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# Association Rule Mining in System Event Logs to Discover Patterns

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## Article Info

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## Abstract

This research paper provides an overview of the current state of logs analysis in IT systems. Initial part covers some fundamental theory and summarises basic goals and techniques about system logs. The current software systems have been drastically evolving which are increasing in scale and complexity of software systems, that leads to a flood of logs. The traditional manual log inspection and analysis became impractical and almost impossible. As logs are unstructured in nature, the first important step is to parse the text log messages into structured and meaningful data for further processing and analysis. Correlation of diverse data and uncovering patterns and relationships in the data is a backbone of Artificial intelligence for IT operations (AIOps) field.

In this research paper, we present a comprehensive evaluation study on log events and discovering best association rules in logs to better understand and get more insight of logs events. More specifically, we evaluate more than a hundred log events spanning across distributed IT systems, hosts, customised services and application servers. We report the pattern discovery results in terms of association rules which gives practical importance when investigating and troubleshoot system issues.

## Article History

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**Keywords:** Log Analysis, Data Mining, AIOps, Pattern Mining, Association rules.

## 1. INTRODUCTION

Logs are very important and play a crucial role in the software development and operations area. It is a standard practice to write detailed system runtime information into log files which allows developers and system administrators to understand the system behaviours and investigate problems.

### 1.1. Logs

Log file keeps recording the events that occur in OS and different system application(s). Logging is the act of keeping a log (record). In short, messages are written to a single log file which may consist of many events [1].

### 1.2. Common Types of logs [1]

**1. Application logs:** Developers have good control over Application logs. It can contain all types of events, error messages, warnings written by the application.

**2. Web and application server logs:** This log file record the activity of the client and all HTTP requests (called hits) made by web browsers.

**3. Garbage collector logs:** The garbage collector logs provide information about garbage collector activities.

**4. System logs:** Operating system writes specific events to System logs. These logs are also a right place to get details of external events.

### 1.3. Logging Levels[1]

1. **FATAL** - It indicates a critical service failure.
2. **ERROR** - It represents a disruption in a request or the ability to service a request.
3. **WARN** - It shows a non-critical service error.
4. **INFO** - It represents the state of the service.
5. **DEBUG** - It conveys extra information regarding life-cycle events.
6. **TRACE** - It is directly associated with activity that corresponds to requests.

## 2. RELATED WORKS

### 2.1 Log Mining

This paragraph summarizes the desired meaningful information which can get from the log files and where it can be applicable.

- General statistics (like average or max values, mean, deviations) which is useful for setting hardware requirements and accounting purposes.
- Program or system warnings (e.g. power or hardware failure, low memory, disk or CPU utilization) which helps in system maintenance or administration.
- Security related warnings can be leveraged for security testing / audits.
- Validation of program runs are helpful in software testing.
- Time related characteristics can be used for software profiling and benchmarking.
- Patterns and trends are getting applied for different data mining purposes.
- Behavioural trends used to determine performance and reliability

### 2.2 Association Rule used for Web Mining

In Website usage mining several data mining techniques are used. Association rules are used to discover the pages which are visited together even if they are not directly connected. It reveals associations between groups of users with specific interest or need. Using this insight, the trends of the activity of the users can be determined and predictions to the next visited pages can be calculated. [3]

### 2.3 Log Pattern Mining

In the log event files, many useful associations or patterns can be discovered using different data mining techniques, as described below and shown in *Figure 1*.

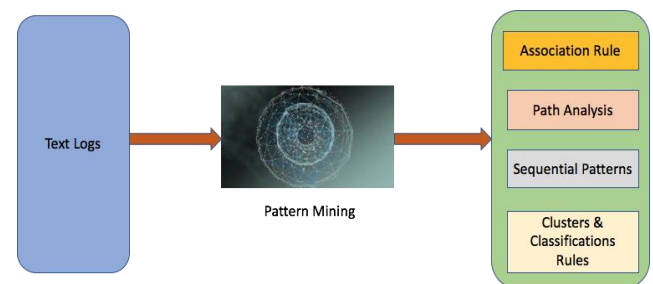


Figure 1: Pattern Mining in text log file

#### 2.3.1 Association Rule:

It is used to predict the correlation of items where the presence of one set of items in a transaction or event implies the presence of other items.

#### 2.3.2 Path Analysis:

Graph models are used for Path Analysis, which represents data in nodes and relationships format.

#### 2.3.3 Sequential Patterns:

The sequence of items or events occurring in transaction has a particular order between the items or the events.

### 2.3.4 Clusters and Classification rule:

This technique groups profiles of items or objects with similar characteristics. This discovers the relationships.

### 3. PROBLEM:

DevOps or system administrators need to closely monitor various IT systems, application stacks and infrastructure. They have to go through all different systems, applications and database logs, to investigate and resolve all kinds of system issues like performance degradation or outages. Manually checking all logs is a very difficult and critical task. Also, it's not possible to correlate the log events to understand the cause of system problems. A logging is an essential part of application support. By nature, logs are in unstructured text format. Most of the time developers simply use printf statements and concatenate strings to generate log messages. This logging has some drawbacks, it needs to parse the text message first to do log analysis, which is very complicated and expensive work. Collecting and combining through log data to identify a system issue is equivalent to searching for a needle in a haystack. In this case, someone may use a magnet to find that needle, likewise IT teams also need an easy way to search log files, correlate and interpret the log events. In this research, we are focusing on analysing IT computing system logs and finding the association (pattern) between different log events and their impacts on the system.

### 4. EXPERIMENTAL SETUP:

For this research work, we shall consider a sample set of 108 log events that have generated from different live hosts and services. Each log has a specific list of events. Here we have demonstrated the

implementation of Apriori algorithm for association rule mining using a tool.

### 4.1 Dataset Insight

**Hosts (Servers)** - Collected sample sets of logs which are generated from 108 hosts (servers), out of that 32 hosts are distinct, shown in *Figure 2*. If we consider it as graph, X-axis represents different hosts whereas Y-axis represents number of instances.

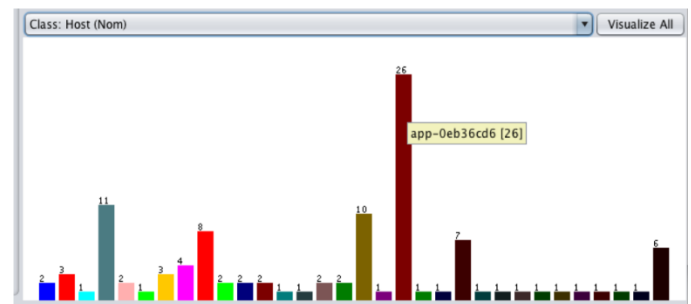


Figure 2: Hosts - From where log events generate

**Services:** There are distinct 10 different customized developed services which have generated these logs from different hosts (servers), shown in *Figure 3*. X-axis represents different customized services whereas Y-axis represents a number of instances in log data.

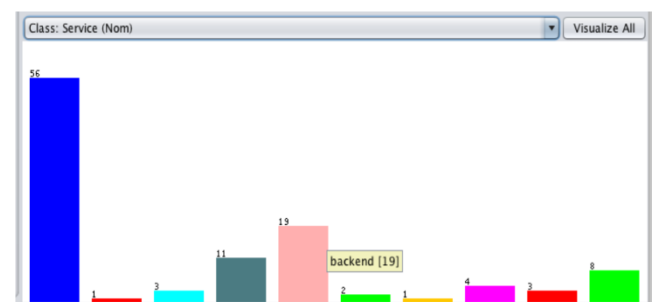


Figure 3: Services - who generates log events

**Log Event:** Collected 108 log data events as a sample set which are considered for this research experiment and out of that 32 are distinct events. As shown in *Figure 4*, X-axis represents different log events whereas Y-axis represents a number of instances in log data.

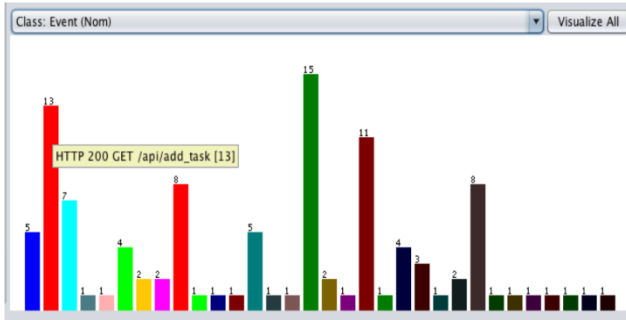


Figure 4: Events -which generated in log files

<b>Host</b>	app1.web.abc.com	
<b>event</b>	executing	query:
	ROLLBACK	
<b>status</b>	debug	

**5. ASSOCIATION RULE MINING**

Association (pattern) Mining is the most important data mining technique. Extracting association rules is the core fundamental of data mining [5]. The benefits of association rules are detecting and discovering unknown relationships or patterns, producing results based on decision making and prediction can be performed [5]. The discovery of association rules is divided into two phases [7] [8] - detection of the frequent itemset and generation of association rules. To find patterns (sequence) in the log events data, we focus on implementing below important association rule mining algorithms for the research experiment. [6]

**Algorithms [10]:**

There are four main important association rule algorithms. Out of that we will be focusing on Apriori algorithm 1. Apriori Algorithm:

2. FilteredAssociator algorithm
3. Predictive apriori algorithm
4. Tertius algorithm

**Measures:**

**Support-** It measures how often rules occur in the database. Formula to calculate support [4].

$$\text{Number of occurrences } \{x, y\}$$

$$\text{Support} =$$

$$\frac{\text{Total Transaction in DB}}{\text{Total Transaction in DB}}$$

**Confidence** - Support measures how often the rules occur in the database while confidence

**Status:** Based on host, service and event, developers have given some labels to these events like error, debug, info, notice and warn. As shown in Figure 5, X-axis represents statuses whereas Y-axis represents a number of instances in log data.

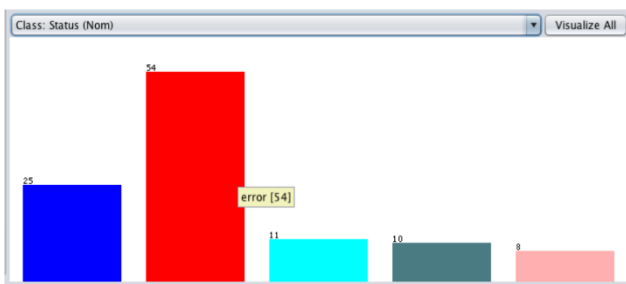


Figure 5: Status - Impact of log events on system

**4.2. Log Parsing:**

As an example, illustrated in Table 1, each system log event from sample dataset is printed by an application logging and records system events with its message header and content. The message header is generated by the logging framework therefore it can be easily extracted, such as date, service name, environment type, hostname, event (message) content and verbosity level (e.g., ERROR/INFO/DEBUG). [2]

Table 1: An Illustrative example of Log Parsing

<b>date</b>	2020-02-06T12:03:08.267Z
<b>service</b>	cont-link
<b>env</b>	prod

measures the strength of the rules. Formula to calculate confidence [4]:

**Total occurrence for item X and Y**

**Confidence =**

**Total occurrence for item X**

## 6. EXPERIMENTS

As shown in *Figure 6*, we implemented the Apriori association rule algorithm and found the best 20 association rules with *Support=50%* and *confidence=50%*. Below are the parameters, values and their

description which has been applied during algorithm implementation.  $N = 20$  =>Number of rules as an output

$T=0$  =>Rank rules

$C= 0.5$  =>Score of rule

$D= 0.05$  =>Delta for minimum support

$U = 1.0$  =>Upper bound for minimum support

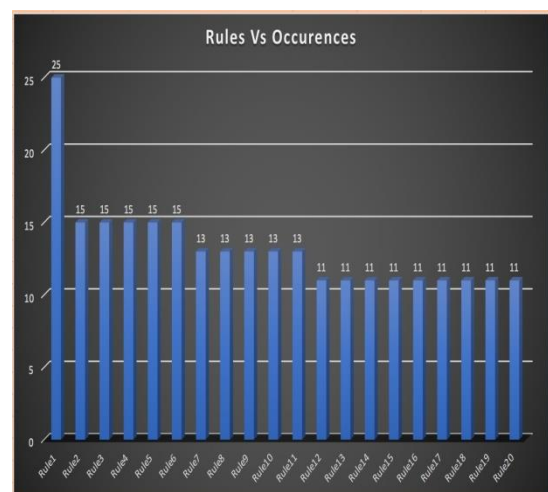
$M = 0.1$  =>lower bound for minimum support

$S = -1.0$  =>significance level  $c = -1$  =>Class index



Figure 6: Implementation of Apriori algorithm on log event data

After implementation of apriori algorithm and pattern discovery, we compared the generated rules and their occurrences as shown in *Graph 1*. We can observe that infrequent log events have been excluded by algorithm and gives only matching association rules as per given thresholds of support and confidence variables.



