion other than the Islam and any name other than the Muslim one. She staunchly maintains her love for him, suffering the punishment given by her father. When she addresses Sethu as Malik, he tells her he is Sethu, but she would not listen to him. She insists his name is Malik, saying:

> "But it is'...You are my Malik, the incomparable one, who came from across the seas. Strong and straight a leader among men, one who would be trusted to brave the Ocean and winds and unknown ways. You are My Malik. Do not you see'"

(Ms. P.185)

She starts her life with Sethu, but being a staunch Muslim, she wants her Koran, and Sethu brings her not only, Koran but also Ramayana and Mahabharata. Sethu and Saadiya's marriage is the intercultural and interreligious marriage. Sethu was already warned by Doctor Samuel in the words:

> "Everyday, you will discover differences. You will find that you have no meeting ground. How can there be one? Thorns, sweat thirst that will be the sum total of your life. Every day, you will regret what you have done, and the sorrow that it will cause will have no place for happiness."

(MS. P.183-84)

Saadiya finds herself alienated as she now realizes her inter-religious identity of being Muslim by birth and Hindu by marriage. But the real problem occurs when Saadiya gives birth to a son. She wants to name her son as Omer Masood and would like to bring him up as a true Muslim. Sethu, of course, would not have it so, and she angrily tells her to leave the house and his son. It is a question of Saadiya's self, her identity, which is being denied to her. She becomes conscious of her own self, which is challenged by Sethu asking her to leave. This is the last straw on her marriage. Saadiya's very self is challenged because without her Omar Masood, her son, her life has no meaning and she cannot have her son. Saadiya realizes her mistake. She now repents that she eloped with her Hamid, who really is the Hindu, Sethu. Before the birth of her son, she makes Sethu promise telling him, "I want my child to know God, my god. I want my child to belong."(MS, p.197) And Sethu assured her at that time, but when the son grows up, she insists on the ritual of 'khitan' (sunnat), and other five acts of cleanliness to be performed. Sethu objects to this because he believes the decision of rituals like circumcision should be left to the son when he grows up. "Old enough to decide for himself" (MS. P.227) But, Saadiya is very stubborn. She maintains her argument saying:

> "I am a descendent of the original Kahirs. In me is the purest of Arab blood. Islam, as we practise it, is a religion that demands sacrifice. In your village, the Muslims are converts. No matter what, they will never know what it is to be a true Muslim. Everything is compromised to make it acceptable. My son is not a convert. He has my blood."

(MS. P.227)

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> Everything is compromised to make it acceptable.
> My son is not a convert. He has my blood."

> (MS, P.227)

Sethu, of course, disagrees with her. Saadiya, with her staunch Muslim faith, has no option but to end her life. She cannot have her son, nor can she go back to her father. Saadiya ends her life walking into the sea.

Saadiya's tragedy results from her insistence on maintaining her self-hood, the self that is shaped and deeply informed by her religious belief. She sacrifices her life to be true to her 'self'. Sethu names his son Koman, and the child 'Koman' is left to the care of sister Faith. Saadiya maintains her identity by sacrificing her life. She could not compromise with her selfhood. Saadiya's tragedy results from being brought up in an isolated authoritarian set up which is very oppressive. She is the victim of alienation as she marries a Hindu, Sethu. Her society is so rigid and powerful that she loses the identity of her own in it. Saadiya's story ends in tragedy because she is not ready to compromise her selfhood, her religious identity.

In a patriarchal society, a woman's world is severely controlled by the tradition of male-dominated society. In a family, this tradition is embodied in the husband who is supposed to look after her well being, and who is also the cause of her sufferings. She cannot take her own decisions affecting the family. Saadiya is controlled by patriarchal convention that severs the woman's connection with her parents in the sense that all the decision about her are taken by the husband or the in-laws. In Saadiya's case, she has no option to go back to her parents, nor can she live with her husband as her 'self' is challenged, the 'self' which is deeply influenced by her religious belief. She chooses to end her life rather than sacrifice her self-hood.

Anita Nair's female characters belong to a new generation, who appear to have new values of life and of man-woman relationship. They make their own choices. Yet these women suffered in their life on account of the patriarchal domination and irresponsibility. Men and women in Anita Nair's novels struggle to achieve their selfhood, through a lot of suffering. The characters in Anita Nair's fiction, men and women both, endure hardship, face domination but emerge successful after their trials of life.

References:

1. Nair, Anita. Mistress. New Delhi: Penguin Books, 2005. Print.

2. Abrams M.H.. A Glossary of Literary Terms, Prism Books Pvt. Ltd., 1993.

1. Agrawal and Sinha M.P., *Major Trends in the Post - Independence Indian English Fiction*. New Delhi: Atlantic Publishers and Distributors, 2003. Print.

2. Bansory, Lakshmi Sree —*Indian Women's Voices: The Postcolonial and Post-Modernist Eral. Postcolonial Discourse: A Study of Contemporary Literature*. Ed. R.K Dhawan, New Delhi: Prestige Books, 2000. Print.

3. Dhawan, R.K., *Fiction of Nineties*. Prestige Books, New Delhi, 1998.

4. Rajeshwar M., *Preface to Indian Women Novelists and Psychoanalysis*, New Delhi: Atlantic Publishers and Distributors, 1998.

5. Bhatnagar, M.K., *Feminist English Literature*. Atlantic, New Delhi, 2003.

6. Nubile, Clara, *The Danger of Gender: Caste, Class and Gender in Contemporary Indian Women's Writing*, New Delhi: Sarup & Sons, 2002.

Cloud Computing: Empowering the Education Sector

Rajshree Shamrao Nikam
Asst. Professor
Mksss'sCollege of computer Application for women Satara, Maharashtra, India

Abstract

Education play important role in social &economical growth of country. Today's world is digital world so now a day's classroom teaching- learning process moving towards technology. Students are becoming more technology oriented, so it is important to concentrate on latest technology incorporated in education sector. One of the new and powerful technology now a days is cloud computing. Implementing cloud computing, it becomes possible to bring teachers and learners together on a uniqueplatform. Teachers can also tie together new and innovative classroom structures through cloud computing.Cloud Computing provides reliable and clear as crystal storage solutions. The cloud helps to create modern, innovative classrooms. Cloud computing can help to enhance students learning experience and improve education values. This paper focuses on impact of cloud computing on education sector and role of cloud computing to empowering education sector.

Keywords: cloud computing, cloud in education, Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

Introduction

The word "Cloud computing" was first used by Compaq in 1996 and popularization was done by Amazon.com when they had introduced Elastic Compute Cloud [1].In this era people are engaging more in ICT. Education sector is not out of this trend. Most of the educational institutes, students now rely on web based educational system(i.electures, assignment submissions etc), everything is now online. There comes the need of cloud. Cloud education is new concept in education area. Flexibility is the heart of cloud computing, it offers to create, save, share and work together from anywhere, at any time and at any place.The future of education is in the cloud.

According to Technavio marketing research, the global cloud computing market in education will see a compound annual growth rate of 26% through 2021 as educators within K-12 schools, colleges, and universities try to enhance efficiency and improve the overall learning practice. The term Clouds is an over sized group of simply shared and accessible resources which may be dynamically reconfigured to regulate to permitting additionally for optimum resource utilization [2]. It is becoming an adoptable concept for educational sector with its dynamic scalability and usage of virtualized resources as a service through the Internet. Cloud storage is provided storage facilities through the network and data stored in local storage service provider to provide online storage space [3].Using cloudcan be utilized to build a high quality education system.Cloud provides a variety of services for giving quality education by providing latest infrastructure in terms of hardware and software. An Internet user can interact with multiple servers at a time and the servers can also trade data with each other [4].

Cloud Computing

The term cloud refers to a network. It is a technology that uses servers on the internet to manage, store, and access information online rather than local drives. The data can be anything such as images, audio, files, video, documents and more.
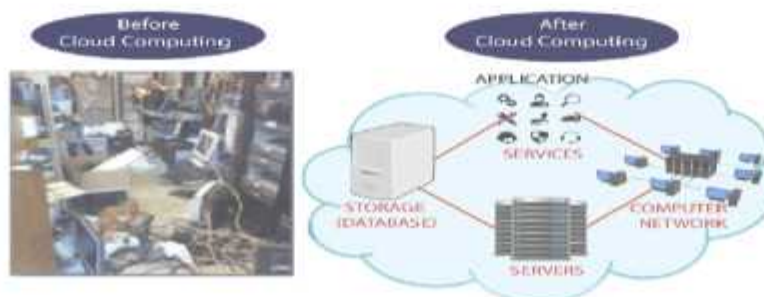
Fig 1.Picture before and after cloud computing

Above fig shows that in the server room, there should be a database server, mail server, networking, firewalls, modems, routers, switches, configurable system, high net speed, and the maintenance engineers. To create such IT infrastructure, we need to pay out lots of money. To overcome all these problems and to reduce the IT infrastructure cost, and for that solution is cloud computing.Low cost cloud-based services are used by learners to support learning, social interaction, content creation, publishing and collaboration [5].Examples of cloud computing services includes Microsoft's SkyDrive ,Google Drive, Apple iCloud, Amazon Cloud Drive etc.

Cloud computing is based on Service model.

1) Software-as-a-Service (SaaS)
2) Platform-as-a-Service(PaaS)
3) Infrastructure-as-a-Service(IaaS)
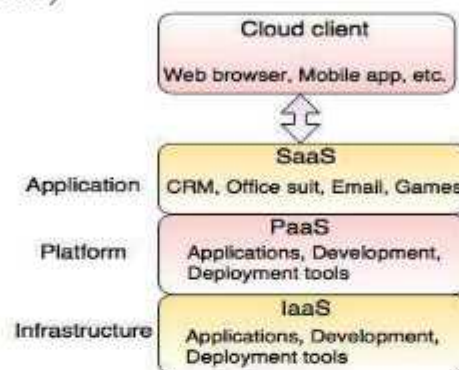
Fig. - Categories of Cloud Computing

Software-as-a-Service (SaaS)

- SaaS is known as 'On-Demand Software service'.
- In this model, the applications are hosted by a cloud service provider and revealed to the customers over internet.
- In SaaS, related data and software are hosted centrally on the cloud server.
- User can access SaaS by using a web browser.
- Office Suite, Email, games, etc. are the software applications are provided as a service through Internet.
- The companies like Google, Microsoft provide their applications as a service to the customers

Advantages of SaaS

- SaaS is easy to buy because the pricing of SaaS is based on monthly or annual subscription and it allows the organizations to access business functionalities at a small cost, which cost is less than licensed applications.
- SaaS needed less hardware, because the software is hosted remotely, hence organizations do not need to additional investment on hardware. Less maintenance cost is required for SaaS.

Disadvantages of SaaS

- SaaS applications are completely dependent on Internet connection.
- It is difficult to switch between the SaaS vendors.

Platform-as-a-Service (PaaS)

- PaaS is a programming platform for developers. This platform is generated for the Developers to create, test, run and manage the applications.
- A developer can easily write the application and deploy it directly into PaaSlevel.
- PaaSprovide the runtime environment for application development and deployment .
- Examples-Windows Azure ,Google Apps Engine(GAE), SalesForce.com .

Advantages of PaaS

- Developer can focus on the development and modernism without worrying about the infrastructure.

- In PaaS, developer only requires a personal computer and an Internet connection to start build applications.

Disadvantages of PaaS

- One developer can write the applications as per the platform provided by PaaS vendor hence the moving the application to another PaaS vendor is a problem.

1) Infrastructure-as-a-Service (IaaS)

- IaaS is a technique to deliver a cloud computing infrastructure like server, storage and operating system.
- The customers can access these resources from cloud computing i.e Internet as an on-demand service.
- In IaaS, you buy complete resources rather than purchasing software, server, data centre space etc
- IaaS also called Hardware as a Service(HaaS).

Advantages of IaaS

- In IaaS, user can dynamically choose a CPU, memory storage, PC configuration according to their requirement .
- Users can easily access the huge computing power available on IaaS Cloud platform.

Disadvantages of IaaS

- IaaS cloud computing model is dependent on ease of use of Internet and virtualization services.

Current Scenario Of Education Sectorin India

In current scenario ICT integration in higher education is very important. As per the survey [7] 80% of teaching in India is done through traditional methods. To improve Indian education services Indian government has to take one step towards the development of IT infrastructure. In India education system is always based on the marks and grades. But in real life the practical knowledge, practical thinking, and some practice is required to remain in competition [6]. Practical knowledge has great impact on career.In Education sector to impart the practical knowledge Institute has to build latest IT Laboratory which required highest cost in hardware configuration and due to technological obsolescence it will becoming recurring cost for the institute. Hence there is need to remove unfeasibility and find out feasible solution and the solution is Cloud Computing service.

Implementation Of Cloud Based Technology In Higher Education
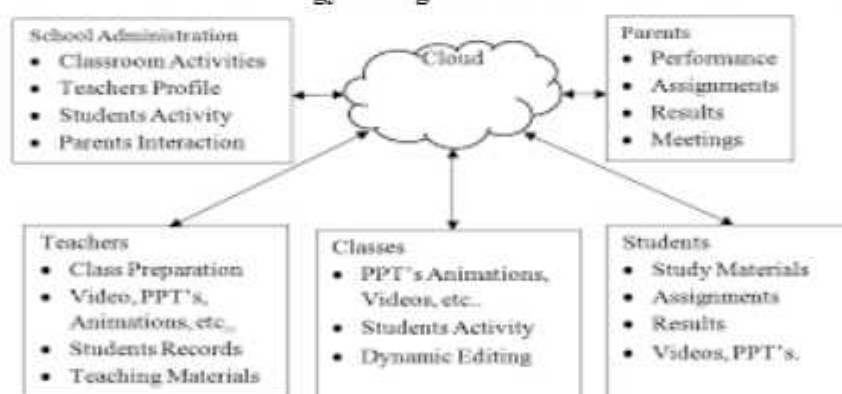
Fig.3: Different users of cloud in education sector

Example is the support of Massive Open Online Courses (MOOCs), which first appeared on the higher education scene in 2012. By 2016, through leveraging cloud-based infrastructures, global MOOC enrolment figures had reached 58 million, with courses being offered by the world's foremost universities such as Stanford, Harvard, and Columbia.

Following fig shows difference between legacy e-learning and cloud based e-learning

Service	Legacy e-Learning	Cloud e-Learning
Acquisition	- Buy assets HW and SW - Own technical architecture	- Buy service - No technical architecture required
Business	- Pay for assets - Overhead for administration	- Pay for use - Limited administration
Access	- Internal Networks - Corporate desktops	- The Internet - Any computer
Technical	- Not shared - static	- Shared - Partly scalable - Dynamic
Delivery	- Expensive - Lengthy	- Cheaper - Reduced time

Fig 4. Difference between legacy e-learning and cloud based e-learning

Benefits Of Cloud Computing In Education

In education area Educational institutions do concentrate more on research & teaching learning rather than how to implementing complex IT infrastructure. Cloud services provide cost effective communication & learning system without large capital investment in IT infrastructure. Cloud computing in education sector helps students, teachers & administrators also. With group of industries around, the world is recognizing the power of cloud based systems. The Cloud has offered very important potential in changing how education as an industry works from with the viewpoint of offering online programs so as to transform the traditional working system to cloud based education system. The teaching learning need of current generation students & teachers are different from past generation. As time changing, learners in current generation preferably use technology. So learner's learn from cloud based education system. With the help of cloud based system learning contents can be retrieved from central place and can be accessed from anywhere and anytime instead of accessed from local servers. Learners don't want to relay on local server.

Following are some of the benefits of adopting cloud computing in education sector

1. Makes academic process more well-organized and Improves institutional productivity

Academic institutions places in different building or campus, so central point is required to access data from anywhere and anytime. So it's possible with cloud computing and its result turns to academic process more effectively run in institute and automatically improves institutional productivity.

2. 24/7 Access to Learning Resources and Universal information access

Cloud based application help to learners. Learners will be able to access learning resources(lessons, websites, assignments, videos, quizzes etc) anytime, anywhere. It saves learners time. Documents are instantly available from wherever you are.

3. Unlimited storage capacity

Cloud computing offers limitless storage. Your computer's current storage capacity of hard drive is small compared to the hundreds of Peta Bytes available in the cloud.

4. Instant software updates

Another advantage to cloud computing is that you are no longer faced with choosing between obsolete software and high upgrade costs. When the application is web-based, updates take place automatically. When you access a web-based application, you get the latest version without needing to payfor.

5. Easier group collaboration

Sharing documents leads directly to better collaboration. Many users do this as it is important advantages of cloud computing multiple users can collaborate easily on documents and projects.

6. Pay Structure

Pay structurewhich means users only pay for those resources that those use by customer

Conclusion

Technology plays a vital role in transforming education sector and taking it to higher level. Cloud computing is definitely one of the innovative technology which is entered in worldwide education sector. Cloud computing plays important role in improving the present status of education sector. The advantages of cloud computing can support education institutions to solve some of the common issues such as privacy, cost, quick and effective communication, security, flexibility and accessibility.This paper present how cloud computing important in education sector for e-learning solution development.

References

1) Wikipedia,"CloudComputing", Available online: http://en.wikipedia.org/wiki/Cloud_computing, Last Access: 4th August, 2017, 2:56 p.m.
2) ShyamPatidar; DheerajRane; PriteshJain(2012) "A Survey Paper on Cloud Computing" in Proceeding of Second International Conference on Advanced Computing & Technologies,
3) Banerjee, P. (2009). An intelligent IT infrastructure for the future. 15th International Symposium on HighPerformance Computer Architecture, Proceedings, Feb 14-18, 3.
4) Hayes, B. (2008). "Cloud computing", Communications of the ACM, Vol. 51 (7), pp. 9-11.
5) KiranYadav, "Role of Cloud Computing in Education", International Journal of Innovative Research in Computer and Communication Engineering,Vol. 2, Issue 2, February 2014.
6) Prof. L. J .Sankpal, AnkushKawalkar, SuhasBhattu, GaurangParnaik, AkashSagar,"Cloud Computing in Education System",International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 2, February 2014.
7) Pandey .U. (2013). Role of Cloud Computing in Higher Education.IJARCSSE, 3(7), 966-97.
8) Almajalid R. "A Survey on the Adoption of Cloud Computing in Education Sector"College of School of Computer Science and Information Systems, Pace University, Pleasantville, New York r.almajalid@seu.edu.sa
9) Saini L.jyoti, Er Kaur H(2017) "Role of Cloud Computing in Education System" International Journal of Advanced Research in Computer Science,Volume 8, No. 4, May
10) Joshi M (2015) "Emerging Trends of Cloud Computing in Education Methodologies: A Review" International Journal of Advanced Research in Computer Science and Software Engineering, Volume 5, Issue 12, December 2015
11) Desai T, Patel R, Patel P(2016)"Cloud Computing in Education Sector" –International Journal for Innovative Research in Science & Technology| Volume 2 | Issue 10 | March 2016 ISSN (online): 2349-6010
12) Parte S,(2017)"Impact of Cloud Computing in E-Learning" International Journal of InnovativeScience, Engineering & Technology, Vol. 4 Issue 1, January 2017 ISSN (Online) 2348 – 7968 |Impact Factor (2015) - 4.332
13) Kale A ,Mente R (2017)"Impact of Cloud Computing on Education System"International Journal of Electronics, Electrical and Computational System IJEECS ISSN 2348-117X Volume 6, Issue 11 November 2017
14) Goyal N, Goyal D "CLOUD COMPUTING IN EDUCATIONAL RESEARCH "International Journal of Recent Engineering Research and Development (IJRERD) Volume No. 01 – Issue No. 02, ISSN: 2455-8761 www.ijrerd.com
15) Yadav K.(2014) "Role of Cloud Computing in Education" International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 2, Issue 2, February 2014 Copyright to IJIRCCE www.ijircce.com
16) Jain A, Pandey U(2013) "Role of Cloud Computing in Higher Education" Volume 3, Issue 7, July 2013 ISSN: 2277 128X International Journal of Advanced Research in Computer Science and Software Engineering.
17) onlineavailable-https://www.dsm.net/it-solutions-blog/how-cloud-computing-benefits-educators-and-students
18) onlineavailable-https://www.tutorialride.com/cloud-computing/service-models-in-cloud-computing.htm

Design and Development of Fee Structure and Analysis Tool

S. S. Patil[1*], R. S. Nikam[2]

[1] College of Computer Application for Women Satara, Mahrashtra, India
[2] College of Computer Application for Women Satara, Mahrashtra, India

Abstract-In 21st century whole world is dependent on Information Technology where accuracy, trustworthiness, speed have huge impact. The fee collection progression in college is very crucial procedure as fee structure for every student is different. The fee structure & analysis tool is designed and developed for fee distribution sheet and total collection sheet preparation with various reports required at university level and college level. In manual procedure has some chances of human error. This is the reason that many educational institute are shifting from manual process to Fee structure and analysis tool. There are many advantages of Fee structure and analysis tool like paperless system, automatic calculation, and safe and secure etc. The aim of research work is to develop a Fee structure and analysis system tool for college to make fees related activity and process easy, efficient and user friendly.

Keywords: Fee structure, fee instalments, fee distribution, Flexibility

I. INTRODUCTION

Administration department of any institute or college plays an important role. Academic course fee collection and Distribution is one of the most important administrative works. It represents college or institute's economic growth. Most of students from rural and urban areas not able to pay course fee at a time so they want concession to pay a fee in instalments. So they pay fee in one ,two or three instalments so it is very tedious task to keep tract of students paid fees and students pending fees etc. Complexity of administrative work has increased, if institute run various courses. The "Fee structure and analysis tool" is standalone desktop application. This software is very much helpful to administrative department of college to maintain information of student's fees. This software hold all information of students fees like paid fees, pending fees, no of instalments, course wise fees paid by students, fee heads priority etc. This software helps to save a lot of time and power. This system can handle millions of records. Any educational institute can use Fee structure and analysis system tool that helps the organization in keeping track of all record related to fee activities.

II. EXISTIN SYSTEM

At present, fee collection process is done with excel sheet but there is lot problems occurs as in fee structure fee is described under lot no of heads like admission fee, tuition fee, gymkhana fee, library fee, laboratory fee etc. In existing system, when students pay fees clerk manually distributes fees against given fee heads in excel sheet. Some fee heads have some priority in fee structure so, paid fee get distributed priority wise under the fees structure heads. This task becomes very crucial task when the students paid their fees in more than one instalment. If no of instalments get increased then no of records/transaction related to particular student also get increased, so it make lot of mistakes by administrative department. In the existing system it is very difficult to quick search for particular student's fees status.

Difficulties found in existing system –
1. Required of excessive man power
2. Enormous paper work
3. Redundancy in information storage
4. Tedious report generation
5. Anomalies due to incorrect updates

III. PRAPOSED SYSTEM

Objective of designing and developing Fee structure and analysis tool is to analysing students fees status , reduce crucial task of existing system, generation of accurate reports of students paid fees and unpaid fees class wise well as course wise etc.

A. SYSTEM DESIGN

System development life cycle (SDLC) is a process uses during the development of any system. SDLC consists of four main phases: analysis, design, implement and testing. During analysis phase, context diagram and data flow diagrams are used to produce the process model of a system. In system development life cycle (SDLC), a system model can be developed by using Data Flow Diagram (DFD). DFD is graphical diagrams for specifying, constructing and visualizing the system. DFD is used in defining the requirements in a graphical view [1],[2],[3].

DFD's are easily understands by technical and nontechnical users. It showed how the data moved from one process to another, as well as its logical storage. In data flow diagram, the highest-level view of the system

is known as context diagram [4], [5]. It is common practice for a designer to draw the context level DFD first, which shows the interaction between the system and external agents which act as data sources and data sinks. System Context Diagram is shown in Figure 1. Context Diagram represents entities such as,

Context Diagram represents entities such as,
 • University
 • Principal
 • Clerk
 • Student

These entities interact with result system. Entities on the left hand side supply information to the system and after processing that information result is send to specific entities mentioned on the right hand side. It represents highest level view of the system. [1],[2]. Context level diagram shows graphical representation of fee structure and analysis system tool. This diagram helps to understand the working of fee structure and analysis tool at a one glance.
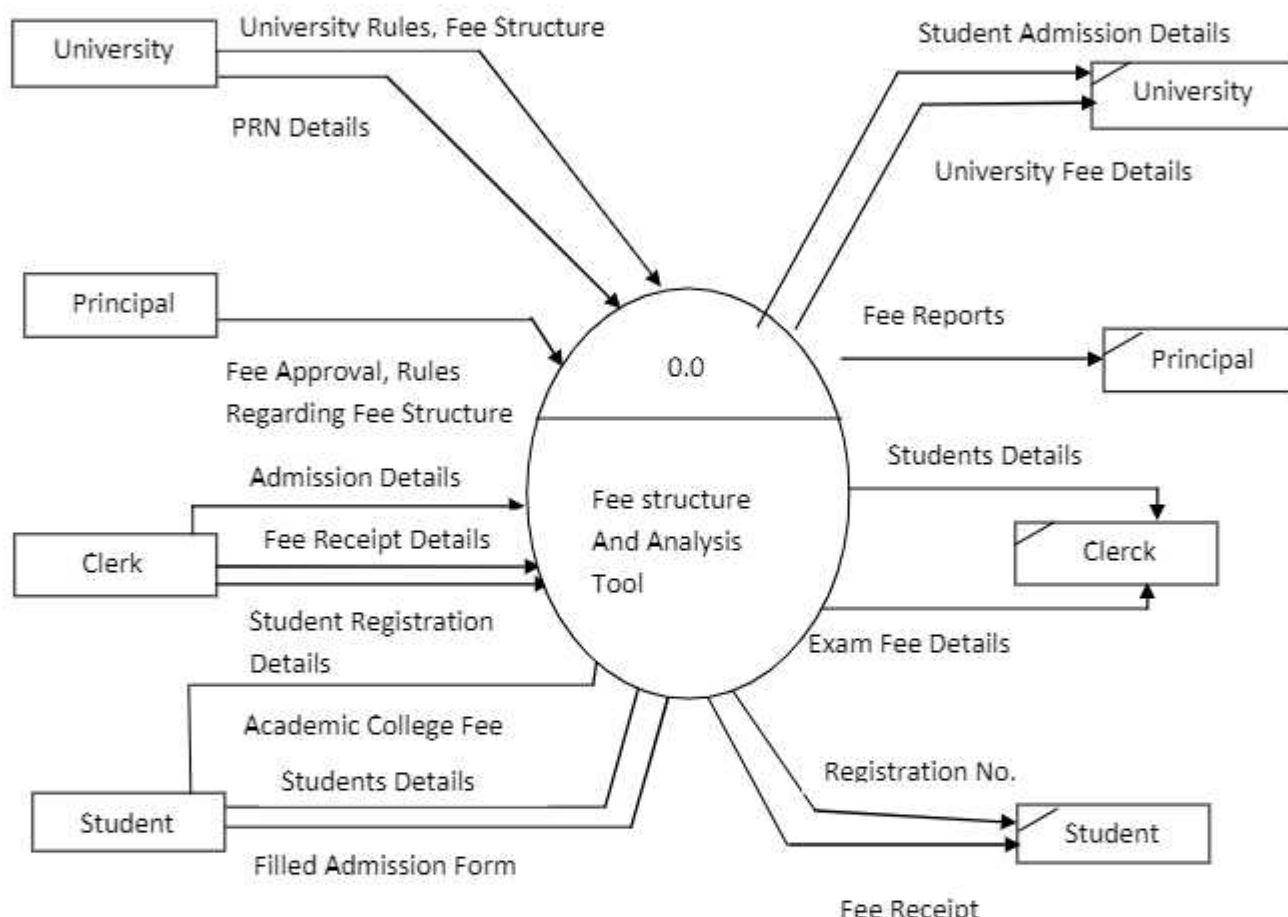
Figure 1- Context Level Diagram

B.MODULE DESIGN

 Following are the different modules designed for fee structure and analysis tool according to System Context Diagram (SCD) shown in fig.1.

1. Student_master
This module is used to collect all required information about student for example registration no, student name, address, admission date, course name, class etc.

2. Course_master
This module is used to enter course details. Any college or institute have various courses like BSC, BCOM, BA , BBA, MCA, MBA etc.
For example course id, course name, duration etc.

3. Fee_master
This module is used to store course wise as well as class wise fee amount details according to fee heads.

4. Fee_challan
This module is used to accept student and fee details which students are going to pay for particular course.

5. Fee_details
This module is used store students fee details of various courses. When students are paid fees in instalments then this file stored records as per instalments in proper priority wise format

IV. SAMPLE REPORTS OF FEE STRUCTURE AND ANALYSIS TOOL

1.Report of individual student regarding paid fees

2. Report of Class wise Student Fee Details

3. Class wise Individual Student Fee Details:

V. BENEFITS OF FEE STRUCTURE AND ANALYSIS TOOL

Now the colleges can use fees structure and analysis tool for improving the competence of their management system.

Paperless Solution:
One of the most important benefits of using fee collection system is, it provides a paperless environment for collecting student fee. The administrative team has to enter data and further maintain it on database.

Easy account management:
Now with the help of this software, the institutes can maintain the student's records easily. They can save student's information like their profiles and even can track student's activities like the paid fee, unpaid fee, class wise fees details, and course wise fees details.

Data backup:
With the advanced automated fees structure and analysis tool, the institutes can get the student's record backup in case of any data loss.

Generate reports:
This system can easily track records and generate various reports according to paid and unpaid fees of students.

VI. CONCLUSION

Money is very important resource for any educational institute, so collection of fee is very important aspect. Fee Structure and analysis tool is very helpful to any college or institutes administration department.   Fee Structure and analysis tool store, retrieve, and maintain, search students fee records easily. Fee Structure and analysis tool generate various reports as per requirement like individual student fee status, class wise paid or unpaid fee status etc.

REFERENCE

[1] K.S.R Anjareyuly, R. Anderson, "The advantage of Data Flow Diagrams for Beginning Programming". Department of psychology Department of psychology, 2008.
[2] Awad Elias M. -Structured System Analysis and Design – Second edition: Galgotia
[3] R. Ibrahim and S. Yen," Formalization of the data flow diagram rules for consistency check", International Journal of Software Engineering & Applications (IJSEA), Vol.1, No.4, October, 2010.
[4] J. Atif, U. Mohammad, N. Amer, "Comparative Study on DFD to UML Designs Transformations", world of computer science and information technology, ISSN 2221-0741,vol 1,No 1,10-16,2011
[5] R. Ibrahim, S. Yen Yen," An Automatic Tool for Checking Consistency between Data Flow Diagrams DFDs)", World Academy of Science, Engineering and Technology 69, 2010.
[6] S.V. nikam, B.T. Jadhav ,"Design and Development of Result Tool for University and College Exam and it's Performance Study" / International Journal on Computer Science and Engineering (IJCSE)

ICT Integration in Education-Online Collaborative Tools to Making Teaching Learning Process Interactive

Rajshree S. Nikam
College of computer Application for women, Satara
Email- rajshree.nikam11@gmail.com

Abstract-

In 21ˢᵗ century learning within the online environment, often termed as "eLearning", differs from the long-established classroom learning process. As compare to traditional classroom learning, online classroom learning gives lots of benefits like providing high retention power, availability of vast information, flexible access, immediate feedback and recognition, measurable result and reporting etc. Developing effective collaborative online learning activities begins with research oriented activities in education sector. Effective online instruction delivery in teaching learning process is very important. Student performance outcome can be improves by online collaborative activities. Online collaborative activities make easy for active learning, shared knowledge, and support social interaction. So in this research paper we mainly focus on importance of online collaborative online learning activities in teaching learning process and tools used for online collaborative activities and there benefits and by using some tools how we can communicate with the students by some assessment tools and community tools when we are not able to take physical class.

Keywords- Collaborative learning, E-learning, Assessment Tools, Community Tools, online Learning

I. Introduction

In the modern period of science and technology, especially, in the realm of information technology, the approach to education has undergone important changes. The philosophy of education has played a varied but essential role in shaping and designing curriculum. The word collaborative mean by produced by or involving two or more parties working together. The online word mean by while connected to a computer or under computer control. Computers in today education era can be used for many purposes such as; administration, guidance services, research, assessment, and teaching and so on (Keser,

1988). Online learning and collaborative learning are two different factors but making this two factors together for interactive and effective teacher learning process.

II. Literature Review

The increasing recognition of the need for education to be closely aligned with team playing, project based learning and problem solving approaches has increase the interest in collaborative learning among university and college instructors [1]. Smith and MacGregor [2] demonstrate that the traditional teacher-cantered method for learning has been shifted to a completely different method with the emergent of the collaborative learning. The new method of learning which involve collaboration can provide number of significant educational outcomes include: critical thinking, metacognition, and motivation [3]. The significant impact of the collaboration has increased with the use of technology [4]. Online Collaborative Learning (OCL), sometimes called Computer-Supported Collaborative Learning (CSCL) creates a Jaflah H. AlAmmary is with the University of Bahrain, Kingdom of Bahrain, Sukair: p.o.box 32038 (phone: 973-39611193; fax: 973-1743449119; e-mail: jalammari@uob.uob.bh). Paradigm shift in teaching methods. OCL has more features than face-to-face collaborative learning which make it more effective [5 - 7]. These factors can play an important role in enhancing the effective impact of OCL on the student's achievement and performance [8].

III. Collaborative learning

The term "collaborative learning" refers to an instruction method in which students at various performance levels work together in small groups toward a common goal [9]. It is based on the concept that learning is collective, so group members work next to one another, talking and working through the Teaching learning process. If implemented properly, what is the effect of collaborative learning on student's interest?

Positive Effects of Collaborative Learning-

In collaborative learning students are working and learning together. Students must adapt to the learning styles, behaviours, and abilities of others. Improved social skills in students can improve their relationships with others in the class.

Following are some benefits of cooperative learning

1. Improved academics
2. Higher level thinking
3. Social skills
4. Personal responsibility
5. Self-awareness

IV. Online Collaborative Tools for Teaching Learning

1. Assessment Tools-

Sr.No	Tool Name	Use of tool in teaching learning	URL
1.	AnswerGarden	Answer Garden is an online feedback app that can be used to obtain answers from your respondents. It allows users to create, share, answer, and manages topic questions without signing up for accounts. It is a simple app, it has the possible to be used to accomplish a large range of education activities, such as brainstorming, polling, synchronous and asynchronous communication activities, and assessment.	https://answergarden.ch/
2.	EdPuzzle	EdPuzzle is a free assessment tool that allows teachers and students to create interactive online videos by including either open-ended or multiple-choice questions, audio notes or comments on a video. EdPuzzle is a formative assessment tool for teachers. Edpuzzle make interactive videos with number of websites, like YouTube, TED, Vimeo, and National Geographic.	https://edpuzzle.com/
3.	Google Forms	Google Forms is a online tool which used to create forms, surveys and quizzes and share the forms with other people Teachers can use Google forms to assess their students at the start of the class and gauge prior knowledge. Also Google forms can be used to give feedback to and receive feedback from students and parents. Similarly, learners can use Google forms to measure their own learning .	www.Gmail.com
4.	Classkick	Classkick is online tool that allows to create course and assignments that students work	https://classkick.com/

Sr. No	Tool	Description	URL
		through on their devices at their own location. Teachers can observe student progress regarding their class and provide fast feedback. Through Classkick help and feedback from the teacher, Classkick allows students to namelessly request help from their peers. Text, images, video, and audio can be easily included into assignments. It is a large tool for synchronous and asynchronous communication, blended learning classrooms, personalized learning, Collaboration and cooperative learning.	
5.	Poll Everywhere	Poll Everywhere is a online polling stage that allows students to vote on teacher generated polls through text messaging, smart phone, or computer by visiting this site. With a free teacher account with Poll Everywhere, polls can receive 40 votes,it is enough to hold most classrooms. There are two types of poll questions that can be used in the classroom: multiple choice questions or open ended questions. Teachers can easily create polls to be deployed individually or as a series of questions. All polls can also receive submissions through a combination of devices. Students can vote online with a Smartphone, handheld device, tablet, laptop, or computer.	https://www.polleverywhere.com/

2. Community Tools

Sr. No	Tool	Description	URL
1	Google Classroom	Google classroom is developed by Google. Google Classroom is an online platform that increases the learning experience. Google classroom is free web service. It is used to make teaching more productive, collaborative, and meaningful. Google worked with educators to create Classroom. It is easy-to-use tool that helps teachers manage coursework. With Classroom, educators can create classes, Create assignments, distribute assignments, grade and send feedback, and see everything in one place. With the help of Google classroom teachers make teaching	classroom.google.com

		learning process more interactive. Google Classroom is a free collaboration application for teachers and learners.	
		Follow these steps to create a class:	
		1. Open a Web browser and go to **classroom.google.com**, then sign in with your Google Apps for Education account.	
		2. On the Welcome panel, click the plus sign at the top and choose Create Class.	
		3. In the Create a Class dialogue box, type Class Name and Section.	
		4. Click on Create.	
2.	Padlet	Padlet is online bulletin board which can be used to display information. With padlet we can easily create account and build a board. You can use in many different ways. It is free, however you can make only three padlet then after we need monthly and yearly subscription. Padlet creators can also fair posts, remove posts, and manage their board 24/7.	www.padlet.com
		Follow these steps to create a bulletin board:	
		1.Go to www.Padlet.com	
		2. Log in with your already established Google or Facebook account OR . Click on "Sign Up" to create a new Padlet account	
		3. Click on "CREATE NEW PADLET" to create a new wall. And display message as Welcome to your first Padlet wall!	
		4. Designe and manage wall and layout of wall as per your requirement	
3	TodaysMeet	This online tool can be used in a no. of ways to encourage students' engagement and interactivity in class. It is very easy to use, even for beginners. TodaysMeet offers both free and paid services, depending on the need of user. One problem seen in classroom some students feel uncomfortable to share their ideas and thoughts. With the help of	www.todaysmeet.com

		TodaysMeet students can raise their voice which encourages to more active participation in class. It include- 1.Discussion forum 2. Include unlimited no of students in the class 3. Meetings 4. Presentation 5. Online Seminars	
4	Scribblar	Scribblar is the real time white board application. Scribblar also use to playing of video and audio and the upload of documents and the presentation of details from websites.The purpose of Scribblar are online training, revising artwork and images, brainstorming, sales and product demos, interviews and tests, and makes students collaboration really easy. Beside all of this it keeps everybody on the same page and collaborators can communicate easily. With Scribblar we find a way to replace the "scrap paper" on our desk.	www.scribblar.com
5	Twiddla	Twiddla is online whiteboard for the digital classroom. Twiddla is also one of the easiest online collaborative tool or platform. It has simple user interface. **How to use twiddla-** 1. Type www.twiddla.com in your web browser 2. Users can elect to create a free account (or not). 3. Those users who do not wish to create an account still has access to all of Twiddla's basic tier options (Free and paid tiers can be viewed at http://www.twiddla.com/pricing.aspx 4. On the home page, find the green button noticeable "Go" and click on it. 5. A whiteboard is launched within the browser. 6. The Twiddla host can now upload	www.twiddla.com

		images, documents, etc.	
		7. A unique URL is also provided on the right hand of the screen. This URL can be shared with all collaborators to join in real time.	
		8. To enable EtherPad (which allows all users to have full control of the whiteboard), click on the icon labeled EtherPad.	
		9.To enable voice to voice communication among users, click on the red icon labeled Audio. Speak into the computer's microphone to ensure others can hear.	
		10. To begin real time text-based chat with all users, type inside the dialogue box that appears on the right side of the screen.	
		11.To save a snapshot of the whiteboard or a transcript of the chat, click on the "Save" icon which appears on the upper right hand corner of the whiteboard. Only registered users are permitted to save their work as a PDF file or on Twiddla's cloud	

V. Conclusion

Online learning is education through Internet. E-learning is playing very important role in the present educational development scenario. It has possible to change the whole education system and due to this very reason it has become one of the most chosen subjects for the researchers. Research works on e-learning are going on in various disciplines like Mass Communication, Education, Information and Technology (IT) and Distance Education [10] .

Following are some benefits of E- learning

1. E-learning saves time and money
2. E-learning leads to better retention.
3. E-learning is consistent
4. E-learning is scalable.
5. E-learning offers personalization.

References

1. Learning Domain. (2011). Module 3: Collaborative Learning. [Online]: Available at: http://www.learningdomain.com/Module_3.Collaborative. pdf

2. Smith, B.L., and MacGregor, J.T. (1992). "What is Collaborative Learning?" In A.S. Goodsell, M.R. Maher, and V. Tinto (eds.), Collaborative Learning: A Sourcebook for Higher Education. University Park, Pa.: National Center on Postsecondary Teaching, Learning, and Assessment.

3. Lai, E., (2011). Collaboration: A Literature Review. [Online] Available at: http://www.pearsonassessments.com/hai/images/tmrs/CollaborationReview.pdf

4. Brodahl, C., Hadjerrouit, S., and Hansen, N. (2011).'Collaborative Writing with Web 2.0 Technologies: Education Students' Perceptions Education'. Journal of Information Technology Education: Innovations in Practice, 10.

5. Lehtinen, E., Hakkarainen, K., Lipponen, L., Rahikainen, M., and Muukkonen, H. (1999). Computer-supported collaborative learning: A review of research and development (The J.H.G.I Giesbers Reports on Education, 10). Netherlands: University of Nijmegen, Department of Educational Sciences.

6. Hsiao, H., Chuang, C., Huang, T., and Wu, C. (2010). Web-based Collaborative learning in secondary education: Teachers' reflection. International Journal of Cyber Society and Education, 3(1), 15-36.

7. Francescato, D., Porcelli, R., Mebane, M., Cuddetta, M., Klobas, J.E. and Renzi, P. (2006), 'Evaluation of the efficacy of collaborative learning in face-to-face and computer-supported university contexts', Computers in Human Behaviour, 22(2), 163-176.

8. Smith, Barbara Leigh, John McCann (Editors) (2001). Reinventing Ourselves: Interdisciplinary Education, Collaborative Learning, and Experimentation in Higher Education. Jossey-Bass.

9. A. A. Gokhale ," Collaborative Learning Enhances Critical Thinking", Journal of Technology Education", Vol. 7 No. 1, Fall 1995

10. Poonam Gaur," Research Trends in E-Learning", ResearchGate, 2016.

11. Jaflah H. Al-Ammary," Online Collaboration Learning: A Way to Enhance Students' Achievement at Kingdom of Bahrain",World Academy of Science, Engineering and Technology International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering Vol:7, No:2, 2013

Attaran, M. (2003) Information technology and businessprocess redesign. Business Process Management Journal, 9(4), 440-458, Alexandra-Paraskevi Chytiri, De Montfort University, Human Resource Managers' Role in the Digital Era, July 2019.

Websites/Important Links :

1.http://shodhganga.inflibnet.ac.in/simple-search?query=mentoring

2. https://www.researchgate.net/

· Magazine : People Matters

· Newspapers : The Times of India

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INTEGRATED SOLID WASTE MANAGEMENT SYSTEM: A CASE STUDY OF SATARA MUNICIPAL CORPORATION

Rajshree S. Nikam
MPhil Research Scholar,
Shivaji University, Kolhapur

Dr. R. D Kumbhar
Research Guide,
Rayat Institute of Research & Development,
Satara

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Abstract -

Solid Waste Management collectively involves the regular waste generation, storage collection, transportation, processing, recycling or disposal, monitoring different types of waste. All these services save a considerable amount of money and also prevent the environment from being impaired. The need for digitalization in waste Management system goes ahead of information technology, still in developing countries not implementing ICT based integrated solution for waste management

Satara is a growing city, so due to the growing industrialization and urbanization rate of solid waste generation will increase in the coming future. Along with the commercial & industrial development of the city, the solid waste management system needs to be revised according to the need of the city. Solid waste management is a significant aspect of any municipal corporation because if it is not done properly, it leads to pollution and diseases. As in solid waste management process has lots of activities from that are Waste generation, sepa-

ration, collection, transport & transfer, treatment & Disposal. So, there is a need to handle all challenges individually from waste generation to the disposal and recycle landfills or plants. The central government's project 'Digital India' launched in 2015, progressive digitalization needs to be implementing also in waste management. The importance of an integrated solid waste management system is a must and requires seriousness in applying it to create a good and sustainable Waste Management system. In this research paper researcher attempt to present solid waste transportation management practices and disposal methods adopted by the municipality. And identifying the opportunities and challenges to improve the Solid waste management system. In this research paper researcher mainly focus on waste transportation management system and waste disposal.

Keywords: Solid Waste, Solid Waste Management, Waste Transportation, Municipal Corporation, challenges and opportunities

I. INTRODUCTION

Solid waste management is one of the important and exclusive municipal services across India. This service is provided by the waste management department of ULB (Urban Local Bodies).So in the waste management service require technologicalinnovation in waste transportation, treatment, disposal, recycling, etc.

Solid Waste Management is today's rising issue for every municipal corporation for the healthy life of the citizen and safe environment.

There must be the primary goal of every municipal corporation is not only to provide services for waste collection, transportation and disposal but also it needs to be reducing and eliminating the adverse effect of waste on the environment and human health which will support the superior quality of life and economic development[4]. India should shift from conventional logistics to automated tracking and moni-

toring technologies that are cost-effective & energy-efficient. Waste generation has increased day by day due to urbanization, industrialization, and increasing population.So there is a need to be an integrated solution for solid waste management that implement effectively to increase sustainable development[7].

Satara is a Municipal Council city in the district of Satara, Maharashtra. Satara city is located at 17.68°N 73.98°E,It lies in the Satara District. The matter was pending for 40 years. Recently this matter cleared and the borders of Satara city extended upto NH4 towards the east, upto Ajinkyatara towards the south, all-region south to Venna River, Shahupuri, Sambhajinagar, Vilaspur, and Dare Budruk gram panchayat is now a part of Satara city. So as the city area is increased so there is a need to change in solid waste management services which are provided by Municipal Corporation to cover recently added new area[3].

II. OBJECTIVES

To develop a proper plan of integrated solid waste management (ISWM) needs to studythe current solid waste management system apart from their quantification which helpful for a municipal corporation.

1. To study the present solid waste transportation management practices and disposal methods adopted by the municipality.

2. Identifying the opportunities and challenges to improve SWM.

III. METHODOLOGY

The researcher studied the existing practices of waste transportation management adopted by the municipality. This research has descriptive in nature. The Researcher used primary and secondary data for this research. Forprimary data collection researcher used the interview method and collect all required information from the city coordinator of the health department and some employees in different departments of the Municipal Corporation. For secondary data collection researcher used Gov-

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ernment publications, Books related to waste management, Ph.D. thesis, magazines, articles, newspapers, the internet, and websites.

IV. PRESENT STATUS OF SOLID WASTE MANAGEMENT (SWM) SYSTEM

The Solid waste management system may vary from city to city and country to country depending on some parameters i.e. geographic location, population, financial support, political involvement, citizen awareness, and municipal responsible authorities, etc. So, there needs to update the waste management system by considering every aspect that affects the system. It is noted that the waste management system must be updated over the period depending on the variations in solid waste management, administrative and political systems, social, economic, geo-climatic condition& technological up-gradation, etc. Hence, it is useful to capture the progressive waste management process for rules, regulations & laws, financial conditions, infrastructure, technology & stakeholder's participation.

1. PRESENT SOLID WASTE MANAGEMENT SYSTEM IN SATARA FOR WASTE TRANSPORTATION AND DISPOSAL-

According to Annual Report on Solid Waste Management Rules, 2016, the state of Maharashtra SWM Annual report 2019, for Satara Municipal Corporation has the following information [6]

Table 1. Information of SWM

Name of ULB	Satara Municipal Council
Class	A
Population	1,20,195(As per provisional reports of Census India in 2011) now in 2021 population of cit near about 1,75,000
MSW Generation MT/Day	49
MSW Treated MT/Day	46
MSW Processing Facility	Composting
Transport Facility	T4 – 40
Segregation %	80
Transport %	100.00

According to census data for the year 2011, Satara city's total population is 1.21 lakh, now in 2021 data collected from municipal authorities total population of Satara city is near about 1.75 lakh. There has been almost double growth in the population in the last few decades.The total geographical area of Satara municipal council is near about 26 square km, now in municipal corporation area has been increased by adding some area (i.eAjinkyatara towards south, all-region south to Venna River, Shahupuri, Sambhajinagar, Vilaspur, and Dare Budruk gram panchayat). Satara city is divided into 20 wards. There is a total of 27,297 households in Satara city. Satara Municipal Corporation is currently collecting 48 TPD(Tonne per day)of waste fromSatara city, with an average of 500 to 600 grams per house per day. Satara Municipal Corporation has taken several steps to modernize and organized the MSW management in the city. However, there is still a need for considerable improvement and a lot of focus on waste management.Satara Municipal Corporation has a door-to-door waste collection system except for the outer area of the city.Satara Municipal Corporation has privatized the collection and transportation of solid waste and awarded the contract to Bhagyadip Waste Management Pvt.Ltd, Pune and Savarkar Cooperative Society, Satara. So, both are responsible for the door-to-door collection of waste and transportation of waste to the dumpsite at Jakatwadi. Current Status of Solid Waste Management in theSatara Municipal Corporation as follows

Table 2. Details of SMC waste transportation and disposal

Total Tricycle Rickshaws/ tipper	40
Other Vehicle(Tractor)	10
The Capacity of each Tricycle	0.700 Tons
Tricycle Trips Per Day	2 (some times 3)
Tractor Trips Per Day	1
Dumping sites	1
Segregation atsource	Wet & Dry
Disposal Method	Landfill & Biomining
Transfer Stations	No
Waste Transportation area	8 -10km
City area in sq.	km 26 sq. km

The Waste management budget for

Satara Municipal Corporation is near about 2.5 Cr and from that 60 to 70% on waste transportation and disposal of waste. SMC spends near about 2.90 lacks per month only on fuel.Satara Municipal Corporation trying to adopt the concept of a "Bin-Free city" adopted. Bins/secondary collection points are not provided bySatara Municipal Corporation in the city. Program of SMC, community bins have been reduced and most of the garbage or waste collected from various commercial residential, and institutional areas are directly transferred to the waste collection and transportation vehicles(tippers & tractors)

In 2019,Satara Municipal Corporation started developing the Geographic Information System (GIS) based-route map for waste transportation and collection and monitoring. The system was developed to increase efficiency in real-time tracking in waste collection and transportation including the saving of fuel, utilization of manpower, ensuring regularity in the collection, and time management. The current waste transportation system is not open for citizens for tracking the tippers or transportation vehicles. Also, a citizen not able to submit their feedback and queries related to waste management.

There is still scope for improving the waste collection and transportation system, optimal utilization of vehicles, including improvements in logistic management, increasing coverage of outer city areas, and bringing efficiency to segregation and disposal practices.

V. CHALLENGES AND OPPORTUNITIES

A city with increases economic activities, changing of lifestyle, growing urbanization, and industrialization leads to negative impacts on land, human, environment, health, climate and so on SataraMunicipal Corporation has taken a lot of initiatives towards proper waste management still there is scope for improvements.

1. Satara Municipal Corporation has a waste transportation technological solution but there is scope for improvement to covert technological solution into a web-based solution which brings involvement of citizens in waste management.

2. Multiple stakeholders are involved in every stage of waste management which leads to complexity, increases cost, and increases coordination problems.

3. Waste transportation in Satara is privatized by providing the infrastructure and service for transportation of waste to the Jakatwadi dumping site. The dumping site is near to 5 to 6 Km far from a city. Tipper has only 0.700 Tone Capacity so, there is required at least 2 to 3 transfer stations to tripper deployed into big size tractor or other vehicle and further waste transfer to the dumpsite. Transfer stations must be developing for optimizing vehicle utility and bringing more efficiency to waste transportation.

4. An optimal routing model is needed for waste transportation in the city which must be created by considering some parameters i.e. population density, area-wise waste generation capacity, type of vehicle, road network and type of road, location of transfer stations, etc. The optimal route uses to trace minimum distance/cost for waste collection path from source to landfill.

5. The waste collection frequency is considerably higher in the municipalities of Kolhapur district as compared to the municipalities of Satara and Solapur districts[2] so there is a need to increase waste collection frequency.

6. For waste disposal need to use the latest landfill disposal technology. Most municipalities discontinue waste burning in the open. Satara Municipal Corporation uses landfills and biomining for waste disposal. So, there is a need to use disposal methods effectively

Solid waste management is a very big challenge due to the amount of waste generated on daily basis. In developing countries like India managementof such a huge quantity of

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solid waste is become a great challenge. Due to lack of funds infrastructure, resources and appropriate strategies improving solid waste management has become a huge task. The major challenges are door-to-door waste collection, transportation segregation of waste, waste treatment, scientific disposal method, and landfill. To overcome the challenges Environment ministry amended Solid waste management rules by the year 2018. But there is a failure in many policies and due to insufficient knowledge of stakeholders and awareness of citizens. So, need there need real-time tracking monitoring and evaluation system which help to analyze the quantity& types of waste generated on daily basis[8]

VI. FINDINGS

1. Current technological solution used by Municipal Corporation for waste transportation is not adequate.

2. Tipper capacity currently used for waste transportation by Municipal Corporation is 0.700 ton which is small to carry waste from the source location to Dumpsite. So, it increases no. of vehicle trips.

3. No transfer station facility available to unload waste from small capacity tippers for reloading into larger vehicles for transport to landfills for final disposal.

4. Satara Municipal Corporation discontinues the practice of burning the municipal waste in the open land. Now, Municipal Corporation uses landfills and biomining for the disposal of waste.

VII. SUGGESTIONS

FollowingSuggestions based on the above Findings-

1. For effective waste transportation need a web-based GPS-enabled solution, which increases real- time productivity and there must be citizen interaction with the web-based solution so, the citizen also tracks the real-time location of the vehicle which reduce the time of citizen.

2. There is a need for higher capacity tippersor big containersto carry waste from collection site to dumpsite which reduces no. of trips per day. So, ultimately reduces waste transportation cost.

3. Waste transfer stations make solid waste collection and transportation more efficient and reduce overall transportation costs, truck traffic, air emissions, etc. So there is a need to develop at least 2 or 3 transfer stations at the central location of the city where garbage collected by tippers can be compressed in one container, and then the container is transported to the disposal site or landfill. In this technology, the use of machinery for compressing is required to be installed.

4. Every Municipal corporation must consider waste as a resource. When waste is recycled or disposed of in an ethical, safe, and responsible manner, it helps to reduce the pessimistic impacts on the environment. So, if Municipal Corporation uses bio methanation ormethanogenesis for waste disposal it will helps for energy generation.

VIII. CONCLUSION

For appropriate &better management of solid waste, there needs to be periodic review of each phase involved in waste management that iswaste generation, collection, transportation, disposal, recycling, etc. Waste should be an income resource for a municipal corporation, not just a problem.

Satara Municipal Corporation has reported to challenges of urbanization and is taking every possible effort to improve thequality of life of citizens. To overcome the challenges of urbanization citizens and government have come together and mutually agreed to implement solutions.Every municipal corporation needs to take corrective actions and use technological solutions for a sustainable environment and should be conducted and implement "Best practices" are necessary. The system should be base on Reduce, Recycle, Reuse and

recover for environmental protection.This will be carried out by the government and every resident in the city to bring Satara to the first rank as a green city. There is a need to prevent the environment so it can lead to a better tomorrow. Preventing a good and clean environment today can lead to a better tomorrow.

REFERENCES

[1] Dr. Gopalakrishnan, S., Manjula, C.B. and Thirupathi M, "An analysis of solid waste management transportation system in Bangalore city", International Journal of Current Research, 11, (12), 8767-8773,(2019).

[2] Dr. Vishal Deshmukh, Dr. Mrs. Sheetal Deshmukh, 2021, "A COMPARATIVE STUDY OF SOLID WASTE MANAGEMENT PRACTICES IN SELECTED MUNICIPALITIES, "international journal of multidisciplinary educational research issn:2277-7881; impact factor:6.514; ic value:5.16; ISI value:2.286 peer-reviewed and refereed journal: volume:10, issue:1(1) (2020)

[3] https://en.wikipedia.org/wiki/Satara_(city)

[4] Chandramani Bhimrao Patil, Dr.Arif Khan, "Sustainable Solid Waste Management; Case study of Nagpur, India",International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181, Vol. 9 Issue 11, November-(2020)

[5] DEVELOPING INTEGRATED SOLID WASTE MANAGEMENT PLAN TRAINING MANUAL, Volume 2: Assessment of Current Waste Management System and Gaps therein,Compiled by United Nations Environmental Programme Division of Technology, Industry and Economics International Environmental Technology Centre Osaka/Shiga, Japan, available-https://wedocs.unep.org/handle/20.500.11822/7730

[6] Annual Report on solid waste management Rules, 2016. For the state of Maharashtra release in (2019) available-at-https://www.mpcb.gov.in/sites/default/files/solid-waste/msw_annual _report_2019_202003082020.pdf

[7] Abdul Mukhit, and Syafrudin Syafrudin, "The Importance of Integration Waste Management Aspects as a System in Good and Sustainable Waste Management", E3S Web of Conferences 73,07012, ICENIS 2018,https://doi.org/10.1051/e3sconf/20187307012, (2018)

[8] R. Gajalakshmi, Dr. S.K. Manivannan, "Solid Waste Management – A Case Study", TEST Engineering & Management, ISSN: 0193-4120 Page No. 9498 – 9504- Volume 83 Page Number: 9498 - 9504 Publication Issue: March – April(2020)

[9] Sudarshan Kumar, Somendra Sharma, Suraj Jaluthriya, "Solid Waste Management: A Case Study of Jaipur City" International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org NCACE Conference Proceedings Volume 4, Issue 23(2016)

[10] Teemu Meronen, "Environmental Sustainability through Digitalization in Finnish Public and Private Sector Organizations" Master's thesis Helsinki, AALTO UNIVERSITY SCHOOL OF SCIENCE Degree Programme in Information Networks (2017)

[11] Zhanna Mingaleva, Natalia Vukovic, Irina Volkova and Tatiana Salimova, "Waste Management in Green and Smart Cities: A Case Study of Russia", MDPI,Published: 21 December (2019)

[12] Ashish R. Mishra, Shweta A. Mishra, Anurag V. Tiwari,E-ISSN: 2321–9637 Volume 2, Issue 1, International Journal of Research in Advent Technology Available Online at:http://www.ijrat.org January (2014)

[13] BARAKADE A.J., AND TODKARI G.U. "A STUDY OF URBANIZATION IN SATARA DISTRICT OF MAHARASHTRA",Geoscience Research ISSN: 0976–9846 & E-ISSN: 0976–9854, Vol. 2, Issue 1, pp-38-44 Available online at http://www.bioinfo.in/contents.php?id=90 (2011)

[14] Collection of Municipal Solid Waste in Developing Countries, UNIHABITAT for better

शहरीकरणाचे सामाजिक आर्थिक परिणाम

निता नागेश बर्गे
अर्थशास्त्र विभाग,
कॉलेज ऑफ कॉम्प्युटर ॲप्लीकेशन फॉर विमेन, सातारा

प्रस्तावना :—

आर्थिक विकासात शहरीकरण अभिप्रेत असते. ज्या विशिष्ट ठिकाणी रोजगाराच्या संधी, शिक्षणाच्यासोयी, आरोग्याच्या सोयी, करमणुकीच्या सुविधा व जास्त आर्थिक सुविधा इ.घटक अनुकूल असतात. अशा ठिकाणी स्थलांतराची प्रवृत्ती दिसून येते. सामान्यत: असे दिसून येते की,एखाद्या क्षेत्राचा जसजसा आर्थिक विकास होत जातो. तसतसा त्या क्षेत्राच्या शहरी भागात लोकसंख्या अनुपात वाढत जातो. थोडक्यात आर्थिक विकास लोकसंख्याच्या शहरीकरणाला चालना देणारा आहे. याउलट शहरीकरणाबरोबर अंतर्गत व बहिर्गत बचतीमध्ये वाढ होते. म्हणून शहरीकरण आर्थिक विकासाचे परिणाम आहे.

शहरीकरण म्हणजे शहराच्या लोकसंख्येची व त्याच्या क्षेत्राची वाढ होय. आपल्या देशाचा विचार केल्यास शेती हा ग्रामीण भागातील प्रमुख व्यवसाय आहे. परंतु तो खेड्यात चालणारा व्यवसाय आहे. आणि त्याचा विकास फारसा झाला नसल्यामुळे लोकांना विविध सेवा व रोजगार संधी कमी प्रमाणात उपलब्ध होते. त्यामुळे रोजगार मिळविण्याच्या हेतूने लोक मोठ्या प्रमाणात शहराकडे धाव घेत आहेत. कारण शहरात मोठ्या प्रमाणात उद्योगधंदे यांचा विकास झाल्यामुळे लोकांना रोजगार संधी उपलब्ध होतात त्यामुळे शहराकडे जाण्याचा व त्याच ठिकाणी राहण्याचा लोकांना ओघ वाढत असल्यामुळे शहरीकरण निर्माण होते.

शहरांचे भारतात मुख्य दोन प्रकार आहेत. पहिला प्रकार म्हणजे, अशी सर्व स्थाने जेथे नगरपालिका, महानगरपालिका, कॅंटॉनमेंट बोर्ड किंवा अनुसूचित टाऊन एरिया कमिटी तर दुसरा प्रकार म्हणजे ज्या ठिकाणाची किमान लोकसंख्या ५००० असते. जेथे किमान ७५टक्के प्रौढ पुरुष शेतीशिवाय दुसऱ्या उद्योगात कार्यरत असतात आणि जेथे लोकसंख्येची घनता किमान ४०० व्यक्ती प्रति चौरस किलोमीटर असते अशी सर्व स्थाने शहर मानली जातात यातील पहिला प्रकार घटनात्मक शहरे म्हणून ओळखली जातात व दुसरा प्रकार जनगणना शहरे म्हणून ओळखली जातात.

शहरीकरणाची उद्दिष्टये :

अ) देशाच्या ग्रामीण भागात लोकांच्या जीवनमानाची गुणवत्ता उंचवणे.

ब) ग्रामीण भागात रोजगार संधी उपलब्ध करुन देणे.

क) जाणीव जागृती आणि आरोग्यविषयक शिक्षण यातून शहरातील नागरिकांचे उद्बोधन करणे.

ड) शहरी भागात स्वच्छता कार्यक्रमाची व्यापकता वाढविणे.

इ) पिण्याच्या पाण्याच्या स्त्रोतांचे अन्नपदार्थांचे प्रदूषण कर्मी करण्यासाठी सहाय्य करणे.

अ.क्र.	वर्ष	नागरी लोकसंख्या वाढ (टक्के)	नागरी वस्तींची संख्या
१	१९६१	१७.७९	२,२७०
२	१९७१	१९.९१	३,५७६
३	१९८१	२३.३४	३,२४५
४	१९९१	२५.७२	३,६०५
५	२००१	२८.०६	५,१६१
६	२०११	३७.०७	७,९३५

भारतातील नागरीकरणाचा विचार करता सन १९६१ ते २०११ पर्यंत नागरी वस्तीतील लोकसंख्या सातत्याने वाढलेली आहे. सन १९६१ ते १९८१ पर्यंत नागरी लोकसंख्येची वाढ साधारणत: ५.५५ टक्के होती. परंतु १८८१ ते २०११ पर्यंतु ही वाढ १३.७३ टक्क्यापर्यंत पोहचल्याचे आढळते आणि हे शहरीकरण अनेक कारणामुळे होत आहे. त्यापैकी काही प्रमुख कारणे पुढीलप्रमाणे आहेत.

शहरीकरण म्हणजे काय?

१) नेल्सन ऑडरसन: ज्या ठिकाणी उद्योगशीलता अधिक प्रमाणात आढळते आणि संपूर्ण जीवनपद्धती नवीन तयार होते.त्यास शहरीकरण म्हणतात.

२) क्लाईड मिचेल: ज्यावेळी मोठ्या संख्येने लोक खेड्यातून शहरीकराकडे येतात.शेतीचा व्यवसाय सोडून यंत्रोउत्पादनाचा स्वीकार करतात.आपल्या सवयी बदलतात.आणि तेथील अनुषंगाने आपली राहणी बदलण्यास सुरवात करतात. त्यावेळी शहरीकरणाची प्रक्रिया सुरु होते.

१) औद्योगिकीकरण —

एखाद्या प्रदेशामध्ये उद्योगाचा विकास व केंद्रीकरण होणे हा नागरीकरणाला साहाय्यभूत ठरणारा घटक आहे. उद्योगधंद्याच्या वाढीमुळे नोकरीच्या आशेने आजूबाजूच्या प्रदेशातील लोक या प्रदेशाकडे आकर्षित होतात. त्यामुळे शहरीकरणाची प्रक्रिया गतिमान होते. एकोणीसाव्या शतकादरम्यान मुंबई शहरी वाढ झपाट्याने झाली. कारण मुंबईमध्ये मोठ्या प्रमाणावर कापडगिरणी उद्योग सुरु झाला होता. त्यामुळे मूळची कोळ्याची वस्ती असलेली अनेक गावे औद्योगिकीकरणामुळे व शहरीकरणामुळे मुंबई महानगराचा भाग झाली.

२) व्यापार —

एखाद्या प्रदेशातील ठिकाण, मालाची ने—आण, चढ—उतार व साठवणूक यासाठी अनुकुल असते. अशा ठिकाणी व्यापार व त्या अनुषंगाने असणान्या इतर सेवाची वाढ होते. उदा: व्यापारी

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संकुल, बँका, पतसंस्था, गोदामे, शीतगृहे इ. या सेवा बरोबरच अशा ठिकाणी रस्ते, उपहारगृहे निवास इ. बाबीही वाढीस लागतात. भारतातील नागपूर शहर देशाच्या केंद्रस्थानी आहे. हे शहर व्यापाराच्या दृष्टीने सोईचे असल्यामुळे तेथे नागरीकरण वाढत गेले.

३)   यांत्रिकीकरण व तंत्रज्ञान —

यांत्रिकीकरण आणि तंत्रज्ञान यांचे अनेक फायदे विविध क्षेत्रात पहायला मिळतात. नागरीकरणासाठी देखील हे दोन्ही घटक सहाय्यभूत ठरतात.

गेल्या काही दशकात शेतीमध्ये तंत्रज्ञानाचा वापर वाढला आहे, तसेच यांत्रिकीकरण वाढले आहे. ग्रामीण भागातील शेतीही आता मोठ्या प्रमाणावर यंत्राच्या सहाय्याने केली जाते. त्यामुळे शेतीतील मनुष्यबळ शेतीच्या कामातून मोकळे झाले आहे. हा कामकरी वर्ग कामधंद्याच्या शोधात शहराकडे स्थलांतरीत झाला. परिणामी शहरी लोकसंख्या वाढू लागली आहे.

४)   वाहतूक व संदेशवहन —

रस्ते, लोहमार्ग इ. वाहतुकीच्या सोईचा ज्या भागात विकास होतो, त्या भागातील छोट्या वस्त्या व गावांचे नागरीकरण वेगाने घडून येते. उदा: कोकण रेल्वे विकसित झाल्यावर या मार्गाच्या सानिध्यात असलेल्या सावर्डे (जिल्हा रत्नागिरी) सारख्या अनेक गावांचे नागरीकरण होऊ लागले आहे. महत्त्वाचे लोहमार्ग एकत्र आल्यामुळे भुसावळचा (जिल्हा जळगाव) विकास झपाट्याने झाला.

५)   स्थलांतर —

स्थलांतर हा नागरिकणावर परिणाम करणारा महत्त्वाचा घटक आहे. हे स्थलांतर अल्पकालीन दीर्घकालीन किंवा कायम स्वरुपाचे असते. हे स्थलांतर प्रामुख्याने एका ग्रामीण भागातून दुसऱ्या ग्रामीण भागाकडे किंवा ग्रामीण भागाकडून शहराकडे होत असते. उच्च राहणीमानाच्या आकर्षणामुळे देखील शहरातील स्थलांतरीत लोकांची संख्या वाढू लागली आहे. उदा: भारताच्या विविध भागातून पुणे, मुंबई या ठिकाणी होणारे स्थलांतर.

शहरीकरणाचे परिणाम

१)   झोपडपट्टी —

नागरिकरणामुळे शहरातील लोकसंख्या झपाट्याने वाढते. ज्या प्रमाणात लोकसंख्या वाढते, त्या प्रमाणात शहरामध्ये निवास व्यवस्था वाढत नाही. बहुतांशी स्थलांतरीत हे आर्थिकदृष्ट्या दुर्बल असतात त्यांना शहरातील निवासस्थाने परवडत नाहीत. स्थलांतरीत होणारे बहुतेक लोक रोजगारानिमित्त शहरात येतात. परंतु सर्वांना योग्य रोजगार मिळतोच असे नाही. त्यामुळे अनेक लोकांचे उत्पन्न कमी असते. असे लोक शहरात उपलब्ध असलेल्या मोकळ्या जागेवर तात्पुरती व कच्च्या स्वरुपाची घरे बांधतात ही घरे बहुधा अनधिकृत असतात. त्यांना स्थानिक स्वराज्य संस्थाकडून सोईसुविधा मिळत नाहीत.

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२)   वाहतुकीची कोंडी —

शहरांचा क्षेत्रीय विस्तार झाल्याने शहरांच्या बाह्यवर्ती भागात व उपनगरात लोक निवास करतात. शहरांच्या केंद्रवर्ती भागात व्यवसाय, उद्योग, व्यापार, नोकरी, शिक्षण इ. साठी रोज उपनगरातून लोकांची ये—जा सुरु असते. सार्वजनिक वाहतुक सेवा लोकसंख्येच्या प्रमाणात पुरेशा उपलब्ध नसल्यास खाजगी वाहनांची गर्दी वाढते. परिणामी वाहतुकीची कोंडी होते व प्रवासात बराच वेळ जातो.

३)   प्रदुषण —

प्रदुषण ही शहरामधील एक प्रमुख समस्या आहे. त्याचा नागरी जीवनावर विपरीत परिणाम झालेला दिसून येतो. यात वायुप्रदुषण, ध्वनीप्रदुषण, जलप्रदुषण पाहायला मिळते. शहराचा वाढता विकास सोईसुविधांचा तुटवडा तसेच नियमांचे उल्लंघन यामुळे प्रदुषण ही एक गंभीर समस्या निर्माण होते. शहरांची जशी वाढ होते. तशी प्रदुषणातदेखील वाढ होते.

४)   गुन्हेगारी —

स्थलांतरित लोकसंख्येपैकी अनेक लोकांना रोजगार उपलब्ध होत नाही त्यामुळे अवैध मार्गाचा वापर करुन अनेक वेळा पैसे कमवले जातात. यातून शहरांमध्ये गुन्हेगारी वाढलेली दिसते. चोरी, घरफोडी, खून इ. स्वरुपाचे गुन्हे शहरात मोठ्या प्रमाणात होतात आढळतात. यामुळे कायदा व सुव्यवस्थेचे प्रश्न गंभीर बनतात व पोलीस यंत्रणेवरील ताण वाढतो.

५)   गृहनिर्माण —

वाढत्या शहरी लोकसंख्येसाठी गृहनिर्माण हे सर्वात मोठे आव्हान आहे. शहरी मध्यमवर्गीयांच्या उत्पन्नाशी तुलना करता घरच्या वाढत्या किंमतीमुळे कमी उत्पन्न गटातील लोकांना परवडणारी घरे घेणे कठीण आहे. त्यामुळे ते अशा ठिकाणी राहतात. जेथे योग्य वेंटिलेशन प्रकाश, पाणीपुरठा, सांडपाणी इ. पासुन ते वंचित असतात.

६)   सुरक्षित पिण्याचे पाणी —

शहरातील पिण्याच्या पाण्याचे स्त्रोत दूषित असतात. कारण शहरातील पाणी मूळताच अपूरे असते आणि भविष्यात अपेक्षित लोकसंख्या वाढीसाठी पुरेशा प्रमाणात पाणी उपलब्ध होत नाही.

७)   अस्वच्छता —

अस्वच्छता ही शहरी भागात विशेषत: झोपडपट्टीतील आणि अनधिकृत वसाहतीमध्ये मोठ्या प्रमाणात असते. यामुळे अनेक प्रकारच्या अस्वच्छतेमुळे पसरणाऱ्या रोगराई, जसे की डायरिया, मलेरिया इ. चा प्रादुर्भाव होतो. असुरक्षित कचरा विल्हेवाट ही शहरी क्षेत्रातील एक गंभीर समस्या आहे आणि कचरा व्यवस्थापन तर एक कायम मोठे आव्हान आहे.

८) आरोग्य आणि शिक्षण —

शिक्षण आणि आरोग्य हे मानवी विकासाचे महत्वाचे साधन मानले जात आहे. शिक्षण आणि आरोग्य या दोन्ही बाबतीत ग्रामीण भागाच्या तुलनेत शहरी भागाची परिस्थिती जास्त बिकटच आहे. सार्वजनिक आरोग्य व्यवस्था दिवसेंदिवस संकुचित होत चालल्या आहेत आणि नागरिकांना अधिकाधिक खासगी आरोग्य सेवावर अवलंबून रहावे लागत आहे. शिक्षणाची देखील अशीच स्थिती आहे. सरकारी शिक्षण व्यवस्थेचे देखील असेच संकुचन होत चालले आहे. त्यामुळे लोकांना खाजगी शिक्षण संस्थावर अवलंबून राहावे लागत आहे. मर्यादित जागा आणि उच्च शुल्क आकारणी यांना तोंड द्यावे लागते सरकारी शैक्षणिक संस्थांची स्थिती निराशाजनक आहे.

९) पर्यावरण —

मानवनिर्मित आणि नैसर्गिक आपत्ती ओढवून धोकादायक परिस्थिती आणि जोखीम निर्माण होत आहे. शहरीकरणाच्या निर्मितीसाठी मोठया प्रमाणात झाडांची कत्तल केली जाते. त्यामुळे पर्यावरणाला हानी पोहोचते. त्यामुळे पर्यावरणाचा समतोल बिघडतो. समुद्राची पातळी वाढत आहे. डोंगर नष्ट होत आहेत. नुकत्याच झालेल्या उत्तर काशीतील जलप्रलयालासुध्दा अनियंत्रित बांधकामच जबाबदार आहे. कॉंक्रीट, विटा यासारखे साहित्य उष्णता शोषून घेतात. त्यामुळे शहरातील हवा रात्रीसुध्दा गरम असते. शहरातील वेगवेगळ्या घडामोडींमुळे वातावरणात वेगवेगळी विषारी द्रव्ये उत्सर्जित केली जातात. जसे कार्बन डायऑक्साईड, सल्फर डायऑक्साईड यांचे प्रमाण खूप वाढत चालले आहे. त्यामुळे शहरात श्वास घ्यायला शुध्द हवा मिळत नाही.

११) समाजव्यवस्था नष्ट —

शहरीकरणामुळे सामाजिक व्यवस्थेवरसुध्दा परिणाम होतो. आता शहरातून एकत्र कुटुंब पध्दती जवळजवळ नष्ट झाली आहे. सर्वजण आत्मकेंद्रित झाले आहेत ते स्वत:च्या विश्वात मग्न असून व्यक्तीची सामाजिक बांधिलकी कमी होत चालली आहे. आता वृध्दाश्रमाची गरज वाढते आहे. या शहरी संस्कृतीमध्ये शेजारच्या घरात एखाद्यावर हल्ला होत असेल तरी कोणी धावून जात नाही.

१२) राजकीय दृष्टीकोनावर परिणाम —

शहरीकरणामुळे राजकीय दृष्टीकोनावरसुध्दा परिणाम होण्याची शक्यता आहे. शहरात राहणाऱ्या मतदारांची संख्या खेड्यातील मतदारांच्या संख्येपेक्षा जास्त झाल्यामुळे राजकारण्यांना शहरी विकासावर जास्त भर द्यावा लागेल.

उपाययोजना —

१) जमिनीचा सुयोग्य उपयोग —

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वाढत जाणारी लोकसंख्या वाढतच असते. पण जमिन ही तेवढीच असते. तेव्हा वाढत्या लोकसंख्येच्या जमीनविषयक गरजा व उपलब्ध जमीन यांचा सुयोग्य उपयोग व्हावा, यासाठी नियोजन करणे गरजेचे असते. घर बांधणी, उद्योग व्यवसाय, क्रिडांगण, शाळा, कार्यालय रस्ते, करमणुकीची केंद्रे इ. विचार करुन कोणत्या कारणासाठी जमिनीचा किती वापर करावा, यावर शहर नियोजनात लक्ष दिले जाते.

२) झोपडपट्टी नियंत्रण व गृहनिर्माण योजना —

शहरातील झोपडपट्टया ही शहराची वाढती समस्या आहे. यावर शहरी नियोजनात उपाययोजना करण्यावर भर देण्यात येत आहे. याविषयक विविध योजना करुन त्यांना कायद्याचा आधार देऊन इतरत्र हलविणे व झोपडपट्टीतील लोकांसाठी आरोग्यदायक इतरत्र घरे उपलब्ध करणे यावर भर दिला जावा.

३) प्रभावी वाहतूक व्यवस्था —

शहराची अंतर्गत व बाह्यपरिवहन व्यवस्था प्रभावी व सुरक्षितपणे होणे अत्यावश्यक असते. त्यासाठी प्रामुख्याने अंतर्गत विभागात बस, लोकल, खाजगी वाहने, भुयारी रेल्वे यांचा विचार केला जावा. तसेच आवश्यक तेथे पुल, बोगदे यांची निर्मिती करावी. तसेच पायी चालणाऱ्यांसाठी फुटपाथ निर्माण करावे.

४) करमणुकीची केंद्रे —

मानसिक ताण कमी होईल, शरीराचे स्वास्थ्य वाढेल, तसेच स्पर्धा—संघर्ष यांना उत्तेजन न मिळता फक्त करमणूक होईल यासाठी काही लोकसंख्येच्या आधारे उद्याने, विहार स्थळे, म्युझियम क्रिडांगणे, प्राणी संग्रहालये, लहान मुलांसाठी खेळावयासाठी मोकळी जागा इ. घटकांवर जाणीवपूर्वक भर द्यावा.

५) पाण्याची व विजेची योग्य व्यवस्था —

शहरातील लोकांना स्वच्छ पाण्याचा पुरवठा नियमित व्हावा लागतो. त्याचप्रमाणे विजेचाही नियमित पुरवठा व्हावा लागतो. यासाठी कायम स्वरुपाच्या योजना हाती घेऊन त्या राबवाव्या लागतात. शिवाय या सोयीची व्यवस्था सुरक्षित राहण्यासाठी काळजी घेणे.

६) सांडपाण्याची व कचऱ्याची योग्य व्यवस्था —

वापरलेले पाणी शहराबाहेर योग्यरित्या टाकले गेले पाहिजे त्यासाठी तज्ञांच्या सहाय्याने भुयारी गटाराची प्रभावी व्यवस्था राबविली जाते. तसेच रोज हजारो टनांने निर्माण होणाऱ्या कचऱ्याचीही योग्य प्रकारे विल्हेवाट लावावी. तसेच ओला कचरा व सुका कचरा वेगळा करुनच टाकावा. त्यामुळे शहरे स्वच्छ ठेवण्यासाठी मदत होत आहे.

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७) शैक्षणिक सोयी—सुविधा —

शहरातील विद्यार्थी व नागरिक यांच्या शैक्षणिक व त्या अनुषंगाने इतर गरजांची पुर्तता करण्यासाठी नगर नियोजनात भर दिला जातो. या सोयी एकाच ठिकाणी केंद्रित न होता त्यावर विशेष लक्ष केंद्रीत करावे.

८) सौंदर्य —

शहरे सुंदर असणे हा देखील नगर नियोजनाचा एक भाग आहे. यात विविध

तज्ज्ञांचे मार्गदर्शनासाठी विविध योजना राबविल्या जाव्यात उदा; लांब—रुंद रस्ते, कारंजे, पुतळे, नौकाविहार, म्युझियम, करमणुक गृहे, वृक्षारोपण यासाठी तज्ज्ञ लोकांची समिती नेमावी.

- निष्कर्ष —

१) शहरी भागांचे आकर्षण जास्त.

२) शहरातील बहुसंख्य मोठ्या गावात पुरेशी सार्वजनिक जागा आणि निधी उपलब्ध नसल्यामुळे त्या गावातील सांडपाण्याचे व कचऱ्याचे नियोजन व व्यस्थापन करता येत नाही त्यामुळे अस्वच्छतेचे साम्राज्य निर्माण झाले आहे.

३) ग्राम स्वच्छता अभियान ज्या कालावधीत राबविण्यात आले तेवढ्याच कालावधीपुरती व गावापुरतेच हे अभियान मर्यादित राहिले.

४) रोजगार मिळविण्यासाठी नागरिकांची शहराकडे धाव.

५) वाढत्या जागेच्या समस्येमुळे झोपडपट्टीत वाढ झाली आहे.

६) वाढत्या लोकसंख्येमुळे वाहतुकीची कोंडी मोठ्या प्रमाणात निर्माण होते.

७) शहरीकरणाचा पर्यावरणावर विपरित परिणाम होतो.

- संदर्भ सूची —

१) जिल्हा परिषद सातारा

२) www.shodhganga.com

३) www.academia.edu.com

४) आंतरराष्ट्रीय व्यापार — डॉ. भोसले काटे

५) लोकसंख्याशास्त्र — डॉ. एस्. एन्. कुलकर्णी

६) व्यावसायिक पर्यावरण — डॉ. सुधाकर उध्दवराव जाधव.

Indian Health Care Industry: An Overview

Dr. Mrs. Sharvari S. Kulkarni   Mrs. Anagha P. Bartakke (M.Com)
(M.Com, M.B.A, M.A, M. Phil, Ph.D)Asst.Professor,
Principal,B.C.A College, Satara
KanyaMahavidyalay, Miraj

Abstract:

Today, Covid-19 pandemic seems to have had an effect on countries of the world. All of this has had a significant impact on the health care industry which has two sides. It creates challenges to India as well as opportunities in India for development in Health Care Industry. Everyone is aware of the stress on the healthcare industry but at the same time, there is a lot of scope for employment and development in this sector. This paper will talk about trends, opportunity in health care industry in the coming period.