Graph 1: Rules and occurrences

## 7. RESULTS AND CONCLUSION

The main objective of this research paper is mining association (pattern) rules in log events. From the experiment and observation, we could solve the problem of manual log monitoring and manually finding the patterns in log events to understand the relationships in various events. Based on the experiment and results of association rules, we could understand the relationships and association between different log events (messages). It also provides more insights into how each host, services and events are correlated with each other and how it generates status results. This research work can be further enhanced by implementing more association rules algorithms, statistical measures and comparing with different algorithms on different parameters. Below is some conclusion which drawn from the experiment and results:

- Rule 1:** There is an association between status and service attributes, when status is info and service is luigid. Apriori algorithm found 25 matching instances.
- Rule 2-6:** Result shows, there are 15 matching instances, where *service:luigid* trigger *event: 'Removing task - UploadAuditResultToS3'* which results into *status:error*.
- Rule 7-11:** It interprets from matching 13 instance that *event: 'HTTP 200 GET /api/add\_task'* get generated from *service:luigid* which has *status:info*.
- Rule 12-13:** There are 11 matching instances which represent association of *service:brain-link* and *host:app2.web*. In other words, *brain-link* service is hosted on *app2.web* server.
- Rule 14-15 :** We can interpret that debug (status) mode has enabled on host *app2.web*, as there are 11 matching instances which generate this association rule.
- Rule 16-17:** There are matching 11 instances which represents, a *service:luigid* is hosted on *host:app-0eb36cd6* and it triggers *event: 'Removing task - UploadFileToS3\_\_data\_audits'*.
- Rule 18-19:** Service brain-link has debug mode enabled as there are 11 instances.
- Rule 20 :** When there is an *event: 'Removing task - UploadFileToS3\_\_data\_audits'* generated it triggers *status:error*, we have 11 matching instances.

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## A Framework Design for Algorithmic IT Operations (AIOPS)

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### Abstract—

AIOPS is acronym for Algorithmic IT operations which was coined by Gartner. It represents automated solutions which consists of machine learning algorithms and techniques to solve unknown, critical, complex and hidden IT operational problems. It helps to intelligently classify log events, predict alerts and standard operating procedures (SOP) and automate solutions. Since past few years, AIOPS has been growing extremely, many organisations and vendors started exploring AIOPS solutions. Gartner recently redefined AIOPS as “Artificial Intelligence for IT Operations.”

AIOPS helps to improve IT system service quality and customer satisfaction. It also boost DevOps productivity and reduce human efforts and operational cost. In this technical research work, we first summarize what is AIOPS, its components, use cases, need of AIOPS platform and real-world challenges. We then propose a framework design for AIOPS platform based on our earlier research work and outcomes. AIOPS is still evolving which need continuous learning and improvement through scientific research and experiment work.

**Keywords** -AIOPS, DevOps, Machine Learning, Log Operations.

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### [1] INTRODUCTION

#### I. WHAT IS AIOPS?

AIOPS refers IT domain which manages and processes various system data of their IT environments using different resources and machine learning (ML) / artificial intelligence (AI) algorithms. As shown in Figure 1, AIOPS combines big data and machine learning techniques to automate complex IT operations which includes classification,

prediction, event correlation and anomaly detection. It is a continuous process of monitoring, learning, managing alerts / incidents and automating implementation of solutions. AIOps collects and processes historical as well as real time data which contains system logs, events, alerts and metrics. Most of organisations defines AIOps as per their understanding and requirements.

As per Gartner definition “AIOps is a platform which utilizes big data, machine learning algorithms to enhance IT operations (like system monitoring, and solution automation) with proactive approach, and more dynamic insight. AIOps platforms can enable parallel use of multiple data sources and data gathering methods, analytics ( historical and real-time) and presentations.” [1]

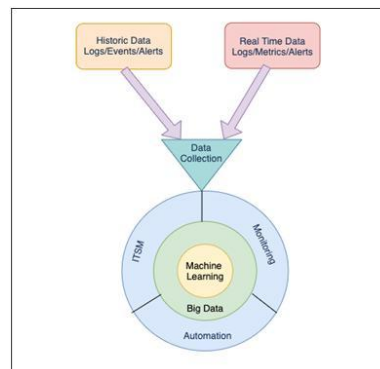


Figure 1 AIOps basic

AIOps platform bridges different IT Operations:

- IT Service Management
- Automation
- Monitoring

## II. COMPONENTS OF AIOps

- *Data Input Sources* - There are various data sources like monitoring events, metrics, incidents, logs etc.
- *Real Time Data Processing* - Systems which accesses and pre-processes input data from data sources in real-time.
- *Rules and Patterns Mining* - Systems which can detect find patterns from the pre-processed data to uncover hidden patterns, association and abnormalities.
- *Domain Algorithms* - Algorithms which allow domain based system to react automatically on detected abnormalities and variations from normal behaviour and it's causes.
- *Machine Learning / Artificial Intelligence* - It improves decision-making ability using Machine learning or Artificial Intelligence algorithms and techniques.
- *Automation* - It uses Machine learning or Artificial Intelligence algorithms results to automate standard operating procedures (SOP) to reduce DevOps workloads and improves systems availability and performance.

### III. USE CASES OF AIOPS

- *Prediction of outages and failures* - Analysis and prediction of warnings/alerts and outages based on supervised learnings using ML algorithms allow admins to take proactive actions to prevent it.
- *Event Correlation* - To troubleshoot system problems, it is critical to understand correlations between events.
- *Anomaly Detection*- Dynamic thresholds allow AIOps to determine what is a normal and abnormal activities.
- *Root Cause Analysis(RCA)* - Determining cause of problem by tracing it to root by using event correlation and log analysis to fix. It reduce Mean Time To Detect(MTTD) and Mean Time to Repair (MTTR).
- *Alarm Management*- AIOps identify false alerts and gives only legit alerts in case of anomaly detection.
- *Intelligent Remediation*- AIOps automate standard operating procedures (SOP) action to resolve problems.

### IV. WHY AIOPS?

IT industry has been evolved from desktop products to online services or applications. The way these services has been built and released are different from traditional desktop products, which brings up the complexity and importance of operational efficacy for online application services. Today's applications are complex and critical. Cloud computing has increased more complexity in application architecture and deployments. DevOps is a process of continuous development, integration and deployment of application services. In software industry Agile methodology and DevOps culture has been widely adopted in almost every organisation. Due to evolution and implementation of cloud computing, microservices, serverless technologies the scale and complexity of application services have increased drastically. Any mistake in this continuous process from designing architecture to deploying codebase and monitoring application can degrade system performance and impact on customer experience. It can also result in interruption of services which cost to business. To address these DevOps IT operation challenges using AI, the term AIOps came out from Gartner [2]. Generally, AIOps can help empowering software applications, engineers and DevOps to efficiently and effectively build and operate application services that are easy to support and maintain by using artificial intelligence and machine learning techniques. The outcome of AIOps is significant, ensuring high availability of services, maintaining quality of services and customer satisfaction, boosting productivity of engineers and DevOps, and reducing operational cost. Below are some major reasons for AIOps platform:

#### A. *Data volumes are large and disparate*

In this decade, we have seen data explosion. There are various sources of data generation due to digital devices, mobiles, IoT devices, Cloud computing etc. The velocity and volume of data is countless. This big data management is nightmare for DevOps and administrators. Building and processing ML models are time and resource consuming process, which ultimately cost to business.

#### B. *Manual Troubleshooting*

In IT operations, keeping system up and running is top most priority. If there are any interruptions or degradation to services, it creates all hands on deck situation for DevOps team. Manually troubleshooting any system through logs, events and alerts is like searching needle in haystack. It definitely increase mean time to detect (MTTD) and mean time to repair (MTTR) of business application which may causes long system downtime. Any system degradation or downtime may lead to business loss and ultimately lose customer trust.

### *C. Emerging Tools / Technologies*

There are plenty of tools and technologies are emerging on daily or weekly basis due to adaptation of agile and DevOps methodology, software / tools are getting build and deploy very quickly. Also microservices, serverless, cloud computing, big data and machine learning technologies adding more complexity towards IT operations. To cope up with these emerging tools and technologies is almost impossible for humankind.

### *D. Bombardment of Alarms*

As there is explosion of data and technologies, it generates tons of logs, events, alerts and alarms. Most of times, they are non-critical and false because of mis-configurations. Single issue can create many events and alerts, which confuses and overload monitoring systems. To handle these bombardment of logs and alarms is almost impossible for DevOps and admin teams without Machine Learning techniques.

## **V. AIOPSSChallenges**

### *A. Lack of innovation in methodologies and mindset*

To build AIOPsplatform, it requires business or domain specific experience to understand application and think holistically. It also need bettervisualisation about the whole system, problems, business perspective, data models, constraints and integration considerations.Today, there is lack of innovation methodologies that can guide people in different disciplineslike business stake holders, engineers, data scientists to build AIOPs solutions which leads to difficulty in mindset shift. AIOPs is a complex, multi component, continuous learning and improvements system.[3]

### *B. Need of changes in engineering to build and support AIOPs*

Traditional engineering standard practices does not fit currentbusiness requirements. Building AIOPsplatform needs significant engineering and operational efforts.AIOPsoriented engineering and operationsare still in early stage. The best practices, principles and design patterns are not defined in the IT industry yet. For example,AIOPs principles should include dataandlabel or tag quality monitoring. The quality and quantity of data available today cannot serve the needs of AIOPs solutions. Today major cloud services collectshuge amount of telemetry data every day/month, there still lacks representative and highquality data for building AIOPs solutions. A continuous improvement of data quality and quantity is necessary.[3]

### *C. Challengesin building ML models for AIOPs*

There are lot of challenges in building ML/AI model for AIOps solutions because those are not always seen in other typical ML/AI scenarios and solutions. To develop supervised machine learning model for AIOps, there are challenges like no clear data labels or lot of manual efforts to label and obtain high data quality [4], there are complex dependencies/relations among various components and services [5], also there are complicated feature engineering efforts required due to the high complexity of cloud computing service behaviours. In most of AIOps scenarios, there is difficulty in labelling a data, it is sometime feasible in only unsupervised machine learning models. For example, detecting anomalous behaviour of services [6].

## [2] RELATED WORKS

AIOps is a interdisciplinary research and innovation area. It is a long journey for IT industry to implement complete AIOps solutions. In this research, we focus on technical innovations and aspect that are required to achieve AIOps platform. However, AIOps research is not entirely new field. Many research works on software or data analytics can be represented as AIOps innovations.

### A. *Evolving from Traditional Systems to AIOps*

In this research, researcher proposed a AIOps system which adopts layered design with interoperability services between modules, which makes it well compatible with traditional systems. Researcher implemented their AIOps system with some considerations and deployed it in a large IT system environment with thousands of devices and achieved good results [7].