Key Words: Health care, Hospital, Medical device, Medical tourism

Introduction:

Earlier basic needs of the human being were food, clothing & shelter but with the passage of time, education & healthcare become important as they develop a person holistically. Health is become one most important need. Healthcare simply means every aspect, service and device for taking care of health.

The health care industry is also known as medical industry. It is the largest and fastest growing industry in the world. It is constantly undergoing modernization and development. Health care industry provides a large number of employment & income opportunities.COVID-19 has also affected on India's healthcare sector. Healthcare expenditure has increased due to increasing population, rising health literacy among common people of India. Rising health literacy among the people of India is leading to an increase habit of taking Health Insurance. This paper highlights on the recent trends and opportunities in Indian healthcare industry. The present study has following objectives.

Objectives of the study:

1. To understand the sectors of healthcare industry in India.
2. To study the trends and market analysis of healthcare industry in India.
3. To assess the opportunities in the healthcare industry.

Limitations of the study:

Covid 19 is affecting all the healthcare industries in the world. For this study, health care industries in India have been considered. There are many sectors in Indian healthcare industry. The study mainly focused on hospitals and medical devices sectors in healthcare industry.

Research Methodology:

The major thrust area of present study is healthcare industry in India. This paper is theoretical and based on secondary data. Government records and publication of commercial institution used for the collection of secondary data.

India's Healthcare Industry

India's healthcare industry includes hospitals, medical devices and equipment, health insurance, clinical trials, telemedicine and medical tourism.

Hospitals:

Hospitals is the essential and important part of health system. In the hospital, treatment is given to the patient with specialized nursing staff and equipment. Government /public hospitals

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include district hospitals, city /town hospitals, primary health center, rural hospitals, and medical collage hospitals. Non-governmental hospitals include nursing home mid-tier and top-tier hospitals.

Medical devices and equipment:

According World Health Organization, A medical device means any instrument, implement,machine,appliance and implant for vitro use software, materials or other similar or related article, intended by manufacturer to be used alone or in combination for human beings for one or more specific purpose of:

 i. Diagnosis, prevention, monitoring, treatment or alleviation of disease.
 ii. Diagnosis, monitoring, treatment or alleviation of or compensation for an injury.
 iii. Supporting or sustaining life.

Health Insurance:

Health Insurance is a type of insurance coverage that typically pays for medical surgical, prescription drug and sometimes dental expenses incurred by insured. Health insurance can refund the insured for expenses incurred from illness or injury, or pay the care provider directly.

Clinical trials:

Clinical trials are research studies performed in people that are aimed at evaluating a medical, surgical, or behavioral intervention. They are the primary way that researchers find out if a new treatment, like a new drug or diet or medical device (for example, a pacemaker) is safe and effective in people. Often a clinical trial is used to learn if a new treatment is more effective and/ or has less harmful side effects than the standard treatment.(1)

Telemedicine:

World Health Organization has defined telemedicine as, "The delivery of health care services, where distance is critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcareprovides, all in the interests of advancing the health of individual and their communities.

Medical Tourism:

Medical tourists elect to travel across international borders to receive some form of medical treatment. Treatment may span full range of medical services.

Market Overview and Trends...

Each challenge brings millions of opportunities. Covid 19 also has an impact from people's lifestyle to economy. But at the same time, the government had the opportunity to reform and restructures the Indian health industry. The importance of telemedicine is well knownin pandemic situation so, Government, organizations are more focused on building digital infrastructure and preventive healthcare.

Healthcare industry in India is expected to reach US$ 372 billion by 2022, driven by rising income, better health awareness, lifestyle diseases and increasing access to insurance. (2)
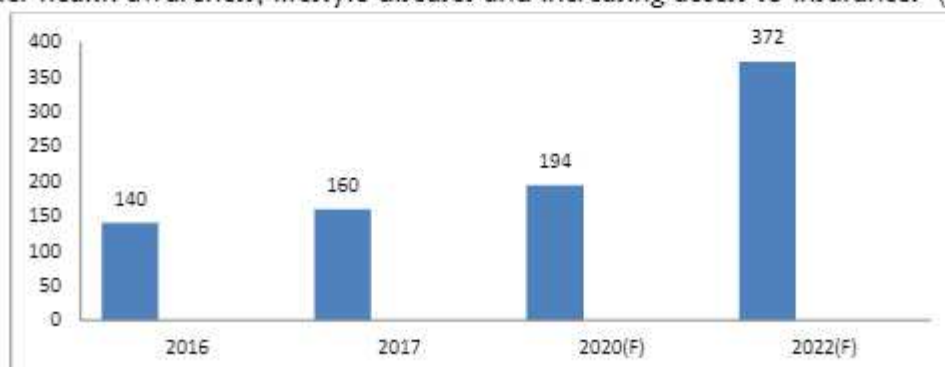
Health care Sector Growth Trend (US$ billion)(CAGR 16.28%)

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(Source: Health Care IBEF (June 2020) www.ibef.org)

The government focuses to develop India as a global healthcare hub. The government announced Rs. 64,180 crore (US$ 8.80 billion) outlay for the healthcare sector over 6 years in the Union Budget 2021-22 to strengthen the existing "National Health Mission" (3)

The hospital industry in the India, accounting for 80% of the total health care market, is witnessing a huge investor demand from global as well as domestic market. This industry is expected to reach $ 132 bn by 2023 from $ 61.8 bn in 2017, growing at CAGR of 16-17%.(2)

Medical device industry is also important element of Medical industry in India. There are plenty opportunities for players in medical device industry. There is diversity in this sector. Indian medical device industry consist segments like Consumables, implants, diagnostic imaging, orthopedic devices, dental products and patient aids. (4)

Imports & Exports in India's Medical Device Sector:

Medical Devices & Equipment (Unit: $ Million)	Year	2018	2019	2020(est.)
	Exports	1,100	1,480	1,520
	Imports	4,900	5,354	7,500

(Source: www.trade.gov/knowledge-product/india-healthcare)

From the above table, it appears that the number of imports is more than export. The medical device market is expected to reach US$11 billion by 2022. The growing number of medical facilities is creating demand for medical devices in Indian market.100% FDI is allowed in the medical device sector in India.

There are 750- 800 domestic medical devices manufacturers in India, with an average investment of $ 2.3 – 2.7 mn and an average turnover of $ 6.2-6.9 mn. (2)
The government has taken some concrete steps to increase manufacturing of medical devicesand its geographical scope. There are six medical devices manufacturing clusters" in the India i.e. Gujarat, Maharashtra, Karnataka, Haryana, Andhra Pradesh, Tamil Nadu. Clusters have "Medical Device Park" developing around them, states have to committed to set up dedicated industrial parks where efficient domestic manufacturing at lower cost. (5)

The Indian health insurance contributes 20% to the non-life insurance, business making it the 2nd largest portfolio. The Indian health insurance is expected to reach over USD 8 bn in FY 2020 and close to USD 20 bn in FY 2025. (2)

Medical tourism market is increasing due to quality healthcare services, medical devices and modern technology. The Indian tourism market is expected to grow from its current size of $ 3bn to $ 7-8 bn by2020. Due to easy access for medical visa approval this market is expected to double. (2)

Overall, during the lockdown we all realize the importance of digital technology. Health care industry is now exploring new possibilities with the help of digital media.

Findings:
1. Due to pandemic, health awareness is increase among the people so, home used medical appliances and telemedicine consultancy increased tremendously.
2. After the pandemic, the government and healthcare organizations needs to focus on building digital infrastructure and preventive healthcare system.
3. In upcoming decades, Indian health industry offers various career opportunities for health care professionals

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4. During pandemic, there has been origin in health data collection in large scale so skilled manpower in various fields likeIT expert, data operators, technicians are essential for digitalization.

Suggestion:

In last two years, the healthcare industry in India has observed increased number of private players setting up hospitals, specialized health care facility. Considering the scope of the medical industry, it is necessary to create medical manpower to provide training medical facilities. For this purpose, it is essential to increase the number of medical colleges and provides the fund of it which will help build a skilled medical manpower as the growing population demands.

Private and public sector partnership is needed to meet the challenges in healthcare industries. Medical research needs to be encouraged and guided for the development of this sector. For the development in the field of medical device manufacturing promote medical nursing as well as technical education.

For the production of medical devices in the country, create a conductive environment so manufacturing became easier in lower cost. It will help meet the local demand as well as exports. For the growth of medical tourism market improving the quality of healthcare infrastructure, personnel, government support are essential elements.

Conclusion:

The health care industry is the largest and important industry in the world. This industry direct affected on quality life of people. This industry needs constant regulation and innovation. Increasing global competition and development of modern technology are having positive impact in this industry. Ultimately, every segment of the health care industry needs to take a developmental approach. If a large number of jobs are available in this industry, then India will become a self-sufficient country.

References:

1. www.nia.nih.gov
2. Medical Device Industry in India / Investment in medical sector; www.investindia.gov.in
3. https://timesofindia.indiatimes.com(Feb.01,2021)
4. Deloitte, NATHEALTH(March 2016) -Medical Devices Making in India-A Leap for Indian Healthcare
5. Medical Device Manufacturing in India – A Sunrise

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A survey on big data analysis using hadoop

Dr. D.R. Vidhate

Asst. Prof. MKSSS College of Computer Application for Women, Satara,
[1]vidhatedhananjay@rediffmail.com

Abstract— Big data is data with variety of different format such as structured, unstructured and semi structured so it is very difficult for traditional methods to handle that data. Big data and analytics on big data describe how to store, analyze and capture very large amount of datasets. The data generation sources are different and rate at which it is entering into the database is very high. Hadoop technology handle this problem by using concept of hadoop distributed file system and mapreduce. These technologies handle massive amount of data in MB, PB, YB, ZB, KB and TB. This paper gives overview of big data and hadoop which is powerful techniques of big data analysis.

Keywords—Big Data, Hadoop, Map Reduce, HDFS, Analytics.

I. INTRODUCTION

In the information world, huge amount of data is available to decision makers. Big data refers to datasets that are not only big, but also high in variety and velocity, which makes them difficult to handle using traditional tools and techniques. Due to the rapid growth of such data, solutions need to be studied and provided in order to handle and extract value and knowledge from these datasets. Furthermore, decision makers need to be able to gain valuable insights from such varied and rapidly changing data, ranging from daily transactions to customer interactions and social network data. Such value can be provided using big data analytics, which is the application of advanced analytics techniques on big data. This paper aims to analyze some of the different analytics methods and tools which can be applied to big data, as well as the opportunities provided by the application of big data analytics in effective decision making.

II. DATA FUNDAMENTALS

Data:
Data is just description of things. Data is a collection of facts such as numbers, words, measurements or simply a direct observation. Data can be collected in many ways.
Big data:
Big data refers to the information which is very diverse and increasing at very high speed. Big data often comes from multiple sources and arrives in multiple formats. Big data is categorized as unstructured or structured. Structured data consists of information already managed by the organization in databases. It is frequently numeric in nature. Unstructured data is information that is unorganized and does not have any predefined format. It includes data gathered from social media sources which help businesses gather information on customer needs. Big Data is a term associated with complex and large datasets. A relational database cannot handle big data, and that's why special tools and methods are used to perform operations on a vast collection of data. Big data enables companies to understand their business better and helps them derive meaningful information from the unstructured and raw data collected on a regular basis. Big data also allows the companies to take better business decisions. With the right data management and analytics systems in place, companies can gather unstructured information and translate it into actionable information. There are various problems occurred due to big data such as decision making, handle customer queries, optimizing and understanding business process and empowering next generation. Every department of company can utilize findings from big data analysis for effective decision making.

Characteristics of big data:

Volume	The quantity of stored data.
Variety	It is nature and type of data.
Velocity	It is speed at which data is generated
Veracity	It refers to data quality.

Importance of Big data:

Businesses use the big data accumulated in their systems to improve operations, provide better service, create special type of activities bases on the need of concern business. Businesses utilize big data to take competitive advantages and better decision making. For example, big data refers to the massive amount of information that is being created on a daily basis. In education sector students, teachers and office staff creating lot of data throughout their time at your institution. This information can be used to gain insight into the individuals at institutional level or at individual level very effectively. Companies may achieve a significant increase of 5-20% in revenue by implementing big data analytics. Companies like Walmart, LinkedIn, Facebook, Twitter, Bank of America are using big data analytics to increase their revenue.

Steps to deploy big data solution:

There are 3 steps to deploy big data solution are data ingestion, data storage and data processing. It is shown diagrammatically as:

1. Data Ingestion: In this data is extracted from various sources.
2. Data Storage: After ingestion, extracted data is then stored in HDFS.
3. Data Processing: The data is processed through one of the processing frameworks like sparks, mapreduce, pig etc.
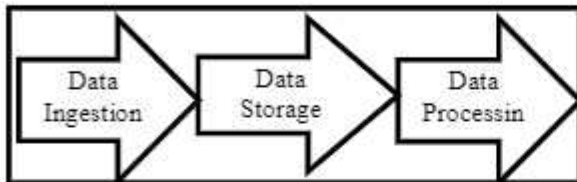
III. DATA ANALYSIS

Obtaining actionable information in an important objective for any businesses. For managers working on the big data it is important to support business decisions, actions, understanding of the theories and techniques in the data analysis. Hadoop is technology used for big data analysis.

Hadoop : Hadoop framework is very popular in big data operations in the world of big data. Hadoop is a solution to all big data problems. The framework can be used by business owners to analyze big data and help businesses to make decisions. It is an infrastructure equipped with relevant tools and services required to process and store Big Data. Hadoop works across clusters of commodity servers. So it is important to manage this work across the hardware. Hadoop can work with any distributed file system, Hadoop Distributed File System is the heart of Hadoop technology. HDFS manages how data files are divided and stored across the cluster. Data is divided into blocks, and each server in the cluster contains data from different blocks.

Components of Hadoop:

There are two components of hadoop are HDFS and Mapreduce

HDFS (Hadoop Distributed File System): HDFS is a Java-based reliable file system used for storing huge datasets in the block format. It follows master-slave architecture. HDFS has two core components NameNode and DataNode.

NameNode: It is the main node and it doesn't store the actual data. It contains metadata. It requires less storage and high computational resources.

DataNode: Actual data is stored on the DataNodes. It requires more storage resources. These DataNodes are commodity hardware in the distributed environment.

Mapreduce:

MapReduce is a programming structure used to process large datasets. This function is further broken down into two parts. First map divides the datasets into tuples and reduce uses the map tuples and creates a combination of smaller chunks of tuples. MapReduce provides a method for parallel processing on distributed servers. Before processing data, MapReduce converts that large blocks into smaller data sets called tuples. Tuples, in turn, can be organized and processed according to their key-value pairs. When MapReduce processing is complete, HDFS takes over and manages storage and distribution for the output. The "Map" in MapReduce refers to the Map Tasks function. Map Tasks is the process of formatting data into key-value pairs and assigning them to nodes for the "Reduce" function, which is executed by Reduce Tasks, where data is reduced to tuples. Both Map Tasks and Reduce Tasks use worker nodes to carry out their functions. JobTracker is a component of the MapReduce engine that manages how client applications submit MapReduce jobs. It distributes work to Task Tracker nodes. TaskTracker attempts to assign processing as close to where the data resides as possible.

Features of Hadoop:

Hadoop supports the storage and processing of big data. It is the best solution for handling big data challenges. Some important features of Hadoop are:

Availability – The data stored in Hadoop is available to access even after the hardware failure. In case of hardware failure, the data can be accessed from another path.

Fault Tolerance – Hadoop is highly fault-tolerant. It creates three replicas for each block at different nodes, by default. This number can be changed according to the requirement. So, we can recover the data from another node if one node fails. The detection of node failure and recovery of data is done automatically.

Open Source – Hadoop is an open source framework which means it is available free of cost. Also, the users are allowed to change the source code as per their requirements.

Distributed Processing – Hadoop supports distributed processing of data i.e. faster processing. The data in Hadoop

HDFS is stored in a distributed manner and MapReduce is responsible for the parallel processing of data.

Reliability – Hadoop stores data on the cluster in a reliable manner that is independent of machine. So, the data stored in Hadoop environment is not affected by the failure of the machine.

Architecture of hadoop:

HDFS

Map   Reduce
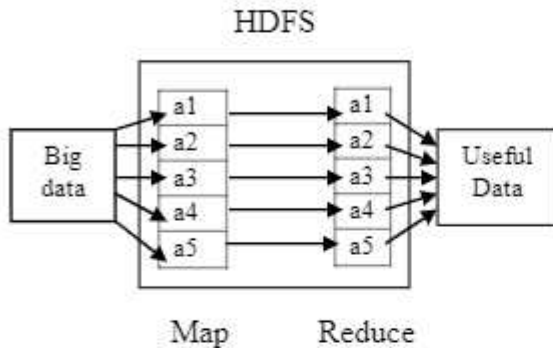
In above architecture, big data which is input file is broken up into smaller pieces which are processed independently of each other in map part. The results of these independent processes are then collected and processed as groups in the reduce part until we get the useful data.

Applications of Hadoop in different Sectors:
1. Banking
2. Communication, Media and entertainment
3. Healthcare providers
4. Education
5. Retailer

IV.   CONCLUSION

The paper describes the concept of Big Data along with 4 Vs, volume, velocity, veracity and variety of Big Data. It also focuses on three steps to deploy the big data solution. The paper describes Hadoop which is an open source software used for processing of Big Data. In this paper we have tried to give overview of Hadoop and Hadoop components.   In this research, we have examined the innovative topic of big data, which has recently gained lots of interest due to its perceived unprecedented opportunities and benefits. In the information world, we are currently living in and using high velocity data that should be extracted and utilized. Hence, big data analytics can be applied to all businesses to help decision making by applying advanced analytic techniques on big data revealing hidden information and valuable knowledge.

V.   FUTURE RESEARCH

This paper was limited to study the fundamental concept of data, big data, hadoop, HDFS and mapreduce. Implementation of this study can be done by taking into consideration education, healthcare or retail sector. It will help the business owner to take decisions in concern fields.

REFERENCES

[1] Briony J Oates , Researching Information Systems and Computing, South Asian Edition, 2006.
[2] S.Vikram Phaneendra, E.Madhusudhan Reddy,"Big Data- solutions for RDBMS problems- A survey", In 12thIEEE/IFIP Network Operations & Management Symposium (NOMS 2010) (Osaka, Japan, Apr 19{23 2013).
[3] Jimmy Lin "MapReduce Is Good Enough?"The control project. IEEE Computer 32 (2013).
[4] Aveksa Inc. (2013). Ensuring "Big Data" Security with Identity and Access Management. Waltham, MA: Aveksa.
[5] Hewlett-Packard Development Company. (2012). Big Security for Big Data. L.P.: Hewlett-Packard Development Company.
[6] Kaisler, S., Armour, F., Espinosa, J. A., Money, W. (2013). Big Data: Issues and Challenges Moving Forward. International Confrence on System Sciences (pp. 995-1004). Hawaii: IEEE Computer Soceity.
[7] Katal, A., Wazid, M., Goudar, R. H. (2013). Big Data: Issues, Challenges, Tools and Good Practices. IEEE, 404-409.
[8] Amit Verma et al.,"Care 2000: Analysis and Re- Engineering ", National Conference on Emerging Trends in Communication held at SVIET-BANUR(District Patiala, PUNJAB) pp. 73, on 20th -21st February, 2009.
[9] Amit Verma et al.,"Cross Layer Feedback Design: Optimization For Energy Efficient Mobile Devices Protocols Stacks Over Wireless Sensor Networks", National Conference on Emerging Trends in Communication held at SVIET-BANUR(District Patiala, PUNJAB) pp. 90, on 20th -21st February, 2009

IMPACT OF INFORMATION TECHNOLOGY GOVERNANCE PRACTICES ON THE PERFORMANCE OF SELECTED BANKS IN WESTERN MAHARASHTRA

Hypotheses Testing

[1] Dr. Mrs. Kishori Pawar

[1]Assistant Professor
[1]Computer Science
[1]MKSSS's College of Computer Application for Women, Satrara, India

Abstract: In the middle and late 90s there was revolution in communication technologies like internet, mobile/cell phones etc. Tremendous improvement has taken place in the Indian banking sector because of the IT revolution. All the private and foreign banks have gone for 100 percent computerization. At a rapid fast, the government owned nationalized banks are also improving their number of computerized branches. This results in faster transaction, transparency in operation. At present many banks switch over to core banking. At present banks are implementing IT applications in different areas but banks are not getting real benefits due to inadequate governance of IT. This research is helpful to banks for knowing problems in IT implementation and its governance. It helps bank management to performing and transforming Information Technology to meet present and future demands of the business and customers.

Keywords - Information Technology (IT), IT Governance, Kruskal-Wallis test, Bi-nominal test

1. RESEARCH METHODOLOGY
The study is inferential descriptive (diagnostic) in nature based on systematic collection, analysis, and interpretation of the data related to IT asset and IT governance practices used in banks.

1.1 Data Required
Data about status of IT implementation, status of IT governance implementation, standard IT Governance practices applied in banks, opinions about IT governance impact, problems IT governance implementation etc. was a need of study.

1.2 Data Sources
Both primary and secondary sources were used to collect the data for the research.

Primary data sources –
The necessary primary data were collected from technical staff of bank and top management representatives by using structured schedule. (Refer annexure)

Secondary data Sources –
The necessary secondary data regarding concept of IT governance, standard IT governance practices, previous studies related to topic were collected from sources like banks documents, reference books, RBI reports, various publications, International and national journals, websites and reports. This data was useful for conceptual framework and literature review.

1.3 Instrument
Structured Schedule is used to collect primary data. Schedule is natured as structured, close ended and codified.

1.4 Sampling
The size of population is finite and district wise population of banks having head offices, zonal offices and regional offices in western Maharashtra is as below –

Table No. 1.1
Number of Banks having HO's & RO's in Western Maharashtra

Sr. no.	District	Public banks	Private banks	Co-operative banks	Total
1	Kolhapur	2	1	47	50
2	Pune	17	2	54	73
3	Sangli	-	-	21	21
4	Satara	2	-	26	28
5	Solapur	2	-	34	36
	Total -	23	3	182	**208**

(Source: RBI Annual Report)

The researcher has used proportionate stratified random sampling method for selection of sample and type of bank is considered as stratum. More details are as under -

1.	Sampling Technique	Proportionate Stratified Random Sampling
2.	Population	Public, Private and Co-operative Banks from Western Maharashtra
3.	Type of Population	Finite Population
4.	Size of Population	208 Banks
5.	Analysis Unit	Head Office, Regional Office or Zonal Office of Bank
6.	Sampling Frame	Banks from 5 Districts of Western Maharashtra
7.	Sample Size	73 Banks
8.	Parameter of Interest	IT governance Status, Problems and Impact on Bank Performance

Formula for calculating the sample size of each stratum according to Proportionate Distribution is as below.

$$n_h = n \times (N_h / N)$$

Where,

n_h = Sample size of each stratum
n = Total sample size
N_h = Size of the stratum
N = Size of total population

Table No. 1.2
Sample Size Details

Stratum	Public banks	Private banks	Co-operative banks	Total
No. of banks	23	3	182	**208**
Calculated Sample size ($n_h = n \times (N_h / N)$)	6.59	0.89	54.60	
Sample size proposed for study	7	1	55	**63**

2. TESTING OF HYPOTHESES

1) H_0- IT governance practices in public and cooperative banks are in infancy stage compared to private banks.

The stated hypothesis is IT governance practices in public and co-operative banks are in infancy stage compared to private banks. To know the extent of IT governance practices 6 point scale has executed. The scale was Non-existent (0): IT governance processes are not applied and institution has not recognized the need for them, Initial (1): IT governance processes are informal and uncoordinated, Repeatable (2): IT governance processes follow a regular pattern, Defined (3): IT governance processes are documented and communicated, Managed (4): IT governance processes are monitored and measured, Optimized (5): IT governance best practices are followed, and there are provisions for amending processes.

To test hypothesis the sample banks where IT governance was not existed were omitted from the analysis. Only 5 co-operative banks were not having any kind of IT governance practices. The scale values of 2= Initial is converted as 1 and scale values of Repeatable, Defined, Managed, Optimized has labeled as 2. Now sample size is 68 banks. Where 10 public, 3 private and 55 co-operative banks are there.

Kruskal-Wallis test has applied to test the hypothesis.

Table No. 2.1
Levels of IT Governance
Result of Hypotheses Testing

Ranks			
	Type of Bank	N	Mean Rank
Codified as infant state and advanced stage	1 – Public	10	56.50
	2 – Private	3	56.50
	3 – Co-operative	55	29.30
	Total	68	

Table No. 2.2

Test Statistics[a,b]	
	Codified as infant state and advanced stage
Chi-Square	29.033
Df	2
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: tob	

The tables above depict that the mean rank score of public limited banks is 56.50 the same is of private limited bank and mean score of cooperative banks is 29.30.

The chi-square value amounts to 29.033 at 2 degrees of freedom, 'p' value comes to 0.000 which significant hence null hypothesis is rejected and alternative hypothesis that the extent of IT governance practices are vary.

To know the extent of IT governance practices with respect to constitution of banks Bi-nominal test has been used as follows. The test is executed independently for public sector banks, private sector banks and cooperative banks as follows.

Table No. 2.3
Test for Public Sector Banks

Binomial Test[a]						
		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
Codified as infant stage and advanced stage	Group 1	Advanced IT Governance Implementation	10	1.00	.50	.002
	Total		10	1.00		
a. tob = 1 – Public						

Above table shows that there are 10 sample public sector banks. At test proportion 0.50 all the ten banks shows in advanced category of IT governance implementation and there no single bank found to in infancy stage of IT governance implementation. The 'p' value is 0.002 hence the null hypothesis is rejected. Since observations are fully in account with advanced IT governance implementation, it is stated that the public limited banks has more IT governance implementation.

Table No. 2.4
Test for Private Sector Banks

Binomial Test[a]						
		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
Codified as infant state and advanced stage	Group 1	Advanced IT Governance Practices	3	1.00	.50	.250
	Total		3	1.00		
a. tob = 2						

The table above narrated the IT governance implementation in private sector banks. There were only three samples which are statistically small size. The 'p' values are 0.250 which is very higher and it is due to very small samples size. Still the group 1 i.e. IT advanced governance practices are existed in all the three sample private sector banks.

Hence by observation it can be stated that in private sector banks the advanced IT governance prevailed.

Table No. 2.5
Test for Co-operative Sector Banks

Binomial Test[b]						
		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)
Codified as infant state and advanced stage	Group 1	Advanced IT Governance Practices	11	.20	.50	.000[a]
	Group 2	Infancy stage	44	.80		
	Total		55	1.00		
a. Based on Z Approximation.						
b. tob = 3						

Above table depicts IT governance practices in cooperative banks. Out of total 55 banks dealing in IT governance 11 banks has advanced IT governance practices and 44 banks does exist IT governance at Infancy stage. The statistics put to test at 0.50 proportion and 'p' value amounts to 0.000, the test is significant hence the possibility of equal number of cooperative banks fall in infancy stage of IT governance and advance stage of IT governance practices failed. To look at the observed proportion it has seen that the proportion is 20:80 hence it can be stated that the cooperative banks at infancy stage of IT governance implementation are more as compared to IT governance implementation at advanced stage.

Concluding the discussion on IT governance implementation it can be stated on the basis on above data that, IT governance implementation in private sector banks and public sector banks is far better compared to IT governance in cooperative banks.

2) H_0 - The extent of IT governance practices is independent on types of banks.

Thirty five parameters depicting IT governance practices were taken spread over five categories. Every category has its own variables asked on dichotomous scale.

The 'Yes' response represents existence of the variable in a sample organization and 'No' represents non-existence of response.

The sum of existence of response over these five categories was taken for each sample. The sample banks were from public, private and cooperative categories. The effort has been made to find out whether the IT governance practices are independent as per the types of banks.

Hence the calculated sum was put on test using Kruskal – Wallis test as follows.

Table No. 2.6
Extent of IT Governance
Result of Hypotheses Testing

Ranks			
	Type of bank	N	Mean Rank
IT governance practices	Public	10	61.35
	Private	3	62.67
	Co-operative	60	31.66
	Total	73	

Table No. 2.7

Test Statistics[a,b]	
	IT governance practices
Chi-Square	21.705
Df	2
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: Type of bank	

Table ranks denotes mean ranks for the IT governance scores bank category wise. Public sector banks received mean rank 61.35, private sector 62.67 and cooperative sector 31.66. The test is significant since the chi-square value is 21.705 at two degrees of freedom and 'p' value is 0.000 signifies that the IT governance practices are dependent as per the type of banks.

The mean rank value signifies that the private sector banks are ahead in IT governance practices followed by public sector banks and last comes cooperative sector banks.

Hence to conclude the discussion on IT governance practices the null hypothesis is rejected and alternative hypothesis i.e. the IT governance practices is dependent on the type of banks has accepted.

3) H_0 - Efficient utilization of IT assets is dependent on IT governance.

There are five focus areas for IT governance. For each area there are some independent parameters. Summing them there are thirty five parameters depicting IT governance practices were taken spread over five focus areas. Every parameter of each area asked on dichotomous scale.

The 'Yes' response represents existence of the parameter in a sample bank and 'No' represents non-existence of response.

The sum of 'Yes' response over these five categories was taken for each sample. Percentage of each area of IT governance was calculated and average of these five percentages is calculated by the researcher. Resulted percentage is supposed as extent of IT governance in the particular bank from public, private and cooperative categories. Table no. ----- shows extent of IT governance in public, private and co-operative sector banks using certain intervals of percentages.

IT assets have clustered into 2 categories. First category is physical assets and second is logical assets. A physical asset covers servers, desktops, printers etc. Logical asset covers all delivery channels and software used by bank.

Table No. 2.8
Extent of IT Governance

Extent of IT Governance (%)					
Type of Bank		Extent of IT Governance Implementation (%)			
		Extent of IT Governance up to 0 to 25%	Extent of IT Governance up to 26 to 50%	Extent of IT Governance up to 51 to 75%	Extent of IT Governance up to 76 to 100%
Public	Count	0	1	3	6
	%	0.0%	10.0%	30.0%	60.0%
Private	Count	0	0	1	2
	%	0.0%	0.0%	33.3%	66.7%
Cooperative	Count	30	14	5	11
	%	50.0%	23.3%	8.3%	18.3%
Total -	Count	30	15	9	19
	%	41.1%	20.5%	12.3%	26.0%

Above table shows that 60 percent public banks have applied 76% to 100% parameters of IT governance out of 35 parameters spread in 5 focus areas of IT governance. Remained 40 percent public banks have applied 26% to 75% out of 35 parameters. All private banks have more than 50% IT governance extent in their banks. Just 1 public bank ranges from 51% to 75% and other 2 ranges from 76% to 100% extent of IT governance.

Out of 60 co-operative banks 30 banks have ranges between 0% and 25%. Further 15 co-operative banks between 26% and 50%. Remained 28 banks applied more than 50% parameters of five focus areas of IT governance.

Pearson correlation is used to test the hypothesis. The test is performed individually for public sector banks, private sector banks and cooperative banks for physical and logical assets separately as follows.

Table No. 2.9
Extent of IT Governance (%) &Utilization of Physical IT Assets
(Public Sector Banks)
Result of Hypotheses Testing

	Servers Utilization hours per day	Desktop Utilization hours per day	No. of daily printouts
Pearson Correlation	.ᵃ	.ᵃ	.913**
Sig. (2-tailed)	.	.	.000
N	10	10	10
**. Correlation is significant at the 0.01 level (2-tailed).			
a. Cannot be computed because at least one of the variables is constant.			

Above table indicates correlation ship between extent of IT governance implementation and utilization of physical assets such as servers, desktop, printers etc. in public sector banks. There is no correlation exist between IT governance extent and Servers Utilization hours per day. Table shows null results because Servers Utilization hours per day not changed. It is almost similar in all banks. The table also indicates no relationship between extent of IT governance implementation and desktop utilization hours per day as working hours of all the public sector banks have very just about same. However, there is strong relationship between extent of IT governance implementation and number of daily printouts taken.(r-.913**; Sig-.000).

Table No. 2.10
Extent of IT Governance (%) &Utilization of Logical IT Assets
(Public Sector Banks)
Result of Hypotheses Testing

	Delivery Channels -No. of daily transactions	Reports of Application softwares			
		Daily	Weekly	Fortnightly	Exceptional
Pearson Correlation	.ᵃ	.855**	.373	.447	.304
Sig. (2-tailed)	.	.002	.289	.195	.393
N	10	10	10	10	10
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					
a. Cannot be computed because at least one of the variables is constant.					

Above table shows that there is no significant relationship between extent of IT governance implementation & No. of daily transactions of delivery channels as all public bank performs daily more than 10000 transactions. Table also indicates strong relationship between extent of IT governance implementation & application software daily reports (Daily- r-.855**; Sig-0.01). There is moderate relationship between extent of IT governance and application software's fortnightly reports (Fortnightly- r - .447; Sig-0.195).

There is weak relationship between extent of IT governance and application software weekly and exceptional reports (Weekly – r- .373; sig - 0.289, Exceptional – r - .304; Sig-0.393).

Table No. 2.11
Extent of IT Governance (%) &Utilization of Physical IT Assets
(Private Sector Banks)
Result of Hypotheses Testing

	Servers Utilization hours per day	Desktop Utilization hours per day	No. of daily printouts
Pearson Correlation	.ᵃ	.ᵃ	1.000**
Sig. (2-tailed)	.	.	.000
N	3	3	3
**. Correlation is significant at the 0.01 level (2-tailed).			
a. Cannot be computed because at least one of the variables is constant.			

Above table indicates correlation ship between extent of IT governance implementation and utilization of physical assets such as servers, desktop, printers etc. in private sector banks. There is no correlation exist between IT governance extent in private banks and Servers Utilization hours per day. Table shows null results because Servers daily Utilization has not different in sample banks. It is almost similar in samples. The table also indicates no relationship between extent of IT governance implementation and desktop utilization hours per day as working hours of all the public sector banks have very just about same.

However, there is strong relationship between extent of IT governance implementation and number of daily printouts taken.(r-1.000**; Sig-0.01).

Table No. 2.12
Extent of IT Governance (%) &Utilization of Logical IT Assets
(Private Sector Banks)
Result of Hypotheses Testing

	Delivery Channels -No. of daily transactions	Application Software			
		Daily	Weekly	Fortnightly	Exceptional
Pearson Correlation	.ᵃ	1.000**	.ᵃ	1.000**	.ᵃ
Sig. (2-tailed)	.	.000	.	.000	.
N	3	3	3	3	3
**. Correlation is significant at the 0.01 level (2-tailed).					
a. Cannot be computed because at least one of the variables is constant.					

Above table shows that there is no significant relationship between extent of IT governance implementation in private banks and no. of daily transactions of delivery channels as all the banks performs daily more than 10000 transactions through delivery channels. Table also indicates no relationship between extent of IT governance and weekly reports, exceptional reports as all 3 sample bank uses application software to generate reports in same range i.e. weekly reports between 40-50 and exceptional reports between 10-15.Further table indicates strong relationship between extent of IT governance implementation & application software daily and fortnightly reports (Daily-r-1.000**; Sig-0.000).

Table No. 2.13
Extent of IT Governance (%) &Utilization of Physical IT Assets
(Co-operative Sector Banks)
Result of Hypotheses Testing

	Servers Utilization hours per day	Desktop Utilization hours per day	No. of daily printouts
Pearson Correlation	.ᵃ	.238	.650**
Sig. (2-tailed)	.	.067	.000
N	60	60	60
**. Correlation is significant at the 0.01 level (2-tailed).			
*. Correlation is significant at the 0.05 level (2-tailed).			
a. Cannot be computed because at least one of the variables is constant.			

Above table indicates correlation ship between extent of IT governance implementation and utilization of physical assets such as servers, desktop, printers etc. in co-operative banks. There is no correlation exist between IT governance extent and Servers Utilization hours per day. Table shows null results because daily utilization of Servers has almost similar in all banks i.e. 24x7. The table also indicates weak correlation between extent of IT governance implementation and desktop utilization hours per day (r - .238; sig. - .067).
However, there is strong relationship between extent of IT governance implementation and number of daily printouts taken.(r-.650**; Sig-.000).

Table No. 2.14
Extent of IT Governance (%) &Utilization of Logical IT Assets
(Co-operative Sector Banks)
Result of Hypotheses Testing

	Delivery Channels -No. of daily transactions	Application Software			
		Daily	Weekly	Fortnightly	Exceptional
Pearson Correlation	.974**	.898**	.878**	.837**	.661**
Sig. (2-tailed)	.000	.000	.000	.000	.000
N	60	60	60	60	60
**. Correlation is significant at the 0.01 level (2-tailed).					

Above table shows that there is strong relationship between extents of IT governance implementation in co-operative banks and no. of daily transactions of delivery channels(r - .974; Sig. - .000) and use of application software reports viz. daily (r - .898; Sig. - .000), weekly (r - .878; Sig.- .000), fortnightly (r - .837; Sig. - .000), exceptional (r- .661; Sig. - .000).
From above tables it has been inferred that there is moderate or strong or weak correlationship between most of the physical-logical assets and extent of IT governance implementation in public, private and co-operative sector banks, hence H₀ is must be accepted to conclude that efficient utilization of IT assets is dependent on IT governance.

4) H_0- **There is inconsistency in aligning IT objectives with organizational objectives in private sector, public sector and cooperative sector banks.**

IT Strategic Alignment addresses the key question–whether a bank's technology investment is aligned to its strategic business objectives, enabling the formation of capabilities necessary to deliver business value. IT strategy provides banks the opportunity to add value to products and services, assist in competitive positioning, reduce costs and improve administrative efficiency, increase managerial effectiveness

Table No. 2.15
Aligning IT Objectives with Bank Objectives

			Type of bank		
			Public	Private	Coop
Have you aligned IT objectives with organization's mission, vision, values?	Yes	Count	10	3	34
		% of Total	100%	100%	56.66%
Is IT strategic plan matches the intent of the enterprise strategic plan?	Yes	Count	10	3	16
		% of Total	100%	100%	26.66%

Above table shows that10 public banks, 3 private banks and 60 co-operative banks responded to this question. It has been observed that 100%public and private banks have aligned IT objectives with bank's mission, vision, values and also matches IT strategic plan with the intent of bank's strategic plan. Whereas out of 60 co-operative banks 56.66% samples have aligned IT objectives with bank's mission, vision, values. Further 26.66% co-operative bank samples have matches IT strategic plan with the intent of bank's strategic plan. Kruskal-Wallis test has been applied to test the hypothesis.

Table No. 2.16
Aligning IT Objectives with Bank Objectives
Result of Hypotheses Testing

IT Strategic Alignment Status: Statistics of hypotheses Testing							
	Type of bank	N	Mean Rank	Chi-Square	Df	Asymp. Sig.	Result
Have you aligned IT objectives with bank's mission, vision, values?	Public	10	24.00	8.630	2	.013	Rejected Null (There is Sig Difference)
	Private	3	24.00				
	Coop	60	39.82				
	Total	73					
Is IT strategic plan matches the intent of the bank strategic plan?	Public	10	15.00	23.669	2	.000	Rejected Null (There is Sig Difference)

Above table depicts the hypothesis testing which intent to assess the relationship between IT objectives with bank's strategic intents. It is found that, using Kruskal-Wallis test the mean-rank for public banks is 24 the same with private banks and co-operative banks has mean rank 39.82. The value of chi-square is 8.63 at 2 degrees of freedom; the 'p' value is 0.013 at 5 percent level of significance.

The null hypothesis is rejected and this shows that alignment of IT objectives with bank's mission, vision and values differs as per the constitution of bank.

The test of hypothesis carried to test the matching between IT strategy plan and intent of bank strategic plan. The Chi-square value of Kruskal-Wallis test is 23.66 at 2 degrees of freedom, the 'p' value is 0.00 rejects null hypothesis and it can be stated that the scenario of IT strategy plan matches with bank's strategic plan differs in public, private and co-operative banks. There is consistency in aligning IT objectives with organizational objectives in private sector, public sector banks. Whereas co-operative banks are inconsistence in aligning IT objectives with organizational objectives.

3. Results of Hypotheses Testing

1) H_0 - IT governance practices in public and cooperative banks are in infancy stage compared to private banks.

Researcher has tested this hypothesis using Kruskal-Wallis test and Bi-nominal test. Kruskal- Wallis test is applied to check if extent of IT governance practices in public, private and co-operative sector banks is contrast or similar. To know the extent of IT governance practices with respect to constitution of banks Bi-nominal test has been used. The test is executed independently for public sector banks, private sector banks and cooperative banks. After the test researcher found that, the null hypothesis is rejected and alternative hypothesis that IT governance implementation in private sector banks and public sector banks is far better compared to IT governance in cooperative banks.

2) H_0 - The extent of IT governance practices is independent on types of banks.

Researcher applied Kruskal – Wallis test to test this hypothesis. After test null hypothesis is rejected and alternative hypothesis i.e. the IT governance practices is dependent on the type of banks has accepted.

3) H_0 - Efficient utilization of IT assets is dependent on IT governance.

Pearson correlation is used to test the hypothesis. The test is performed individually for public sector banks, private sector banks and cooperative banks for physical and logical assets separately.

After testing it has been inferred that there is moderate or strong or weak correlation between most of the physical-logical assets utilization and extent of IT governance implementation in public, private and co-operative sector banks, hence null hypothesis is accepted to conclude that efficient utilization of IT assets is dependent on IT governance.