### B. *Reducing Incidents Using Correlation Approach*

In this work, researcher emphasis on discussing AIOps and explains the model needed to handle digital changes in IT operations. AIOps platform is useful for complex IT systems and infrastructures which require continuous monitoring and resolution in case of accidents. [8]

### C. *Self-Supervised Anomaly Detection from Distributed Traces*

The focus of this research is on anomaly detection based on distributed tracing records which contains information of services of distributed system. Detecting trace anomalies accurately is challenging due to large number of microservices and complex calls between them. Researcher proposed supervised method and task formulation for anomaly detection problem. The evaluation shows high accuracy and solid performance in experiments. [9]

## [3] AIOPS FRAMEWORK DESIGN

In Figure 2, we propose high level methodology of AIOps system. In IT organisation, there are lot of application system works for various business purposes. Those application systems continuously generates logs, metrics and incidents from database, network, application and OS technical stacks. Based on their severity, these inputs can be pre-processed and categories into error, warning or information. These data pre-processing transforms raw

unstructured logs, alerts into structured format. All these transformed structured data getting used as an input to AIOps system. AIOps apply various machine learning algorithms and techniques and produce different expected solutions like finding pattern or associations, prediction of Standard Operating Procedures (SOP) and clustering common feature data points which aids in troubleshooting and root cause analysis (RCA). AIOps is a complex, multi component, continuous learning and improvements system.

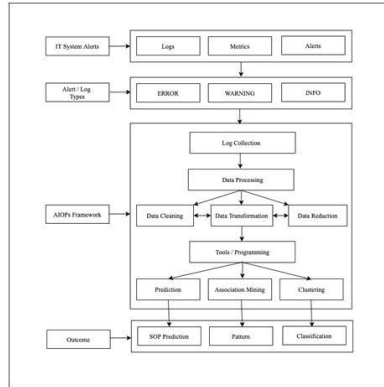


Figure 2 AIOps Framework Design

## Log Operations:

System logs are crucial component of any IT system. Logs records noteworthy events happened in the past such as user activity, resource usage, program execution status and duration, data changes, application status change etc. They provide a meaningful view of past and current states of complex IT system. Log data can only be trustworthy if it is accurate. [10]

As shown in Figure 3, there are various sources of logs like web or application servers, end users, database servers, digital devices, business applications, databases, Application Programming Interfaces(API), login activities etc. Logs can be collected at centralised place through different ways like monitoring tools, agent-based log collectors and APIs. Once logs are collected, it would get store at centralise location for further monitoring, analysis and processing.

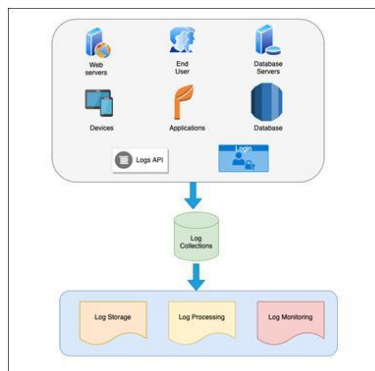


Figure 3 Log Operations

## [4] AIOPS FLOWCHART

A flowchart is a graphical representation of steps to complete the intended task. In Figure 4, it shows flowchart of algorithm for AI Ops platform which work through different phases. It starts with IT system monitoring's of applications and databases to collect logs and event data. After pre-processing it gets ready for ML algorithms. Based on requirements, AI Ops framework apply ML algorithm like Association, Clustering, Prediction and gives efficient analysis which helps to reduce system operational problems and reduce MTTD and MTTR. AI Ops results can be used to implement provided recommendation through automations.

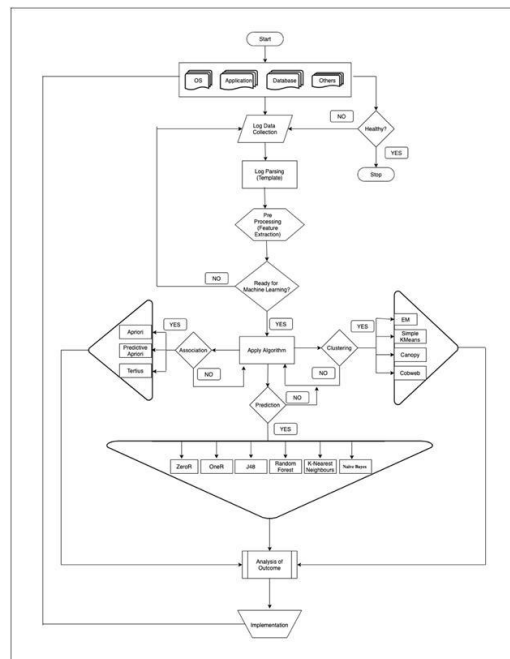


Figure 4 AI Ops Flowchart

## [5] AIOPS BENEFITS

- Simple to use : There is no configuration or ML experience required.
- Auto Detection: AI Ops continuously analyses streams of data and metrics to determine application behaviour.
- Quick Resolution: AI Ops help to resolve issues quickly with ML techniques.
- Reduce noise: AI Ops helps to overcome alarm fatigue by automatically correlating and grouping related anomalies.
- Reduce MTTD and MTTR: AI Ops helps to reduce mean time to detect and mean time to recover systems.

## [6] CONCLUSION

Machine learning or Artificial Intelligence techniques can be used to provide IT operations solutions. AI Ops platform should be built on this concept to solve IT operational challenges. AI Ops platforms use machine learning power to discover hidden relationships between log events and alerts.[11] Machine Learning algorithms efficiently predicts the Standard



Operating Procedures (SOP) based on different alerts triggered from various system sources.[12]

This paper addresses the problems of IT operational challenges by designing systematic algorithmic framework and flowchart. We addressed the IT operational problems by introducing new machine learning and log based platform – AIOps. The proposed approach opens a new possibility for Association mining and Clustering to detect patterns and sequences. AIOps also gives possibility for Classifications of log events and alerts to predict possible outages / problems in the system.

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## QoS Routing Protocols for Aeronautical Ad hoc Networks : a Survey

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**Abstract:** In Aeronautical ad hoc networks which is one of the family member of wireless ad hoc network and subset of MANET and VANET due to Some factors like high mobility, multi-hop communication and huge geographical area and therefore Quality of Service (QoS) routing is a critical issue. Some researchers have been done performance and comparison study to provide QoS assurances in AANET routing protocols. In current years some of QoS routing protocols with distinguishing capabilities were proposed for AANET .This paper presents a survey of some of these protocols which include a overview of all elements, evaluation parameters and recourses of QoS routing which can be affecting the performance.

**Keywords:** QoS ,AANET, routing protocols

### Introduction:

Aeronautical ad hoc network (AANET) is highly dynamic mobile ad hoc network between aircrafts, which enables communion among ground station and air perceive information. Research study have showed that it is possible to set up a mobile ad hoc network among the aircraft thus providing a multi- hop communication link between the airliner and the ground base station. Compared with the normal ad hoc networks, the airliners in AANET move at a very high speed, typically 700km/h to 1000km/h [1]. So the multi-hop communications in AANET are extremely unbalanced due to the frequent network topology changes.

Airplanes are connected through wireless links to build a live and on-the-fly network called a Aeronautical Mobile Ad-hoc Network (AANET). The airplanes (nodes) communicate among themselves and act as both hosts and routers. Hence, maintaining appropriate Quality of Service (QoS) for AANETs is a complex task due to the dynamic behaviour of the network topology. Commonly, QoS for a network is measured in terms of the guaranteed amount of data which a network transfers from source to destination within specific time. The QoS is identified as a set of measurable pre-specified service requirements; such as delay, bandwidth, probability of packet loss, and delay variance (Jitter). The traffic types in aeronautical ad-hoc networks are quite different from other infrastructures and the use of wireless technologies in AANETs make the QoS approaches more complex.

Basically, Wireless ad hoc network is more and more utilized in the military aeronautical network communication domain, such as High Frequency Intra Task Force (HF-ITF) developed by the Office of Navy Research (ONR), its objective is quickly realizing interoperability between the navy and the air with lower cost. DARPA and Air Force Research Laboratory (AFRL) commissioned Rockwell Collins to be chargeable for the tactical focused on community technology (TTNT), to attain the speedy discovery of time touchy objectives and well timed attacking [2], [3]

Accordingly, such networks are annoying to have unique capabilities; i.e., independent architecture, allotted operation, multi-hop routing, reconfigurable topology, fluctuating hyperlink capacity, and mild weight terminals. Thus, several interesting issues can be technically involved when designing AANETs; such as security, routing, reliability, internetworking, and power consumption due to the shared nature of the high mobility ,Frequent topology change ,limited bandwidth,node density and Sparse distribution of the ground stations. Therefore, providing suitable QoS for delivery of real-time communications in AANETs is more challenging.

In this paper, we have provided the theoretical study of issues and challenges for QoS protocol in AANETs which have been found after study of previous research papers, we also presented routing protocols specially consider for AANET as it has been found that current routing protocols which are being used for MANET are

not able to cope with AANETs environment.

## **ISSUES AND CHALLENGES FOR QOS PROTOCOL IN AANET**

### **A. Mobility**

There is a strong need for providing connectivity in aircraft, so that they can continuously communicate with other devices attached to the Internet, at any time and anywhere. However, the connectivity of the network may be frequently interrupted due to the excessive pace of aircraft [4] and sometime interrupted by weather, highly-dynamic wireless channel fluctuations as well as changing topology [5]. Hence, the network protocols of AANETs have to be more flexible. The inevitable delay problems due to routing over large geographical distances and the connectivity troubles because of the frequent setup and breakup of verbal exchange hyperlinks amongst plane require extraordinarily strong answers to help excessive mobility.

### **B. Congestion**

AANETs are intended for providing Internet access, it required all multi-hop traffic to flow through the GSs, gateway congestion may be caused at or among the aircraft near these Ground Stations. Moreover, by efficiently allocating flows, the traffic may be balanced amongst the gateways to avoid congestion as well as routing of packet in the network, the path between an aircraft and a gateway determines the service which is provided by the gateway to the aircraft. The approaches of Internet gateway allocation, routing and scheduling which minimizing the common packet delay within the network.

### **C. Threats**

It is extremely critical to secure AANETs from every conceivable threat. Generally, the security threats to aircraft networks are internal and external ones. Internal safety threats originate from the in- cabin passenger community. On the other hand, the external security threat is caused by the security vulnerabilities of the communication links [7]. In the future, available radio spectrum will become more scarce. However, the signal transmissions in AANETs take place over A2A, A2G and A2S across airports, populated and unpopulated areas, each having different bandwidth requirements

### **D. Decentralized control:**

The aeronautical network is set up spontaneously and all nodes may join or leave the network anytime. So there may not be any centralized control on the nodes which causes increased algorithm's overhead and complexity, as QoS state information must be disseminated efficiently.

### **E. Unpredictable channel:**

The bit mistakes are the primary hassle which arises due to the unreliable wi-fi channels. These channels motive excessive bit blunders price and that is because of excessive interference, thermal noise, multipath fading effects, and so on. This ends in low packet delivery ratio.

### **F. Data Loss:**

It refers when the data is loss or packet loss when the data is send from sender to receiver due to distortion.

### **G. Route Maintenance:**

The maintenance of network state information is very difficult due to the frequent changes in the network topology and changing behaviour of the communication medium. During the data transfer process the predefined routing path may be broke so that it is become important to focus on maintenance and reconstruction of routing paths with minimal overhead and delay required. The QoS aware routing would require the reservation of resources at the intermediate nodes[8].

## **EVALUTION PARAMETERS FOR QOS ROUTING PROTOCOLS**

As different applications have different requirements, the services required by them and the associated QoS parameters differ from application to application as per their service requirement. For example, in multimedia applications, bandwidth, delay and delay-jitter are the key QoS parameters, whereas military applications have stringent security requirement. The following is a sample of the metrics commonly used by applications to specify QoS requirement to the routing protocol.

### **A. Throughput –**

In AANET throughput is defined as rate of how much data can be transferred from source to destination within a given timeframe over the wireless infrastructure and it is measured by how many packets arrive at destinations . Throughput generally measured in bits per second or data packets per second/per timeframe.

Throughput = Total packet received/ amount of forwarded packet over certain time interval

### **B. Dropped Packets –**

Dropped packets are the number of packets that sent from the source node and unable to reach the destination node successfully.