4) H_0 - There is inconsistency in aligning IT objectives with organizational objectives in private sector, public sector and cooperative sector banks.

Kruskal-Wallis test has been applied to test the hypothesis. The null hypothesis is rejected and this shows that alignment of IT objectives with bank's mission, vision and values differs as per the constitution of bank.

REFERENCES

- C. R. Kothari (2004). *Research Methodology Methods and Techniques*. New Delhi: New Age International (P) Limited, Publishers.
- Cron, W. L. and Sobol, M. G. (1983). The Relationship between Computerization and Performance: A Strategy for Maximizing Economic Benefits of Computerization, Information and Management, 171-181.
- De Haes, S. and Van Grembergen, W, 2004. IT Governance and its Mechanisms. Information Systems Control Journal, Vol. 1, 2004.
- Deolalkar G.H "The Indian Banking Sector On the road to progress" Article from www.fedral.co.in
- Dr. Selig, Gad J. (2008). 'Implementing IT Governance: A Practical Guide to World Class IT Management Using Current & Emerging Best Practices', TCMG 533/MGMT – IT Strategy & Governance Spring.
- Dr.Uppal, R.K. (2011). 'E-Delivery Channels in Banks – A Fresh Outlook', *Researchers World-Journal of Arts Science & Commerce* ISSN: 2229- 46486, Vol.– II, Issue –1,P.182
- Dr.UthayasuriyanK.,&Dr.Kesavan S. (2012). 'Role of IT in Banking Sector', *Research journal of commerce &behavioral science*, Volume: 01, Number: 10.
- DuyyuriSubbarao (2013), Banking Structure in India Looking Ahead by Looking Back1, FICCI-IBA Annual Banking Conference in Mumbai.
- Elena Beccalli (2007). Does IT investment improve bank performance? Evidence from Europe, *Journal of banking Finance*, 2205-2230

Information Technology Policy for Banks

Dr. Kishori Sachin Pawar[1], Dr. R. D. Kumbhar[2]

[1]Assistant Professor, MKSSS's College of Computer Application for Women, Satara, Maharashtra, India
[2]Assistant Professor, Rayat Shikshan Sanstha's KBPIMSR, Satara, Maharashtra, India

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Abstract - *Based on the study undertaken on IT governance in banks in Western Maharashtra, it is found that there is ample scope for implementation of IT governance in terms of its usage for efficient and effective use of IT assets. Hence, it is suggested that banks should provide attention on IT governance implementation. Standard IT Governance framework would enable a bank to perform its business in an orderly and effective manner improves the customer service and aid in its own survival and growth.*

Key Words: Information Technology, IT Governance, IT Policy, Hardware/Software Acquisition, Security etc.

1. INTRODUCTION

Banks extensively depend on Information Technology (IT) to execute its mission and provide services to the customers and banks' business partners. Information Technology policies are an essential requirement to sound IT usage and IT Security.   They are designed to preserve the confidentiality, integrity, availability, and value of IT assets, as well as ensure the continued delivery of services. They also establish the appropriate focus and standards for acceptable IT practices across an organization. This policy is based on IT Act guidelines and highlights banks' goals and requirements for protecting its IT assets.

All bank components must comply with the basic requirements of this policy and its associated operational standards and technical documentation.

1.1 Purpose

Every organization that uses computers, email, internet and software on a daily basis should have information technology (IT) policies in place. It is important for employees to know what is expected and required from them when using the technology provided by their employer, and it is critical for a company to protect itself by having policies to govern areas such as personal internet and email usage, security, software and hardware inventory and data retention. It is also important for the business owner to know the potential lost time and productivity at their business because of personal IT usage.

Without written policies, there are no standards to reference when both sticky and status quo situations arise.

1.2 IT policy areas

IT policy address following areas:

1. **Acceptable Use of Technology**: Guidelines for the use of computers, fax machines, telephones, internet, email, and voicemail and the consequences for misuse.
2. **Security**: Guidelines for passwords, levels of access to the network, virus protection, confidentiality, and the usage of data.
3. **Disaster Recovery**: Guidelines for data recovery in the event of a disaster, and data backup methods.
4. **Technology Standards**: Guidelines to determine the type of software, hardware, and systems will be purchased and used at the company, including those that are prohibited (for example, instant messenger or mp3 music download software).
5. **Network Set up and Documentation**: Guidelines regarding how the network is configured, how to add new employees to the network, permission levels for employees, and licensing of software.
6. **IT Services**: Guidelines to determine how technology needs and problems will be addressed, who in the organization is responsible for employee technical support, maintenance, installation, and long-term.

Purpose of IT policy is to set direction and provide information about acceptable actions and prohibited actions or policy violations.

Guidelines are created and provided to help organization, branches and individuals who are part of bank community to understand how bank policy applies to some of the significant areas and to bring conformance with stated policies.
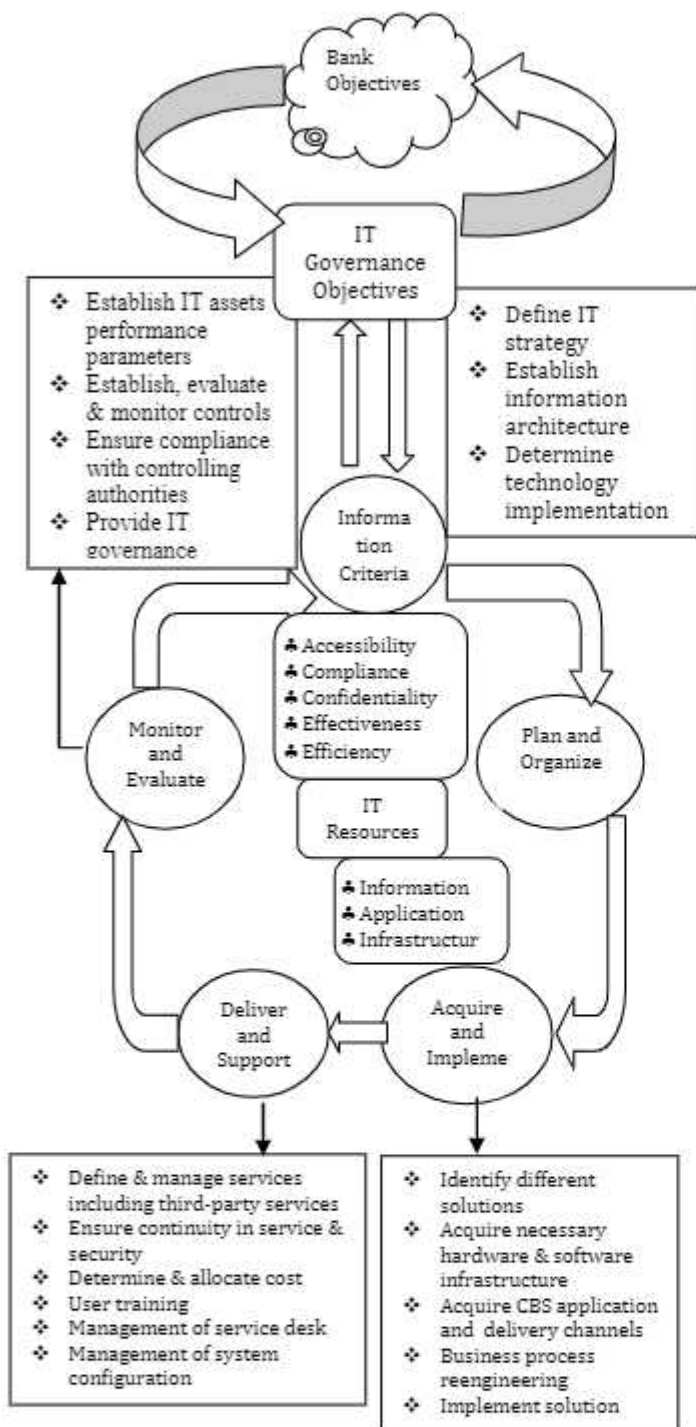

Fig -1: IT Governance Framework

2. CLASSIFICATION OF IT POLICY

IT policies may be classified into following groups:
1. Hardware Acquisition, Installation and maintenance Policy
2. Software Acquisition, Installation, maintenance and Licensing Policy
3. Network (Intranet & Internet) Use Policy
4. Security Policy
5. IT usage Policy

2.1 Hardware Acquisition, Installation and Maintenance Policy

Steering committee prepare hardware requirement schedule for necessary hardware in consultation with technical advisor.

Bank should acquire required hardware of reputed brand by using standard purchasing method suggested by state government and RBI.

Hardware required for HO and branches is purchased at HO level. In case of emergency branches purchase hardware and peripheral items by taking permission of HO. (The price of said purchases should not exceed RS._____ per month)

Purchased material will be verified through technical consultant if any deficiencies observed at the time of inspection. The deficiencies will be communicated to vendor and necessary action as per purchase order terms will be taken by Head Office.

Bank should make maintenance agreement with reputed and authorized vendors only.

Terms and conditions of maintenance contracts are decided at HO level in consultation with IT department of a bank and technical consultant of a bank.

2.2 Software Acquisition, Installation, Maintenance and Licensing Policy

It is the policy of banks to manage its software assets and to ensure that banks installs and uses only legal software on its PCs (including portables) and servers. Banks will take all steps necessary to prohibit its users from duplicating any licensed software or related documentation for use either on bank premises or elsewhere unless bank is expressly authorized to do so by agreement with the licensor. Unauthorized duplication of software may subject users and/or bank to both civil and criminal penalties under the IT Act. Bank must not permit any employee to use software in any manner inconsistent with its applicable license agreement, including giving or receiving software from clients, contractors, customers and others. It is the policy of the bank to acquire copy, distribute, transmit and use software in accordance with the software management policies of the bank and the terms and conditions in any license agreement accompanying a particular software product.

2.3 Network (Intranet & Internet) Use Policy

Bank offers employees access to its bank computer network and the Internet for only official work assigned to respective employee.

If you or anyone you allow to access your account (itself a breach of this policy) violate this policy, your access will be denied or withdrawn. In addition, you may be subject to disciplinary action, up to and including termination.

2.4 Security Policy

A Security policy includes the overall importance of security within the organization, identifies what is being protected, identifies key risks and mechanisms for dealing with those risks and provides for on-going and regular monitoring and feedback to ensure the polices are enacted and enforced. Regular updates are needed to reflect changing business needs and practices. The policy enumerates the roles and responsibilities of all information systems users for protecting the confidentiality, availability and integrity of information assets.

2.5 IT Usage Policy

All members of the bank community are obligated to use bank's IT resources in accordance with applicable laws, with Bank policies (including its work policy, and its standards of honesty and personal conduct), and in ways that are responsible, ethical, and professional. Recognizing the need to ensure the preservation and availability of the official records of the Bank for legal, administrative, and historical purposes, the bank has adopted the following archival policy.

All records generated or received by the various branches. Administrative and Head offices of the Bank in the conduct of their business, regardless of the form in which they are created and maintained, are the property of the Bank and constitute archival material. The records covered by this policy include official printed material, correspondence, machine-readable files, record books, minutes, committee files, financial records, and associated papers.

All branches, administrative officers of the bank and Officers of the HO, as well as those members of the staff who, by virtue of administrative responsibilities either of a continuing or occasional nature, possess files, records, or documents relating to their official duties, are requested to observe the following regulations:

The use of bank's IT resources is restricted to Bank business and incidental personal use. Incidental personal use may not interfere with bank work, nor may it result in additional direct cost to bank. Bank's computers and other IT resources must be used in a manner consistent with bank's status as professional financial Institution, and so, for example, cannot be used for the benefit of personal businesses or other organizations unless permitted by bank policy. Unauthorized access to and use of bank's IT resources violates this policy

3. CONCLUSIONS

It is concluded that, the study throws light on status of IT governance implementation, impact of IT governance and problems faced by banks while IT governance implementation. Many direct and indirect factors affect on the progress of IT governance implementation in banks in general and banks under study in particular.

The analysis of the data pertaining to IT governance implementation clearly indicates that there is an ample scope for furthering IT governance implementation. The study reveals that It governance implementation in private and public bank is satisfactory but IT governance implementation in co-operative banks is infancy stage, because of lack of top management awareness about IT governance.

IT governance implementation in banks would greatly influence by involvement of top level management and may expand vertically and horizontally to ensure all the business requirements. This could happen only when –

- Top management associates themselves as IT user
- IT objectives are clearly defined
- Adoption of IT strategy/policy and furthering as per technology and business changes
- Establishes separate IT department with required qualified professionals
- Business processes are reengineered

Besides above mentioned factors the involvement of regulatory agencies with mandatory and minimum standards in terms of technology governance would also work as driving force. The study carried out on selected banks clearly indicates that there is an urgent need to act and deploy standard IT governance framework which could cover all areas of IT governance activities under one umbrella. The suggested IT Policy is based on the study would probably provide a roadmap for banks and put the IT as a business driver rather than business enabler.

REFERENCES

[1] Panduleni, E. Ndilula (2008). 'IT Governance as Requirements and Status of Implementation in Namibia', Thesis for Master of Information Technology at the Polytechnic of Namibia.

[2] Dr.UthayasuriyanK.,&Dr.Kesavan S. (2012). 'Role of IT in Banking Sector', *Research journal of commerce &behavioral science*, Volume: 01, Number: 10.

[3] Cron, W. L. and Sobol, M. G. (1983). The Relationship between Computerization and Performance: A Strategy for Maximizing Economic Benefits of Computerization, Information and Management, 171-181.

[4] Calder Alan &Warkins Steve (2006). 'IT Governance: A Manager's Guide to Data Security & BS 7799/ISO 17799', Kogan Page, 3rd Edition.

[5] Ahluwalia, Montek S (2002). Economic Reforms in India since 1991: Has Gradualism Worked?, Journal *of Economic Perspectives*, Vol.16, Issue 3) (Pg67-88)

[6] Sharma, M. C. & Sharma Abhinav (2012),'Role of Information Technology in Indian Banking Sector' *SHIV SHAKTI International Journal in Multidisciplinary and Academic Research*, Vol. 2, No. 1.

BIOGRAPHIES

Dr. Mrs. Kishori S. Pawar
M.C.M, M.C.A, M.Phil, Ph.D
Assistant Professor
MKSSS's College of Computer Application for Women, Satara, Maharashtra, India.
Work Experience – 12 Yrs.

A CONCEPTUAL STUDY OF DEPRECIATION IN FIXED ASSET ACCOUNTING

Mrs. Archana Kulkarni

Abstract:

In a business or organization, Depreciation is the important part of Financial Statement which helps company to maximise profit.

Depreciation is the process of allocating cost to an asset over its complete life. This allocation is done in a way that the cost of the asset is charge to the accounting period during the economic life of the asset and decreases the net value of the fixed asset.

The research objective of the paper is to understand the selected methods of depreciation in fixed asset accounting. The study is also providing suggestions about depreciation recording in financial statements.

Keywords – Financial Statement, Depreciation, Fixed Asset

Introduction:

Depreciation- Meaning and Definition:

The depreciation term is found on both the income statement and balance sheet. On the income statement, it is listed as depreciation expenses and on the balance sheet; it is listed as accumulated depreciation.

Depreciation is the cost of the fixed asset used up in the period. This must be treated as cost or expenses transferred to income statement; otherwise the profit will not be correctly assessed.

Depreciation is calculated on fixed assets and current assets. Deprecation is the fall in the price of asset and this fall is shown in the accounts as provision for depreciation.

International Accounting Standard 4 (IAS 4) defines depreciation as "The systematic allocation of the depreciable amount of an asset over as its useful life"

From the above definition explanation of the terms :

- Systematic allocation means that the depreciation is charged according to a consistent policy and method.

- The depreciable amount of an asset is the value which is systematically allocated over the useful life of asset.

- Useful life of an asset is the period over which an asset is expected to be utilized.

- Depreciation caused by wear and tear is called ordinary depreciation.

- The depreciation which represents total depreciation to data on fixed assets is called Accrued Depreciation.

- The depreciation calculated on one asset is called Unit Depreciation.

- When asset's service life terminates then the depreciation of asset is called Complete Depreciation.

- Depreciation Accounting is the mathematical process of distributing the cost of an asset over the various accounting period.

Fixed Asset- Meaning and Definition:

Fixed assets are tangible assets which are used to generate income.

Financial Accounting Standard Board (FASB) defines Assets as "Probable future and economic benefits obtained or controlled by a particular entity as a result of past transactions or events."

Fixed assets are assets that are held by a firm for use in the production or supply of goods and services, and not intended for sale with the ordinary course of business.

Fixed assets also referred to as long term assets are often divided into tangible and intangible categories.

- Tangible Assets: tangible assets are fixed assets that have physical existence and can be seen. For example: Land, Building, Equipment etc.

- Intangible Assets: Intangible assets are fixed assets that haven't physical existence. For example: Goodwill, Patents etc.

- Natural Resources: Natural Resources are fixed assets which must be depletion during a specific period. For example: Mines of Gold, iron coal etc.

Fixed Asset Accounting is the system of accounting which aims at distributing cost or other best value of tangible assets. A company or firm uses fixed assets to run its business

since they are used overtime, the function of the fixed assets got declined as well as their value. This declined value of the fixed assets is called Depreciation.

Objective of study:

1. The main objective of this paper is to review the selected methods of depreciation & practices in relation to depreciation and fixed asset.
2. To recognize the effects of theoretical approach for providing depreciation on fixed assets.

Research methodology:

The research methodology which is used during the study is based on exploratory method.

Prospects of study of Depreciation:

Depreciation expenses are not visible expenses like other expenses. Depreciation is a fall in the value of asset. Depreciation treated as expense and transferred to profit & loss statement, otherwise the profit will not be correctly assessed.

1. Depreciation means conclusion of the cost of the fixed asset during the period for which accounts are being prepared.
2. To show the fixed asset at their original worth in the balance sheet. Due to wear and tear, the value of the assets is much less. Depreciation therefore must be accounted in order to present the assets at their proper value
3. When depreciation charge to profit and loss statement an equal amount is either retained in the business or invested outside the business. When the useful life of an asset comes to an end, a new asset can be purchased by using the resources available in the business
4. While calculating tax depreciation is deductible from income hence depreciation is computed and charged to profit and loss statement to reduce tax liability, as per the Indian income tax act,
5. Indian Companies Act, 2013, Section 123(1), requires every company to provide depreciation on fixed asset before declaring dividend on its share holders. Depreciation is provided on fixed assets to fulfil with the provisions of law apart from Income Tax Act

Methods of depreciation:

There is a wide variety of depreciation methods in use and all these methods are based on certain implicit though they all seek to distribute the cost the asset over its useful life. Various methods are used by companies to calculate depreciation

1. Straight Line Method or Fixed Instalment Method
2. Written Down Value Method or Diminishing Balance Method
3. Annuity Method
4. Depreciation Fund Method or Sinking Fund Method
5. Sum of Digits Method
6. Revaluation Method
7. Depletion Method
8. Machine Hour Rate Method

Depreciation methods used in this short research:

This research paper deals with selected methods of depreciation with their merits and demerits so that a firm or company is in a position choose the best method.

1. Fixed Instalment or Straight Line Depreciation Method:

Straight line depreciation method charges cost evenly throughout the useful life of a fixed asset. This method is appropriate where economic benefits from an asset are expected to be realized evenly over its useful life. Under this method, depreciation is calculated as difference in the original cost over its residual value and this value is divided by the number of its useful life.

Merits:

- Under this method, the value of the asset at the end will be scrap value.
- The amount of depreciation if transferred to profit and loss statement is same for all years.

Demerits:

- There is no provision for replacement of asset in the company.
- It is difficult when new asset is purchased during a year.

Fixed instalment method of depreciation is applied in case of those assets which have small value or which do not require many repairs and renewals e.g. short lease

2.   **Written down value method :**

Under the written down value method, while calculating depreciation, the amount charged for depreciation declines over the assets expected life. Depreciation at a certain rate is applied to the written down value of the asset as at the beginning of each year. Under this method, the depreciation amount charged every year is an amount less than the previous year.

Merits:

- There is no need for fresh calculations in case there is an addition to the asset, unless such addition is made in the middle of the year.

Demerits:

- Under this method, it is quite difficult to find out exact rate of depreciation.
- It does not consider the question of interest on the capital outlay involved.

Written Down Value method of depreciation is most suited to plant & machinery where additions and extensions take place so often and where the question of repairs is also very important. This method does not suit in the case of lease, whose value has to be reduced to zero.

3.   **Annuity method:**

Under this method a constant annual charge for depreciation is credited to the asset account during the useful life of asset, less scrap value, if any. The cost of the asset is regarded as providing an allowance during its life, the value of allowance being the annual charge for depreciation.

Merits:

- This method takes interest on capital invested in the asset into account
- It is regarded as most exact and precise from the point of view of calculations; and is therefore most scientific

Demerits:

- When the asset requires frequent additions and extensions, the calculation have to be changed frequently, which is very problematic
- The burden of profit and loss account goes on increasing with the passage of time where as the amount of depreciation remains constant

Annuity method of depreciation is best suited to those assets which require considerable investment and which do not call for frequent additions e.g. long lease

4.   Depreciation Fund /Sinking Fund Method:

Under this method, a fixed amount of depreciation is charged for every year of the estimated life of asset and a fixed rate of interest is calculated on the same amount has been invested in some other form of capital investment. This method arranges for funds to be available for the replacement of assets at the end of its useful life. The method involves the investment of cash outside the businesses. The amount of depreciation is charged with the help of sinking fund table.

Merits:

- Sinking fund method helps to build up financial position of a concern.
- Sinking fund method makes available a sum of money for the replacement of asset by maintaining separate provision.

Demerits:

- The market value of investment may rise or fall due to inflation of which the realised value may differ noticeably.
- Sinking fund method create difficulty due to frequent investment.

Sinking Fund Method of depreciation is suitable wherever it is desired not only for machinery and other wasting assets.

Data Collection:

The study is based on secondary data. This data has been collected through various articles research paper, subject related books & world wide web

Research paper:

1.   'Review of Accounting Gimmicks Called Depreciation'
      Author: Onojah Attah Larence, Unegbu Angus Okechukwu.

2.   'Effects of Depreciation Methods on Performance Measurment Methods'
      Author: Huseyin Mert, Sema Erkiran Dil

3.   'Accounting for fixed Assets And Depreciation'
      Author: Saoud Chayed Mashkour.

4.   'Dpreciation Methods and Life Cycle Costing Methodology'

Author: Konstantinos J. Liapis, Dimitrios D. Kantianis.

www.accoungdetails

www.shodganga

All other material published on financial accounting on website.

Literature review is also needed for understanding the nature of the research topic deeply.

The literature review for the present study is as follows:

1. Advanced Accounts by M. C. Shukla and T. C. Greval.

Conclusion & findings:

- Different methods give different outcomes on the financial statements. An organisation needs to understand and appreciate the effects of the depreciation.

- A company adopts a constant policy in the choice of depreciation method so that the firm's performance can be analyzed periodically.

- Company sometimes fluctuate their depreciation charges in order to smooth periodic profit.

- In company any additions to fixed asset during the period, the depreciation applicable to the additional amount should be separately disclosed with the date addition in annual report.

- If a company adopts more than one method for charging depreciation, the separation of asset should be clearly stated with the name of method used.

- If a company adopts different methods of depreciation for same class of asset because of location of usage. Therefore the company should clarify the reasons behind it.

- If a company charges higher rate of depreciation, the reason should be clearly stated in annual report.

- As per current trends, the most commonly used method for depreciation is Straight Line Method or Fixed Installment Method. This method is the simplest to calculate depreciation and reflects the consumption of the asset.

A Comparative SEO Techniques Analysis on core WebPages and its Effectiveness in Context of Google Search Engine

Prof. Seema Patil

Assistant Professor
College Of Computer Application for Women, Satara, Maharashtra, India

Abstract: In digital era, internet is one of the most important source of informationin almost all spheres of our life.In the world of Information technology, internet is the primary source to search desired information. Among various browsers, GoogleChrome is one of the most popular web browser used in India.When user searches for particular information on browser then Google search engine displays billions of related web pages available to that particular information (i.e.SERP).so to appear website on first page of SERP (Search Engine Result Pages), every page of developed website should follow SEO techniques. This research papers explains a comparison of web pages of two different websites to check whether these web pages developed are as per SEO techniques properly and its Effectiveness in Context of Google Search Engine.To appear on 1st page of SERP ,which essential SEO techniques/parameters they should follow, which updations they need to do,which things they need to improve,how they should ranked up as compare to others and in future new website developer what need to do so their clients website should appear on 1st page of SERP and keep rankedup.

Keywords: Google Search Engine,SEO Techniques,SERP, Ranking, webpages, analysis

I. INTRODUCTION

Websites are used to advertise any product or services. Every business, university, multinational companies, institutes, colleges, schools, social medias have their own websites. In order to make growth in everyfield, it is necessary to reach at maximum customers /viewers which is possible only because of launching websites on internet. The main objective of any website is to list at the top of all the links i.e.to appear on the 1st page of SERP of Google search engine.Search Engines which are used to find any information across internet [1]. So to appear on 1st page of SERP's, Google SEO techniques need to be used very carefully.

In order to make comparative analysis and to check whether SEO techniques are used properly or not, two international school websites are taken into consideration. From these websites, thoseweb pages which are common in both websites and mostly viewed by visitors are analyzed.

PaperStatement: ThisResearch Paper provides the comparative analysis of core web pages of two different websites which uses Search Engine Optimization techniques. If SEO techniques are properly used that can help to improve the ranking of a website otherwise to get more number of viewers or to increase visibility of a website, websites needs to improve themselves.

Purpose and Motivation:
Lots of websites are available on internet. Some are ranked up on SERP and some are not.To appear website on 1st page of SERP ,analyze which essential SEO techniques/parameters they should follow, which updations they need to do,which things they need to improve, how they should ranked up as compare to others and in future new website developer what need to do so their clients website should appear on 1st page of SERP and keep ranked up

II. SEARCH ENGINE OPTIMIZATION(SEO)TECHNIQUES/METHODS

SEO techniques can be classified into two categories.
These techniques are more effective to improve the ranking of a website in the context of Google search engine if
Implemented in the right way:
1. On Page Optimization
2. Off Page Optimization [2].

Table 1.On page optimization

Techniques	Description	Techniques	Description
Page Title	Atitletagis the HTML element used to specify the title of a webpage. Its primary job is to tell visitors and search engines what they can expect from the web page. Make sure all title tags are unique and exist on all pages. It should accurately describe what the page is about. Your finished title tag should not exceed 50–60 characters otherwise Google starts cutting off title tags in the SERPs after around 50–60 characters so Keep it short and sweet. Include your primary keyword in the title tag.[3]	Heading Tags	Heading tags are tags used to identify headings and subheadings within your content from other types of text (e.g., paragraph text). HTML has six different heading tags h1 To h6 .*The h1 is an HTML tag that indicates a heading on a website*. The h1 is considered the most important tag, and the h6 is the least important. H2-H6 are optional tags to organize the content in a way that's easy to navigate.[6][7]
Meta Description	The meta description is the short paragraph of text placed in the HTML of a webpage that describes its content. The meta description will then appear under your page's URL in the search results. This is also known as a snippet. Meta description should be a normal, human-written sentence along with most important keywords.A meta description should be no longerthan 135 – 160 characters long. The meta descriptions must be written differently for every page. You can add elements to the snippets to increase their appeal. For instance: star ratings, customer ratings, product information, calorie counts etc.[4]	Image Alt Attribute	Image alt attributes are used within an HTML code to describe the appearance and function of an image on a page. Image Alt Tag provides a text alternative for search engines to describe the image more specifically as possible. Keep your alt text fewer than 125 characters.Don't start alt text with "picture of..." or "Image of..."[8][9]
Meta Keywords	Meta keywords are types of meta tags in the HTML source code of a webpage. They describe the content of a website shortly and concisely, and are therefore important indicators of a website's content to search engines. The keywords are generally written in lower case, and separated with a comma.[5]		

Table 2.Off page optimization

Techniques	Description	Techniques	Description
Site Map Page	A sitemap is a blueprint of your website that help search engines find, crawl and index all of your website's content. Sitemaps also tell search engines which pages on your site are most important.Search engines like Google, Yahoo and Bing use your sitemap to find different pages on your site.From SEO standpoint, Every website should have a sitemap. Sitemaps are not only useful for search engines but also for all those users	Link Building	Link building is a process of building or creating the linkin order to improve the ranking of your website. You can build external links a well as internal links. By using external links you able to links other social media websites and by using internal links you able to traverse through your webpages of your own website. Your link free or by paid some amount also. Like-**Google** Adwords, where you need to pay some amount to advertise your website.[2]

	looking for a particular page on your website.[10][11]		
Social Networking Sites	Social Networking sites are one of the effective ways to improve the ranking ofa website. Social Networking sites like facebook, Twitter, instagram, YouTube are very popular to advertise your website by sharing your content on these sites where lots of people will visit/link to it, and links are a very important **SEO** ranking factor.	Blogging	A blog is a discussion or informational website. It is managed by individuals whosharetheirviews,experiences,guidelines etc.Googlealsoproviding the blog facility. You cancreate a blog and upload the link of yourwebsite for any queries to the user. They will contact to your website andmay help to improve the searching of yourwebsite. Posts are typically displayed in reverse chronological order, so that the most recent post appears first, at the top of the web page

III. WORKING AND COMPARATIVE ANALYSIS

Two international school websites are taken here for comparative analysis.
  A) American School of Bombay
      Website URL- https://www.asbindia.org

  B) Podar international school Mumbai
      Website URL-https://podarinternationalschool.com

Both these schools have their own websites.so compare these websites according to Google SEO techniques. From these websites, those webpages which are common in both websites and mostly viewed by visitors are analyzed.
  Web Pages taken for comparison are

  1) Home page 2) Admission page 3) Co-curricular page 4) Contact Us page

Table 3.Comparative Analysis using SEO Techniques of ON page optimization

Web page	SEO Technique Used	A) American School of Bombay	B)Podar international school Mumbai
Home Page (ON Page Optimization)	Page Title	<title>American School of Bombay – Mumbai's Best International School</title>	<title>Best International Board School in Santacruz - Mumbai | Podar International School<\title>
		Total Characters- 62	Total Characters-46
		Recommended characters are 50 to 60	
	Meta description	<metaname="description" content="American School of Bombay is the best international school in Mumbai, India. It offers international IB Primary Years and Diploma Programs and American High School Diploma accredited by the Middle States Association of Colleges and Schools (USA).">	<metaname="description" content="Podar International School is one of the Top international board schools in Santacruz - Mumbai. We provide a stimulating, safe and supportive environment along with the opportunities for all our students to reach the best levels of achievement. For more information call us 022- 26001311."/>
		Total Characters :- 246	Total Characters-288
		Recommended characters are 135 to 155	
	Meta keyword	<meta name="keywords" content="International college preparatory school Mumbai, International high school Mumbai, International middle school Mumbai, International elementary school Mumbai, Expat school mumbai">	Keywords not used
		Total keywords- 5	Total keywords- 0

	Heading Tag	<h2class="fsElementTitle">Dream Learn Serve</h2> <h4>COMMUNITY</h4> <h6>Elementary Campus</h6>	<h2style="fontsize:28px;color:#cc9966;">Accreditations</h2> <h3><ahref="https://podarinternationalschool.com/ibdp-results-of-may-2019-exam-session/">Podar International School students qualify for MakeX National Championship.</h3>
		Use of h1 tag recommended.h1 tag not used on both webpages of websites.	
	Image Alt Attribute	<imgalt="AmericanSchoolofBombay"width="267"src="/uploaded/themes/default/images/logo.png">	<imgwidth="150" height="100" src="https://podarinternationalschool.com/wpcontent/uploads/2019/10/MakeX-new-150x100.png" class="attachment-rdtheme-size5 size-rdtheme-size5 wp-post-image" alt="BasseimSiddiqui and Aarav Parikh"/>
		Alt text characters=25 provides a text alternative for search engines to Describe the image more specifically. Image is used for logo and text specifies alternative text for image	Alt text characters=37provides a text alternative for search engines to Describe the image more specifically. Exam name given as Image name and text specifies alternative text for student's image who clears exam.
Admission Page(ON Page Optimization)	Page Title	<title>Admissions at American School of Bombay</title>	<title>Best IB Board School in Santacruz - Mumbai	Podar International School<title>
		Total Characters- 39	Total Characters- 71
		Recommendedcharacters are 50 to 60	
	Meta description	<meta name="description" content="The American School of Bombay has a "rolling admission" process which means students may enroll at any time during the school year. Read on for detailed information.">	<meta name="description" content="Podar International School is one of the top International Baccalaureate (IB) Schools in Santacruz – Mumbai which is known for its perfection in teaching. For more information call us on 022- 26001311."/>
		Total Characters :- 165	Total Characters- 201
		Recommended characters are 135 to 155	
	Meta keyword	<meta name="keywords" content="Admissions, American School of Bombay">	Meta keyword Not used
		Total keywords- 2	Total keywords- 0
	Heading Tag	<h2 class="fsElementTitle">Horizontal Tier Navigation</h2> <h2 class="fsElementTitle">Landing Hero Slider</h2> <h4>ABOUT</h4>,h4>LEARNING</h4>,	<h2>Details Required for Admissions:</h2>
		Use of h1 tag recommended.h1 tag not used on both webpages of websites.	
	Image Alt Attribute	<imgalt="American School of Bombay" width="267"src="/uploaded/themes/default/images/logo.png">	<imgsrc="https://podarinternationalschool.com/wpcontent/uploads/2019/11/Podar-International-School-Logo.png" alt="Podar International School">
		Alt text characters=25 provides a text alternative for search engines to Describe the image more specifically. Image is used for logo and text specifies alternative text for image	Alt text characters=26provides a text alternative for search engines to Describe the image more specifically. Image is used for logo and text specifies alternative text for image

Co-Curricular Page (ON Page Optimizatio n)	Page Title	`<title>Co-Curricular - American School of Bombay</title>`	`<title>Co-Curricular - Podar International School</title>`
		Total Characters- 41	Total Characters- 42
		Recommendedcharacters are 50 to 60	
	Meta description	`<meta name="description" content="Co-Curricular - American School of Bombay">`	not given
		Total Characters :- 41	Total Characters-0
		Recommended characters are 135 to 155	
	Meta keyword	`<meta name="keywords" content="Co-Curricular, American School of Bombay">`	not used
		Total keywords- 2	Total keywords- 0
	Heading Tag	`<h1 class="fsPageTitle">Co-Curricular</h1>` `<h2 class="fsElementTitle"><a role="tab" aria-selected="false" aria-expanded="false" href="#fs-panel-2054">Elementary Student Life</a></h2>` `<h2 class="fsElementTitle"><a role="tab" aria-selected="false" aria-expanded="false" href="#fs-panel-2057">MS and HS Athletics & Activities</a></h2>` `<h4>LEARNING</h4>`	`<h1 class="entry-title">Co-Curricular</h1>` `<h2><span style="font-size: 28px"><strong>Co-Curricular Activities</strong></span></h2>` `<h2 style="color:#003399;">Connect With Podar</h2>` `<h3 class="rtin-content mt-3rem"><span style="font-size: 20px"><strong>ROBOTICS</strong></span></h3>` `<h3 class="rtin-content mt-3rem"><span style="font-size: 20px"><strong>STEM EDUCATION</strong></span></h3>`
		h1,h2,h4 tags are used	h1,h2,h3 tags used
	Image Alt Attribute	`<imgalt="American School of Bombay" width="267"src="/uploaded/themes/default/images/logo.png">`	`<imgclass="alignnone wp-image-4258 sizefull"src="https://podarinternationalschool.com/wpcontent/uploads/2019/11/Co-cirricular-Acitivites-1.png" alt="" width="1166" height="378" />`
		Alt text characters=25 provides a text alternative for search engines to Describe the image more specifically Image is used for logo and text specifies alternative text for image	Alt attribute is not used
Contact UsPage (ON Page Optimizatio n)	Page Title	`<title>International School in Mumbai</title>`	`<title>Contact Us - Podar International School</title>`
		Total Characters- 30	Total Characters- 39
		Recommendedcharacters are 50 to 60	
	Meta description	`<meta name="description" content="American School of Bombay is a top international school in Mumbai that offers Pre-K through Grade 12. Students from than 50 countries study American and IB Curriculum at ASB.">`	not given
		Total Characters :- 174	Total Characters :- 0
		Recommended characters are 135 to 155	
	Meta keyword	`<meta name="keywords" content="Our Campuses, American School of Bombay">`	not used
		Total ketwords-2	Total ketwords-0
	Heading Tag	`<h1 class="fsPageTitle">Our Campuses</h1>` `<h2 class="fsElementTitle"><a role="tab" aria-selected="false" aria-expanded="false"`	`<h1 class="entry-title">Contact Us</h1>` `<h2>Leave a Message</h2>` `<h2 style="color:#003399;">Connect With Podar</h2>`

		href="#fs-panel-8990">Early Childhood Campus</h2> <h2 class="fsElementTitle">Elementary Campus</h2> <h3>Addresses</h3> <h4>ABOUT</h4>	<h3 class="widgettitle">Our School Philosophy</h3> <h5 class="modal-title" id="exampleModalLabel">Virtual Tour</h5>
		h1,h2,h3,h4 tags are used	h1,h2,h3,h5 tags used
	Image Alt Attribute	<imgalt="American School of Bombay" width="267"src="/uploaded/themes/default/images/logo.png">	<imgsrc="https://podarinternationalschool.com/wpcontent/uploads/2019/11/Podar-International-School-Logo.png" alt="Podar International School">
		Alt text characters=25 provides a text alternative for search engines to Describe the image more specifically. Image is used for logo and text specifies alternative text for image	Alt text characters=26provides a text alternative for search engines to Describe the image more specifically. Image is used for logo and text specifies alternative text for image

Table 4.Comparative Analysis using SEO Techniques of OFF page optimization

Web page	SEO Technique Used	A) American School of Bombay	B)Podar international school Mumbai
OFF Page Optimization	Social media networking	<ahref="https://www.facebook.com/americanschoolbombay" target="_blank">Facebook <ahref="https://twitter.com/ASBIndia"target="_blank">Twitter <ahref="https://www.flickr.com/photos/45394362@N03/sets"target="_blank">Flickr Instagram <ahref="https://in.linkedin.com/school/americanschoolofbombay/" target="_blank">LinkedIn 	<ahref="https://www.facebook.com/PodarIBSantacruz" target="_blank" class="vc_single_image-wrapper vc_box_border_grey"> <iframeclass="podaryoutubeVideo" src="https://www.youtube.com/embed/5azt3hmU1yY?autoplay=0&showinfo=0&loop=0&rel=0" frameborder="0" allow="accelerometer; autoplay; encrypted-media; gyroscope; picture-in-picture" allowfullscreen></iframe> <ahref="https://instagram.com/podarinternationalschoolib/" target="_blank" class="vc_single_image-wrapper vc_box_border_grey">
		Social media used are Facebook, Twitter, Flickr, Instagram, LinkedIn, YouTube	Social media used are facebook,YouTube, Instagram
	Site Map page	Site Map	Site map not given
	Blogging	Blog not given	Blog
	Link Building	Internal links-30 External links-6 Backlinks-3607	Internal links-46 External links-3 Backlinks-217

Table 5.Website Reviews

Website Reviews	A) American School of Bombay	B)Podar international school Mumbai
Website Reviews	asbindia.org March 15, 2020 7:31 PM Passed To improve Errors **56**	podarinternationalschool.... March 15, 2020 7:30 PM Passed To improve Errors **61**

IV. AFTER COMPARATIVE ANALYSISRESULTS AND DISCUSSION

On Page Optimization:

A)   Home page :

1) *Page Title– The title tag have* Recommended characters between 50 to 60.so both websites need to follow these rage. So search engine robotics algorithm can get right signals from webpages as well as visitors easily found page which they desired.

2) *Meta Description*-The Mata Description tag haveRecommended characters are 135 to 160.Both website's homepage have description above range. The meta description will then appear under your page's URL in the search results.so only those characters below 160 will be displayed on SERP and remaining will not be displayed.Home page of American School of Bombay use some important keywords. Home page of Podar International School Mumbai not used some important keywords.

3) **Meta Keywords**- keywords are important indicators of a website's content to search engines.so search engine can easily able to find your webpage in crawling.Home page of American School of Bombay use 5 important keywords. Home page of Podar International School Mumbai not used some important keywords.

4) **Heading Tags**-Use of h1 tag recommended.h1 tag not used on both webpages of websites.The h1 is an HTML tag that indicates a heading on a website. The h1 is considered the most important tag.

5) **Image Alt Attribute**- Image Alternative text will not exeed more than 125 characters.home page of both websites have characters less than 125,Home page of American School of Bombay use Img alt attribute for logo image and it's text only.whereas Home page of Podar International School Mumbai used image of students who cleared exam and alternative text is given studen's name who cleared exam.

B) Admission Page :

1) **PageTitle**– The title tag have Recommended characters between 50 to 60.so both websites need to follow these rage. So search engine robotics algorithm can get right signals from webpages as well as visitors easily found page which they desired.