Dropped packets = sent packets – received packets

### **C. Mean inter arrival time -**

- Mean inter-arrival time is the summation of inter-arrival times of packet divided by the number of received packets and can be computed by the following equation

$$av = (\sum ai/n)$$

### **D. Average end to end delay-**

End-to-end delay refers to the time taken for a packet to be transmitted across a network from source to destination.

The average end to end delay can be calculated by summing the times taken by all received packets divided by its total numbers.

Average E-2-E =  $\frac{\sum(\text{received time-sent time})}{\sum(\text{number of packets})}$

#### **E. Jitter –**

Jitter in ad hoc networks is the **variation in the latency on a packet flow between two nodes**, when some packets take longer to travel from one node to the other. Network congestion, timing drift and route changes may affect jitter.

The basic standard term is "packet delay variation" (PDV) which is an important quality of service (QoS) factor in evaluation of network performance.

Jitter (J) =  $D_{i+1} - D_i$  where  $D_{i+1}$  is the delay of  $i+1$  packet and  $D_i$  is the delay of  $i$ th packet.

#### **F. Packet delivery fraction (PDF) –**

Packet delivery fraction (PDF) can be measured as the ratio of the delivered packets at destination to the packets sent from the source node.

PDF =  $100 * (\text{Number of received packets} / \text{Number of sent packets})$

#### **ROUTING PROTOCOLS IN AANETS:**

After a lot of relevant survey of Adhoc networks, we observed that some traditional MANETs routing protocols are not effective to meet QoS implementation in AANETs due to its very high mobility of aircraft nodes and large geographical area.

So, there is a need to find out suitable routing protocols for these highly dynamic Ad-hoc networks. Here, we present some of the protocols which may be implemented in these networks.

#### **Open Shortest Path First (OSPF):**

Open Shortest Path First (OSPF) internet routing protocol which is designed based on link-state algorithm. OSPF is used to find the best path between the source and the destination router using its own Shortest Path First. OSPF is developed by Internet Engineering Task Force (IETF) which is one of the Interior Gateway Protocol (IGP), i.e, the protocol which aims at moving the packet within a large autonomous system. It is described as OSPF Version 2 in RFC 2328 (1998) for IPv4. If timer settings are reduced then there will be a decrease in packet loss during link failures. The overhead can also be reduced to meet out the problem of scalability.

#### **Multi-Meshed Tree (MT) Protocol:**

This approach is basically a combination of clustering, reactive and proactive routing schemes[9]. This protocol has been evaluated for strong connectivity amongst distinctly dynamic. This is hybrid approach of proactive Multi-Meshed Tree (MMT) and Reactive Multi-Mesh Tree (RMMT) is employed for inter-cluster routing. This protocol has outperformed other protocols in terms of success rate percentage, End-to-End packet latency, and file transfer delay.

#### **Predictive-OLSR (P-OLSR):**

This protocol makes use of GPS data available on board in aircraft which is able to track changes in highly dynamic network. For highly mobile Aircrafts Networks, geographic routing protocols can prove to be very successful as this GPS data can be obtained from airplanes. Some researchers proven that P-OLSR outperforms OLSR for frequent topology changes by the experimental and simulation results.

#### **Reactive-Greedy-Reactive (RGR) Protocol:**

Reactive-Greedy-Reactive (RGR) is a routing protocol designed for UAANETs. RGR covers both the characteristics of topology-based protocols and position-based protocols. RGR is a combination of AODV and GGF with no recovery strategy. This is a promising routing protocol for high mobility and dense scenarios. The concept of scoped flooding and mobility prediction will be used to improve the original RGR protocol [11].

#### **AeroRP:**

AeroRP is a geographic routing protocol that can be configured to run on one of three modes: ad-hoc mode, GS-location mode, and GS-topology mode. In addition, It has two parallel phases: neighbour discovery and data forwarding. This is another geographical protocol for highly dynamic networks for AANETs geographical information can be helpful for improved routing. AeroRP also is very helpful for improved accuracy, less delay and overhead, etc.

#### **DREAM (Distance Routing Effect Algorithm for Mobility):**

Here, the frequency of sharing of location information among the nodes is decided on the basis of inter-node distance and how fast the individual nodes are moving. More the nodes apart from each other, the less often position updates need to be shared. This way DREAM optimizes the rate of generation of control messages [12].

#### **Location-Aided Routing (LAR):**

It is also based on the concept of wedge zone which is referred to as the request zone as used in the DREAM.

This request zone is used to forward the route request instead of data packets[13, 14]. There are two different methods to decide if a node is in the request zone. In the first method, the sender sends a route request containing the coordinates of a rectangular area which has the request zone. A node receiving this request message will discard it if it is not in the rectangle and forward it if it is. In the second method, the request zone is not defined explicitly but instead, the packet is forwarded based on the distance between the sender and destination nodes.

#### **Optimized Link State Routing (OLSR):**

OLSR is a proactive link-state protocol this routing protocol uses HELLO messages and topology control (TC) messages to discover neighbour node [14]. The HELLO messages are used to find out the neighbour nodes in direct connection (i.e. one hop). While Topology Control messages are used to build a topology information base. This protocol can be used for ad-hoc networks having bandwidth and neighbour mobility. OLSR uses the Multi-point Relay (MPR) technique to reduce control traffic overhead.

#### **Conclusion**

In this paper, we have presented a survey of QoS aware routing protocols for aeronautical mobile adhoc networks. A lot of research has been done in this field. However the different protocols discussed in the paper are very effective and useful for new researchers to identify topics for further research. The QoS routing in an ad hoc network is a challenging task due to inherent characteristics of such a network. Here, following points are covered in this paper: 1) A review of the basic concepts and challenges of QoS routing in AANETs. 2) evaluation metrics for qos routing protocols and 3) The classification of the routing protocols has been done.

The protocols are selected in such a way so as to highlight many different approaches to QoS routing in AANETs, so as to explore the future areas of research. All the QoS routing protocols discussed above can further be explored in many prospective to improve their performance.

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## To simulate AODV, DSR, GRP and OLSR routing protocols of VANET and study the performance indicators using Opnet Modeler 14.5

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**Abstract** - Wireless technology is developing very fast. VANET is an evolving technology in the field of wireless communication and with the advancement it will contribute more to the smart transportation system in days to come. Quality of service in Vehicular ad-hoc Network (VANET) is primarily dependent on routing protocols. Maximum throughput, minimum packet loss and controlled overhead are the major ultimate objectives of each proposed routing protocol. VANET gives a communication framework that has enhanced the traffic service. Data sharing in this system is time sensitive and require quick and vigorous network connection forming. VANET is serving the said purposes but there are some issues and challenges like efficient handling of fast handovers for audio applications. Therefore, in this paper recently proposed routing protocols along with their pros and cons are discussed. VANET routing protocols are simulated using Opnet simulator and key performance Indicators were assessed. Simulation is performed to check the delays and throughput comparisons between the routing protocols.

**Keywords:** VANET, Opnet, Simulation, Routing Protocols, ad-hoc network

### 1. Introduction

VANET is the short form of Vehicular Ad-hoc Network, it is subclass of network of MANET type. The main characteristics of the VANETs are as follows: heterogeneous communication range, mobility of the vehicles, geographically constrained topology, time varying vehicle density, frequently disconnected network, dynamic topology, and the vehicles being the components that build the network. The VANET routing protocols need to be designed considering factors such as the security, mobility and scalability of vehicular communication. The goal of VANET architecture is to allow the connection between vehicles or between vehicles and fixed road side units to have a smooth communication possible.

For routing protocols Key Performance Indicators (KPIs) are essential like (Delay, No. of Hops, Retransmission Attempts, Traffic Received, Throughput); it is not necessary that the network should have the best results in all KPIs, but they must be realistic, and provide acceptable results in all KPIs, and during the decision taking part all the KPIs must be prioritized based on the required solution.

Specific applications like audio and video requires better handoffs and packet transmission across the network. In this paper, a simulation using the Opnet modeler for the most popular VANET routing protocols for a voice enabled service network will be done to obtain the best KPIs from its perspective and choose the best one based on the KPIs.

### 2. VANET routing protocols

#### 2.1. AODV

AODV (Ad-hoc On-demand Distance Vector) is a loop-free routing protocol for ad-hoc networks. It is designed to be self-starting in an environment of mobile nodes, withstanding a variety of network behaviors such as node mobility, link failures and packet losses. The information is only transmitted between nodes in an on demand mode.

Advantages

- Routes are established on demand and destination sequence numbers are used to find the latest route to the destination.
- AODV can be used in large VANET networks.
- Any failure in the VANET links is handled in a prompt way by the AODV.
- The connection setup delay is lower.

- Distance Sequence Number is providing recent route to the destination node.

#### Disadvantages

- It expends extra bandwidth, because of proactive beaoning high control overhead is occurring when many route reply packets for a single path.
- Compared to other approaches, high processing time is required for the connection initiation and the first attempt to set the path.
- Route inconsistency may occur when old entries are included in intermediate nodes.

#### 2.2. DSR

The DSR protocol utilizes source routing and maintains functional paths. It consists of route detection and route servicing. Route Discovery determines the optimum path for a transmission between a given source and destination. Route Maintenance ensures that the transmission path remains optimum and loop-free as network conditions change, even if this requires changing the route during a transmission.

#### Advantages

- In DSR protocol no proactive updates are desired.
- Route caching can reduce route discovery.
- The DSR protocol is Beacon less.

#### Disadvantages

- When the links get down it can't be reformed locally.
- The performance of DSR protocol views declining in highly mobile VANET.
- DSR is not scalable to large networks.
- The connection setup delay is higher

#### 2.3. OLSR

The Optimized Link State Routing Protocol (OLSR) is an IP routing protocol optimized for mobile ad hoc networks, which can also be used on other wireless ad hoc networks. It means optimized link state routing which means a routing protocol using the proactive mode. In this, whenever any change in the topology occur, MPR (multipoint relay) are responsible to generate and forward the topology information to selected nodes. OLSR operation fundamentally consists of servicing and updating information in a set of tables. The tables are managing the route calculation itself as well.

#### Advantages

- Suitable with data intensive application as it has less average end-to-end delay.
- Doesn't require central administrative system to handle routing process

#### Disadvantages

- The control message overhead gets increased with increased in mobile hosts.
- In OLSR, large amount of bandwidth and CPU power is required to compute the optimal path.

#### 2.4. GRP

GRP routing is used into two approaches. In greedy forwarding, the data is sent to the closest neighbor of the destination node; the second approach is perimeter routing which implies planner graph traversal concept.

#### Advantages

- Route discovery and management is not required.
- GRP supports scalability
- Suitable for high node mobility pattern

#### Disadvantages

- The protocol requires position determining services.
- GPS devices don't work in tunnel

#### 3. Simulation setup and metrics

To monitor different performance matrices related to all four routing protocols in VANET environment, we have simulated some scenarios with the help of OPNET modeler 14.5. This scenario consists of 40 nodes enabled with voice application. The area considered for simulation is 10 km X 10 km. For the application designation we have included the Application config and Profile config to set the applications (voice) used by the nodes. Subsequently, we changed the routing protocol of all the nodes to all the routing protocols i.e. AODV, DRS, OLSR and GRP consecutively. The metrics considered for observation are throughput, media access delay, network load, traffic drop and delay. The seed value considered for simulation is 128.

#### 4. Simulation Results

4.1 Throughput – fig. (1) Depicts the throughput of the network. The simulation runs for the entire duration which generates result in time\_average mode, specifies OLSR has maximum throughput, than AODV. GRP protocol gives minimum throughput, whereas DSR remains behind to AODV.

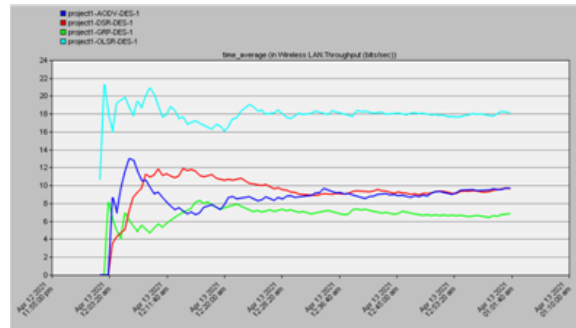


fig. (1) Throughput in the network

4.2 Network Load – as depicted in fig. (2) The network load for AODV and DSR is equal minimum at approx. 10 min. of the experiment. Further the network load increases steadily throughout the execution. At the same time interval, GRP has 1000 bits/sec network load, further remains constant. The OLSR has maximum network load 2200 bits/sec.

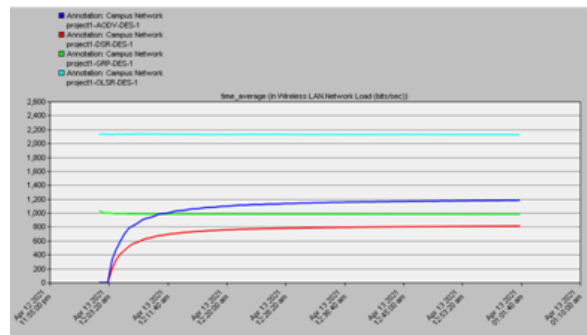


fig. (2) Network Load in the network

4.3 Media Access Delay – GRP protocol has maximum peak of Media Access Delay at around 20% time of the execution; further the delay gets decreasing. OLSR and DSR have gradual increase in their delays. AODV protocol has minimum delay and it remains consistent throughout the experiment, as shown in fig. (3).

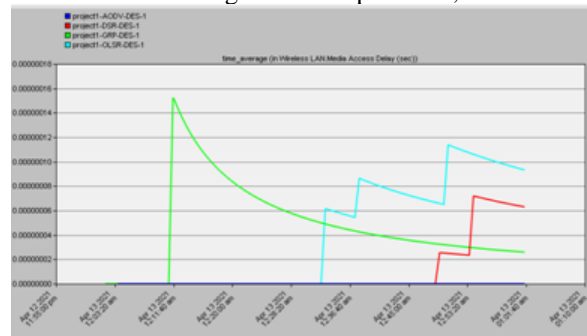


fig. (3) Media Access Delay in the network

4.4 Traffic Dropped – fig. (4) Specifies OLSR protocol has the maximum packets traffic drop. Other protocols AODV, DSR and GRP have minimum packets traffic drop.

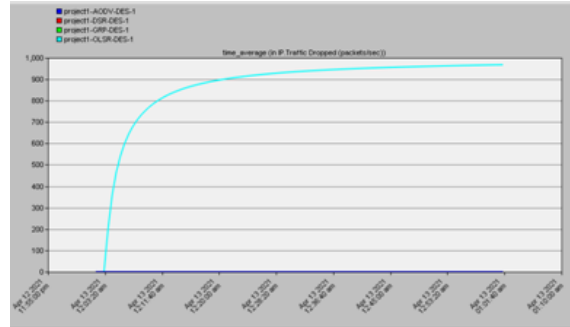


fig. (4) Traffic Dropped in the network

4.5 Delay – All protocols have propagation after 10% of execution time, DSR has minimum delay 0.00024 s, which remains constant further. OLSR and AODV protocols are having slightly higher delay than DSR and it remains constant in execution. The GRP protocol has highest delay peak 0.00030 s, which further gets decreases until reaches to 0.00026 s.

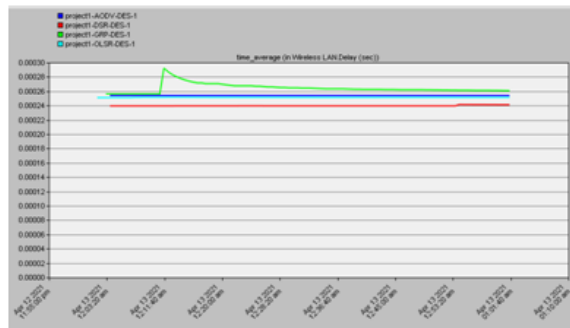


fig. (5) Delay in the network

## 5. Conclusion

In this work, simulation based analysis has been carried out to analyze the VANET system performance using different routing protocols. In this paper, we have reviewed many studies related to routing protocols. As per the research completed, AODV proved to be the best routing protocol in VANET environment. The proposed simulated results may be serving as guidelines for design of modern traffic control mechanisms which follows safety application, faster data packet dissemination and intermittent connection problem in VANETs.

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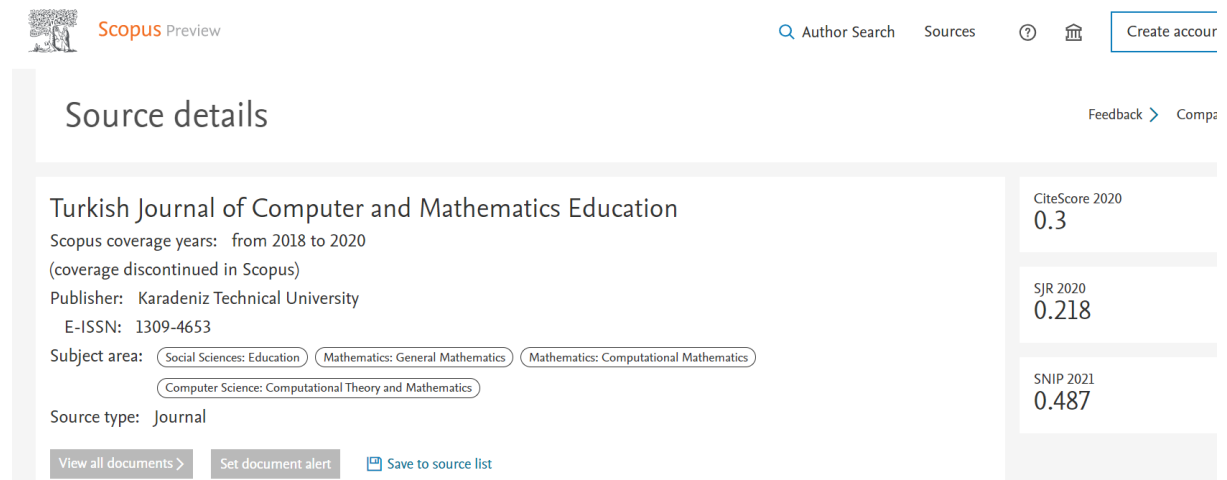
Paper Title- "To simulate AODV, DSR, GRP and OLSR routing protocols of VANET and study the performance indicators using Opnet Modeler 14.5"

Paper Link - <https://www.turcomat.org/index.php/turkbilmam/article/view/8109>

Journal Name- Turkish Journal of Computer and Mathematics Education (1309-4653)

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**A comparative study of Word Embedding Techniques to extract features from Text**

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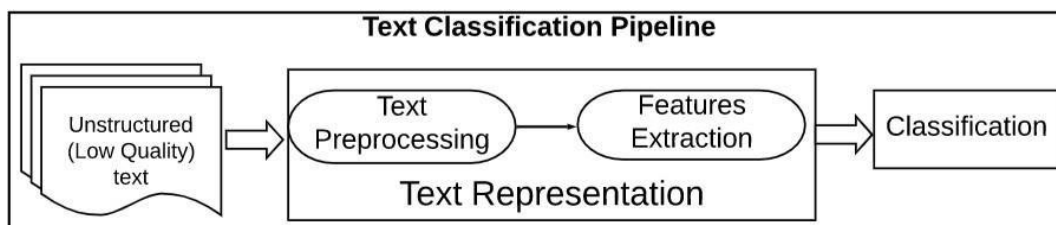
**Abstract:** Extract information from text into feature vectors is known as word embedding, which is used to represent the meaning of words into vector format. There have been no. of word embedding techniques developed that allow a computer to process natural language and compare the relationships between different words programmatically. In this paper, first, we introduce popular word embedding models and discuss desired properties of word model like similarity analysis, or the testing of words for synonymic relations, is used to compare several of these techniques to see which performs the best.

**Keywords:** Word embedding, Natural Language Processing, Neural Network, Machine Learning.

**1. Introduction:[1][9]**

In natural language processing (NLP) there are many algorithms used to achieve the best results, algorithms from Machine Learning (ML), Deep Learning (DL) and many others. The first issue you face in NLP is converting text to numbers that can be used in any algorithm a scientist chooses, but how to convert text to numbers? this is where Word Embedding algorithms come in picture.

Text-based data is increasing at a rapid rate, where the inferiority of the unstructured text is growing rapidly than structured text. Textual data is extremely common in many various domains whether social media, online forums, published articles and online reviews given online where people express their opinions and sentiments to some products or businesses. Text data is a rich source of getting information and gives more opportunity to explore valuable insights which cannot be achieved from quantitative data. The main aim of different NLP methods is to get a human-like understanding of the text. It helps to look at the vast amount of unstructured and low-quality text and find out appropriate insights. Couple with ML, it can formulate different models for the classification of low-quality text to give labels or obtain information based on prior training. Over the years text has been used in various applications such as email filtering, Irony and sarcasm detection document organization, sentiment and opinion mining prediction, hate speech detection, question answering, content mining, biomedical text mining and many more.



**2. Word Embedding:[2][8]**

Word embedding is a real-valued vector representation of words by embedding both semantic and syntactic meanings obtained from unlabelled large corpus. It is a powerful tool widely used in modern natural language processing (NLP) tasks, including semantic analysis, information retrieval, dependency parsing, question answering and machine translation. Learning a high- quality representation is extremely important for these tasks, yet the question “what is a good word embedding model” remains an open problem. As extensive NLP downstream tasks emerge, the demand for word embedding is growing significantly. As a result, lots of word

embedding methods are proposed while some of them share the same concept.

## 2.1 Desired Properties of Embedding Models:[2]

Different word embedding models yield different vector representations. There are a few properties that all good representations should aim for.

- Non-conflation
- Robustness Against Lexical Ambiguity
- Demonstration of Multifacetedness
- Reliability
- Good Geometry

## 3. Word embedding techniques:[7]

Below are the popular and simple word embedding methods to extract features from text are

- Bag of words
- TF-IDF
- Word2vec
- Glove embedding
- Fastest
- ELMO (Embeddings for Language models)

## 4. Feature Extraction Method:[1][7][4][8]

In this section, we discuss various popularly used feature extraction models. Different features of extraction models are proposed to address the problem of losing syntactic and semantic relationships between words. These methods have been adopted for different NLP related tasks. First, we present some classical models, followed by some famous representation learning models.

### 4.1 Classical Models

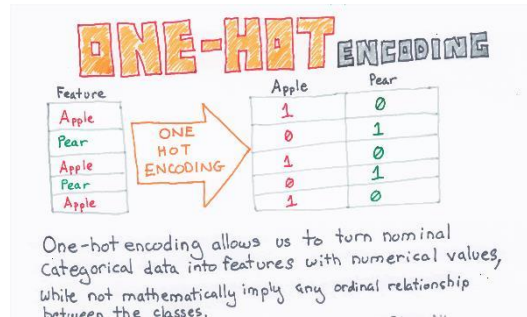
This section presents some of the classical models which were commonly used in earlier days for the text classification task. Frequency of words is the basis of this kind of words representation methods. In these methods, a text is transformed into a vector form which contains the number of the words appearing in a document.

#### (1) Categorical word representation:

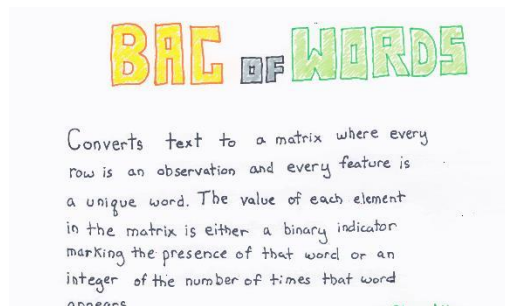
This is the simplest way to represent text. In this method, words are represented by a symbolic representation either "1" or "0".



- One hot encoding: The most straightforward method of text representation is one hot encoding. In one hot encoding, the dimension is the same amount of terms present in the vocabulary. Every term in vocabulary is represented as a binary variable such as 0 or 1, which means each word is made up of zeros and ones.