2) **Meta Description** -The Mata Description tag have Recommended characters are 135 to 160.Both website'sAdmission page have description not within range. The meta description will then appear under your page's URL in the search results.so only those characters below 160 will be displayed on SERP and remaining will not be displayed. Admission page of American School of Bombay use some important keywords. Admission page of Podar International School Mumbai not used some important keywords.

3) **Meta Keywords**- keywords are important indicators of a website's content to search engines.so search engine can easily able to find your webpage in crawling.Admission pageof American School of Bombay use 2 important keywords. Admission pageof Podar International School Mumbai not used some important keywords.

4) **Heading Tags**-Use of h1 tag recommended.h1 tag not used on both webpages of websites.The h1 is an HTML tag that indicates a heading on a website. The h1 is considered the most important tag.

5) **Image Alt Attribute**- Image Alternative text will not exeed more than 125 characters.home page of bothwebsites have characters less than 125.Admission Pageof American School of Bombay use Img alt attributefor logo image and it's text only.whereas Admission Pageof Podar International School Mumbai used use Img alt attribute for logo image and it's text only.For other images alternative text is not used.

C) Co-Curricular Page :

1) **Page Title** – The title tag have Recommended characters between 50 to 60.so both websites need to follow these rage. So search engine as well as visitors easily found page which they desired.

2) **Meta Description** -The Mata Description tag have Recommended characters are 135 to 160.Co-Curricular page of American School of Bombay have description not within range. Co-Curricular page of Podar International School can't have meta description tag. The Meta description will then appear under your page's URL in the search results.so only those characters below 160 will be displayed on SERP and remaining will not be displayed. Co-Curricular page of American School of Bombay use some important keywords.

3) **Meta Keywords**- keywords are important indicators of a website's content to search engines.so search engine can easily able to find your webpage in crawling.Co-Curricularpage of American School of Bombay use 2 important keywords. Co-Curricularpage of Podar International School Mumbai not used some important keywords.

4) **Heading Tags**-Use of h1 tag recommended.h1 tag is used on both webpages of websites.The h1 is an HTML tag that indicates a heading on a website. The h1 is considered the most important tag.

5) **Image Alt Attribute**- Image Alternative text will not exeed more than 125 characters.Co-Curricularpage of American School of Bombay website have characters less than 125.Co-CurricularPage of American School of Bombay use Image for logo and text specifies alternative text for image.whereas Co-CurricularPage of Podar International School Mumbai used use Img for representing Co-Curricularactivities but alt text is not used.

D) Contact Us page :

1) **Page Title** – The title tag have Recommended characters between 50 to 60.so both websites need to follow these rage. So search engine as well as visitors easily found page which they desired.

2) **Meta Description** -The Mata Description tag have Recommended characters are 135 to 160.Contact Uspage of American School of Bombay have description not within range. ContactUspage of Podar International school can't have meta description tag. The meta description will then appear under your page's URL in the search results.so only those characters below 160 will be displayed on SERP and remaining will not be displayed. Contact Us page of American School of Bombay use some important keywords.

3) **Meta Keywords**- keywords are important indicators of a website's content to search engines.so search engine can easily able to find your webpage in crawling.Contact Uspage of American School of Bombay use 2 important keywords. Contact Uspage of Podar International School Mumbai not used some important keywords.

4) **Heading Tags**-Use of h1 tag recommended.h1 tag is used on both webpages of websites. The h1 is an HTML tag that indicates a heading on a website. The h1 is considered the most important tag.

5) **Image Alt Attribute**- Image Alternative text will not exeed more than 125 characters.Contact Us page ofAmerican School of Bombay website have characters less than 125.Contact Us Page of American School of Bombay use Image for logo and text specifies alternative text for image.whereas Contact UsPage of Podar International School Mumbai used for logo and text specifies alternative text for image. For other images alternative text is not used.

Off Page Optimization :

1) **Social media networking**- American school of Bombay website used Social media networking sites like Facebook, Twitter, Flickr, Instagram, LinkedIn, YouTube etc. Podar International school of Mumbai used Social media networking sites like Facebook, Instagram, YouTube etc. On Social media networking sites make advertise of your website by sharing your content on these sites where lots of people will visit/link to it, and links are a very important **SEO** ranking factor.so comparatively American school of Bombay ranked up as compare to Podar International school of Mumbai

2) **Site Map**- American school of Bombay website used site map page. ButPodar International school of Mumbaiwebsite not used site map page

3) **Blogging**- American school of Bombay website not used blog .but Podar International school of Mumbai website used blog. so any new, fresh updates are uploaded on blog, it's a great way to build links and increase the ranking of a site on Google. If you publish the contents to blog, Google start to recognize you as a great source of information.

4) **Link building**- Links are also so much important. Google love links, especially from other relevant websites. Join any with back link to your website and submit your site to any relevant directory to improve your ranking. [12]

V. CONCLUSION

In the end, I would like to conclude that Search Engine Optimization is a very important for websites optimization.Because the optimized website appears at the better rank of the search engine result. This research paper compare and analyzed two educational websites as per ON page as well as OFF page optimization. Both of them follow some Google SEO techniques up to some extent. These techniques can help to improve the ranking of a website if used in a proper manner.so to achieve best results and to appear on first page of SERP; both websites need to be updated as per SEO techniques time to time. Anynew website developer develops his/her client's website as per Google SEOTechniques properly then client's website should appear on 1st page of SERP and ranked up.

REFERENCES

[1] Prashant Ankalkoti, "*Survey on Search Engine Optimization Tools & Techniques*"Vol-3, Issue-5, 2017 ISSN: 2454-1362, http://www.onlinejournal.in.For IJIR Journal

[2] Lalit Kumar1* and Naresh Kumar, "SEO Techniques for a Website and its Effectiveness in Context of Google Search Engine" Vol-2, Issue-4,2014,E-ISSN:2347-2693 International Journal of Computer Sciences and Engineering

[3] https://ahrefs.com/blog/title-tag-seo/

[4] https://www.searchenginewatch.com/2016/05/26/how-to-write-meta-descriptions-for-seo-with-good-and-bad-examples/

[5] https://en.ryte.com/wiki/Meta_Keyword

[6] https://www.searchenginejournal.com/important-tags-seo/156440/#close

[7] https://neilpatel.com/blog/h1-tag/

[8] https://blog.hubspot.com/marketing/image-alt-text

[9] https://moz.com/learn/seo/alt-text

[10] https://backlinko.com/hub/seo/sitemaps

[11] https://statcounter.com/insights/seo/sitemap

[12] http://searchengineland.com/21-essential-SEO-tips-techniques-11580

ICT plays a vital role in social and educational sector on accidental occurrence of covid-19

Seema Patil

Assistant Professor
College Of Computer Application for Women, Satara,
Affiliated to S.N.D.T. University, Mumbai, Maharashtra, India

Abstract: In digital era, Information and Communication Technology (ICT) plays an important role in almost all spheres of our life. Application of ICT tools in social and educational sector has changed the total scenario of social and educational life. In emergency situations like spreading COVID-19 Disease, to overcome viral spreading of covid-19 some decisions need to be taken forcefully, various activities from various fields need to be stopped .in such cases, ICT tools are used to communicate with citizens of country in order to decide further strategy to run so as routine activities are going on smoothly. Because of covid-19 spreads in all over the world, most of the countries in world are locked down. All social, financial and economical activities are almost stopped, which may cause on economical growth of country. In such situation, only digital world which uses various ICT tools like Devices working on Satellite communication, Video conferencing, Internet, Drone camera's, CCTV Camera's, Aarogya setu app, various social media as per requirement, should continued their work without any interrupt. In educational sector, all schools, colleges and universities remain closed because of lockdown. This affect on academic loss of students. To overcome, ICT tools are used to prevent student's academic loss, helps to keep in student's touch, keep student's engage, assign some work to them and take response. This paper discusses definition of ICT, features of ICT, various components of ICT, how ICT tools provides services for social and Education sector, discuss how ICT tools are useful and may be used in emergency situations with live examples.

Index Terms: ICT tools, Social media, Video conferencing, Drone Camera, Aarogya Setu, Internet

I. INTRODUCTION

Internet is one of the primary source of information to search desired information because of which whole world became closer to each other. But in emergency situations like spreading COVID-19 Diseases, entire world is in trouble, face many problems, can't able to perform many routine activities smoothly in all fields such as industries, businesses, societies, lives of people and education etc., they have to maintain social distance.

In such situations, ICT plays an important role. ICT tools are used to communicate with each other and able to perform many routine activities smoothly of all fields.

Government of each country in world fight against spreading COVID-19 Diseases. Because of COVID-19 Disease, most of countries are locked down. All social, financial and economical activities are almost stopped. It's affect is on almost all spheres of our life .In social life, to defend their citizens, planned and implement various policies and use one of the ICT tool to increase the awareness among people about different plans and policies. By using ICT tool, communicate with citizens of country in order to decide further strategy to run, make citizens aware about different plans and policies, decisions taken, information about current situation, survey made for tracking etc.

In educational sector, all schools, colleges and universities remain closed because of lockdown. This affect on academic loss of students. To overcome this, ICT tools are used to prevent student's academic loss, helps to keep in student's touch, keep student's engage, assign some work to them and take response.

II. DEFINATION OF ICT

ICT stands for Information Communication Technology. Information Technology (IT) includes technology used for collecting, processing, manipulating, storing and protecting data. The processed data is known as information. Communication Technology (CT) refers to the use of technology for telecommunication, broadcasting media, audio-visual processing and for transmitting information through wired and wireless networks. It includes the internet, wireless networks, phones etc.

III. FEATURES OF ICT

1. **Transforming the society**- ICT has transformed our society into digital one which is known as 'Information Society'. It is a society which is driven by information in social, economic, political and cultural spheres with use of phones, internet, networks etc.
2. **Speed**- Interactions with use of ICT take place rapidly. We have real-time interactions in the form of chats, voice calls, video calls, emails etc.
3. **Research and Development**- it is easy to record data, sort, analyse and present it using computer software. Researchers can communicate his research findings through online platforms.
4. **Versatility**- ICT has as ability to perform multiple task at the same distance.one can play a video, work on an Excel sheet, download a file, transfer data to pen drive at the same time. Splite screen function has enhanced versatility of smart phones.
5. **Precision**-ICT provides always precise output.

6. **Cost**-Considering the requirement of hardward and software, ICT can be expensive. But the expences get justified considering the great reach and coverage it provides.

7. **Storage**-data can be stored electronically with the help of computers, hard disks, pendrives etc. Cloud or server based services like Google Drive, dropbox and icloud can also be used to store data.

8. **Facilitates learning**-Use of ICT in teaching implies the use of slides, Projectors, presentations, Videos, podcast, radio stream, interactive boards and online courses facilitate learning. These will lead to student-cantered learning. ICT adds the element of flexibility and makes the student independent.

IV. COMPONENTS OF ICT

1. **Satellite communication**- India launched a satellite for communication called INSAT and for Education purpose EDUSAT was launched in the year2004. Broadcast media refers to mass media outlets, such as television and radio stations. ABC, CBS, NBC, Fox Broadcasting, PBS & CW are examples of broadcast network.[11]

2. **Video conferencing**- It is a two way communication system. The use of television video and sound technology as well as computers to enable people in different locations to see, hear and talk with one another.

3. **World wide web**- The World Wide Web is one of the several internet resources developed to help, publish, organize and provide access to information on the Internet. The web was first developed by Tim Berners Lee in 1989.

4. **Social media**- social media like Facebook, Twitter, whatsapp are used for sharing messages, audio-video file, photos, images etc.

5. **Drone camera**-Drones are devices which fly without a pilot on board – they are remotely controlled, either manually (perhaps from a mobile smart phone or tablet) or through programmed instructions. They can be very large and heavy (often carrying cameras, with a big battery capacity to enable long range in the air), or small, lightweight and able to be carried in the hand (with very limited battery capacity and air time but more suited to indoor use in a classroom).[5]

6. **CCTV camera**-Closed Circuit Television (CCTV) also known as video surveillance. It is a system where all the elements like video camera, display monitors, recording devices are directly connected.CCTV also known as video surveillance, is the use of video cameras to transmit a signal to a specific place which are monitored, primarily for surveillance and security purposes

7. **Aarogya setu App**-Aarogya Setu, the government's Covid-tracker app, is helping govt in contact tracing, and also raised one's alert level if one was in the vicinity of someone who had been tested Covid-19 positive.It also provides guidelines about covid-19 awareness.

8. **E-mail:** E-mail is a most popular and excellent web-based media. Teacher can use E-mail for various purposes specially for delivering some web-based services. Through e-mail teacher should be able to send e-books, study material attachments etc. whereas students should be able to communicate with teachers by asking queries, questions, doughts etc.

9. **Mobile learning :** The term M- Learning stands for mobile learning., which means learning with the help of hand held technology such as Mobile Phone, Laptop and other portable devices, Mobile is a portable device, M-learning is convenient as it is accessible virtually from anywhere. MLearning means, acquisition of any knowledge and skill through using mobile technology anytime, anywhere that result s in alteration of behavior (Tejwani & Silviya Thomas, 2013). Now days, Smart Phones are available in the market and they have most common features like laptop and computers, and they are relatively less expensive than Laptop and Computer. M- Learning also brings Strong portability by replacing books and a note with a small RAM''s filled with tailored learning contents. It can download a PDF File or E-books with the help of Android or Windows Phone and store it in its RAM.[11]

V. APPLICATION OF ICT IN SOCIAL SECTOR

1. **Communications satellites** are commonly used for mobile phone signals, weather tracking, or broadcasting television programs. In lockdown Period of covid-19, following list along with references explains use of ICT Tools for various purposes in different situations.

A. In 'Man ki Baat' program, Indian Prime minister Narendra Modi convey message to Indian   Citizens on 29th March 2020[1].

    B. Through television broadcasting programs, Indian Prime minister Narendra Modi calls citizen curfew to fight corona virus on 22nd March 2020 from 7am to 9 pm [1].

    C. Through television Broadcasting programs, Indian Prime minister Narendra Modi urges citizen for 'Let us switch off lights at home and light a lamp for 9 minutes at 9 pm on 5th April 2020.[2].

    D. Through television Broadcasting, Chief Minister and Home Minister of Maharashthra convey some information to citizens about planning and implementation of different policies determined on impact of COVID-19.

2. **Videoconferencing** (or **video conference**) means to conduct a **conference** between two or more participants at different sites by using computer networks to transmit audio and **video** data. Each participant has a **video** camera, microphone, and speakers mounted on his or her computer.

    A. Apr 2, 2020 - Sonia Gandhi held CWC meeting via video conferencing [3]

    B. PM Modi to interact with CMs on April 27 through video conferencing[4]

    C. PM Modi to interact with Chief Ministers via video conferencing[7]

3. *Drone Camera*-

    A. PM Modi has announced 21 days lockdown in the entire nation to combat the deadly corona   virus. Despite the lockdown people in various cities are stepping out of their homes and violating the lockdown rules. The Police are using drone cameras to

keep an eye on the violators of social distancing and lockdown. In a bid to maintain the lockdown amid COVID-19 outbreak, Police is monitoring the situation using drone cameras and making sure that people are not breaking the law on 10 Apr 2020[8]

B. Lockdown over corona virus: Mumbai police use drones to monitor situation[10]

VI. APPLICATION OF ICT IN EDUCATION SECTOR

In lockdown Period of covid-19, all school, colleges are remaining closed. To decide educational policies, to keep students engages various ICT tools are used.

1.   Through Video conferencing, Principals and Staff members of school and colleges participate in meeting to decide what to do, how assign task to students and keep them engaging in their studies.

2.   Through Video conferencing, students should participate in video conferencing to attend meeting, any online workshop/course.e.g. Zoom app,Cisco Webex meetings app.

3.

4.   School/College teachers use social media like whatsapp to share audio-video files,images,PDF,documents on Mobile phones to engage students in lockdown period by assigning task like watch video, solve assignments, solve test and upload results etc.

Table 1: School Teachers Interacts with students about study through whatsapp.

Table 2: College Teachers Interacts with students about study through Google Classroom.

5.   Through Internet, create Google forms in order to make survey about awareness about COVID-19

 Video "Coding with students – Using Tynker and coding with Drones" by Richard Poth – showing how to use the Parrot Mambo minidrone using the Tynker app in a classroom.[9][5]

6.   CCTV cameras are the best possible safety for students, staff and valuable school equipment. When placed in the right areas of a school such as a corridor or outside areas, CCTV can be extremely effective, and should not be dismissed by key decision makers. Classroom CCTV can be a valuable tool in assisting with teacher training, enabling specific lessons to be reviewed - without the distraction of a teaching colleague in the classroom - and valuable feedback provided.

VII. CONCLUSION

In emergency situations like spreading of covid-19 diseases, working of all fields are stopped. Only online task are carried out by using various digital devices. In such situations, main aim of using ICT tools is to make every citizen digital literacy and awareness about beneficial use of ICT tools. So in complex and crucial conditions ICT tools make task quite easy.

REFERENCES

[1].https://aceutical.technology.com
[2].https://www.narendramodi.in
[3]. www.news.abplive.com › News
[4]. http://newsonair.com/
[5]. https://blogs.glowscotland.org.uk/fa/ICTFalkirkPrimaries/drones-in-the- classroom/
[6]. https://news.abplive.com/videos
[7]. https://news.abplive.com/videos/news/india-pm-modi-to-interact-with-chief-ministers-via-video-conferencing-1206826
[8]. https://news.abplive.com/tv-show/sansani/drone-camera-captures-lockdown-violators-sansani-1194365
[9]. https://youtu.be/mQe2cmOhWtU
[10]. https://youtu.be/tBy2bI2b92g
[11]. Sudipta Deb Roy "Application of ICTs in Teaching-Learning Process", *IRJIMS, ISSN: 2394-7969,Volume-I,Issue-VII,August2015,*

IMPLICATION OF VARIOUS DEPOSIT SCHEMES OF SELECTED MAHILA COOPERATIVE BANKS IN WESTERN MAHARASHTRA

[1]Dr. Govind Mahadeo Dumbre, [2]Anjali Chandrakant Salunkhe.
[1]HOD& Vice-Principal, A.W. College, Otur., Former Chairman BBA;BOS Member, Academic Council, SPPU, Pune
[2]Assistant professor, College of Computer Application for Women, Satara. SNDT University. Mumbai

Abstract:

The women's cooperative banks can make the efforts to tap the savings from women by opening banks purely for women. The women cooperative banks can make good impact on the economic life of member if they are well managed. Banks are key financial intermediaries or institutions that serve as "middle man" in the transfer of fund from servers to those who invest in real assets as house, equipment and factories. In performing this function financial intermediaries improve the' well-being of both saver and investor. By improving economic efficiency they raise living standard of the society. The banking sector is considered to be an important source of financing for most businesses. Mahila cooperative banks have offered the various Deposits and Loans schemes to their members. The present paper attempts for the implication of various deposit schemes of selected Mahila Cooperative Banks in Western Maharashtra were studied.

Key words: Mahila Cooperative Bank, Schemes, Deposit, Implication

Introduction:

The Mahila banks were primarily established with the objectives of to encourage for habit of mutual support and frugality among women and to mobilize the deposits. The investments can be used for fruitful purpose and to extent banking behaviors amongst women and to come across monetary requirements of women and to make them able the clutches of money-lenders, to inspire the women and to increase their earnings and standard of living, meet the monetary requirements of professionals like beauty parlors, artisans, etc. and to meet the financial needs of women by giving them credit facilities for purpose of home articles such as furniture, tailoring machines, kitchen-wears, vehicles. The needs of corporate or individual were offered various schemes. Besides the schemes has uncommon features; for providing quick liquidity to depositors and no harm. For a term period, an investor can deposit a lump sum amount in these schemes. At the time of maturity, principal along with interest is returned.

Objectives of the Study:

1. To understand the various deposit schemes of selected Mahila Cooperative bank.
2. To examine the implication of various schemes on economic upliftment of women
3. To suggest the remedies for effective implementation of these schemes.

Review of Literature:

- **Goetz and Sen Gupta, (1994),** Researcher observed at the control females engaged over advances received from the Grameen Bank, a large government scheme and a small NGO, in Bangladesh. The study was based on 275 detailed loan users' history. The findings of the study recommended that in 37% cases women retained significant control over loan use, while 63% had no control over loan use. The study further concluded that single, divorced and widowed women were more likely to retain control of loan use than others. Control was more when loans were small.

- **Rezaul, Karim and MitsueOsada, (1998),**The study on Micro lending schemes has served millions of poor people. This does not necessarily; mean that poverty has been reduced. Although solving the multiple factors that influence poverty is difficult. Many practitioners have stated that the significance of credit is positive. Clients repay loans and again borrow. A large majority of borrowers are continuing members, although drop-out rates have been increasing in some programs and many probably dropped out before they graduated out of pauperism.
- **Punjab National Bank,** The bank announced various schemes for women entrepreneurs will be contributed for setting up of new projects in small scale sector. PNB Mahila SamrdhiYojana this scheme have been launched for establish tailoring shop, boutique, purchase of sewing machines, beauty parlor, cyber cafe, purchase of fax machine, Xerox machine etc. A scheme for financing to provide support services for women empowerment. The women will be contributed for purchase of required infrastructure for establishing créches like basic equipment tools, stationers, growth monitoring appliances, fridge, cooler, fan, water filter etc.
- **State Bank of Mysore,** The'bank launched Mahila Shakti platform for ladies entrepreneurs. Bank authorities will offer essential inputs. Support to those ladies who do not idea to established business and would similar to do something at home. Bank also declared 'Annapurna' scheme to finance those women for beginning food cooking units intended for selling food, and launch parcels etc.
- **Bank of Baroda,** The bank announced 'Akshaya Mahila ArthikSahayYojana'. The new age women are to look for the chances and tasks to be capable to buttress herself and her family. In order to inspire such females and fulfil their wish to accomplish somewhat in life, Bank of Baroda deals monetary support for professional, entrepreneurial ladies and also those into wholesale trade and farming activities.

Having reviewed the various studies provides a great deal of insight into complexities of the cooperation.

Scope of Study:

The present study intends to examine the deposit schemes of the Mahila Co-operative Banks. The main focus of the investigation is to evaluate the implication of deposit schemes of Mahila Cooperative Banks at Pune, and Kolhapur district in the state of Western Maharashtra. Present study encompasses the five financial years of selected units from 2009-10 to 2013-14.

Research Methodology:

Research Design: The research article is based upon exploratory research.

Sample Size:

For the analysis of the deposit schemes ofthree Mahila Cooperative Banks in Pune and Kolhapur District of Pune Region of Western Maharashtra are selected for the study for the year 2009-10 to 2013-14.Kolhapur Mahila Sahakari Bank Ltd, Kolhapur, The Priyadarshini Mahila Sahakari Bank Ltd, Gadhinglaj district Kolhapur and Jijamata Mahila Sahakari Bank Ltd, Pune

Data Collection:

Data was collected through Annual Reports of the bank and framed questionnaire for beneficiaries of the bank

Techniques and Tools of Data Analysis

On the basis of data collected, from all the banks have been analysed by using simple average, percentage. The objectively collected data have been suitably classified and arranged in tables, charts and graphs.

Analysis of the Study:
Table No. 1.1: Composition of Various Deposit Schemes in Kolhapur MahilaSahakari Bank Ltd. Kolhapur from 2009-10 to 2013-14 (Amountin lakhs)

Deposit Schemes	2009-10	2010-11	2011-12	2012-13	2013-14
Fixed Deposit	1452.80	1486.91	1711.03	1768.64	2087.18
Current Deposit	147.69	149.19	220.52	208.76	300.72
Saving Deposit	433.42	631.26	812.23	791.93	809.25
Reinvestment Deposit	834.86	894.16	1013.31	1382.71	1544.33
Recurring Deposit	29.36	39.28	49.90	57.77	89.38
SubhLaxmi Deposit	131.45	150.69	184.32	183.49	208.89
Sevak Cash Security	43.75	48.23	52.78	60.24	63.50
Agent Cash Security	17.72	19.24	17.33	20.11	23.76
Dam Duppat Deposit	17.92	14.78	3.62	3.44	3.71
Dam Tippat Deposit	2.07	1.03	0.04	-	-
Locker Deposit	6.46	12.06	2.73	1.20	1.05
Term End Deposit	70.58	106.96	93.60	69.61	72.07
Total	3188.08	3553.79	4161.41	4547.90	5203.84

(Source: Researcher's Compilation from the Annual Reports of the bank)

Table No. 1.1 shows the Composition of Various Deposit Schemes in Kolhapur Mahila Sahakari Bank Ltd. Kolhapur from 2009-10 to 2013-14. The amount deposited in the various schemes has been increasing trend in the study period. The highest amount deposited in the Fixed Deposit Scheme and then in the Reinvestment and Saving Deposit Scheme. The bank has been implemented 12 deposit schemes very well. The bank has been started Dam Duppat and Dam TippatYojana in 2008-09 but it is not implemented very well.

Table No.1.2:

Composition of Various Deposit Schemes in The Priyadarshini Mahila Sahakari Bank Kolhapur from 2009-10 to 2013-14(Amount in lakhs)

Deposit Schemes	2009-10	2010-11	2011-12	2012-13	2013-14
Saving Deposit	23.04	21.11	33.25	38.85	52.61
Current Deposit	1.48	0.70	0.39	0.17	0.65
Pigmy Deposit	4.24	4.68	5.49	5.86	7.61
Fixed Deposit	152.2	195.8	177.3	245.1	287.6
Dam Duppat Deposit	44.65	44.45	41.57	44.36	47.80
Priydarshini Deposit	0.49	0.49	0.17	0.17	0.17
Recurring Deposit	2.82	4.36	4.23	4.50	7.20
Monthly Deposit	59.49	42.87	66.05	70.10	63.53
Term End Deposit	0.02	0.02	0.02	0.02	0.02
Reinvestment Deposit	2.50	2.00	-	-	-
Total	291.0	316.5	323.7	409.0	467.2

(Source: Researcher's compilation from the Annual reports of the bank)

Table No. 1.2 shows the Composition of Various Deposit Schemes in The Priyadarshini Mahila Sahakari Bank Ltd, Gadhinglaj district Kolhapur from 2009-10 to 2013-14. The amount deposited in the various schemes has been increasing trend overall in the study period. Amount deposited in fixed deposit, monthly deposit and saving deposit schemes were Rs. 152.2 lakhs, Rs. 59.49 lakhs and Rs 23.04 lakhs respectively in 2009-10. The bank has been implemented 10 deposit schemes very well. In the year 2013-14 amounts deposited in fixed deposit, monthly deposit and saving deposit schemes were Rs. 287.66 lakhs, Rs. 63.53 lakhs and Rs. 52.61 lakhs respectively. The highest amount deposited in the Fixed Deposit Scheme and then in Monthly Deposit Scheme and then Saving Deposit Scheme. Current deposit and Priydarshini VikasPatra were very negligible.

Table No.1.3:

Composition of Various Deposit Schemes in Jijamata Mahila Sahakari Bank Pune from 2009-10 to 2013-14   (Amount in lakhs)

Deposit Schemes	2009-10	2010-11	2011-12	2012-13	2013-14
Current Deposit	1393.75	1747.36	1850.44	1772.34	1656.42
Saving Deposit	5341.77	6557.81	7045.96	6701.57	6361.57
Recurring Deposit	258.53	266.23	328.13	402.55	652.94
Pigmy Deposit	1027.32	1141.79	1242.09	1239.79	1228.09
Unclaimed Deposit	25.72	25.95	25.31	25.21	25.04
Term End Deposit	1.84	1.84	1.33	1.33	1.35
Fixed Deposit	14411.06	15574.02	17367.33	26353.86	22755.63
Jijamata Thev	515.80	8.64	-	-	-
Total	22975.79	25323.64	27860.59	30496.65	32681.04

(Source: Researcher's compilation from the Annual reports of the bank)

Table No.1.3 shows the Composition of Various Deposit Schemes in Jijamata Mahila Sahakari Bank Ltd, Pune from 2009-10 to 2013-14. The amount deposited in the various schemes has been increasing trend in the study period. Saving and Current Deposits have been decreased in 2012-13 and 2013-14. The highest amount deposited in the Fixed Deposit Scheme and then in Saving Deposit Scheme. The bank has been implemented 8 deposit schemes very well.

Table No:1.4 Saving Position of the Respondent

Sr. No	Range of Earning	Respondents Saving Position					
		Before Membership	%	Cum. %	After Membership	%	Cum. %
1	501 – 1000	28	28	28	15	15	15
2	1001– 1500	27	27	55	17	17	32
3	1501– 2000	18	18	73	19	19	51
4	2001 –2500	15	15	88	22	22	73
5	Above 2500	12	12	100.0	27	27	100.0
Total		100	100.0		100	100.0	
S.D		7.17			4.69		
Correlation		-0.92					

(Source: Compiled by Researcher by Primary Data)

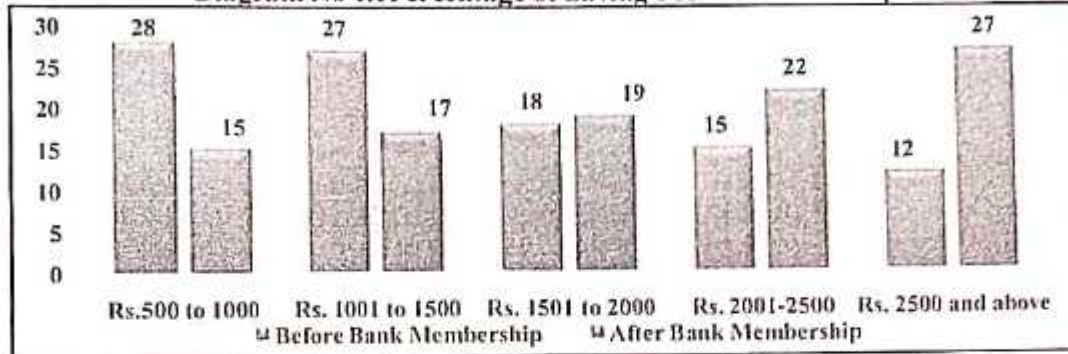Diagram No 1.1 Percentage of Saving Position of the Respondent

Table No: 1.4 and diagrammatic representation shows percentage of saving position of respondents. There were two factors to be determined before bank membership and after bank membership. Above table and diagram indicates that 28 percent, 27, 18, 15 and 12 percent members saving their money in Rs.501 to 1000, Rs. 1001-1500, Rs. 1501 to 2000, Rs. 2001 to 2500 and Rs. 2500 and above respectively before the member of the Mahila bank. While 15 percent, 17, 19, 22 and 27 percent members saving their money in Rs.501 to 1000, Rs. 1001-1500, Rs. 1501 to 2000, Rs. 2001 to 2500 and Rs. 2500 and above respectively after the member of Mahila bank. It has been ascertained from the analysis women members are self-dependent after the member of the bank.

Table No 1.5
Saving increases after the Member of the Sample Bank

Sr. No.	Saving	Respondent	Percentage	Valid Percentage	Cumulative Percentage
1	Increased	97	97	97	97
2	Not Increased	3	3	3	100.0
	Total	100	100.0	100.0	

(Source: Compiled by Researcher through Primary Data)

Table No. 1.5 represents that saving was increased after the member of the sample bank. Out of 100 respondents' 97 respondents were expressed that saving increased after the member of the sample banks.

Graph No. 1.2
Respondents Saving Increases after the Member of the Bank
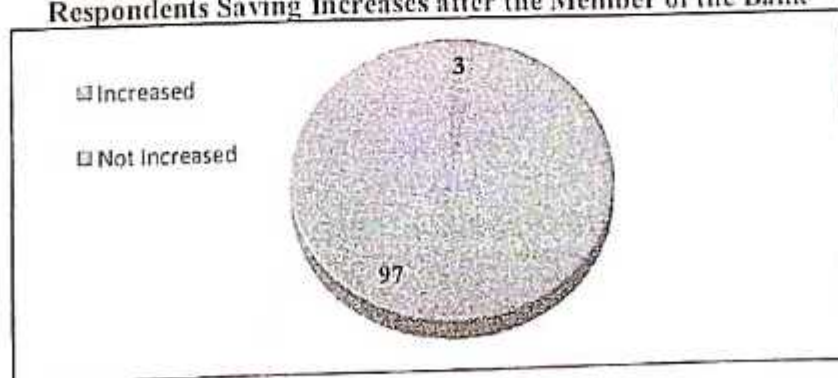
97 percent respondents states that saving was increased after the member of the bank. Only 3 percent respondents states that saving was not increased after the member of the bank. It has been negligible. It is clear that increased in savings that proves that women members are economically strong.

Table No. 1.6
Benefit of Deposit Scheme

Particulars	Do you know different type of Deposit Scheme			Have you Taken the Benefit of Scheme		
	Yes	No	Total	Yes	No	Total
Respondent	79	21	100	92	8	100
Percentage	79	21	100.0	92	8	100.0

(Source: Compiled by Researcher through Primary Data)

Table No: 1.6 shows that out of 100 sample size 79 respondents know the different type of deposit schemes but 92 were already taken the benefit of the scheme implemented by sample banks. It, is noted that that the result is positive. It is concluded that there is relationship between different types of deposit scheme and respondent taken the benefit of such schemes.

Graph No: 1.3 Benefit of Deposit Scheme
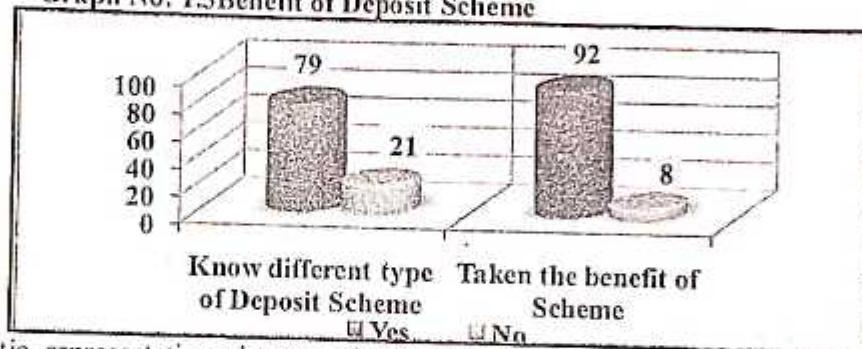
Diagrammatic representation clear-cut shows that the maximum respondents were taken the benefit of deposit schemes implemented by the sample banks.

Table No: 1.7
Bank Participation for Economic Upliftment of Members

Sr. No	Bank Participation	Members	%	Valid %	Cumulative Percentage
1	Participated	82	82	82	82
2	Not Participated	18	18	18	100.0
	Total	100	100.0	100.0	

(Source: Compiled by Researcher through Primary Data)

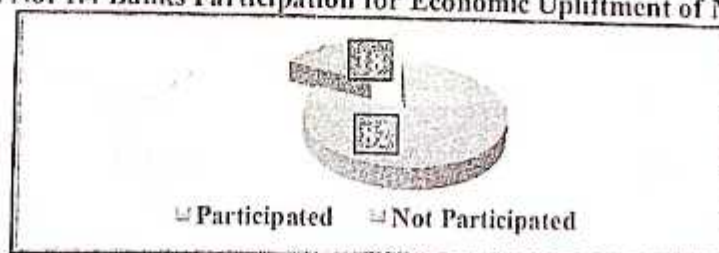Graph No: 1.4 Banks Participation for Economic Upliftment of Members

Table No.1.7 and Diagram No. 1.4 represent that sample banks were participated for raising economic condition of women members. Out of 100 members, 82 members expressed that bank was participated for economic condition of women members of the bank. It is concluded that Mahila Banks participation for raising the economic condition of women members are worth mentioning.

Conclusions

To prove the objectives of the study and out of the hypotheses formulated and tested, the following conclusions were made:

- It is concluded that Kolhapur Mahila Sahakari Bank Ltd, Kolhapur had implemented eleven deposit schemes for women very well. It is clear that members of Kolhapur Mahila Sahakari Bank Ltd, Kolhapur took the advantage of various deposit schemes.
- The Priyadarshini Mahila Sahakari Bank Ltd, Gadingalj, District Kolhapur was implemented total ten deposits schemes. The highest amount deposited in fixed deposit scheme. It is clear that fixed deposit scheme was very well implemented in the study period. It was clear that The Priyadarshini Mahila Sahakari Bank Ltd, Gadinglaj, Kolhapur was fulfilled the needs of the women members.
- Jijamata Mahila Sahakari Bank Ltd, Pune announced various deposit schemes for women members has been increasing trend in the study period. It is concluded that Jijamata Mahila Sahakari Bank Ltd, Pune has been implemented 15 different loan schemes for women members very well.
- They increased their saving after the member of the bank. Bank members also knew the various deposit schemes implemented by the sample bank. They already took the benefit of that scheme. Members were preferred the fixed deposit scheme. Mahila banks implemented various deposit schemes for women members. So it is concluded that Members of the banks are benefited through its various schemes.
- After joining the bank majority of women have considered that they have enhanced their economic condition. It is concluded that members of the bank are economically uplifted after joined with Mahila bank.

Suggestions

On the basis of above conclusion the researcher would like to make the following suggestions to prove objectives of the study and for efficient working of the Mahila cooperative banks in Western Maharashtra.

- Saving capacity of the women member should be increase for better future. So that they can fulfill all their needs, for this banks need to announce various deposit schemes.
- Banks should be appointed committees such as administration, planning and development. It helps to increase the business of women banks.
- Women banks can divide their work into different departments such as deposit section for the volume of deposits.
- Mahila banks must improve its functioning. They should give fast services to their customers, so that maximum customers should attach to the banks. There is need to increase finance for women members of the banks. Number of deposit schemes should be increased. Different policies should be introduced which is benefited for the women customers.
- Design of innovative deposit schemes that are need-based and attractive may contribute significantly towards bank's efforts in mobilizing deposits. Directors of the bank have to

visit at every nook and corner of the city to insist women folk, the necessity of the promotion of women's bank, explain them the saving schemes of the bank. The staff should go to offices, schools, colleges, hospitals, women's clubs, etc., to collect deposits and advertise their schemes and policies.

References:

- Bhatt. E.R. (1994). "Empowerment of women: Are Cooperatives appropriate instruments: Ashish Publications, New Delhi.
- K. G. Karmarkar. (1999). "Rural Credit and Self-Help-Groups - Micro Finance Needs and concepts in India," Sage Publications India Pvt. Ltd; New Delhi
- Bali Swain. R., Wallentin. F.(2012). Factors empowering women in Indian self-help group programs, International Review of Applied Economics, 26(4), P. P. 425-444.
- Bhuria M. P. (1987). "Women's Participation in Cooperatives," The Cooperators, New Delhi, Vol. XXIV, No.21, Pg 628.
- Dr.Mrs. P. P. Koli. (1990). "Women's Urban Cooperative Banks in Western Maharashtra: A Critical Appraisal." Shivaji University, Kolhapur.
- Goetz. A.M., Sen Gupta.R. (1994). "Who takes the credit? Gender, power, and control over loan use in rural credit programmes in Bangladesh "Unpublished manuscript, Brighton.
- Rezaul, Karim.,MitsueOsada. (1998). "Dropping out; an emerging factor in the success of micro-credit based poverty alleviation programmes", The Developing Economies, Vol.36, No (3) P. P. 257-288.
- http://www.rbi.in
- http://www.Shodhgangotri.ac.in
- http://www.maharashtra.gov.in
- https://www.pnbindia.in
- www.statebankofmysore.co.in
- www.rediff.com/business/report/pix-modi-launches-jan-dhan-scheme

Feminism in Anita Nair's Ladies Coupe

Prof. Bartakke Kalyani Jitendra
Asst. Prof., Dept.of English
Collegeof Computer Application for Women, Satara

Emailid : bartakkekalyani1@gmail.com

Abstract – Anita Nair is one of the finest writers in Indian writing in English with an international reputation. She effectively highlights their trials and tribulations faced by women in a patriarchal society. In every novel, Anita Nair always thought about the woman's search for freedom and self-realization. The present article deals with the woman's capacity to assert her own rights and individuality in marriage and develop into a full-fledged woman of prospective as a human being. In the present novel, she explores the freedom of the woman to fulfill herself basically as human being, independent of her various traditional roles as a daughter, wife mother and so on. This article deals with the theme of self-discovery as seen in her novels. In her *Ladies Coupe* also Anita Nair presents stories of several female protagonists, who struggle to achieve their self-hood.

Keywords: Feminism, Anita Nair, Ladies Coupe

Anita Nair, in her fiction, presents her male and female protagonists trying to express their 'self', their hopes and fears, the goals they would like to achieve, their joys and sorrows as they try to look for meaning of their life. Her protagonists are mostly women, who suffer physically and psychologically in their family set-up. They are frustrated, disappointed or sometimes they suffer a sense a guilt. the female protagonists in Anita Nair's fiction also struggle to achieve their individuality and actualization of their self. Her characters appear to strive for the expression of their self while struggling to fulfil their obligations to the family, their daily life influenced by ups and downs, victories and failures.

In her novel *'Ladies Coupe'*, Anita Nair traces the journey of the protagonist, Akhilandeshwari (hence forward Akhila) from her bondage of family expectations to her freedom and self-discovery as she undertakes a literal journey away from home to Kanyakumari.