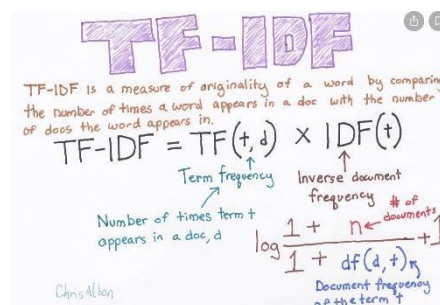
- Bag-of-Words (BoW): BoW is simply an extension of one-hot encoding. It adds up the one-hot representations of words in the sentence. The BOW method is used in many different areas such as NLP, computer vision (CV), and information retrieval (IR) etc.



(2) Weighted Word representation:

Here, we present the common methods for weighted word representations such as Term Frequency (TF) and Term Frequency-Inverse Document Frequency (TF-IDF). These are associated with categorical word representation methods but rather than only counting; weighted models feature numerical representations based on words frequency.

- Term Frequency (TF): Term frequency (TF), is the straightforward method of text feature extraction. TF calculates how often a word occurs in a document. A word can probably appear many times in large documents as compared to small ones. Hence, TF is computed by dividing the length of the document. In other words, TF of a word is computed by dividing it with the total number of words in the document.



Term Frequency-Inverse Document Frequency (TF-IDF): TF-IDF is presented to cut down the impact of common words such as 'the', 'and' etc. in the corpus. TF means Term frequency which is defined in the above section, and IDF is inverse document frequency which is a technique presented to be used with TF to reduce the effect of common words. IDF assigns a more weight to words with higher or lower frequencies. This combination of TF and IDF method is known as TF-IDF.

4.2 Representation Learning

The limitations of classical feature extraction methods make it use a limited for building a suitable model in ML. Due to this, different models have been presented in the past, which discovers the representations automatically

for downstream tasks such as classification. Such methods which discover features itself are called as feature learning or representation learning. In the area of NLP, unsupervised text representation methods like word embeddings have

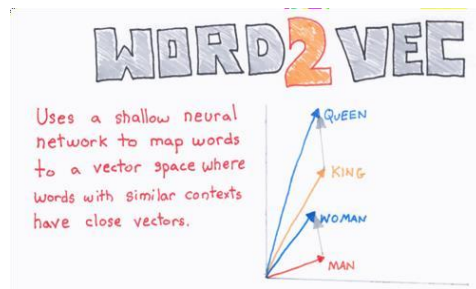
replaced categorical text representation methods. These word embeddings turned into very efficient representation methods to improve the performance of various downstream tasks due to having a previous knowledge for different ML models. Classical feature learning methods are replaced by these neural network-based methods thanks to their good representation learning capacity. Word embedding is a feature learning method where a word from the vocabulary is mapped to  $N$  dimensional vector. Many different words embedding algorithms have been presented.

(1) Continuous Words Representation (Non-Contextual Embeddings):

Word Embedding is NLP technique in which text from the corpus is mapped as the vectors. In other words, it is a type of learned representation which allows same meaning words to have the same representation. It is the distributed representation of a text (words and documents) which is a significant breakthrough for better performance for NLP related problems.

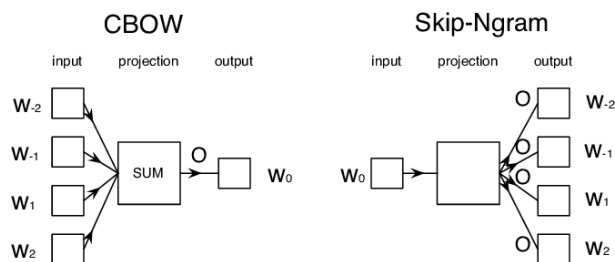
**Word2Vec**

Word2vec is an efficient analytical model used to transform the raw text into word embeddings. This model is predicated on words with similar semantics present within the same context. this will be modelled by placing a word during a high dimensional vector space then moving words closer supported their probabilities to seem within the same context. Two important methods are used to calculate these vectors like, Continuous Bag-of-Words model (CBOW) and Skip-Gram model. The advantage of this model is to handle huge volume of documents and provides the optimal results with word vectors.



**Continuous Bag of words (CBOW) [5]**

Continuous Bag of words (CBOW) gives words prediction of current work based on its context. CBOW communicates with the neighbouring words in the window



**Skip-Gram:**

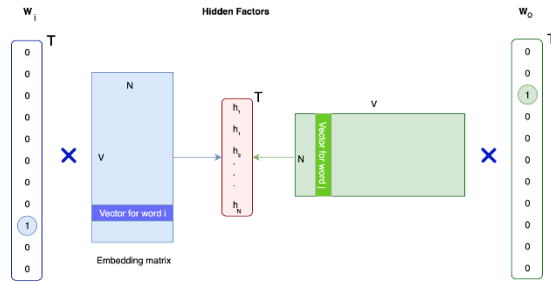
Skip-Gram is the reverse of CBOW model; prediction is given based on the central word after the training of context in skip-gram.

**GloVe**

The Global Vectors for Word Representation, or GloVe, calculation is an augmentation to the word2vec strategy for efficiently learning word vectors, created by Pennington, et al. at Stanford University. Conventional vector space models expose of words were produced utilizing matrix factorization strategies. GloVe is an approach to extracts both the novel measurements of matrix factorization procedures like LSA with the local context-based learning in word2vec. GloVe constructs an express word-context or word co-occurrence matrix

utilizing statistics over the entire text corpus .The outcome is a learning model is the better embeddings in terms of words.

**Word Order Vectors (WOVe) [4]**



The next word embedding technique is WOVe , a modification upon GloVe proposed by Cox in 2019 that was able to improve GloVe’s effectiveness in the analogy task by 9.7%. While GloVe does use word-weighting based on those words’ distance from the target word when creating the word vector, it does so by generating inclusive matrices. For an inclusive matrix, all words from the target word to the edge of the context window are considered and weighted according to their distance, resulting in a singular vector

**FastText [6]**

Bojanowski et al. [15] proposed FastText and is based on CBOW. When compared with other algorithms, FastText decreases the training time and maintains the performance. Previously mentioned algorithms assign a distinct representation to every word which introduces a limitation, especially in case of languages with sub-word level information/ OOV

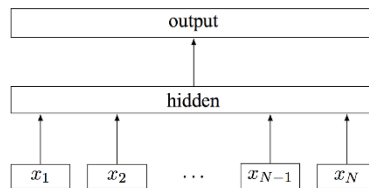
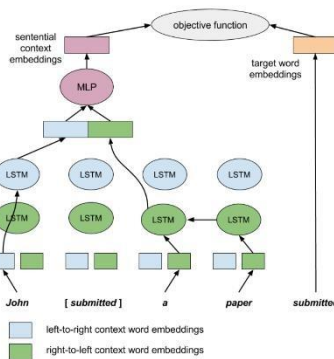


Figure 1: Model architecture of fastText for a sentence with  $N$  ngram features  $x_1, \dots, x_N$ . The features are embedded and averaged to form the hidden variable.

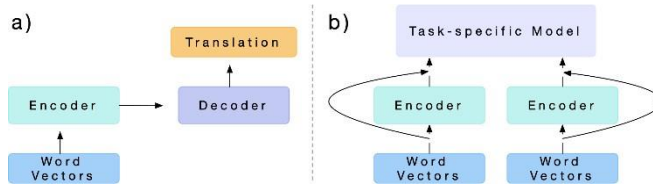
(2) Contextual word representations:

- Generic Context word representation (Context2Vec):

Generic Context word representation (Context2Vec) was proposed by Melamud in 2016 to generate context-dependent word representations. Their model is based on word2Vec’s CBOW model but replaces its average word representation within a fixed window with better and powerful Bi-directional LSTM neural network



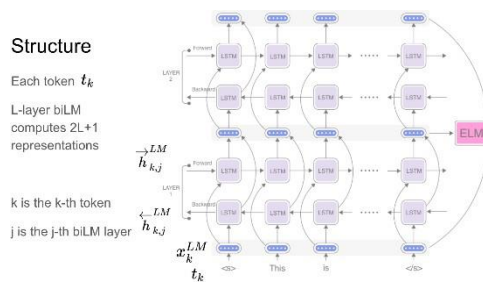
- Contextualized word representations Vectors (CoVe):



McCann presented their model contextualized word representations (CoVe) which is based on context2Vec. They used machine translation to build CoVe instead of the approach used in Word2Vec (skip-gram or CBOW) or Glove (Matrix factorization)

- Embedding from language Models (ELMo):

Peters et al. proposed Embedding from Language Models (ELMo), which gives deep contextual word representations.



### 5. Analysis of Word Embedding Models: [1][10]

Language Models	Semantics	Syntactical	Context	Out of Vocabulary
1-Hot encoding	[×]	[×]	[×]	[×]
BoW	[×]	[×]	[×]	[×]
TF	[×]	[×]	[×]	[×]
TF-IDF	[×]	[×]	[×]	[×]
Word2Vec	[✓]	[✓]	[×]	[×]
GloVe	[✓]	[✓]	[×]	[×]
FastText	[✓]	[✓]	[×]	[✓]
Context2Vec	[✓]	[✓]	[✓]	[✓]
CoVe	[✓]	[✓]	[✓]	[×]
ELMo	[✓]	[✓]	[✓]	[✓]

**6. Comparison of Word Embedding Models [1][3]**

Model	Architecture	Type	Pros	Cons
One Hot Encoding and BoW	-	Count based	Easy to compute Works with the unknown word Fundamental metric to extract terms	It does not capture the semantics syntactic info. Common words effect on the results Can not capture sentiment of words
TF and TF-IDF	-		Easy to compute Fundamental metric to extract the descriptive terms Because of IDF, common terms do not impact results	It does not capture the semantics syntactic info. Can not capture the sentiment of words
Word2Vec	Log Bilinear	Prediction based	It captures the text semantics syntactic Trained on huge corpus ( Pre-trained)	Fails to capture contextual information. It fails to capture OOV words Need huge corpus to learn
GloVe	Log Bilinear	Count based	Enforce vectors in the vector space to identify sub-linear relationships Smaller weight will not affect the training progress for common words pairs such as stop words	It fails to capture contextual information Memory utilization for storage It fails to capture OOV words Need huge corpus to learn (Pre-trained)
FastText	Log Bilinear	Prediction based	Works for rare words Address OOV words issue.	It fails to capture contextual information Memory consumption for storage Compared to GloVe and Word2Vec, it is more costly computationally.
Context2Vec CoVe ELMo	BiLSTM	Prediction based	i) It solves the contextual information issue	Improves performance Computationally is more expensive Require another word embedding for all LSTM and feed-forward layer

**7. Conclusion:**

The paper has presented multiple techniques used in word embedding and the models and techniques used in those techniques in an attempt to ease the pain of understanding and learning them, it is not considered a full material to learn everything about word embedding techniques but more like an introduction. The main aim of this research work is to analyse the performance of word embeddings algorithm. we have introduced various algorithms that enable us to capture rich information in text data and represent them as vectors for traditional frameworks. We firstly discussed classical methods of text representation. every method has their advantages like a Bag-Of-Words suitable for text classification, TF-IDF is for document classification, WOVE technique for synonyms and if you want semantic relation between words then go with word2vec. We have to choose embedding model depends upon the requirement and corpus.

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[10]<https://medium.com/sfu-csmp/nlp-word-embedding-techniques-for-text-analysis-ec4e91bb886f>
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## Performance of MyNET Model on Handwriting Biometrics

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### ABSTRACT:

This paper is in the continuation of Writer Identification using Neural Network[1]. Offline signature identification is the challenging task till date. Unlike to verification problem of one-to-onemapping, identification maps single with rest them to identify the signer. For this process we model a model using convolution neural network. This paper explains the performance of MyNET model on MyNET offline signature dataset which consists of 434 writers 20 signatures each.

**Keywords:**Signature Identification, CNN, Handwriting Biometrics, MyNET, neural network

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### Introduction:

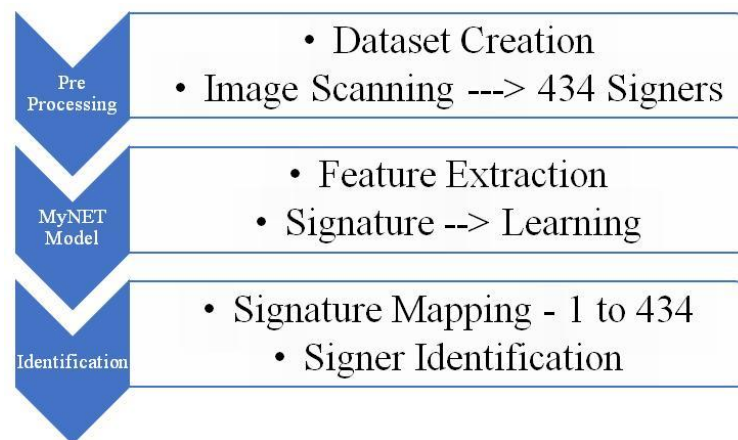
Biometric systems play major role in different applications. The two main important biometrics widely used are fingerprint scanner and iris scanner with many applications in different areas such attendance monitoring to security access controls. Handwriting biometrics usually referred as signature is mainly used largely in banking and legal application thought the globe. But due to their performance issues they are less used.[2][3]

There are two major problems associated with handwriting biometrics. They are namely, i) Writer Identification ii) Signature Verification. The writer identification is based on the identifying the signer from previous set of signatures available. For the process of identification current signatures is mapped with every signer's signature and based on matching pattens the writer is identified. Instead in signature verification process claims are made based on the signer

and only the process maps current signature with the only claimed signer's signature available. If the matching patterns is more that desired the verification confirms the signer to be valid.[4][5]

There are mainly two major techniques used in handwriting biometrics mainly, i) Offline and ii) Online. In offline, signatures are generally made on the piece of the paper and then they are computerized using scanners and then process with image processing techniques. On the other hand, in online signatures are captured using devices such as digitizers and then are process based on the parameters recorded during the acquisition process. Due to the advantage of acquiring the parameters using digitizers online techniques provided more accurate results compared to offline.[6][7]

## Proposed Architecture:



*Figure 1 Identification Process*

In order to study the performance which will identify the signer the following architecture has been implemented and performance was recorded.

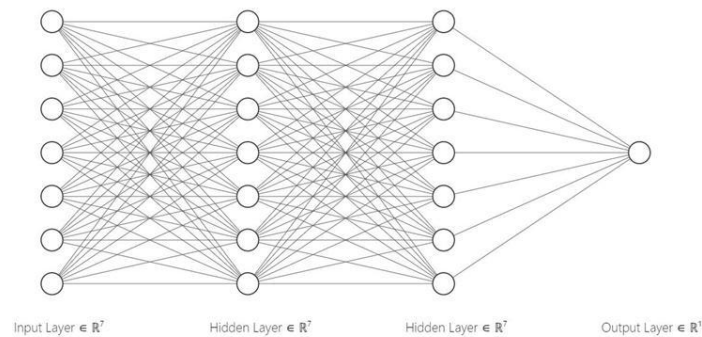
There are three major processes as shown in figure 1.

### 1. Dataset Creation

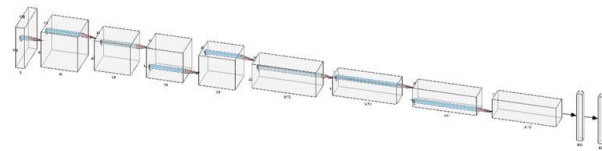
There are several existing datasets available for offline signature verification. Major of the datasets were on mixed mode i.e., offline and online. In the previous research work we have found the offline signatures datasets have signatures varies from 300 to 3000[1]. Hence, we proceeded to create a larger dataset with at least 8000 genuine signatures.

20 signatures of each signer were collected using page and paper method. Then using HP scanner with 1200 dpi each signature scanned and store separately with coding separate numeral for each signer. In this process we collected signatures from 500 signers. After implementing selection process for each signature 8680 signatures of 434 signer's 20 each were shortlisted for further process. With these signature MyNET signature dataset created.

## 2. MyNET Model



*Figure 2 MyNET Neural Network Architecture*



*Figure 3 MyNET Framework Architecture*

- Image Preprocessing – Each signer's signature images were of different sizes. All images were resized for common input size [224 224]. The colour images were converted to grey scaled images.
- Convolution Neural Network[8] – Each signature image was processed for convolution with 5 by5 filter matrix and such 96 different random filters were used to create 96 filter maps. Followed by ReLu Activation functions to remove negative values. We have done down sampling of these images further using max-pooling layer. Since the filter numbers are large, we have use mini-batch normalization to speed CNN training further.
- Multiple Convolutions – 32 Grouped convolutions were implemented with ReLu and Average pooling for performance and speed improvement. Further cross-normalization was implemented channel wise. Additionally, drop-out layer added at the end to randomize the values to improve the performance of the network.

### **Experimentation:**

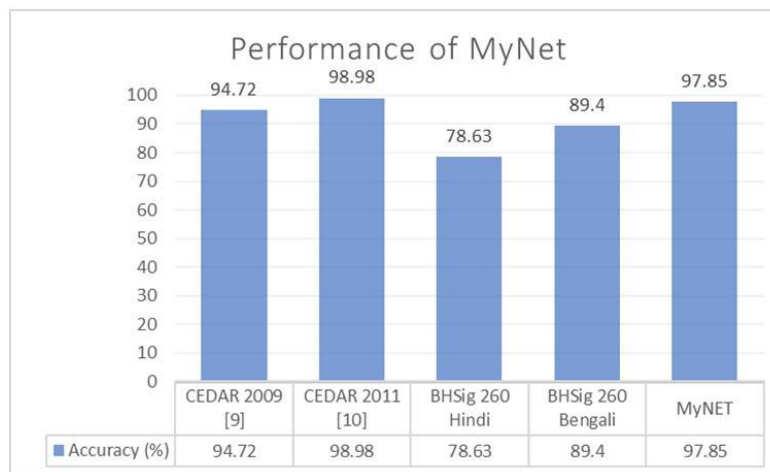
## 3. Identification

To study the performance of our MyNET model for the process of signer identification we have used our own dataset MyNet with 434 signers. Our objective was to identify the signer from the set of signatures available. Hence, we have implemented writer dependent signer identification. From the dataset randomly signatures were split into two different set for the process of training and validation. 21 different sets of 352 signatures each were created and MyNET model

implemented with cross validation. Since all of the signatures where genuine accuracy of signer identification was measured for each set.

## Results:

Considering new era of computation with enhancement into computation technologies, a larger dataset always important for research advancement. MyNET dataset with 9000+ genuine signatures without any synthetic signature creation could be larger dataset in this category. The performance of MyNET Model with larger dataset gives promising results for further research work. Below Table shows performance of MyNET model on different datasets with accuracy.



*Figure 4 Performance of MyNET on different datasets*

Based on the performance of MyNET Model on different dataset given in the above table we state of results as follows:

1. The performance of MyNET is promising on CEDAR datasets.
2. The performance of MyNET on BHSig 260 varies a lot with different Indic Scripts. In Hindi, performance has reduced below 80. This indicates to research further to improve the performance.
3. Compared to the performance with other Bengali shows less performance but considering other literature its still promising.
4. The accuracy of MyNET model on MyNET dataset and other as mentioned above proves the stability of the model with some variation to Hindi.

## Conclusion:

Handwriting biometric framework based on convolution neural network showed high accuracy performance on different datasets. The parameters could be further tunes to improve the

performance to other scripts as well. This model can be further implemented in real life application for signer identification.

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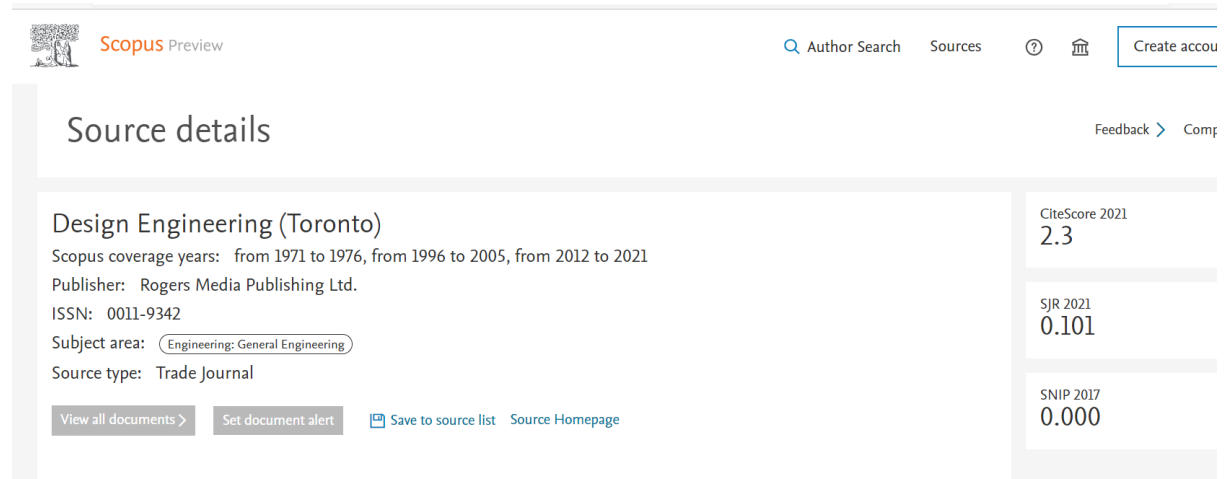
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# FACTORS AFFECTING EMPLOYABILITY – A STUDENT’S PERSPECTIVE

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## ABSTRACT

*The basic objective of the Master of Computer Application (MCA) program is to provide a steady stream of necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into rapidly expanding world of Information Technology. Current MCA Curriculum is built on the implementation of the Choice Based Credit System (CBCS) and Grading System. Curriculum also gives emphasis on identifying industrial expectations and institutional reparation for meeting industrial needs. These interventions would be successful only when the perceptions of its major stakeholder i.e. students are taken into consideration. Doing so will help in taking maximum advantage of India’s favorable demographic dividend.*

**Key words:** Master of Computer Application (MCA), Choice Based Credit System (CBCS), stakeholder.

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## 1. INTRODUCTION

India has witnessed a massive transformation in its educational system in the 21st century and is flourishing with well-designed form of it. Management education in India is not very old. After the establishment of the IITs, there was awful need for similar establishments in the field of management education. Thus, Indian Institute of Management Ahmadabad came into existence. After that many institutions started which are offering various professional courses including management programs like Master in Computer Application (MCA).

Management education gives emphasis on developing a broad range of managerial knowledge and abilities amongst the students. The basic objective of the Master of Computer Application (MCA) program is to provide a steady stream of necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into rapidly expanding world of Information Technology. Current MCA Curriculum is built on the implementation of the Choice Based Credit System (CBCS) and Grading System. Curriculum also gives emphasis on identifying industrial expectations and institutional reparation for meeting industrial needs.

Students' employability is a key concern for the institutions offering higher education. Focused and timely efforts of institution and students towards employability will give positive results. Many factors are associated with employability. Most of the international companies need MCAs who are flexible, trainable with an innovative attitude and who will serve as change agents in the business.

Employability skills focus more on performance of the candidates on the job and this requires a set of skills that match the job. To become employable, in addition to subject-specific job skills, student need to have problem solving, planning and organizing, innovation, learnability, technology skills, self-management skills, interpersonal skills, leadership skills, team building and communication skills. This paper sheds light on the study of employability skills of MCA students from their own perspective.

## 2. LITERATURE REVIEW

Employability is explained by Lee Harvey as an attempt to get a job in stipulated time, more specifically after defined period after graduation, or an ability to fit our self as per company needs (Mishra *et.al.* 2016).