Akhila is the eldest child in the middle-class Brahmin family. The name Akhilandeshwari means the mistress of all world, but it is a misnomer as being a girl, her life is controlled at every stage. As a daughter, she is groomed to be a bride, and the she has to perform the role of a wife, a mother, carrying on household duties. But Akhila's life takes a different turn when her father dies, and she has to take up a job in his office. She becomes a bread-winner for the family consisting her mother, a sister and two brothers. After her father's death, when Narayan, her younger brother, asks her 'what are we going to do?' She harshly replies"

'Cremate him and then …….and then, we'll find some way to keep ourselves afloat and alive.' (*Ladies Coupe*, p.57)

Akhila's self-hood is thus endangered being born a woman. Nirupama Dutt says: "In patriarchy, all women in the world are second class citizens". In this system,(which is the predominant system in India),sons are valued because they are supposed to continue the so-called lineage of the family, while girls are supposed to be the property of the others.

Akhila's self-discovery starts with her journey by train. Like Vivekananda, long ago, she too has undertaken the journey to Kanyakumari, to seek answers to her questions. Like Kanyakumari, her life is put on hold, and this journey is the beginning of her quest, an answer to the question. 'Can a woman manage alone?' Akhila would like to live alone, by herself, but she is worried about everyone telling her that a woman cannot live alone. It is a question of woman's self-hood. Does she have to depend on some man to live her life? She would like companionship. But, is it socially acceptable? Akhila's quest is to find answers to such questions. And as Margaret says, she has to find her own answers. (*Ladies Coupe*, P.21) Akhila does not have experience of living alone, by herself, or managing everyday running of a household, because she has been an office-going girl since her late teens. Her mind is, therefore, full of doubts about living alone, running a household, how to cope if she fell ill and so on. Her education of selfhood starts with Janaki telling her life story, a story of typical housewife looked after by her husband, then her son. The way she is brought up,

hnd taught her that a woman's destiny is to get married and be a good wife, mother etc..

Janaki's story exemplifies common life of all women, but even she, at the late stage, feels tired of living such life of dependence. But even his typical housewife, Janaki, feels irritated with her husband when he tries to impose his choice of shoes on his grown-up son. Janaki's story, thus, tells Akhila how the patriarchal control is inevitable in the life of a woman. Akhila had already noticed in her own family how her father was lionized by her mother, while even the children in the family had secondary treatment.

Sheela, a girl in the compartment, is also an example of the patriarchal control. As a child, she used to delight everybody by her wit and pert remarks, and even her father enjoyed it. But when she grew up, her father started scolding her for the same pertness, what was seen to be clever, now began to appear wrong and rude.

Sheela beautified her dead grandmother's face because she knew her wishes. The elders were angry with her. Sheela, thus, gives expression to the self-hood of her grandmother in particular and womanhood in general. Sheela also narrates her experience of unwanted touching of her friend's father when she goes to her house. She learns from it the lesson to be ready to protect herself. From Sheela's experience, Akhila understands how to protect the self and develop a sense of selfhood.

The story of Margaret Shanthi is about her excessive dependence on and love for her husband Ebenzer Paulraj, who controls her life and thwarts her in her career, as well as her wish to have a baby, all for his own selfish ends. But, her love for him, blinds her to his selfish motive. She finds her personality being crushed and her selfhood being trodden by her husband. Margaret retaliates by planning a silent war against him. She makes use of a strategy to make him dependent on her.

In the narration of Marikolanthu, there is a story of working girl, who is sexually exploited by the male members of the upper class society. Being a girl from a poor family, she is deprived of education. She was withdrawn from the school as she completed her fifth standard. Only her brothers could go to school in the town. Her mother says there is a risk to send a girl by a bus to town for school. She accompanies her mother to Chettiar house, where becomes a baby-sitter for no pay.

Marikolanthu has to struggle very hard to realize her selfhood. Marikolanthu decides to end living for others, making sacrifices for other and being happy in doing this. She emerges as a strong and independent woman shouldering her own responsibility. In her decision to accept Muthu and bring him up, she flouts the conventional morality and the bondage of family. When she tells Akhila,"I am the woman you think you have wondered about. For within me is a woman I have discovered."(P. 270). This self-discovery of Marikolanthu gives her strength and courage, to face life on her own terms.

In this novel, Anita Nair has examined the question whether woman can achieve her selfhood. In the stories narrated by Janaki, Margaret Paulraj and Prabhadevi, these women protagonists learn to make adjustment. Janaki is brought up to be a good wife and does not have an identity of her own. She is happy in her traditional life in which she is blessed with a docile husband. Margaret, a chemistry scholar, finds a way to tame her husband and succeeds. Prabha Devi tries to form sexual alliance outside marriage, but she is hardly aware of the dangers of it and withdraws from it in time. Instead, she learns to swim secretly. From all the stories of these women, Akhila hopes to find answer to her question whether a woman can live alone. Though these women have asserted their self-hood, they have had their married life except Marikolanthu, and they seem to have come to terms with their respective husbands finding a way to assert themselves. But Akhila's problem is whether she can live alone without getting married. She realizes that their life-stories cannot be a how-to- guide for her, but listening to their stories, she acquires consciousness of her self. As Sunita Sinha says(2008:157), "She is empowered to reclaim her lost love and relates herself from the hold of conventions and family expectations."

Akhila decides to live her own life freeing herself from the family responsibilities imposed on her. Listening to the stories of her fellow travelers, she has finally discovered herself.

In this novel, Anita Nair appears to make out a case for self-dependence of woman in the male-dominated society. The female protagonists presented by her in the stories come out of their domestic sphere and asset themselves in the world outside, to realize their self.

References :-

Nair, Anita, Ladies Coupe, New Delhi: Penguin Book (2001)
Nubile, Clara, The Danger of Gender: Caste, Class and Gender in Contemporary Indian Women's writing, New Delhi:Sarup and Sons, 2002.
Rajeshwar M., Preface to Indian Women Novelists and Psychoanalytics, New Delhi: Atlantic Publishers and Distributors, 1998.
Sinha, Sunita, Post – Colonial Women Writers New Perspectives. New Delhi: Atlantic Publishers and Distributers, 2008

Theme of self-discovery in Anita Nair's The Better Man

Bartakke Kalyani Jitendra,
Asst. Prof., Dept.of English, College of Computer Appl. For Women Satara
Email id : bartakkekalyai1 @gmail.com

Abstract – Anita Nair is one of the finest writers in Indian writing in English with an international reputation. She effectively highlights their trials and tribulations faced by women in a patriarchal society. In every novel, Anita Nair always thought about the woman's search for freedom and self-realization. The present article deals with the woman's capacity to assert her own rights and individuality in marriage and develop into a full-fledged woman of prospective as a human being. In the present novel, she explores the freedom of the woman to fulfill herself basically as human being, independent of her various traditional roles as a daughter, wife mother and so on. This article deals with the theme of self-discovery as seen in her novels. Her debut novel *The Better Man* shows the external and internal identity of her female characters.

Keywords: Anita Nair's, self-discovery, The Better Man

Anita Nair is a post-modern novelist, who presents her characters in search of their own self. In the third chapter of this thesis, the researcher has tried to present the efforts of several female protagonists of their own stories trying to discover their own self in the novels *Ladies Coupe* and *Mistress*. Each human being, man or woman, seeks to discover meaning of his or her life. This search for self has been the predominant theme of the novels of Anita Nair. The fictional world of Anita Nair is peopled by men and women confronting problems in their social and family life as they try to come to terms with the constraints they feel or rebel against them, flouting the social norms. Every man or woman makes an effort to find meaning of their own life and the inner peace, and in this effort they inevitably come in conflict with others in the family and society. In the novel, *The Better Man*, there are men and women, who try to discover their self and achieve happiness.

Anita Nair's *The Better Man* is a novel set in the fictitional village called Kaikurussi in the north of Kerala, known as Malabar in the olden days. The village Kaikurussi is surrounded by hilly area. This is, of course, a fictional creation of Anita Nair, where most of the novel's action takes place.

Though the story is woven around the life of Mukundan, an elderly bachelor and a retired government servant, about fifty year old, there are other significant characters such as Bhasi, a painter by profession also practicing a kind of medicinal practice, Meenakshi – Muakundan's childhood friend, Anjana married but estranged from her husband and now in love with Mukundan, Valsala – the young woman married to an old man, and turning into a criminal.

According to psychologists, every person, man or woman gradually builds up an idea about himself or herself. This 'self' building process works in the life of an individual unconsciously. Seelking 'self' is, thus, an ongoing process. Anita Nair presents her characters showing the psychological crisis they undergo in the family life. Their dependence and mental subjugation deeply affects them right from their childhood. In case of Mukundan in The Better Man he is affected deeply by the towering, domineering personality of his father, Achutan Nair,.

Mukundan, now a fifty-year old man served as a clerk in the explosives factory in Trichy. Mukundan's colleague and friend, Narendran, had a plan to set-up a type-writing institute after retirement and he wanted Mukundan to be the part of it. But, unfortunately Narendran died of brain-tumor; and their retirement plan was abandoned. Mukundan came back to his village Kaikurussi after his retirement.

At home in Kaikurussi, Mukundan experiences hallucinations as if his mother was entreating him to come back, and not to go away. His mother had fallen down the stairs years ago, he remembered, as she came down holding a lamp in her hand. Mukundan hallucinated about his mother entreating him. His mother's ghost took hold of him and carried him upstairs to show how his father had pushed her down the stairs to die with a smashed head. When he woke up in the morning, he realized how he had survived the horrible experience of the night. Mukundan felt guilty of not helping his mother. His memories of those tragic times haunted him. Mukundan was terrified of his father, and could not muster up courage to help his mother taking her with him to the town. This fear he nurses in his mind even as an adult. Mukundan's self-discovery is thwarted by his father's dictatorial attitude not only towards Mukundan but the mother Paru Kutti as well. Mukundan's self is greatly inhibited by the traumatic experience in his childhood. It is

interesting to see how Bhasi cures Mukundan of this trauma by his psychic experiments on him. Mukundan's self-discovery is complete only when he realizes where his self interest lies. He discovers his self through Bhasi and then through Anjana. At one stage his weakness appears to triumph when he comes under the spell of Power House Ramkrishnan, and estranges both Bhasi and Anjana. But, he becomes aware of his self and realizes the role these two have played in his life to make him a white man. He subsequently asserts his self-walking out of Ramkrishnan's coterie and rehabilitating both Bhasi and Anjana in his life. it is the self-discovery of Mukundan which makes him take bold decisions in his life and bring about a change.

Self-discovery in *The Better Man* relates not only to Mukundan but to the female characters in the novel as well. In fact, there are episodes dealing with the life of female characters Anjana, Meenakshi and Valsala, the women who also attain their selfhood through the trials and sufferings in their life. They are the protagonists of their own stories or episodes interwoven in this novel.

Valsala, in The Better Man, is a tragic character driven to crime, in her effort to attain self-discovery. She is a young woman married to Prabhakaran, who is many years older than her. She does not have the pleasure of marital life. All that she does is to cook for her husband and herself. And Prabhakaran being an old man, her cooking was something he could digest. Valsala's marriage is the result of very unjust practice in the Indian social life, in which the father of a grown-up daughter somehow wants to get his daughter married without thinking of her well-being. An unmarried daughter is a kind of social stigma for him.

Mukundan does not know Valsala personally, but by some freak mistake of the telephone department, all his incoming calls go to Valsala's house, and there was misunderstanding about him when his friends try to call him. Mukundan noticed her eyes, which wore 'dense black,remote and devoid of any emotion. When she spoke she sounded old as Mukundan had experienced, while talking to her on phone, It was her marriage to old Prabhakaran, which had rendered her so different, a woman without any dreams and expectations. She appeared to Mukundan as 'living dead'. Valsala had not at all experienced the pleasures of married life. All her womanly emotions were dampened by the marriage with an old man. It is quite true that Valsala is the victim of the unjust marriage. It is quite understandable if she flouts conventional morality and maintains relationship with Sridharan. If she had decided to divorce Prabharakaran and marry Sridharan, it would have been quite understandable. But Valsala would not give up or break her marriage because she is the mistress of the land that Prabhakaran owns, and the money he would get after his retirement. There was also LIC Policy of Prabhakaran for a considerable amount. She cannot think of sacrificing all these monetary gains, as well as the house and the land, by divorcing Prabhakaran. She is married to Prabhakaran for twenty three years, and was not ready to give up all these benefits. . Together with Sridharan, she conspires to kill Prabhakaran. **They** buried him in Sridharan's plot over which he planted the saplings of coconut.

As a new woman, if she seeks sexual pleasure outside marriage, especially when her husband is incapable of giving it, she is quite within her rights. Valsala is, thus, an example of misguided or self-deceived new woman, who resorts to crime for her self-fulfillment. It must be made clear that self-fulfillment of any man or woman cannot be by committing a crime, taking life of another human being. If there is injustice in Valsala's life, her parents were equally responsible for it. Her action of taking law into her hands and murdering her husband cannot be explained as an act of self-fulfillment. Valsala's Self-discovery is, thus, tainted by criminal action.

The story of Meenakshi occurs as an episode in The Better Man, but it is a story of a spirited woman. She is educated by the standards of the village in Kerala, where young men and women naturally came in contact with the Marxist elements and their activities. Meenakshi's stoy has a background of this political and social activism. Anita Nair's fictional characters are realistically presented situating them in their social background.

Meenakshi had become a loving, caring mother and a dutiful wife. But, to begin with Meenakshi wanted to escape the village life in a small village like Kaikurussi and go away to a city like Trichy. She was influenced by the books on Lenin and Stalin and wanted to rebel against the rich capitalist bourgeois class. In Meenakshi, Anita Nair has presented a new woman, who is not only educated but who is also aware of socio-political aspects of life, going beyond her domestic sphere. As a wife, she remains loyal and dutiful to her husband. As a mother, she on her own brings up her son and she is repository of the worries and sorrows of other women who confide their worries to her. She becomes the support of her disloyal husband when he comes to her as a TB affected decrepit old man.

Meenakshi is quite realistic in the assessment of her life and what she would do with the rest of her life. She does not shy away from responsibility. She treats her husband in his last days. She brings up her son single-handed and now plans for her future. She has been a militant young woman who was aware of social and political cause. Anita Nair has created a spirited

new woman in her. Meenakshi could have married Mukundan, her childhood friend, and ended all her problems. But, she has a sense of duty towards her child and her unfaithful husband. She, in this respect, is a typical Indian Hindu woman, who remains loyal to her husband in any circumstances.

Parukutti, Mukundan's mother, has been a traditional wife, who is very much awed by her domineering husband, Achutan Nair. She is pregnant when Achutan Nair undertakes a journey to Burma for a job. When Parukutti expresses her wish to go with him, he refuses to take her with him giving an excuse of her pregnancy. Parukutti is, to begin with a very docile and submissive, and a woman mutely suffering injustice. But when Achutan Nair tries to bring home another woman, Ammini, Parukutti's self-hood is threatened, and she flatly says 'No' to her husband. She tells him:

> "I said 'no'. I'm willing to live with the
> shame of your taking a mistress.
> But I'm not going to let you flaunt how
> little I mean to you. I am your wife
> and I insist you treat me with
> respect due to me".
>
> (P.74)

She asserted herself as the rightful owner of the property, and reminded her husband of her ownership. He was annoyed and bought a piece of land in front of Parukutti's house and built a house there. This transition of Parukutty from a timid wife to a bold, undaunted woman was a surprise to him. She lived alone in the house, but all the while she nursed a desire to take revenge on her husband for his tyranny of so many years. She did not allow her husband's paddy to be stored in her part of the house. She told the workers to dump the husband's paddy on the dirt road before his new house. She did not allow even palm-leaf mats of hers to heap the paddy. She, thus, publically declared war against her husband, and asserted her self-hood.

Anjana's marriage to Ravindran proved a tragedy in her life because Ravindran did not love her. He treated her merely as a sex object. He himself was a failure as a businessman. When Anjana's mother fell ill, she had to go to her father's house, and her husband also accompanied her.

Anjana enjoyed her job as a teacher. Being educated and occupied as a teacher, she emerges as a free individual and asserts her personal freedom. When she meets Mukundan, she quite appreciates his simplicity and honesty, Anjana enjoyed her job as a teacher. Being educated and occupied as a teacher, she emerges as a free individual and asserts her personal freedom. When she meets Mukundan, she quite appreciates his simplicity and honesty.

Anjana is a spirited woman. She loves Mukundan, but she does not like his duplicity, and shows him cold shoulder, when he tries to postpone taking her home for fear of losing his reputation. She behaves with him politely, and in a reserved manner which makes Mukundan realize his mistake. Anjana shows that she has attained her self-discovery and she would not succumb to any feeling and lose her self-respect. By returning the necklace to Mukundan, that she is not an ordinary woman who could be enticed by an ornament and accept any situation. She maintains her self-respect by returning the necklace to Mukundan and at the same time keeps her poise behaving with him politely. She accepts Mukundan only when he confesses his mistake of seeking recognition at the cost of his love. Anjana is a new woman, who attains selfhood. She is educated, and in her marriage with Ravindran she very much wants to play a part of not only a housewife but a friend and one who can share responsibility. But, when she is treated as a door mat by Ravindran she asserts her individuality. She becomes financially independent. Anjana's positive attitude to life and with others is revealed when Mukundan tells her how he is weak-minded person. Anjana, then assures him saying:

> All of us have our weaknesses, but we
> seldom have the courage to accept them, or
> even declare it as you have done now. To
> me, that makes you, braver than anyone
> else.(P.245)

Anjana, thus, appreciates Mukundan's frank admission of his weakness. But when this Mukundan tries to postpone bringing her home for fear of losing his recognition in the village community, she calmly expresses her displeasure. She shows herself to be a no nonsense woman. When Mukundan realizes mistake and tells her so, then only she accepts him.

All these characters struggle for self-realization in their life, and either succeed or come to grief. Their life-stories are interwoven in the narration of what happens with Mukundan.

Works Cited:

Nair, Anita. *The Better Man,* New Delhi: Penguin Books: 2000.

Sinha, Sunita. *Post – Colonial Women Writers New Perspectives.* New Delhi: Atlantic Publishers and Distributors (p) Ltd., 2008

Rajeshwar M., *Preface to Indian Women Novelists and Psychoanalysis,* New Delhi: Atlantic Publishers and Distributors, 1998

Sinha, Sunita, *Post-colonial women writers New Perspectives,* New Delhi, Atlantic Publishers and Distributors(p)Ltd., 2008

Delay Analysis of DSDV Protocol using NS 2.34

Samiksha Nikam
College of Computer Application for Women,
Satara, Affiliated to S.N.D.T. university, Mumbai

B. T. Jadhav, PhD
Department of Electronics and Computer
Sciences, Y.C. Institute of Sciences, Satara,
Affiliated to Shivaji University, Kolhapur

ABSTRACT

Mobile ad hoc network is very much popular due to its flexibility, easy to install and low cost. The aims of this paper it to analyze delay of mobile ad hoc network for DSDV routing protocol. Delay is most important parameter to evaluate performance of a mobile ad hoc network. It measures total time taken by the packet to reach the destination. Delays in ad hoc network get affected by mobility of nodes, packet transmission speed, and length of route and interference level along the route. In this paper delay of ad hoc network is measured by changing various parameters of ad hoc network such as number of nodes, pause time, speed and connections between the nodes. Network simulator ns2.34 is used for simulation

Keywords
Ad-hoc Network, DSDV, NS2.34, Performance Measurements, Delay.

1. INTRODUCTION

In ad hoc network nodes can enter and leave a network as per their wish. Hence routes may break or new route forms during data communication process. Various routing protocols are designed for ad hoc mobile network. The major challenges researchers have to face while designing routing protocols are mobility of nodes, hidden and exposed terminal problem [2][12].Ad hoc routing protocols are broadly classified as proactive, reactive and hybrid protocol.

Proactive protocols are also known as table driven protocols which maintain list of destinations and their routes by periodically distributing routing table. Reactive protocols are also known as on demand routing protocols because route are discovered on demand [8]. Hybrid protocols combine merits of both proactive and reactive protocols. DSDV protocol is example of proactive protocol.

Due to self-organized nature of ad hoc network it is very much popular now days. Ad hoc networks are mostly used to transmit multimedia data. Requirement for such transmission is minimum delay. In this research paper delay of ad hoc network is analyses in different scenario.

2. DESTINATION-SEQUENCED DISTANCE-VECTOR (DSDV) ROUTING PROTOCOL

It is a first table driven ad hoc network protocol. It is a hop by hop table distance vector routing protocol. In this protocol each node maintain routing table that contains all possible destinations within network and number of routing hops to each destination. The information in routing table is updated by increasing sequence number which avoid count to infinity problem. The sequence number shows freshness of route and route with higher sequence number are favorable. Each mobile node of ad hoc network maintain a routing table which stores information about all available destinations, number of hop and a sequence number. Using this routing table packets are transmitted between the nodes. Routing tables can be exchanged between neighbors at regular interval to keep an up to date view of network topology. The tables are also forwarded if a node observes a significant change in local topology [4], [7][12].

3. SIMULATION MEASUREMENT TECHNIQUE

As configuration of mobile ad hoc network is not stable, simulation techniques are best option to measure performance. Network simulators implemented in software are valuable tools for researchers to develop, test, and diagnose network protocols. Simulation is economical and flexible because it can carry out experiments without the actual hardware. Simulation results are easier to analyze than experimental results because important information at critical points can be easily logged to help researchers diagnose network protocols [13]. A broad survey of 8370 papers published in the selected IEEE Journal and Conference proceedings reveals that majority network researchers are using ns-2 for simulation tasks [11].

In this paper delay of ad hoc network is analyses using network simulator ns2.34 when DSDV routing protocol is used.

3.1 Performance Metric
Efficient routing protocol provides significant benefits to ad hoc network. Efficiency of routing protocol can be measured by considering various performance metrics like throughput, end to end delay, packet delivery ratio, normalized load and packet drop. Here researcher focusing on end to end delay performance parameter. A network's end-to-end delay is defined as the average time interval between the generation and successful delivery of data packets, for all nodes in the network, during a given period of time. Packets that are discarded or lost are not included in the calculation of this metric [1][7]. In this paper ad hoc network performance parameter delay is analyses when DSDV protocol is used for routing.

3.2 Simulation Process
The simulations were performed using Network Simulator (NS2.34). Initially scenario and traffic files are generated. These files are used as input for TCL script. After execution of TCL script two files are created i.e. NAM file and trace files. Trace files are used to analyze the behavior of network. Trace files are analyzed using AWK scripts. Detailed simulation process steps are as follows.

1. Select the performance parameters.
2. Generate scenario and topology files using cbrgen and setdest commands.

3. Write TCL script (.tcl Extension file)
4. Execute TCL script (Use ns Command)
5. Generate Trace and NAM file.
6. Execute AWK script to measure Performance of protocol.
7. Plot the graph.

3.3 Experimental Setup

The goal of the experiments is to examine and compute delay of ad hoc network when DSDV routing protocol is used. Each run of the simulator accept as input a scenario file that describe exact motion of each node and sequence of packets originated by each node together with exact time at which change in packet or motion occurs. To evaluate delay of ad hoc network we consider 9 random simulation runs to generate 9 random scenario patterns. Result is calculated by taking average of those 9 outputs.

Experimental simulations is carried out by varying only one parameter (pause time, number of nodes, max. connections, max. speed) at a time and other parameters are kept constant. The values set for experiment is shown in Table 1.1. Total four simulation experiments performed and data is represented in Table 1.2.

Table 1.1. Values Set for Parameters

Experiment no.	Variable Parameter	Constant Parameter	Values set
1.	Pause Time (0- 90)	Nodes	60
		Max. Speed	10
		Max. Connections	10
2.	Nodes (15 – 60)	Pause Time	0
		Max. Speed	10
		Max. Connections	10
3.	Max. Speed (5 – 50)	Pause Time	0
		Nodes	60
		Max. connections	10
4.	Max. Connections (5 – 50)	Pause time	0
		Nodes	60
		Max. Speed	10

Table 1.2. Experimental Data

Exp. No 1		Exp. No 2		Exp. No 3		Exp .No 4	
(Pause Time Vs. Delay)		(Nodes Vs. Delay)		(Max. Speed Vs. Delay)		(Max. Connections Vs. Delay)	
P. T.	Delay	No de s	Delay	M. S.	delay	M. C.	Delay
0	25.3978	15	20.8811	5	17.8193	5	8.0732
10	20.5222	20	11.9512	10	32.7326	10	15.7002
20	10.7184	25	22.2656	15	52.2981	15	19.1635
30	11.883	30	15.3304	20	38.8622	20	11.7855
40	10.6073	35	10.0033	25	27.2053	25	12.8076
50	14.3643	40	20.5615	30	56.2937	30	14.849
60	12.9492	45	16.9044	35	24.7179	35	15.4024
70	12.7268	50	10.0625	40	44.3834	40	14.99
80	13.9889	55	10.1917	45	36.7122	45	15.4006
90	14.2314	60	19.8352	50	61.1404	50	15.4006

3.4 Graphical Representation

Graphical representation of simulation result is shown with respect to delay of ad hoc network. Fig 1.1 shows graphical representation of pause time vs. delay. Similarly fig 1.2, 1.3 and 1.4 shows graphical representation for Nodes vs. delay, Max. Speed vs. delay, and Max. Connections vs. delay respectively.
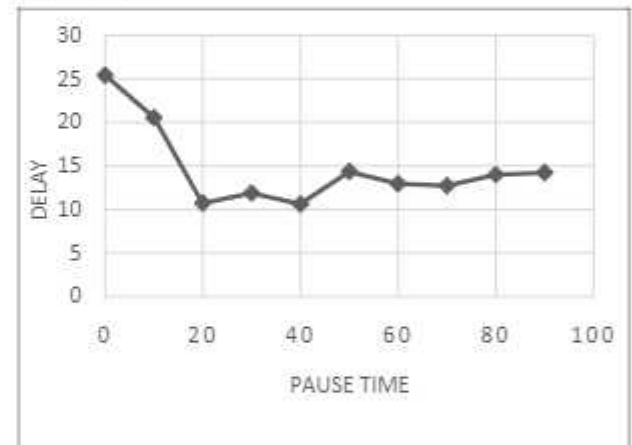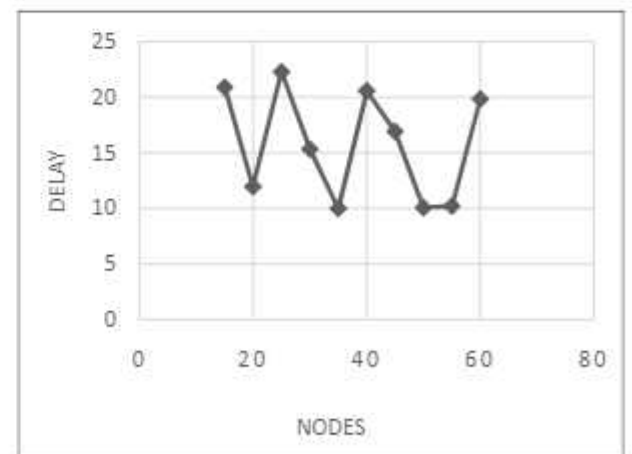

Figure 1.1 Pause time vs. delay
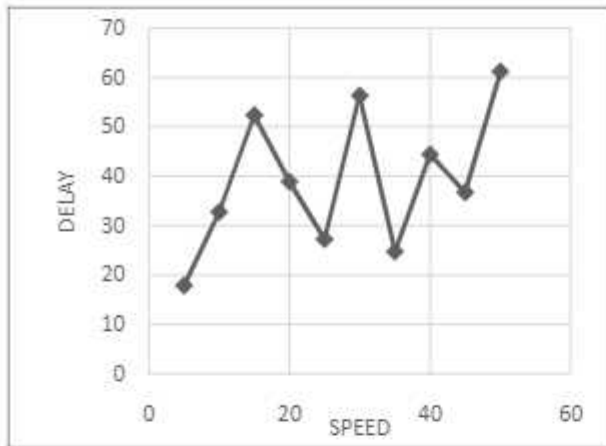

Figure 1.2 Nodes vs. delay
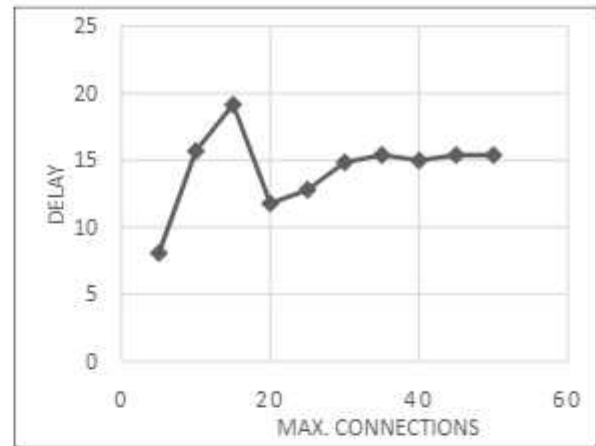
Figure 1.3 Max. Speed vs. delay

Figure 1.4 Max. Connections vs. delay

3.5 Performance Analysis

Data is collected in text file after execution of awk scripts. Collected performance data can be export to the Excel file. Built in Excel data transformation techniques are used to reduce size of experimental data.   For Data visualization Microsoft Excel built in graph tool   is used. Experimental performance data is presented in graphical format against delay.

1.   Pause time vs. Delay

As shown in Table1.2 and 1.3 input parameters i.e. number of nodes, connections between nodes and speed of nodes are kept constant. Only parameter pause time is variable. It is observed from Fig 1.1, as mobility changes from high to low and rest of the parameters are constant then delay in the network maintain at certain level. This is because when Pause time is increasing nodes does not enter or exit the network frequently. Node movement is slow down as connection between nodes are not changing frequently. Delay is approximately remains in between 10-15msec.

2.   Nodes vs. Delay

Table 1.3 shows experimental data for the nodes changing from 15 to 60 and other input parameters are constant. Density of nodes has significant effect on delay. Low density causes frequent connection failure and high density increases traffic in the network which increases delay. Here in this experiment nodes are increasing and at the same time pause time is 0 means nodes are continuously moving. Graphical representation of nodes vs. delay is shown in figure 1.2. It represents that delay is highly unstable as number of nodes increases in high mobility scenario. This is because nodes are frequently entering and exiting a network which required frequent updating of routing tables. If the number of nodes in the network grows, the size of the routing tables and the bandwidth required to update them also grows which reflect in unstable nature of delay.

3.   Max. Speed vs. Delay

Table 1.3 represents experimental data for variable speed of nodes. As shown in fig 1.3 speed of node affect the delay of network. As speed of node increases delay become unstable. As speed increases nodes enter and exit a network frequently and route changes frequently which reflect in unstable delay.

4.   Max connections vs. Delay

Table 1.3 shows experimental data for number of connections and delay. It has been observed from graphical representation of fig 1.4 i.e. as numbers of connections between the nodes are increasing delayis increasing slightly then maintain constant level. Routing is achieved in DSDV protocol by maintaining routing tables by each node. The complex task in DSDV is in generating and maintaining these routing tables. Routing table contain information about destination node, next hop, metric and destination sequence number. As connections between the nodes increases updates packets are broadcasted throughout the network so every node in the network knows how to reach every other node. Thus increasing connections in between the nodes provides alternate route in case of route break. This maintains delay at desired level in the network.

4.   CONCLUSION

This simulation based study was conducted to analyze delay of ad hoc network when DSDV routing protocol is used. Ad hoc network has dynamic topology which raises various performance issues. Delay is important parameters for performance measurement. It is observed from the simulation experiments that in high mobility scenario if number of nodes and speed of nodes are variable then delay in ad hoc network become unstable. Lower delay is always desirable in ad hoc network. it is observed form the experiment that if number of connections in between the nodes increases it helps to reduce delay in ad hoc network.

The study helps to minimize and stable delays in the ad hoc network by maintaining scenario parameters.

5.   REFERENCES

[1] Ahmed A. Radwan, Tarek M. Mahmoud and Essam H. Houssein,"Performance Measurement of Some Mobile Ad Hoc Network Routing Protocols",IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 1, January 2011 ISSN (Online): 1694-0814

[2]   C.Siva Ram Murthy,B.S.Manoj, "Ad Hoc Wireless Network   s   ,PEARSON,ISBN   978-81-317-0688-6,Twenty Second Impression.

[3] G.Jose,Moses,D.SunilKumar,Prof.P.SureshVarma,N.Sup riya," A Simulation Based Study of AODV,DSR, DSDV RoutingProtocols in MANET Using NS-2", International Journal of Advanced Research in Computer Science and Software Engineering, ISSN: 2277 128X, Volume 2, Issue 3,March2012 .

[4] GuoyouHe,"Destination-Sequenced   Distance   Vector (DSDV) Protocol"

[5] Madhuri Pal, KalyaniSatone, BhawaChilke "Implementation DSDV routing protocol for wireless mobile ad-hoc network, using NS2 simulator"

[6] International Journal of Engineering Research & Technology (IJERT) Vol -. 1 Issue 8, October - 2012 ISSN: 2278-0181

[7] Md. Anisur Rahman, Md. Shohidul Islam, Alex Talevski," Performance Measurement of Various Routing Protocols in Ad-hoc Network", Proceedings of the International MultiConference of Engineers and Computer Scientists 2009 Vol I IMECS 2009, March 18 - 20, 2009, ISBN: 978-988-17012-2-0

[8] MehranAbolhasan a, TadeuszWysocki a, ErykDutkiewicz,"review of routing protocols for mobile ad hoc networks". Ad Hoc Networks 2 ,pp1-22,2004.

[9] Mueen Uddin, Azizah Abdul Rahman, AbdulrahmanAlarifi Muhammad Talha, Asadullah Shah, MohsinIftikha and Albert Zomay," Improving Performance Of Mobile Ad Hoc Networks Using Efficient Tactical On Demand Distance Vector (Taodv) Routing Algorithm", International Journal of Innovative Computing, Information and Control ICIC International c 2012 ISSN 1349 4198Volume 8, Number 6, June 2012 pp. 4375–4389

[10] Nurul I. Sarkar, syafnidar A. Halim, "A Review of Simulation of Telecommunication Networks: Simulators, Classification, Comparison, Methodologies, and Recommendations", Cyber Journals: Multidisciplinary Journals in Science and Technology, Journal of Selected Areas in Telecommunications (JSAT), March Edition, 2011.

[11] S. Mohapatra,P.Kanungo," Performance analysis of AODV, DSR, OLSR and DSDVRouting Protocols using NS2 Simulator", International Conference on Communication Technology and System Design2011, Available online at www.sciencedirect.com

[12] SampoNaski, "Performance of Ad Hoc Routing Protocols: Characteristics and Comparison",HUT T-110.551 Seminar on Internetworking, 2004.

[13] Subir Kumar Sarkar,T.G. Basavraju,CPuttamadappa, "AdHoc Mobile Wireless Network, Auerbach Publication.

[14] S.Y. Wang, C.L. Chou, C.H. Huang, C.C. Hwang, Z.M. Yang, C.C. Chiou, and C.C. Lin,"The Design and Implementation of the NCTUns 1.0 Network Simulator".

DELAY ANALYSIS OF ADHOC NETWORK USING NS 2.34

Samiksha Nikam[1], B. T. Jadhav[2]

[1]College of Computer Application for Women, Satara, Affiliated to S.N.D.T. University, Mumbai; [2]Department of Electronics and Computer Sciences, Y.C. Institute of Sciences, Satara, Affiliated to Shivaji University, Kolhapur.

ABSTRACT

Ad hoc network is popular nowadays due to the easy disposition and self-configuring nature. Hence, routing related issues encounter challenges in the ad hoc network. Such network is mainly used for transmission of text, picture and video data. The speed of data delivery decides the quality of service of the network. The quality of service depends upon the protocol used for data transmission. Efficient routing protocol improves the quality of service. The efficiency of the protocol is decided by evaluating different performance parameters like throughput, delay, packet drop, routing load, packet delivery ratio etc. The end to end delay is one of the most important performance parameter sofad-hoc network. It plays a major role in deciding the quality of service. The delay is measured as total time is taken by the packet to reach the destination. Delay in ad hoc network gets affected by the mobility of nodes, and a number of nodes connected to the network. The objective of this research paper is to analyze delay of ad hoc network for DSDV routing protocol. The delay is measured in high and low mobility scenario by changing various parameters of ad hoc network such as a number of nodes, pause time, speed, and connections between the nodes. Network simulator ns2.34 is used for this.

Key Words: Ad-hoc Network, DSDV, NS2.34, Performance Measurements, Delay

INTRODUCTION

In ad hoc network nodes can enter and leave a network as per their wish. Hence, routes may break or new route forms during data communication process. Various routing protocols are designed for the ad hoc mobile network. The mobility of the nodes is major challenges researchers have to face while designing routing protocols. [2][12].

Due to self-organized nature of ad hoc network, it is very much popular nowadays. Most of the people using the ad-hoc network for transmission of multimedia data. The requirement for such transmission is that delay should be minimum. Delay in ad hoc network depends on the factors such as node density, the number of connected nodes, and the speed and mobility of the nodes. In this research paper researcher analyses the delay of ad hoc network in two different scenario such as,

1. By assigning maximum and minimum values for network parameters and running a simulation to evaluate delay for various combinations.
2. The delay is measured in low and high mobility scenario by changing number of nodes and speed of nodes.

DESTINATION-SEQUENCED DISTANCE-VECTOR (DSDV) PROTOCOL

It is a first table driven ad-hoc network protocol. It is a hop by hop table distance vector routing protocol. In this protocol, each node maintains arouting table that contains all possible destinations within network and number of routing hops to each destination. The information in the routing table is updated by increasing sequence number which avoids counter to infinity problem. The sequence number shows freshness of route and route with higher sequence number are favorable. Each mobile node of ad hoc network maintains a routing table which stores information about all available destinations, the number of hops and a sequence number. Using this routing table packets are transmitted between the nodes. Routing tables can be exchanged between neighbors at regular interval to keep an up to date view of network topology. The tables are also forwarded if a node observes a significant change in local topology [4] [7][12].

PERFORMANCE METRIC

The delay is the important performance parameter of ad hoc network. A network's delay is defined as the time required forsuccessful delivery of data packets to the destination node. [1][7]. Delay performance parameter is an important entity to decide efficiency of the routing protocol. In DSDV protocol routes are already stored in routing table hence route establishment time is negligible. However due to the mobility of nodes routes get fail and this increases the delay in the network. In this research paper delay is measured by changing various network parameters in a different scenario.

SIMULATION PROCESS

The simulations were performed using Network Simulator (NS2.34). Fig 1.2 shows various steps used in the simulation. Initially scenario and traffic files are generated. These files are used as input for TCL script. After execution of TCL script, two files are created i.e. NAM file and trace files. Trace files are used to analyze the behavior of the network. Trace files are analyzed using AWK scripts. Detailed simulation process steps are as follows.

1. Generate scenario and topology files using **cbrgen** and **setdest** commands.
2. Write TCL script (.tcl Extension file)
3. Execute TCL script (Use ns Command)
4. Generate Trace and NAM file.
5. Select performance parameters. (Delay).
6. Execute AWK script to measure performance parameter delay of protocol.
7. Plot a graph.

Experiment No.1.

The goal of the experiment is to examine and compute delay of ad hoc network when DSDV routing protocol is used. To evaluate the delay of ad hoc network we consider 10 random simulation runs to generate 10 random scenario patterns. The result is calculated by taking an average of those 10 outputs.

To carry out simulation experiment parameter values set to maximum and minimum levels as shown in table 1.1. As four input parameters are selected total $2^4 = 16$ combinations are possible.

Table 1.2 shows a simulated experimental reading for sixteen combinations of four input parameters.

Table 1.1: Scenario Parameter Values

Input/ scenario parameter	Min. value	Max. value
Pause time	0	90
Nodes	15	60
Max connections	5	10
Max speed	10	50

Table1.2: Experimental Results

Sr.no	Pause Time	Nodes	Max. Speed	Max. Connections	Delay
1	0	15	10	5	8.6860
2	0	15	10	10	35.4407
3	0	15	50	5	8.0384
4	0	15	50	10	45.0554
5	0	60	10	5	9.0225
6	0	60	10	10	43.6726
7	0	60	50	5	9.5911
8	0	60	50	10	47.4159
9	90	15	10	5	12.3971
10	90	15	10	10	17.6771
11	90	15	50	5	16.4312
12	90	15	50	10	19.6135
13	90	60	10	5	11.8881
14	90	60	10	10	13.3639
15	90	60	50	5	12.9327
16	90	60	50	10	13.2926

Experimental data stored in table 1.2 is studied and collective performance data analysis is shown in table 1.3

Table 1.3: Collective Delay Analysis

Sr. no	Pause Time	Nodes	Max. Speed	Max. Connections	End to End Delay
Case 1.	High Mobility (P.T. – 0)	15/60	10/50	5	Less than 10ms.
Case 2.	Low Mobility P.T. - 90	15/60	10/50	5/10	Between 10 -20ms.
Case 3.	High Mobility (P.T. – 0)	15/60	10/50	10	Above 20ms.

ANALYSIS OF EXPERIMENT 1

Case 1: Pause time means the amount of time for which node remains stable in the network. The pause time term relates with mobility of the nodes. Low pause referred as high mobility and high pause time referred as low mobility. In first case network mobility is high (P.T. = 0).It is observed that in high mobility scenario to maintain low delay in the network number of connections in between the nodes should below.

Case 2: The mobility of the nodes plays an important role to maintain delay in ad hoc network. It is observed from Table1.3 that in a low mobility scenario delay is maintained

at moderate level (i.e.10 to 20 ms). This is because in low mobility situation frequency of route failure is less and in DSDV protocol routes are already stored hence less time is required for route discovery. This reduces delay.

Case 3: In the third case it is observed that in high mobility scenario as the number of connections between the nodes increased it will increase the delay significantly.

EXPERIMENT NO 2:

In the previous experiment, we consider maximum and minimum values for the parameters and calculate delay. It is observed that delay depends on mobility and number of connections between the nodes depicted in table 1.3. To strengthen the collective analysis perform in the first experiment second experiment is performed. In this experiment simulation is run for case 1 and case2. Here case 3 is not considered because low delay always desirable in networking

Case 1: In this case mobility is high i.e. P.T. =0.A number of nodes and speed of the nodes is variable. Nodes vary from 15 to 60 and speed of nodes changes from 10 to 50 ms. A number of connections between the nodes are5 and 10 respectively. The reading of the experiment is shown in table 1.4.

Table 1.4: Delay Analysis under High Mobility Scenario

Sr. no	Nodes	Max. Speed	Delay when Max. Connections = 5	Delay when Max. connections = 10
1	15	10	8.7041	13.6838
2	17	12	10.2078	27.6334
3	21	16	9.2179	20.7361
4	25	18	8.2552	25.7013
5	28	20	8.6651	32.2212
6	31	24	8.5097	46.4306
7	34	26	8.8499	54.9927
8	37	28	9.1396	50.5272
9	40	32	8.2582	36.3120
10	43	34	8.5422	27.9240
11	46	36	7.6866	63.7486
12	49	40	8.5634	29.1667
13	52	42	8.5196	32.6418
14	55	44	8.5727	29.6839
15	60	50	8.4606	32.4901

Case 2: The mobility is low (P.T. =90ms), the number of nodes vary from 15 to 60 and the speed vary from 10m/s to 50 m/s. The number of connections between the nodes kept

either 5 or 10 respectively. The experimental data is stored in table 1.5.

Table 1.5: Delay Analysis under Low Mobility Scenario.

Sr. no	Nodes	Max. Speed	Delay when Max. Connections = 5	Delay when Max. Connections = 10
1	15	10	15.1603	19.4782
2	17	12	15.6038	19.9353
3	21	16	12.1737	16.9835
4	25	18	13.1928	16.1472
5	28	20	14.1064	15.2906
6	31	24	13.1477	13.2454
7	34	26	11.4642	14.3767
8	37	28	11.6770	11.6620
9	40	32	11.0789	13.1489
10	43	34	11.0039	11.7969
11	46	36	14.1787	14.3276
12	49	40	11.5431	14.3089
13	52	42	12.5479	12.7235
14	55	44	11.1589	13.7828
15	60	50	11.7489	13.4804

Analysis of Experiment 2:

It is observed from table 1.4 that in high mobility scenario when a number of connections in between the nodes is 5 delays is less than 10 ms. When the number of connections between the nodes increases to the number10 delay increases more than 10 ms. This shows that a number of connections between the nodes affect the delay of ad hoc network. To maintain low delay in ad hoc network when DSDV protocol is used for routing try to keep a number of connections in between the nodes minimum.

It is observed from table 1.5 that in low mobility scenario when a number of connected nodes are either 5 or 10 then delays maintain between 10 to 20 ms. It is concluded that delay depends on mobility and connection between the nodes of ad hoc network. By regulating these parameters low delay can be preserve in the ad hoc network.

EXPERIMENT NO 3:

To scrutinize effect of a number of connections on delay in ad hoc network this experiment is performed. In this experiment speed of the nodes is kept constant at 40ms. And a number of nodes are 100. Connections between the nodes vary from 5 to 75 and delays measured in high and low mobility scenario. The reading is shown in table1.6.

Table 1.6 Experimental Data

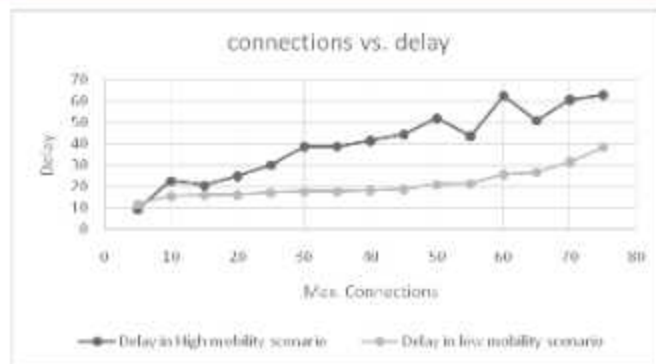| Sr. no	M.C.	Delay in High mobility scenario	Delay in low mobility scenario
1	5	9.4157	11.8622
2	10	22.5643	15.4899
3	15	20.4645	15.8681
4	20	24.9097	16.1651
5	25	29.9623	17.1140
6	30	38.4999	17.5304
7	35	38.7019	17.6481
8	40	41.4092	18.2163
9	45	44.2991	18.6635
10	50	51.7256	20.9201
11	55	43.4658	21.3988
12	60	62.4093	25.7854
13	65	50.7550	26.6981
14	70	60.4532	31.4957
15	75	62.6862	38.3093

Figure 1.1: Connection vs. Delay graph in high and low mobility scenario

Analysis of Experiment No 3

It is observed that as the number of connections increases delay is increasing in both the cases. However in low mobility case delay maintain at a lower level than high mobility scenario.

In high mobility scenario nodes are continuously moving. In DSDV protocol, each node maintains a routing table which contains information of other nodes in a range. The continuous movement of nodes requires frequent updating of routing tables this increases the delay in the network.

CONCLUSION

This simulation-based study is conducted to analyze delay of ad hoc network when DSDV routing protocol is used. Ad hoc network has dynamic topology which raises various performance issues. The delay is important parameters for performance measurement. It is observed from the first experiment that in high mobility scenario if a number of nodes and speed of nodes are variable and other parameters are constant then delay in ad hoc network become unstable. The parameters Pause time and number of connections in between the nodes helps to reduce delay in ad hoc network. In the second experiment, we set parameters in combination and it is observed that mobility plays a significant role to maintain low delay in the network. Low mobility scenario helps to maintain moderate delay. In high mobility scenario if a number of nodes are kept minimum then delay can be maintained at a lower level. It is observed that delay dependson more than one factor hence, the researcher suggested using fuzzy logic to maintain low delayin an ad hoc network.

REFERENCES

1. Ahmed A. Radwan, Tarek M. Mahmoud and Essam H. Houssein,"Performance Measurement of Some Mobile Ad Hoc Network Routing Protocols",IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 1, January 2011 ISSN (Online): 1694-0814.
2. C. Siva Ram Murthy, B.S. Manoj, "Ad Hoc Wireless Networks, PEARSON,ISBN 978-81-317-0688-6,Twenty Second Impression.
3. G. Jose, Moses, D. Sunil Kumar, Prof. P. Suresh Varma, N. Supriya," A Simulation Based Study of AODV,DSR, DSDV Routing Protocols in MANET Using NS-2", International Journal of Advanced Research in Computer Science and Software Engineering, ISSN: 2277 128X, Volume 2, Issue 3, March2012.
4. Guoyou He,"Destination-Sequenced Distance Vector (DSDV) Protocol"
5. Madhuri Pal, Kalyani Satone, Bhawa Chilke "Implementation DSDV routing protocol for wireless mobile ad-hoc network, using NS2 simulator" International Journal of Engineering Research & Technology (IJERT) Vol -. 1 Issue 8, October - 2012 ISSN: 2278-0181.
6. Md. Anisur Rahman, Md. Shohidul Islam, Alex Talevski," Performance Measurement of Various Routing Protocols in Ad-hoc Network", Proceedings of the International Multi Conference of Engineers and Computer Scientists 2009 Vol I IMECS 2009, March 18 - 20, 2009, ISBN: 978-988-17012-2-0
7. Mehran Abolhasan A, Tadeusz Wysocki A, Eryk Dutkiewicz,"review of routing protocols for mobile ad hoc networks". Ad Hoc Networks 2, pp1-22,2004.
8. Mueen Uddin, Azizah Abdul Rahman, AbdulrahmanAlarifi Muhammad Talha, Asadullah Shah, MohsinIftikha and Albert Zomay," Improving Performance Of Mobile Ad Hoc Networks Using Efficient Tactical On Demand Distance Vector (Taodv) Routing Algorithm", International Journal of Innovative Computing, Information and Control ICIC International c 2012 ISSN 1349 4198Volume 8, Number 6, June 2012 pp. 4375–4389.

9. Nurul I. Sarkar, syafnidar A. Halim, "A Review of Simulation of Telecommunication Networks: Simulators, Classification, Comparison, Methodologies, and Recommendations", Cyber Journals: Multidisciplinary Journals in Science and Technology, Journal of Selected Areas in Telecommunications (JSAT), March Edition, 2011.

10. S. Mohapatra,P.Kanungo," Performance analysis of AODV, DSR, OLSR and DSDVRouting Protocols using NS2 Simulator", International Conference on Communication Technology and System Design2011, Available online at www.sciencedirect.com

11. SampoNaski, "Performance of Ad Hoc Routing Protocols: Characteristics and Comparison",HUT T-110.551 Seminar on Internetworking, 2004.

12. Subir Kumar Sarkar, T.G. Basavraju, C Puttamadappa, "AdHoc Mobile Wireless Network, Auerbach Publication.

13. S.Y. Wang, C.L. Chou, C.H. Huang, C.C. Hwang, Z.M. Yang, C.C. Chiou, and C.C. Lin,"The Design and Implementation of the NCTUns 1.0 Network Simulator".

Routing Load Analysis of AODV Protocol with Respect to Mobility of the Network using Ns2.34

Samiksha Nikam

College of Computer Application for Women, Satara
Affiliated to S.N.D.T. Women's University, Mumbai
Maharashtra, India

Dr.B.T. Jadhav

Y.C. Institute of Sciences, Satara
Affiliated to Shivaji University, Kolhapur
Maharashtra, India

Abstract—: Nowadays People wish to use their laptops, mobile, PDA anywhere anytime. Ad hoc network gives this privilege to the users. It does not require any centralized control as each node act as a router. Routing protocol plays a key role in improving network performance. This paper focuses on AODV routing protocol. In AODV protocol during route discovery route request packet is flooded into the entire network and the reply from the destination or intermediate nodes sets up the path between the source and destination. Thus, multiple route reply packets (RREPs) in response to a single route request packet (RREQ) can lead to heavy control overhead which increases routing load in the network. Also due to unstable nature of an ad hoc network it is challenging to maintain low routing load and high throughput in the network. In this paper routing load and throughput of the network is evaluated by varying number of nodes in the network under low to high mobility scenario. This study is carried out using network simulator 2.34.

Keywords-component; AODV, NRL, Network Simulator, Routing Protocol, NS2.34)

Terms Used: P.T. – Pause Time, N – Nodes, M.S.- Max. Speed, M.C.- Max. Connections

I.INTRODUCTION

Ad hoc network is an autonomous collection of mobile users communicate over relatively constrained bandwidth. The network topology may change unpredictably and rapidly over the time. The main goal of an ad hoc network routing protocol is to establish an optimal route between source and destination node. The route should be discovered and maintained with a minimum overhead and bandwidth consumption. Routing is a key factor for transfer of packets from source to destination. [1]

AODV is routing protocol used to route packets from source to destination. In this protocol instead of prior storing routes, they are created on demand. It saves memory requirement as well as bandwidth consumption. When source node demands route, multiple copies of route request query are flooded across the network and if the route is available then

multiple acknowledgment packets from the destination and intermediated nodes are flooded across the network. This might increases the load on the network. This paper centers on routing load of the network and it is examined by varying number of nodes. The mobility of ad hoc network is one of important factor which affects performance of the network [5]. The routing load of the network for AODV protocol is analyzed under different five cases as mentioned in table 1.1.

TABLE 1.1 EXPERIMENTAL SETUP UNDER DIFFERENT SCENARIO

	P.T. (ms)	N	M.C.	M.S. (m/s)
Case 1	0	15 - 125	10	10
Case 2	25	15 - 125	10	10
Case 3	50	15 - 125	10	10
Case 4	75	15 - 125	10	10
Case 5	100	15 - 125	10	10

A. Ad hoc On Demand Vector (AODV) Routing Protocol

AODV routing protocol uses an on-demand approach for finding routes. It is packet routing protocol designed for use in mobile ad hoc network. It is based on DSDV and DSR algorithm. AODV protocol uses request-reply query approach to finding the route. Whenever there is a need for a path from any source to destination and if the route is not available then source initiate request packet (RREQ) containing destination address across the network [2, 3]. Nodes receiving this packet update their information for the source node and set up backward pointers to the source node in the route tables. A node receiving the RREQ send a packet (RREP) as an acknowledgment, if it is either the destination or if it has a route to the destination. Source node receives RREP packet route is established and data transmission starts. In reactive routing protocols, the route is calculated only when a node needs to send data to the destination node. Thus, route discovery is initiated only when needed. This saves overhead in maintaining unused routes. However, this may lead to larger initial delays. [4]
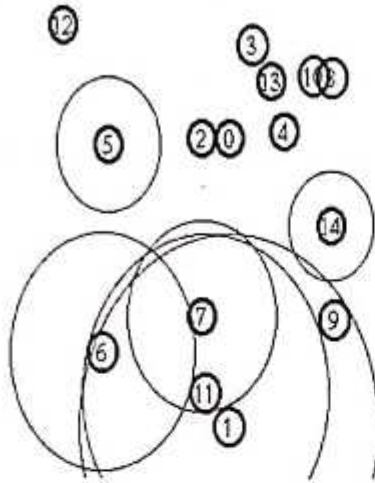
Figure. 1.1 Block diagram of AODV protocol path establishment

II. SIMULATION AND EXPERIMENTAL DESIGN

In this paper simulations carried out using network simulator NS2.34. The routing load and throughput of the network is evaluated when AODV protocol is used for routing. The analysis is done by varying nodes in different mobility scenario as mentioned in Table 1.1. Nodes vary from 15 to 125. Rest of the parameters kept constant as mentioned in table 1.1.

The Performance parameters throughput (TH) and normalized routing load (NRL) are selected to evaluate the performance of AODV protocol. These two parameters play an important role to decide efficiency of an ad hoc network. Due to the mobility of ad hoc network, it is challenging to maintain high throughput without increasing routing load in the network. Low routing load and high throughput are desirable to improve protocol performance.

The simulations were performed using Network Simulator (NS2.34). Fig 1.2 shows various steps used in simulation. Initially scenario and traffic files are generated. These files are used as input for TCL script. After execution of TCL script two files are created i.e. NAM file and trace files. Trace files are used to analyze the behavior of network. Trace files are analyzed using AWK scripts [7].

Figure 1.2 Simulation Work Flow

Following fig 1.3 and fig1.4 shows topology created for 125 and 25 nodes respectively. The snap shot of trace file is shown in fig 1.5.

Figure. 1.3 Topology Files created using setdest command for Nodes

Figure. 1.4 Topology Files created using setdest command for Nodes 15

Figure. 1.5: Snap shot of Trace file generated during simulation for AODV protocol.

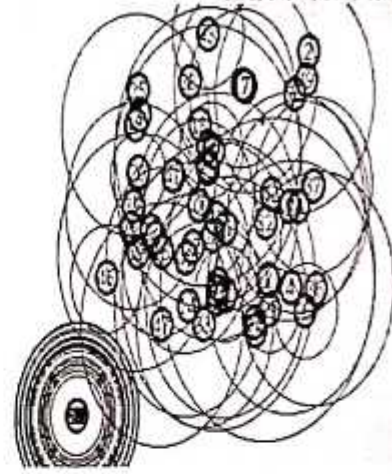Figure1 6 Screen shot of animation file when Nodes = 15 and P T = 0

Figure 1.7 Screen shot of animation file when Nodes = 125 and P T. =25

The experimental performance data under different mobility scenario is shown in Table 1.2.

TABLE 1.2 Experimental Performance Data under Different Mobility Scenario

Sr.no	Nodes	Case 1 P.T.= 0		Case 2 P.T. = 25		Case 3 P.T. = 50		Case 4 P.T.= 75		Case 5 P.T.=100	
		TH1	NRL1	TH2	NRL2	TH3	NRL3	TH4	NRL4	TH5	NRL5
1	15	48.22	0.295	48.22	0.254	48.23	0.241	48.53	0.18	46.86	0.159
2	20	48.19	0.384	48.05	0.339	48.22	0.299	48.38	0.256	48.82	0.171
3	25	47.83	0.491	48.32	0.4	48.43	0.376	48.37	0.321	48.78	0.239
4	30	48.11	0.522	48.19	0.53	48.46	0.457	48.48	0.356	48.53	0.276
5	35	48.35	0.643	48.53	0.677	48.22	0.57	48.4	0.452	48.56	0.311
6	40	48.13	0.794	48.14	0.777	48.16	0.677	48.39	0.55	48.85	0.356
7	45	48.32	0.969	48.34	0.864	48.27	0.868	48.55	0.596	48.68	0.46
8	50	48.03	1.062	47.91	1.069	48.45	0.904	48.73	0.733	48.23	0.543
9	55	47.91	1.543	48.23	0.939	48.47	0.982	48.7	0.769	48.56	0.626
10	60	48.24	1.251	48.37	1.261	47.73	1.257	48.36	1.05	48	0.717
11	65	48.27	1.735	48.39	1.38	48.41	1.349	48.79	0.973	48.83	0.726
12	70	48.14	1.887	49.03	1.724	47.9	1.728	48.59	1.029	48.35	0.831
13	75	47.79	2.012	47.42	1.936	47.72	1.992	47.73	1.296	47.99	0.871
14	80	47.73	2.093	47.45	2.084	47.25	2.004	48.5	1.224	48.27	1.085
15	85	47.91	2.599	47.88	2.211	46.26	2.588	47.68	1.56	48.14	1.127
16	90	46.48	2.875	46.81	2.559	46.72	2.319	47.77	1.665	48.33	1.147
17	95	46.41	2.723	47.3	2.618	47.03	2.327	47.77	1.834	48.1	1.196
18	100	46.69	3.290	45.66	2.999	47.58	2.464	45.89	2.474	48.15	1.406
19	105	47.27	2.985	45.8	3.703	47.32	2.577	47.66	1.867	46.36	1.856
20	110	47.42	3.172	46.89	3.242	46.72	3.078	46.71	2.628	47.51	1.804
21	115	44.75	3.866	46.56	3.927	46.42	3.284	46.35	2.784	46.95	2.042
22	120	46.93	4.077	45.2	4.237	45.63	3.943	46.91	2.454	46.99	2.024
23	125	46.94	4.214	46.13	4.003	45.87	3.807	46.78	3.054	46.48	2.27

Collective performance analysis is mentioned in Table 1.3. This analysis is done by observing performance data stored in Table 1.2. The performance parameter throughput is not mentioned in collective performance analysis because there is no considerable variation in throughput data. It approximately varies between the ranges 44 to 48 kbps during the experiment. It is observed that as the number of nodes and pause time increases simultaneously then routing load is decreasing.

3

Table 1.3 Collective Routing Load Analysis

Normalized Routing Load	Number of Nodes				
	P.T = 0	P.T = 25	P.T = 50	P.T = 75	P.T = 100
0.1 - 0.99	15 - 45	15 - 55	15 - 55	15 - 65	15 - 75
1.0 - 1.99	50 - 70	60 - 75	60 - 75	70 - 95	80 - 110
2.0 - 2.99	75 - 95	80 - 100	80 - 105	100 - 120	115 - 125
3.0 - 3.99	100 - 115	105 - 115	110 - 125	125	
4.0 - 4.3	120 - 125	120 - 125			

It is observed from table 1.3 that under high mobility (P.T. =0) scenario when number of nodes increases routing load in the network is increases.

For E.g. When P.T. = 0, and Number of nodes = 15 – 45 then NRL is 0.1 to 0.99

Similarly When P.T. = 100 and Number of Nodes = 15 – 75 then NRL =0.1 to 0.99.

It is analyzed that to maintain desirable load in the network mobility (P.T.) and number of nodes can be adjusted

B. Performance Analysis

Nodes vs. NRL It is observed from table 1.3 that as number of nodes increases under high mobility situation then routing load is increasing. As a number of nodes increases, multiple copies of RREP packets are flooded while establishing the route. Also, as nodes are increasing routing table entries and control packet information is increasing. This increases routing load in the network. The mobility affect routing load in the network. As node mobility varies from 0ms to100ms, it is observed that routing load is decreasing.

Nodes vs. Throughput: Table 1.3 shows collective routing load analysis for nodes vs. throughput under various pause time. Throughput gives a number of bits transmitted per unit time. It is observed that in the case of AODV protocol throughput is not highly depends upon a number of nodes in the network. Throughput is decreasing slightly as the number of nodes increasing. In AODV protocol route is formed on demand. Hence, there is a guarantee of route availability which results in approximately constant throughput .Throughput is measured under different mobility scenario. It is observed that as pause time is increasing network become more stable and throughput is slightly higher.

III. RESULT ANALYSIS

Graphical representation of routing Load vs. Number of nodes under different pause time scenario is shown in fig1.8. It is observed that the mobility affect routing load in the network. When number of nodes are increasing under high mobility then routing load is increasing. Whereas under low mobility scenario routing load decreases though number of nodes increases. From the graphical representation it is observed that when mobility is high (P.T. =0) normalized routing load is represented by top most green line in the

graph in fig 1.8. When Mobility is low (P.T. =100) Normalized routing load is represented by lower blue line in the graph

Similarly, graphical representation of throughput vs. number of nodes under variable pause time is shown in fig1.9. Throughput is measured by varying number of nodes under high to low mobility scenario. It is observed that as mobility decrease throughput is slightly increasing. When P.T. = 0 throughput is lowest represented by blue line in the graph. When P.T. =100 throughput is highest represented by green line in the graph.

IV. CONCLUSION

In this paper normalized routing load and throughput of ad hoc network is measured against a variable number of the node under different mobility condition. It is observed that mobility plays a vital role to decide the efficiency of the network. When network is stable routing load decreases and throughput increases. When performance parameters routing load and throughput of the network is observed simultaneously it is noticed that as a number of nodes increases routing load is increasing and throughput is decreasing. It seems complex to maintain low routing load without decreasing the throughput of the network. The researcher suggested deciding scenario parameters i.e. number of nodes and mobility to maintain low routing load without decreasing the throughput of the network. Thus, performance of AODV protocol increases.

References

"Dmitri D. Perkins, Herman D. Hughes, and Charles B. Owen", Factors Affecting the Performance of Ad Hoc Networks", 0-7803-7400-2/02/O 2002 IEEE.

[2] Dr. Sanjay Sharma, Pushpinder Singh Patheja," Improving AODV Routing Protocol with Priority and Power Efficiency in Mobile Ad hoc WiMAX Network ",International Journal of Computer Technology and Electronics Engineering (IJCTEE),vol2 , issue1, ISSN 2249-6343.

[3] Dr.Umadevi Chezhiyan, "Measurment Based Analysis of Reactive Protocols in MANET", International Journal of Wired Communications Vol.1, Issue 2, April, 2013

[4] Jitendra Moond, Dharm Singh, Naveen Choudhary," Advancements in AODV Routing Protocol - A Review" National Conference on Recent advances in Wireless Communication and Artificial Intelligence (RAWCAI-2014), International Journal of Computer Applications (0975 – 8887)

[5] Prashant Kumar Maurya , Gaurav Sharma , Vaishali Sahu , Ashish Roberts , Mahendra Srivastava,"An Overview of AODV Routing Protocol", International Journal of Modern Engineering Research (IJMER) Vol.2, Issue.3, May-June 2012 pp-728-732 ISSN: 2249-6645

[6] S H Manjula, C N Abhilash, Shaila K, K R Venugopal, L M Patnai ,"Performance of AODV Routing Protocol using Group and Entity Mobility Models in Wireless Sensor Networks"

[7] "Samiksha Nikam, B T. Jadhav ", DELAY ANALYSIS OF ADHOC NETWORK USING NS 2.34, IJCRR Section: Technology Sci. Journal Impact Factor 4.016, Vol.8, Issue 9, May 2016

[8] Sheng Liu, Yang Yang, Weixing Wang ,"Research of AODV Routing Protocol for Ad Hoc Networks1" 2013 AASRI Conference on Parallel and Distributed Computing and Systems, Available online at www.sciencedirect com

[9] Siddharth Singh, Dr.Naveen Hemrajani, "Performance Evaluation of AODV Routing Protocol in Wireless Sensor Networks with the Constraints of varying terrain areas by varying pause time" International Journal of
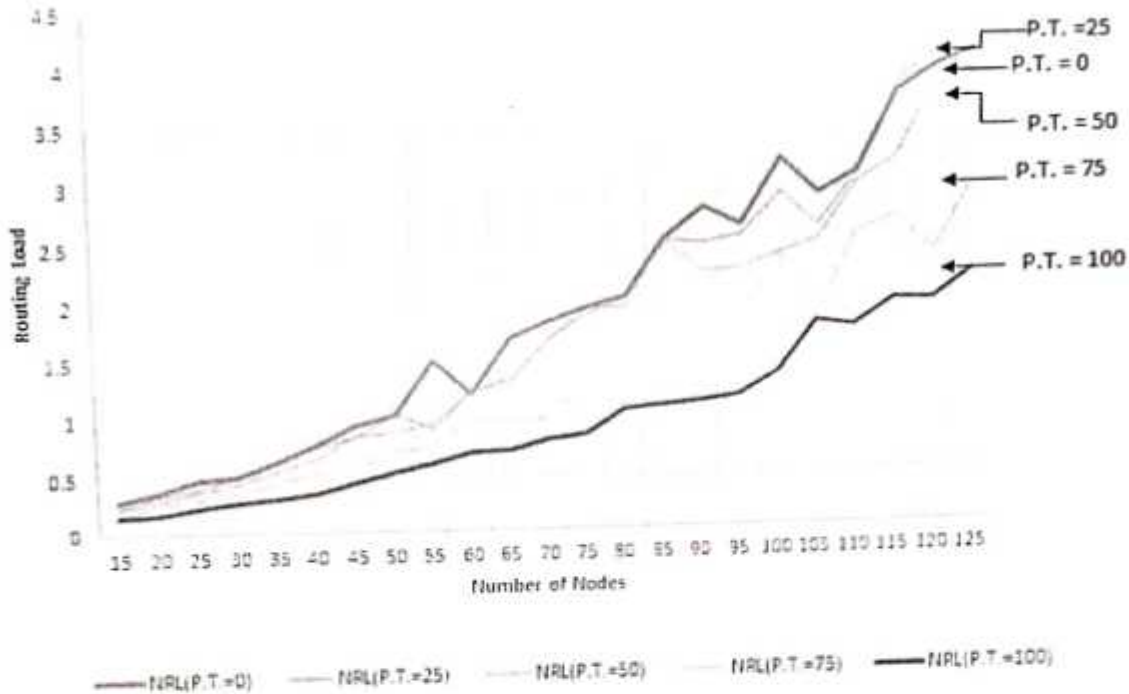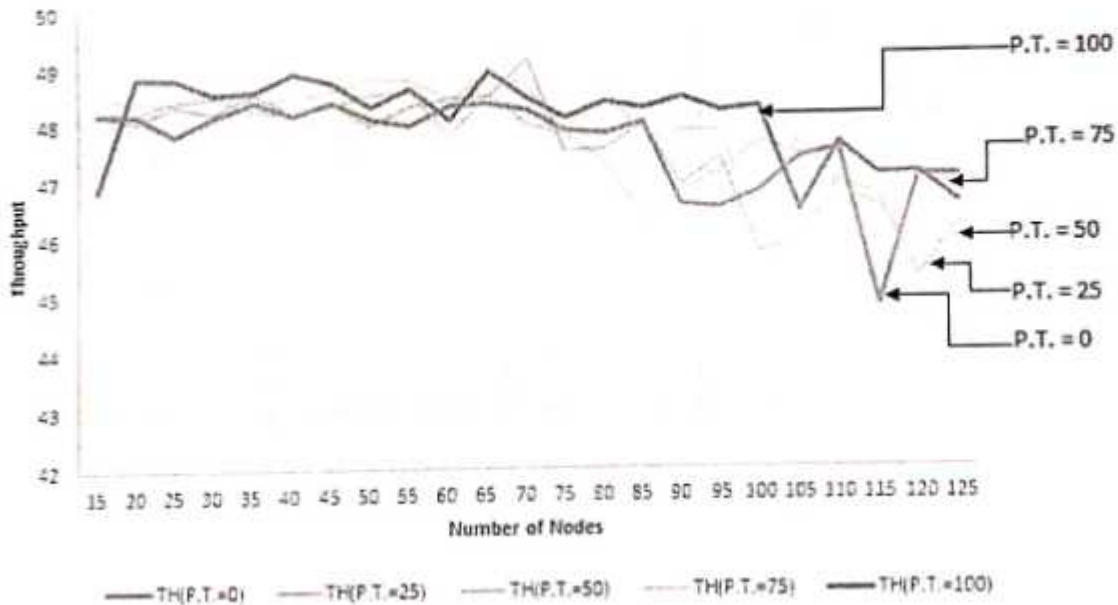
Fig 1.8 Collective Performance Analysis of Routing Load Vs. No .of Nodes

Analysis of AODV Protocol against Pause Time Using NS2.34

Samiksha Nikam[a], B.T. Jadhav [b]

[a] *College ofConputer Application for Women's Satara, Affiliated to S.N.D.T. Women's University, Mumbai, Santacruz(w)*
[b] *Y.C. Institute of sciences, Satara, Affiliated to Shivaji University, Kolhapur*

Abstract

An ad hoc network is very popular because of its easy deployment. It is a self-organising network which has dynamic topology. The routing is a major issue in the ad hoc network due to its node mobility. As nodes are moving continuously the source to destination pair is completely broken and repeated route discovery increases delay and network load and reduces throughput of ad hoc network. The routing protocols play a vital role in data transmission and affect the efficiency of the ad hoc network. Also, mobility factor affects the efficiency of the ad hoc network. The ad hoc network is said to be efficient if it transfers data with higher throughput, minimum delay and low overheads. In this paper, researcher studies efficiency of AODV protocol against node mobility. The node mobility term relates to the pause time i.e. the amount of time node is stable at a particular location. The high pause time means nodes in the network have low mobility and low pause time means nodes have high mobility. The performance of AODV protocol is evaluated on the basis of four performance matrices i.e. throughput, delay, routing load, and packet delivery ratio using the Network simulator NS2.34. This study will help the researcher further to regulate the scenario parameters of ad hoc network which will help to improve performance of the protocol.

Index Terms: AODV, Performance, network simulator, pause time.

1. Introduction

Mobile ad hoc network is an autonomous collection of mobile users communicating over relatively constrained bandwidth. The network topology may change unpredictably and rapidly over the time. The main goal of an ad hoc network routing protocol is to establish an optimal route between source and destination node. The route should be discovered and maintained with a minimum overhead and bandwidth consumption. Routing is a key factor for transfer of packets from source to destination. [3]. Node mobility is an important parameter in ad hoc network which decides efficiency of the network. The efficiency of the network highly

* Corresponding author.
E-mail address:

depends on the performance of the protocol. Due to mobile nodes topology of the network changes frequently and accordingly protocol has to update their routing tables. This might lead to increase routing load in the network. Thus, dynamic topology is one of the greatest challenges in the ad hoc network.

AODV protocol is popular on-demand routing protocol. It comprises new routing concept compared to DSDV routing protocol. It provides a scalable solution to relatively large network topology. In AODV protocol routes are created when source node want to transfer the data. Due to mobile nodes, sometimes nodes may not available to form a route. In such case delay and routing load increases as multiple route request packets flooded in the network. These also affect throughput and PDF of the network. It seems that mobility plays the vital role to decide performance of the protocol.

Many researchers have analysed the performance of AODV protocol by using different performance parameters under different circumstances. The main objective of this paper is to evaluate AODV protocol performance on the basis of varying pause time. Low pause time means high mobility and high pause time mean low mobility. Under predefined scenario and constrained like 50 mobile nodes, simulation area 500*500, maximum connections 10,512 bytes packet size, having fix mobility of 10m/s with varying pause time from 0 to 100ms. Throughput, delay, routing load and packet delivery fraction are the network performance parameters selected to investigate the performance of AODV protocol. A simulation study is carried out using network simulator ns2.34 [9].

This paper is organized as follows. The second section explains the working of AODV protocol and the performance parameters selected for evaluation; the third section describes the simulation environment and experimental performance data against pause time; the fourth section evaluates the efficiency of AODV protocol against node mobility and then we concluded at the end.

2. Ad Hoc on Demand-Vector Routing Protocol (AODV) Protocol

AODV routing protocol uses an on-demand approach for finding routes. It is packet routing protocol designed for use in mobile ad hoc network. It is based on DSDV and DSR algorithm. AODV protocol uses request/reply query approach for finding the route. Whenever there is a need for a path from any source to destination and if the route is not available then source initiate request packet (RREQ) containing destination address across the network [6, 7]. Nodes receiving this packet update their information for the source node and set up backward pointers towards the source node in the routing tables. A node receiving the RREQ send a packet (RREP) as an acknowledgment, if it is either the destination or if it has a route to the destination. Source node receives RREP packet then route is established which starts data transmission. In reactive routing protocols, the route is calculated only when a node needs to send data to the destination node. Thus, route discovery is initiated only when needed. This saves overhead in maintaining unused routes. However, this may lead to larger initial delays [8].

3. Methodology

In this section researchers describe the performance metric, simulation process and environment, and experimental setup used to evaluate efficiency of AODV protocol.

3.1. Performance Metrics

The performance measurement of any network is an essential task because it helps to determine network performance need any upgrading for better performance. Basically three techniques are used to measure the performance of the network.

- Empirical Measurements
- Analytical Measurements

- Simulation Measurements.

Once the system is built and it is in running phase empirical technique is used. During design and developing phase analytical and simulation technique is used. Researchers used simulation technique to measure the performance of AODV protocol. Routing protocol plays a vital role in data transmission in mobile ad hoc network. The protocol is said to be efficient if it is able to transfer data with low delay, high throughput, low routing load and higher packet delivery fraction. Following performance metrics have been selected to evaluate protocol performance [1].

- Throughput: It is measured as total number of packets successfully transmitted to the destination per unit time. It is measured in bits/sec. Throughput is calculated by using following formula,

Throughput (bits/sec) = (Number of delivered packets *Packet size *8) / Total simulation period

- Delay: it is measured as a total time required to transfer packets from source to destination. It also includes the delay caused by route discovery process and the queue in data packet transmission. Only the data packets that successfully delivered to the destinations that are counted. The lower delay in the network associated to better performance of the protocol.
- Packet delivery fraction (PDF): the ratio of the total number of generated packets to the number of delivered data packet to the destination. This illustrates the level of delivered data to the destination. The greater value of packet delivery ratio means the better performance of the protocol.
- Normalized Routing Load (NRL): it is measured as the number of routing packets transmitted per data packet delivered at the destination. Low routing load is desirable in the network which corresponds to better performance of the protocol

3.2. Simulation process

The simulations were performed using Network Simulator NS2.34. Initially scenario and traffic files are generated. These files are used as input for TCL script. After execution of TCL script two files are created i.e. NAM file and trace file. Trace files are used to analyze the behavior of network. Trace files are analyzed using AWK scripts. Ad hoc networks are highly dynamic hence simulation technique is an option to measure the performance. Table 1 shows list of simulation parameters and their values to run the simulation.

Following steps are performed to run the simulation.

- Select performance parameters. (Throughput, delay, routing load and packet delivery fraction).
- Generate scenario and topology files using cbrgen and setdest commands.
- Write TCL script (.tcl Extension file)
- Execute TCL script (Use ns Command)
- Generate Trace and NAM file.
- Execute AWK script to measure performance.

Table 1. Simulation Environment

Parameter	Value
Ad-hoc Routing Protocol	AODV
Antenna Type	Omni-directional
Simulation Time	100 sec
Simulation Area	500 X 500
Traffic Type	CBR
Node Speed	10 m/s
Data Packets	512bytes
Pause Time	0 - 100 ms
Number of Nodes	50
Mobility Model	Random Waypoint
Propagation Model	Two-ray Ground reflection
Interface Queue Type	Drop Tail/ Priority Queue
Interface Queue Length	50 Packets
Max. Number of Connections	10

3.3. Experiment Setup

The goal of our experiments is to examine and compute performance of ad hoc network when AODV routing protocol is used. Each run of the simulator accept scenario file as input. The scenario file describe exact motion of each node and sequence of packets originated by each node together with exact time at which change in packet or motion occurs. To evaluate performance of ad hoc network we consider 10 random simulation runs to generate 10 random scenario patterns. The result is calculated by taking average of those 10 outputs. Experiments are carried out in two ways. Total 21 Simulations run each for 100 sec and result is stored in Table 2. The fig1 shows screenshots of scenario generated for 50 nodes, pause time 25ms and node speed 10m/during simulation. Fig 2 depicts topology created for 50 nodes with cbr generator. Fig 3 shows screen shots of animation file while executing 50 nodes.

Table 2. Experimental Performance Data

Experimental Design					
	Scenario Parameter	Performance Parameters			
Sr. No	Pause Time	Throughput	Delay	PDF	NRL
1	0	48.27	87.498	98.92	1.203
2	5	48.08	31.49	98.77	1.046
3	10	47.82	80.005	98.15	1.466
4	15	48.18	63.80	98.87	1.170
5	20	48.12	49.982	98.58	1.525
6	25	48.17	54.30	99.17	1.160
7	30	48.21	55.521	98.85	1.279
8	35	48.52	25.71	99.56	0.956
9	40	48.58	52.44	99.03	1.195
10	45	48.46	26.15	99.56	0.780
11	50	46.56	49.446	95.33	3.502
12	55	48.39	19.67	99.51	0.788
13	60	48.34	40.807	99.15	1.076
14	65	48.93	22.42	99.61	0.669
15	70	48.78	58.805	89.52	0.814
16	75	47.28	45.51	99.05	0.791
17	80	48.65	33.061	99.24	0.772
18	85	48.45	22.58	99.83	0.534
19	90	48.55	41.572	89.76	0.605
20	95	48.71	26.65	99.88	0.501
21	100	48.85	46.666	99.92	0.514

Fig.1. Screenshot of Scenario File Created using setdst Command

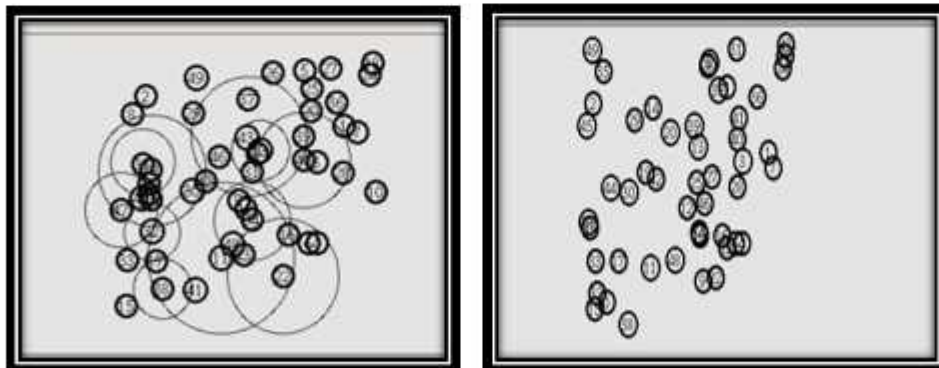Fig.2. Screenshot of Topology Created using cbrgen Command

Fig.3. Screenshots of NAM File for Execution for 50 nodes

4. Performance Analysis

Performance evaluation of AODV protocol with respect to pause time is mentioned below with graphical representation.

4.1 Pause time vs. Throughput

Graphical representation of throughput vs. pause time is shown in fig.4. It is observed that as pause time is increasing throughput is slightly increasing. Increasing pause time corresponds to decreasing node mobility. As nodes become stable possibility of route breakage is reduced and chances of successful transmission of data is increased. In AODV protocol route is formed on demand. Due to this probability of data transmission is increased and throughput increases to some extent. It is observed that mobility of nodes does not affect the throughput of ad hoc network significantly. Throughput measure approximately 46 to 49 kbps for the pause time varying between 0 and 100ms.
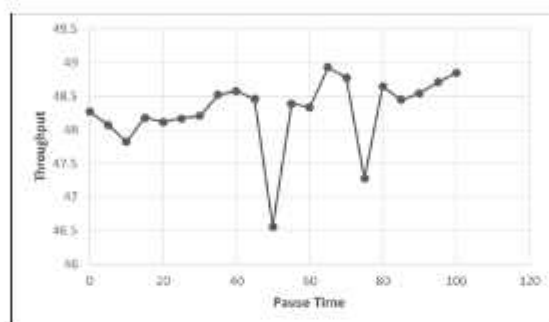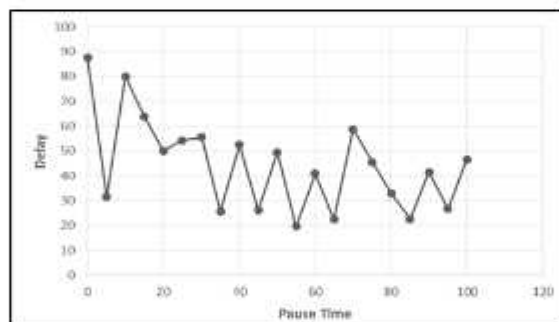

Fig.4. Pause Time vs. Throughput

Fig.5. Pause Time vs. Delay

4.2 Pause Time vs. Delay

The graphical representation for pause time vs. delay is shown in fig 5. It is observed that delay is variable with changing pause time. In AODV protocol routes are not stored prior. When any node wants to transfer data then route is generated accordingly. The time required to create a route and transmit data depends on the availability of destination node and traffic in the network. Due to this delay is variable in the ad hoc network. As pause time is increasing nodes are becoming more stable which helps in reducing delay to some extent in the ad hoc network.

4.3 Pause Time vs. PDF

As pause time increases from 0 to 100ms packet delivery factor (PDF) is approximately constant as shown in fig.6. Packet delivery factor means the total number of packet received with respect to packet sent by the sources. In AODV protocol, two factors are responsible for increasing PDF. The first factor is increase in pause time reduces node mobility which ultimately reduces route breakage. Another factor is routes are created on demand which increases the possibility of data delivery. It is also observed that sometimes packet delivery fraction is decreasing below 90%. This is due to increase in delay and routing load. In AODV protocol routes are formed on demand but if nodes are not available to transfer the data then route settling time increases which increase the delay in the network.

4.4 Pause Time vs. Routing Load

Graphical analysis of pause time vs. routing load is shown in fig .7. As pause time is increasing routing load is decreasing. Actually, in AODV protocol, a number of control packets required are more as compared to DSDV protocol. However when pause time increases, network become more stable. Hence, route breakage reduces. No control packets are required to broadcast broken link. Whenever there is a need to transfer the data from source to destination then the only route is created. Hence, no unnecessary control messages are required. This decreases routing load with increasing pause time.
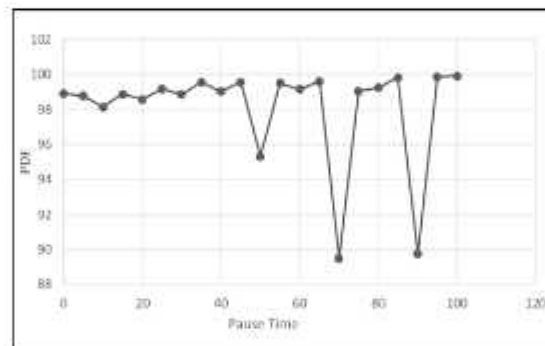

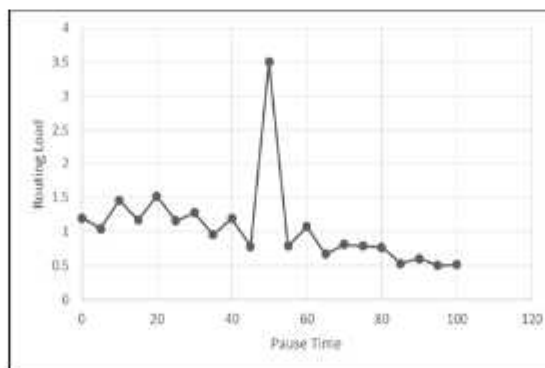
Fig.6. Pause Time vs. PDF

Fig.7. Pause Time vs. Routing Load

5. Conclusions

The performance analysis of existing routing protocol is necessary to study efficiency of an ad hoc network. The AODV protocol is important routing protocol used in Ad hoc network. It creates a route on demand when source node initiates the route request. In this paper the performance of ad hoc network is scrutinized considering various performance parameters like throughput, delay, routing load and packet delivery fraction. In this experiment different self-created scenario file and CBR files are used for simulation through TCL file. Performance of AODV protocol is analyzed against pause time varying in the range 0 to 100ms and rest of the network scenario parameters are kept constant. Pause time term correspond to the mobility of nodes. It is observed that as pause time is increasing throughput and PDF is increasing up to some extent however delay, routing load is decreasing. This is because as pause time increases network become stable hence probability of route failure is less. It means when nodes become stable protocol performance is increasing and thus network performance increases. However, practically mobility factor is unpredictable in ad hoc network. So it is essential to regulate mobility of ad hoc network to maintain the performance of the network.

References

[1] "Dmitri D. Perkins, Herman D. Hughes, and Charles B. Owen", Factors Affecting the Performance of Ad Hoc Networks", 0-7803-7400-2/02/© 2002 IEEE.

[2] Dr. Sanjay Sharma, Pushpinder Singh Patheja," Improving AODV Routing Protocol with Priority and Power Efficiency in Mobile Ad hoc WiMAX Network ",International Journal of Computer Technology and Electronics Engineering (IJCTEE),vol2 , issue1, ISSN 2249-6343.

[3] Dr.Umadevi Chezhiyan, "Measurment Based Analysis of Reactive Protocols in MANET", International Journal of Wired Communications Vol.1, Issue 2, April, 2013.

[4] Jitendra Moond, Dharm Singh, Naveen Choudhary," Advancements in AODV Routing Protocol - A Review" National Conference on Recent advances in Wireless Communication and Artificial Intelligence (RAWCAI-2014), International Journal of Computer Applications (0975 – 8887).

[5] Prashant Kumar Maurya , Gaurav Sharma , Vaishali Sahu , Ashish Roberts , Mahendra Srivastava,"An Overview of AODV Routing Protocol", International Journal of Modern Engineering Research (IJMER) Vol.2, Issue.3, May-June 2012 pp-728-732 ISSN: 2249-6645.

[6] S H Manjula, C N Abhilash, Shaila K, K R Venugopal, L M Patnai ,"Performance of AODV Routing Protocol using Group and Entity Mobility Models in Wireless Sensor Networks"

[7] Sheng Liu, Yang Yang, Weixing Wang ,"Research of AODV Routing Protocol for Ad Hoc Networks1" 2013 AASRI Conference on Parallel and Distributed Computing and Systems, Available online at www.sciencedirect.com

[8] Siddharth Singh, Dr.Naveen Hemrajani, "Performance Evaluation of AODV Routing Protocol in Wireless Sensor Networks with the Constraints of varying terrain areas by varying pause time" International Journal of Emerging Trends & Technology in Computer Science (IJETTCS),Volume 2, Issue 1, January – February 2013 ISSN 2278-6856.

[9] Sudhir Goswami, Chetan Agarwal, Anurag Jain, " Location Based Efficient Scheme for Maximizing Routing Capability od AODV Protocol in MANET ",I.J.Wireless and Microwave Tecnologies(IJWMT), vol 3, issue1, May 2015, ISSN 2076-9539.

[10] Zafar Mahmood, Muhammad Awais Nawaz, Dr Mudassar Iqbal, saleem Khan, Ziaul Haq,"Varying Pause Time Effect on AODV,DSR and DSDV Performance"I.J.Wireless and Microwave Tecnologies(IJWMT), vol 5, issue1, March 2015, ISSN 2076-9539.

Authors' Profiles

Samiksha Nikam has completed her B.E. in electronics from Shivaji University, Kolhapur. She has completed her M.C.A. from IGNOU, Delhi and MPhil (C.S.) from YCMOU Nashik. She is presently perusing her Ph.D in computer science from Shivaji University, Kolhapur, Maharashtra. Her area of interest is in the field of Ad hoc Network and Fuzzy Logic.

Dr.Bharat Jadhav has obtained his Ph.D degree in electronics from Shivaji University, Kolhapur. Currently he is the Head of Computer Science and Electronics department of Y.C Institute of Sceinces, Satara, Maharashtra. His area of interest is in the field of Network and Fuzzy Logic.

Fuzzy Approach to Maintain Delay in Ad Hoc Network for DSDV Protocol

SamikshaNikam, Dr.B.T.Jadhav

Abstract: Ad-hoc network is very popular due to its flexibility and self-configure nature. Routing protocol plays key role in case of data transmission. The major function of routing protocol is to discover the route and transmit the data with minimum delay. Delay is important performance parameter of ad hoc network and it get affected by network parameters such as node density, mobility , speed of nodes and number of connected nodes. This research paper focuses on delay performance parameter. Due to mobility of nodes it is challenging to maintain low delay in ad hoc network. In this research paper researcher proposed to use fuzzy inference system to maintain delay in the ad hoc network.

1.0 Introduction:

Dynamic nature of ad hoc network raises various performance issues for routing protocols. Performance of network depends the efficiency of protocol used during data transmission. Efficient protocol plays vital role to improve networkperformance. Performance of network protocol is measured by considering various parameters such as throughput, delay, routing load, and packet delivery fraction [2][10]. In this paper researcher focus on only delay performance parameter and DSDV protocol for study.The primary objective of this study is to use fuzzy inference system to maintain delay in ad hoc network. Desired delay is inputted to fuzzy inference system. The outcome of fuzzy system defines values for pause time, number of nodes, maximum speed and maximum connections. Output values specified by fuzzy inference system is used to set an ad hoc network scenario. Simulations perform using network simulator NS2.34 to verify whether delay is maintaining at lower level or not. Fuzzy inference system is implemented in Matlab. The research paper is organized as follows.

Second section describes delay analysis of DSDV protocol.A discussion on work flow of fuzzy inference system is mentioned in section 3. Section4 describes simulation environment and methodology. Section 5 describes fuzzy inference system, followed by result comparison and analysis in section 6.

2.0Delay Analysis of Ad Hoc Network for DSDV Protocol:

DSDV is the first table driven ad hoc network protocol. In this protocol each node maintain routing table that contains all possible destinations within network and number of routing hops to each destination. The information in routing table is updated by increasing sequence number which avoid count to infinity problem. The sequence number shows freshness of route and route with higher sequence number are favorable. Each mobile node of ad hoc network maintain a routing table which stores information about all available destinations, number of hop and a sequence number. Using this routing table packets are transmitted between the nodes. [3] [5].

Delay is important performance parameter of mobile ad hoc network. Due to unstable nature of ad hoc network it is challenging to maintain the low delay during data packet transmission. Delay in ad hoc network get affected bynetwork parameters like (1) pause time, (2) number of nodes, (3) speed of nodes, (4) numer of connected nodes. Simulation study is performed to evaluate and quantify effect of network scenario parameters on delay of ad hoc network. Analysis is performed by varying only one parameter at a time and rest of the parameters are kept constant[7]. Following is the analysis,

1. **Pause Time:**Variation in pause time does not affect delay in ad hoc network significantly . Delay approximately remains constant at specific value.
2. **Number of nodes**: Density of nodes has significant effect on delay. If the number of nodes in the network grows, the size of the routing tables and the bandwidth required to update them also grows which reflect in unstable nature of delay.

3. **Speed of nodes**: When speed of nodes increases nodes enter and exit a network frequently and route changes frequently which reflect in variable delay.

4. **No. of Connections**: As connections between the nodes increases updates packets are broadcasted throughout the network so every node in the network knows how to reach every other node. Thus increasing connections in between the nodes provides alternate route in case of route break. This maintains delay at desired level in the network.

However practically topology of ad hoc network is unstable network parameter can be change any time. If mobility of nodes other network parameters vary in combination then it helps to maintain delay in the ad hoc network . Low mobility scenario helps to maintain moderate delay. In high mobility scenario if number of nodes are kept minimum then delay can be maintain at lower level.In high mobility scenario if number of nodes and speed of nodes are increasing and other parameters are constant delay in ad hoc network become unstable.

It is observed that to maintain delay at desired level is challenging and complex task. In such circumstances fuzzy logic is best suitable to take a decision. In this research paper use of fuzzy logic is proposes to decide pause time, nodes, maximum speed and maximum connections to maintain desired delay.

3.0 Work Flow of Fuzzy System

Fuzzy systems are suitable for ambiguous and approximate reasoning. It help to estimate output values depends upon input variables provided and set of rule extracted considering incomplete or uncertain information. [10]. Fuzzy inference system consists of set of input, output variable and set of rules to control the fuzzy system. Following flow chart depicts work flow of fuzzy system and how it is used to maintain delay in ad hoc network at desired level.

Initially network scenario is created and accordingly parameters pause time (P.T.), nodes (N), maximum speed (M.S.), and maximum connections (M.C.) are set for ad hoc network and run the simulation using network simulator ns2.34. At the end of simulation delay is calculated using trace files. If delay is at desired level then maintain these parameters. Otherwise go to fuzzy inference system and change the parameters to obtain desired delay. Here fuzzy logic is used to decide network scenario parameter values to maintain delay of network at desired level.
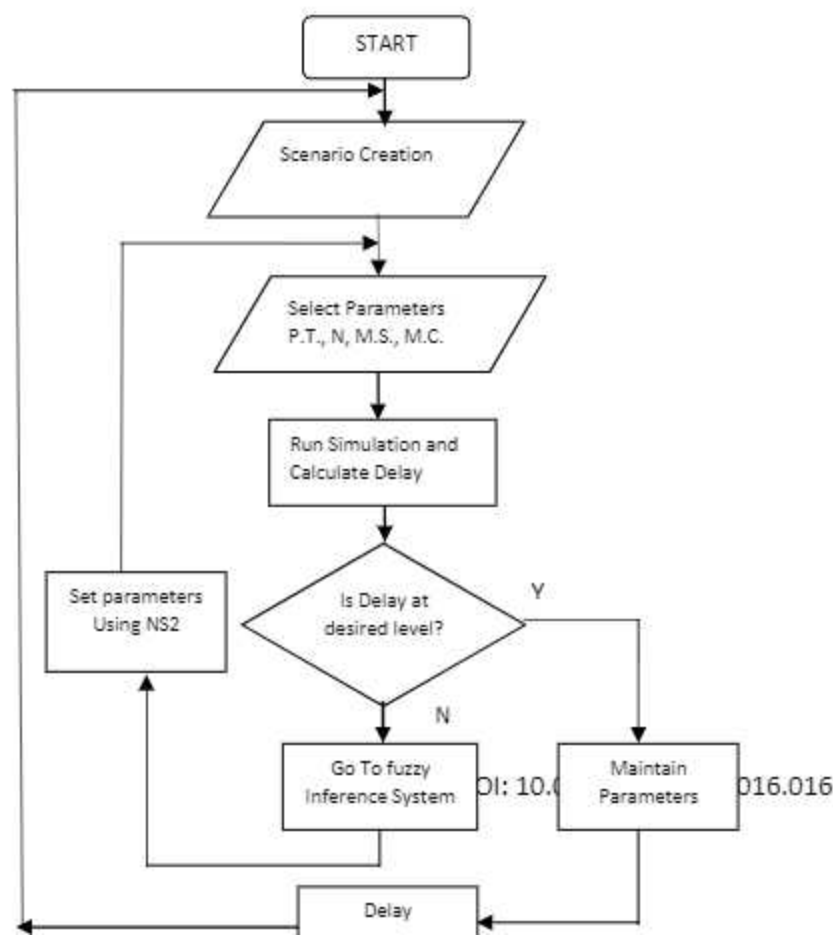
Fig 1.1 Work Flow for Fuzzy System

4.0 Experimental Procedure:

Simulation is carried out with network simulator NS2.34. Ad hoc networks are highly dynamic hence simulation techniques is an option to measure the performance. Network simulators implemented in software are valuable tools for researchers to develop, test, and diagnose network protocols. A delay of ad hoc network is analyzed using network simulator ns2.34 while DSDV protocol is used for routing.

 Following steps are performed to run simulation.

1. Select performance parameters. (Delay).

2. Generate scenario and topology files using cbrgen and setdest commands.

3. Write TCL script (.tclExtension file)

4. Execute TCL script (Use ns Command)

5. Generate Trace and NAM file.

6. Execute AWK script to measure performance.

Table 1.1 shows simulation environment designed to evaluate delay. Total 32 Simulations runeach for 100 sec and result is stored in Table 1.2. These results are used to implement fuzzy inference system.

Table 1.1 Simulation Environment for NS2

PARAMETER	VALUE
Ad-hoc Routing Protocol	DSDV
Antenna Type	Omni directional
Simulation Time	100 sec
Simulation Area	500 X 500
Traffic Type	CBR
Node Speed	6 - 92 m/s
Data Packets	512bytes
Pause Time	9- 101 ms
Number of Nodes	10 -124
Mobility Model	Random Waypoint
Propagation Model	Two-ray Ground reflection
Interface Queue Type	Drop Tail/ Priority Queue
Interface Queue Length	50 Packets
Max. Number of Connections	7 – 78

Table 1.2 Experimental performance Data Using NS2

	Network Scenario Parameters				Performance Parameter
Sr No.	Pause Time	Nodes	Max.Speed	Max. Conn.	Delay
1	9	10	6	7	8.51
2	12	13	8	10	9.52
3	15	16	10	10	9.52
4	20	17	12	11	14.81
5	20	17	13	12	14.83
6	23	21	15	14	10.52
7	26	23	18	17	14.91
8	29	26	21	18	21.99
9	32	29	24	20	15.16
10	35	33	27	22	13.07
11	38	37	30	24	10.97
12	41	42	33	26	11.76
13	44	47	36	28	10.82
14	47	52	39	30	11.85
15	50	57	42	32	12.35
16	53	62	45	34	10.29
17	56	67	48	36	13.06
18	59	72	51	38	13.33
19	62	77	54	40	14.32
20	65	82	57	42	15.08
21	68	87	60	44	13.98
22	71	92	63	46	16.2
23	74	97	66	48	15.67
24	77	100	69	50	15.75
25	80	103	72	53	17.97
26	83	106	75	56	19.43
27	86	109	78	59	22.72
28	89	112	81	62	21.95
29	92	115	84	65	28.95
30	95	118	86	68	23.91
31	98	121	89	73	35.93
32	101	124	92	78	51.12

5.0 Fuzzy System Construction

A fuzzy system consist of three steps i.e. fuzzification, inference engine and defuzzification. Fuzzification is the process in which crisp values are transformed into membership values of fuzzy set. Fuzzified data is fed to inference engine. Inference engine calculate fuzzy output using rule base. Defuzzification is a mathematical process used to convert fuzzy output to crisp values. Fuzzy systems are able to make decisions in complex situation. Here fuzzy logic is used to decide parameter values for pause time, nodes, speed and connections in such a way that it help to maintain desired delay. For development of fuzzy based system delay is given as input to fuzzy inference system and output of system gives four parameters i.e. P.T.), nodes maximum speed (M.S.) and maximum connections (M.C.). Following fig1.2 show input and output parameters selected to build fuzzy system. Triangular membership functions are used to design fuzzy sets. Total five fuzzy sets are designed.
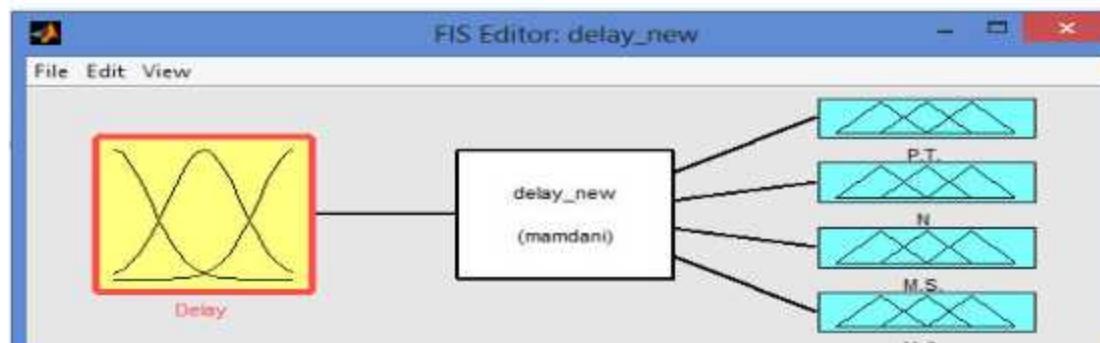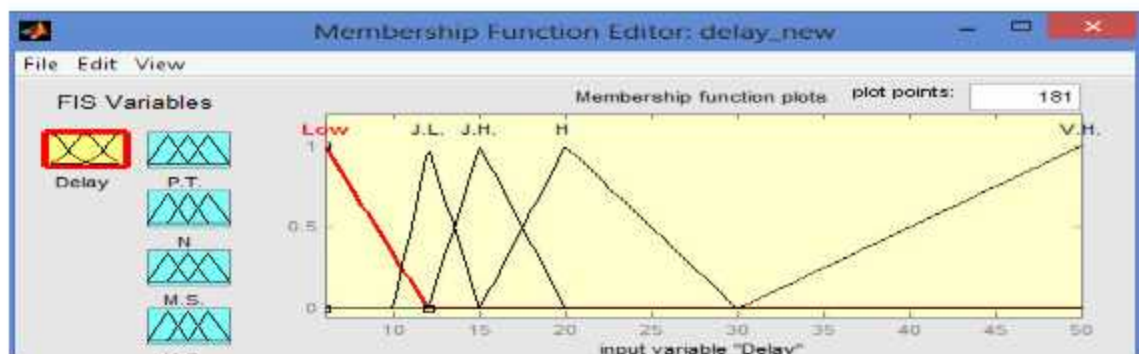

Fig 1.2Input and output parameters

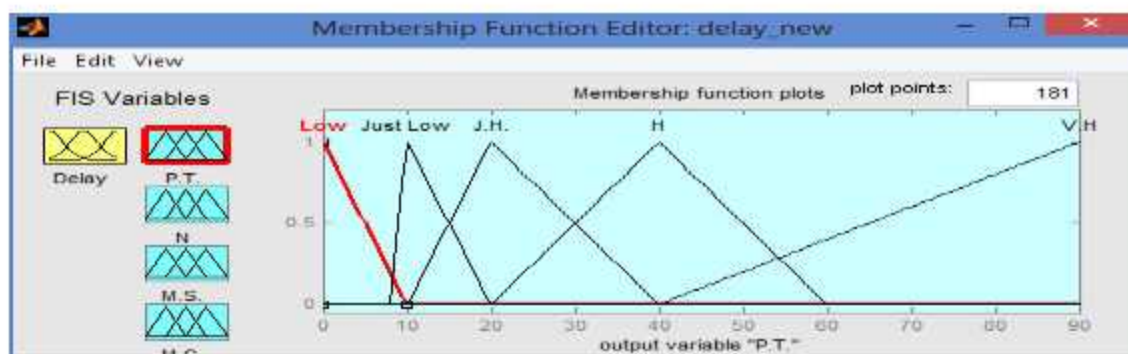Fig 1.3 Membership Function for Input Variable Delay

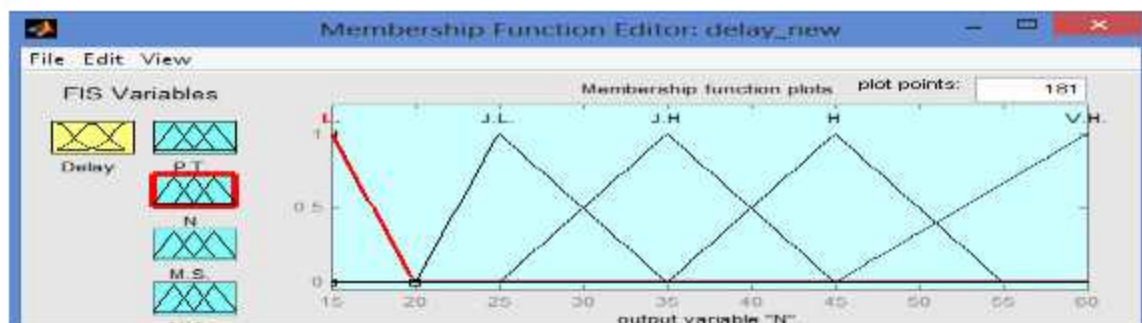Fig 1.4 Membership Function for Output Variable Pause Time (P.T.)

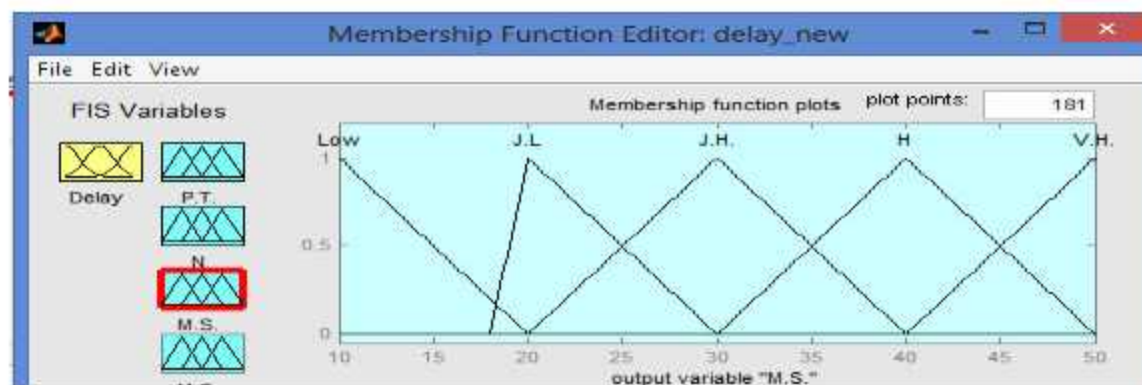Fig 1.5membership Function for Output Variable Nodes (N)

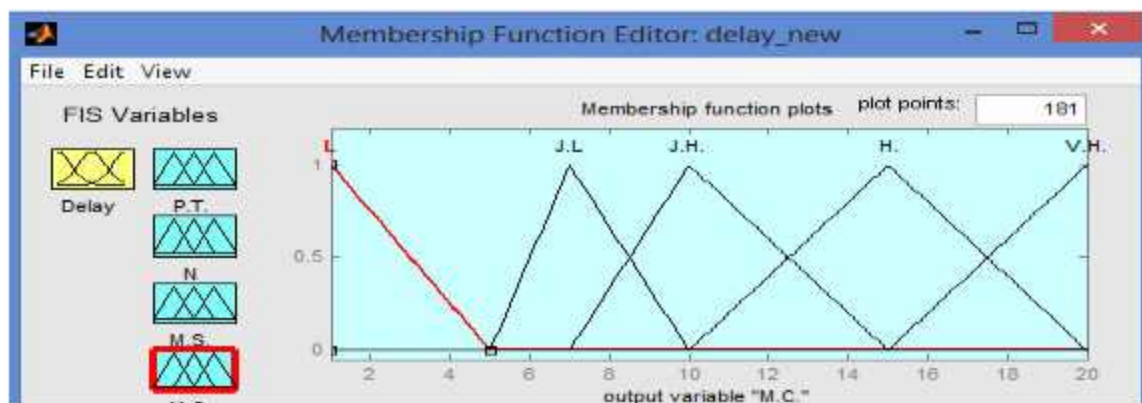Fig 16 Membership Function for Output Variable Max. Speed (M.S.)

Fig 1.7 Membership Function for Output Variable Max. Connections (M.C.)

Fuzzy Sets: Fuzzy sets are named using linguistic variables such as Low, Just Low, High, Just High and Very High. Table 1.4 shows minimum and maximum ranges to design fuzzy sets. These values are designed by considering performance data of table 1.3.

Table 1.4fuzzy ranges for Input and Output Parameters

Fuzzy parameters	Min	Max
Delay(ms)	6	50
Pause time(ms)	0	90
Nodes	15	60
Max. speed(m/s)	10	50
Max. Connections	1	20

Table 1.5 Fuzzy set for Input and Output

Linguistic Variables	Input parameter	Output parameters			
	Delay	Pause Time	Nodes	Max. Speed	Max.Connections
Low(L)	⌊(6 6 12)	⌊(0 0 10)	⌊(15 15 20)	⌊(10 10 20)	⌊(1 1 5)
Just Low(JL)	^(10 12 15)	^(8 10 20)	^(20 25 35)	^(18 20 30)	^(5 7 10)
Just High(JH)	^(12 15 20)	^(10 20 40)	^(25 35 45)	^(20 30 40)	^(7 10 15)
High(H)	^(15 20 30)	^(20 40 60)	^(35 45 55)	^(30 40 50)	^(10 15 20)
Very High (VH)	⌐(30 50 50)	⌐(40 90 90)	⌐(45 60 60)	⌐(40 50 50)	⌐(15 20 20)

Fuzzy Rule Set suggested by researcher is shown below in table 1.6. Total 33 rules are designed.

Table 1.6 fuzzy rule set

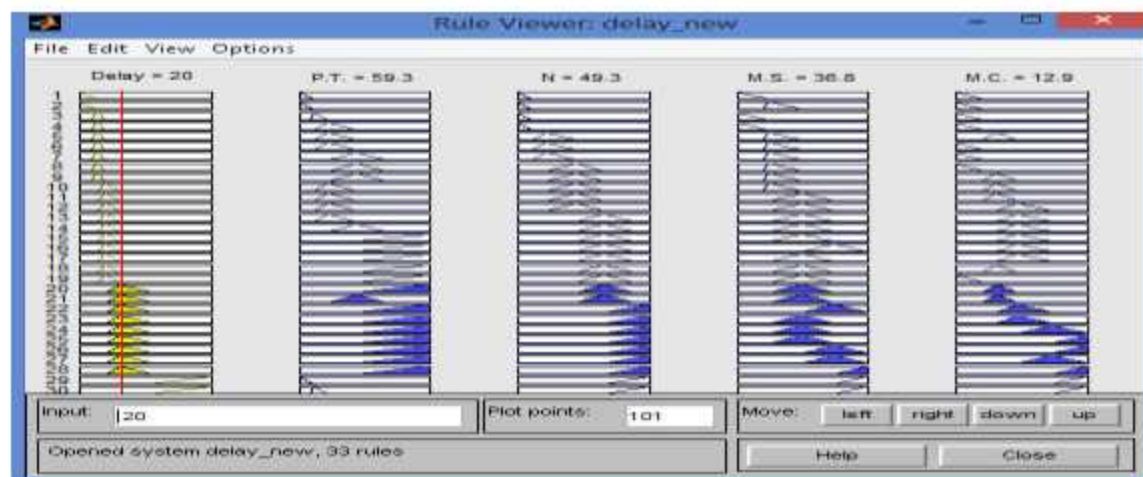|	Delay is			P.T.		N		M.S.		M.C.
	L			L		L		L		L
	JL			JL		JL		JL		JL
IF	JH	THEN		JH	AND	JH	AND	JH	AND	JH
	H			H		H		H		H
	VH			VH		VH		VH		VH

Fig 1.8 Fuzzy rule viewer for Delay =20

6.0Result Comparison:

To check efficiency of Fuzzy Inference system following steps are performed. Fig 1.9 and fig 1.10 shows block diagram of result module. Here two modules are used i.e. Network simulator ns2.34 and fuzzy inference system implemented in Matlab.

1. Random value for delay in the specified range mentioned in table 1.5 is given as input to fuzzy inference system. It is shown in table 1.7 column 2
2. Fuzzy inference system in response to delay offer at the input delivers theoutput valuesas shown in fig 1.9such as Pause Time (P.T.), Nodes (N), and Max. Speed(M.S.), and Max. Connections (M.C.). These values are stored in Table .1.7.
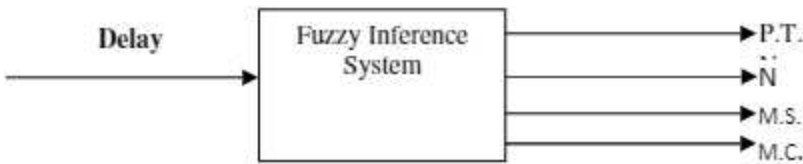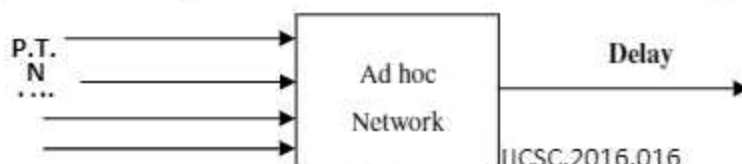
Fig 1.9 block diagram of result module(FIS)

Table1.7 Fuzzy System Output

Sr. No	Delay inputted to FIS	Pause Time	Nodes	Max.Speed	Max. Conn.
1	8.51	3.51	17	18.7	3
2	9.52	3.82	17	19	3
3	14.8	51.7	39	32.2	8
4	10.52	28.8	29.7	19.3	5
5	14.91	51.8	40	32.4	8
6	21.99	59	49	36.7	13
7	15.2	51.8	40	32.7	8
8	13.07	44	33	27	7
9	10.97	30.2	30	18.8	5
10	11.76	30.8	29	18.3	5
11	10.82	29.9	29	19	5
12	11.85	30.8	29	18.3	5
13	12.35	35.4	31	22	6
14	10.29	26	28	19.2	5
15	13.06	43.8	33	26.9	7
16	13.33	47	34	28.3	7
17	14.32	51.1	38	31.1	8
18	15.08	51.8	40	32.7	8
19	16.2	51.6	41	32.9	9
20	15.67	51.7	41	32.8	8
21	15.75	51.7	41	32.8	9
22	17.97	53.3	45	35.1	11
23	19.43	58	48	36.5	13
24	22.72	48.4	39	35	11
25	21.95	48	38	33.5	11
26	28.95	55.8	47.9	35.5	13
27	23.91	58.2	49	36.5	13
28	35.93	9.08	49.3	41.8	15
29	51.12	8.08	49	41.8	16

3. Output from fuzzy inference system is used to set scenario parameters for ad hoc network. Then simulation is run using network simulator NS2.34 as shown in fig 1.10 and at the end of simulation delay is calculated using AWK script. These results are presented in Table 1.7 column 7.

4. These two delay values i.e. delay inputted to fuzzy inference system and delay calculated using fuzzy values are compared. Its graphical representation is shown in Fig. 1.11. It is observed that if network parameters values provides by fuzzy Inference system are used to set scenario for ad hoc network. This helps to maintain delay of network at desired level. This is verified using network simulator ns2.34.

M.S

M.C.

Fig1.10Block diagram of Result Module (NS2.34)

Table 1.8 Experimental Data using fuzzy values

Sr. No	Pause Time	Nodes	Max.Speed	Max. Conn.	Delay calculated (using fuzzy data)
1	3.51	17	18.7	3	8.76
2	3.82	17	19	3	9.66
3	51.7	39	32.2	8	12.21
4	28.8	29.7	19.3	5	9.27
5	51.8	40	32.4	8	13.52
6	59	49	36.7	13	16.02
7	51.8	40	32.7	8	13.52
8	44	33	27	7	10
9	30.2	30	18.8	5	10.28
10	30.8	29	18.3	5	10.39
11	29.9	29	19	5	10.26
12	30.8	29	18.3	5	10.28
13	35.4	31	22	6	11.51
14	26	28	19.2	5	9.81
15	43.8	33	26.9	7	11.12
16	47	34	28.3	7	11.19
17	51.1	38	31.1	8	13.37
18	51.8	40	32.7	8	18.26
19	51.6	41	32.9	9	11.42
20	51.7	41	32.8	8	14.76
21	51.7	41	32.8	9	14.76
22	53.3	45	35.1	11	11.60
23	58	48	36.5	13	11.93
24	48.4	39	35	11	13.72
25	48	38	33.5	11	13.62
26	55.8	47.9	35.5	13	15.52
27	58.2	49	36.5	13	14.08
28	9.08	49.3	41.8	15	22.00
29	8.08	49	41.8	16	24.92

Table 1.9 Result Comparison table

Sr.no.	Delay calculated using only NS2	Delay calculated using fuzzy Data
1	8.51	8.76
2	9.52	9.66
3	14.8	12.21
4	10.52	9.27
5	14.91	13.52
6	21.99	16.02
7	15.2	13.52
8	13.07	10
9	10.97	10.28
10	11.76	10.39

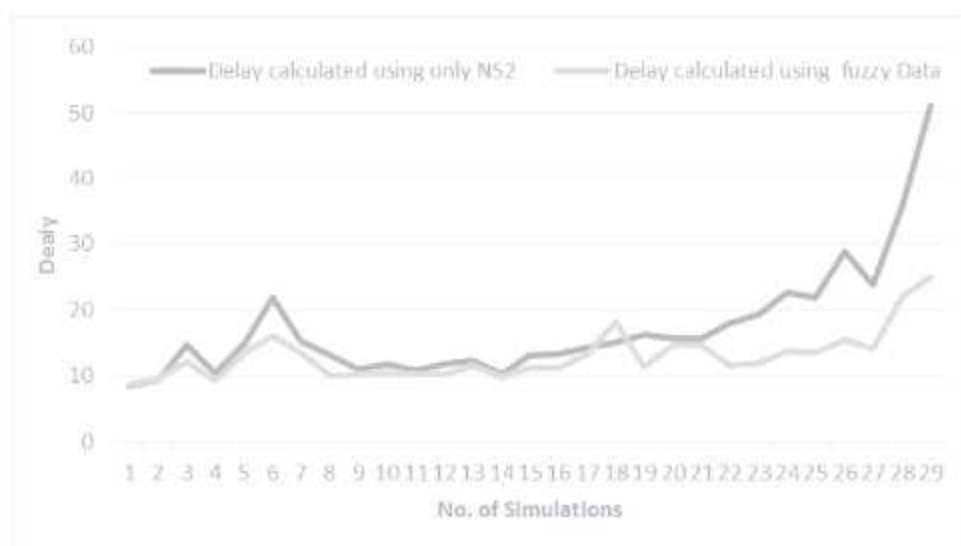| 11	10.82	10.26
12	11.85	10.28
13	12.35	11.51
14	10.29	9.81
15	13.06	11.12
16	13.33	11.19
17	14.32	13.37
18	15.08	18.26
19	16.2	11.42
20	15.67	14.76
21	15.75	14.76
22	17.97	11.60
23	19.43	11.93
24	22.72	13.72
25	21.95	13.62
26	28.95	15.52
27	23.91	14.08
28	35.93	22.00
29	51.12	24.92

Fig 1.10Graphical Representation of Result Comparison

7.0 Conclusion:

Efficiency of protocol is decided by evaluating protocol performance parameter. Delay is one of the important performance parameter to decide efficiency of protocol. Delay of ad hoc network depends on mobility, density, speed of the node and number of connected node in the network. Due to flexible nature of ad hoc network it is a complex task to maintain delay at lower side. Hence Fuzzy inference system is designed which help to maintain delay of ad hoc network at lower side. The system is implemented in Matlab. It is found that implemented system is helpful to maintain delay in ad hoc network at low level by deciding network parameter values using FIS.

References:

[1] Ahmed A. Radwan, Tarek M. Mahmoud and Essam H. Houssein,"Performance Measurement of Some Mobile Ad Hoc Network Routing Protocols",IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 1, January 2011 ISSN (Online): 1694-0814

[2] C.Siva Ram Murthy,B.S.Manoj, "Ad Hoc Wireless Network s ,PEARSON,ISBN 978-81-317-0688-6,Twenty Second Impression.

[3]   G.Jose,Moses,D.SunilKumar,Prof.P.SureshVarma,N.Supriya," A Simulation Based Study of AODV,DSR, DSDV RoutingProtocols in MANET Using NS-2", International Journal of Advanced Research in Computer

[4] GuoyouHe,"Destination-Sequenced Distance Vector (DSDV) Protocol"

[5]   Md. Anisur Rahman, Md. Shohidul Islam, Alex Talevski," Performance Measurement of Various Routing Protocols in Ad-hoc Network", Proceedings of the International MultiConference of Engineers and Computer Scientists 2009 Vol I IMECS 2009, March 18 - 20, 2009, ISBN: 978-988-17012-2-0

[6]Mueen Uddin, Azizah Abdul Rahman, AbdulrahmanAlarifi Muhammad Talha, Asadullah Shah, MohsinIftikha and Albert Zomay," Improving Performance Of Mobile Ad Hoc Networks Using Efficient Tactical On Demand Distance Vector (Taodv) Routing Algorithm", International Journal of Innovative Computing, Information and Control ICIC International c 2012 ISSN 1349 4198Volume 8, Number 6, June 2012 pp. 4375–4389

[7]samikshanikam, B.T. Jadhav,"Delay Analysis of DSDV Protocol using NS2.34",International Journal of Computer Application (0975-8887),Vol 134-No.2, Jan 2016.

[8] Pankaj Sharma , ShrutiKohli , Ashok Kumar Sinha ,"DSR Routing Decisions for Mobile Ad Hoc Networks using Fuzzy Inference System , computer science and information technology(CS & IT 07), pp. 31–36, 2012.

[9] S. Mohapatra,P.Kanungo," Performance analysis of AODV, DSR, OLSR and DSDVRouting Protocols using NS2 Simulator", International Conference on Communication Technology and System Design2011, Available online at www.sciencedirect.com

[10]Subir Kumar Sarkar,T.G. Basavraju,CPuttamadappa, "AdHoc Mobile Wireless Network, Auerbach Publication.

[11] S.Y. Wang, C.L. Chou, C.H. Huang, C.C. Hwang, Z.M. Yang, C.C. Chiou, and C.C. Lin,"The Design and Implementation of the NCTUns 1.0 Network Simulator".

[12]TanuPreet Singh, Dr. R.K Singh, Jayant Vats," Routing Protocols in Ad Hoc Networks: A Review", International Journal of Computer Applications (0975 – 8887), Volume 25– No.4, July 2011