Another approach given by Hillage and Pollard to look at employability is the capability to get primary employment, sustaining and upgrading oneself with new employment if needed. The primary factors that are needed are in-depth knowledge, abilities and right attitude. They have proposed three types of skills i. Baseline Skills These are simple skills and personal qualities like trustworthiness and integrity ii. Intermediate Skills - It consists of professional skills, like communication skills, problem solving skills etc. iii. High level Skills –these are specific skills related to performance in the industry such as self-management, team work, commercial alertness etc. Thus, employability skills are person dependent and environment dependent (Mohapatra *et.al.* 2019).

Talking about the employability of male and female students from post graduate management programs, India Skills Report 2019-20 claims that female employability showed an upward trend, climbing from 38 per cent in 2017; 46 per cent in 2018 and registering 47 per cent in the year 2020. Of these, the most employable candidates are MBA students with 54 per cent as against 40 per cent of Engineering and MCA in the last two years i.e., 2018 and 2019.[10]

Information and communication technology (ICT) is very important in today's era. The most important skills with which a student can get ready to face or solve the critical issues in the industries is technological skills. ICT skills are vital and should form a major part of institutional strategy in providing better quality students. This skill is an important factor in inhibiting the learning of the students from developing communities. If technology literacy is not recognized or dealt with, the lack of technology skills may discourage the efforts to use e-learning in bridging the digital divide (Mohapatra *et.al.* 2019).

In the study of role of employability skills in management education, MCA students are the integral part management education. Human resources are considered to be the biggest asset for any nation. Fortunately, India has this demographic dividend. To take the advantage of this



demographic dividend, skills of the students must be upgraded through innovative initiatives. (Asirvatham *et.al.* 2017)

The objective of this study is to explore and understand student’s perception regarding importance of various skills that are required for being employable.

### 3. METHODS

#### 3.1 Sample

Survey method was adopted to explore student’s perspective on factors affecting their employability. Data was collected through a survey of 187 respondents studying in first, second and final year of their Master Degree (MCA). For collecting the data Google form was made and sent to students. Out of 300 forms sent online, 187 responses were received by data collection deadline.

Out of 187 respondents, 101 were male. The average age of respondents is 23 years.

#### 3.2 Measure

For understating the factors that affects employability of students, various items/statements were prepared based on the review of previous literature and students were asked to rate each item on the scale of 5 (0 = not at all important to 4 = Extremely Important). Total 48 items/statements were given. Sample items include “*I can speak and write clearly so that others understand*”, “*I recognize the many dimensions of a problem and can determine a root cause*”, “*I am good at managing time and priorities – setting timelines*”, “*I usually come up with creative and innovative ideas during group work*”, “*I am able to adapt to act in new situations*”, “*I am successful in resolving conflicts with others*”, “*Initiates change to enhance productivity*”.

### 4. ANALYSIS & RESULTS

#### 4.1 Exploratory Factor Analysis

Factor analysis is an interdependence technique, whose primary purpose is to define the underlying structure among the variables in the analysis (Hair, Anderson, Tatham, Black, 1995). It is a multivariate statistical procedure that has many uses. Factor analysis reduces a large number of variables into a smaller set of variables (also referred to as factors). It also provides construct validity evidence of self - reporting scales (Gorsuch, 1983; Hair, Anderson, Tatham, Black, 1995; Tabachnick & Fidell, 2007; Thompson, 2004)

In Exploratory Factor Analysis, the investigator has no expectations of the number or nature of the variables and as the title suggests, is exploratory in nature. That is, it allows the researcher to explore the main dimensions to generate a theory or model from a relatively large set of latent constructs often represented by a set of items (Pett, Lackey, Sullivan, 2003; Henson & Roberts, 2006; Thompson, 2004).

In this study we tried to explore the factors that affects employability from student’s perspective, exploratory factor analysis (EFA) was used to examine and understand the structure and relationship between variables.

**Table 1** Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett’s Test of Sphericity

<b>KMO and Bartlett's Test</b>		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.899
Bartlett's Test of Sphericity	Approx. Chi-Square	5054.170
	df	171
	Sig.	.000

The KMO measure indicates adequacy level of 0.899 and Bartlett’s Test of Sphericity was significant ( $p = .000$ ), validating the data for analysis.

The factor structure of the 48 item scale was examined. The Rotated Component Matrix shows the factor loadings for each variable (Table 1.2). Factor loadings  $> .5$  are shown in the table.

Based on these factor loadings, 6 items loaded strongly on Factor 1, which represents “Team Player Skills”. Items 30 to 36, all loaded strongly on Factor 2, which represents “Time Management Skills”. Item 37 to item 39 and items 43 to 46 and item 48 loaded strongly on factor 3, which represents “Adaptability and Interpersonal Skills”. Item 1, 2, 4,5,21 & 47 loaded highly on factor 4 which represents “Communication Skills”. Items 3, 6 and 8 loaded highly on Factor 5 which represents “Problem Solving Skills”. Items 15 to item 20 loaded highly on Factor 6 which represents “Planning & Creativity Skills”. Items 7, 41 and 42 loaded highly on Factor 7 which represents “Assertiveness Skills”. Items 22 to 24 loaded highly on Factor 8 which represents “Ability to learn”. While, items 26 to items 29 loaded highly on Factor 9 which represents “Technology Skills”.

**Table 2** Factor structure of Employability scale

**Rotated Component Matrix**

	Components								
	1	2	3	4	5	6	7	8	9
Item 1				.589					
Item 2				.587					
Item 3					.625				
Item 4				.560					
Item 5				.550					
Item 6					.717				
Item 7							.517		
Item 8					.599				
Item 9	.619								
Item 10	.812								
Item 11	.583								
Item 12	.803								
Item 13	.714								
Item 14	.660								
Item 15						.574			
Item 16						.403			
Item 17						.448			
Item 18						.620			
Item 19						.649			

## Factors Affecting Employability – A Student’s Perspective

Item 20						.560			
Item 21				.558					
Item 22								.604	
Item 23								.604	
Item 24								.696	
Item 25									.633
Item 26									.610
Item 27									.641
Item 28									.720
Item 29									
Item 30		.505							
Item 31		.535							
Item 32		.564							
Item 33		.731							
Item 34		.693							
Item 35		.612							
Item 36		.568							
Item 37			.652						
Item 38			.608						
Item 39			.598						
Item 40									
Item 41							.587		
Item 42							.545		
Item 43			.702						
Item 44			.580						
Item 45			.509						
Item 46			.534						
Item 47				.599					
Item 48			.536						
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.									

The factor structure that was extracted from the above given EFA is represented in following diagram.

## 4.2 Derived Research Model

The derived research model is presented in Figure

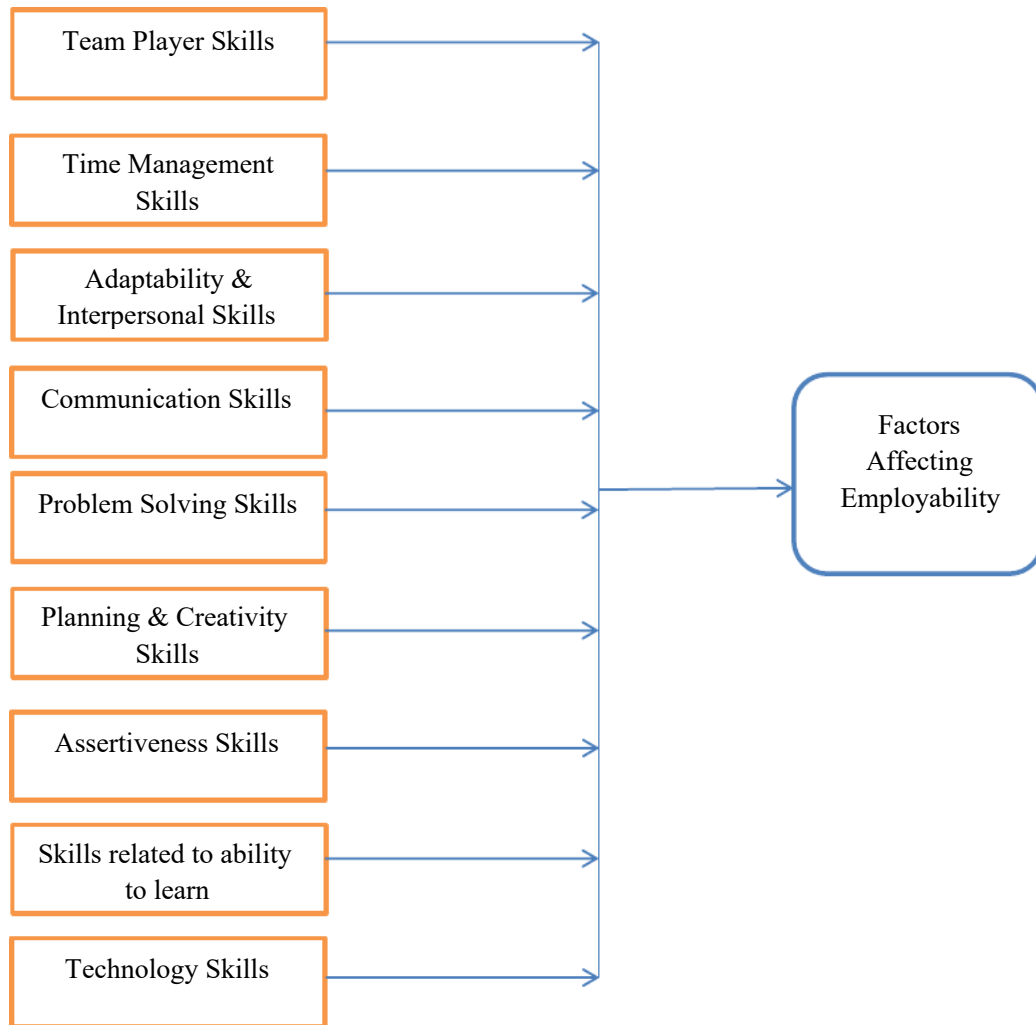


Figure 1 Research Model

## 5. DISCUSSION & IMPLICATIONS

The study to find out factors that are important for employability from students' perspective has derived nine factors/ skills. These skills can be further divided into three categories i.e. Baseline Skills, Intermediate Skills and High level Skills (Mohapatra *et.al.* 2019).

Out of all the skills derived in this study assertiveness Skills, ability to learn, Time Management skills and adaptability and interpersonal skills fall in the category of baseline skills. Communication skills and problem solving skills are from intermediate skills category. While, high level skills category includes skills like, technology skills, team player skills and planning & creativity skills.

Baseline skills like time management and interpersonal skills are highly in demand by employers irrespective of industry. It is claimed that even in technical area like IT and engineering talent requirement of baseline skills is ever increasing [11]. Additionally, it is found that Intermediate Skills like Communication Skills and Problem Solving Skills are few of the highly sought after skills from employers in IT candidates [12]. Whereas, High level Skills like Technology Skills are considered to be the foundation for employability in IT industry.

The categorized skills received from the students through above research must be evaluated with the Industrial Requirements. The fitment of these skills with precise Industry requirements is of vital importance. If needed from Industry viewpoint, addition of supplementary skills and imparting its training to students can be thought of. To enhance the placements, these skills can be fine-tuned with the MCA curriculum. Curriculum amendments can be done if possible. Along with amendments in curriculum, Institutes can undertake Employability Enhancement Programs (EEP) for students partnering with Industries. One to one student mentoring can also be done which can be supplemented with SWOT analysis. All these efforts would take the students to achieve their placement goals in general and successful career paths in particular.

## 6. SCOPE FOR FUTURE RESEARCH

Further research studies can be conducted in the direction of suggesting implementation methodologies for skill enhancement of management students. Student’s family background and geographical area from which they belong has influence on skills possessed by them. Hence these factors can be taken into consideration for in-depth study. Industry specific skills study can also be conducted.

## 7. CONCLUSION

In today’s global context where challenges of business sustainability are increasing, management education has a crucial role to play. In ever changing business environment, most of the organizations today are looking for young talent from management and technology specializations that possess not only good domain knowledge but also exhibit skills like adaptability, flexibility and effective interpersonal skills. The gap between demand and supply in employment market is increasing. Though the number of graduates entering the job market is ever rising, the quality of these young graduates is questionable. To bridge the gap of skill shortage in industry, active interventions are needed from the supply side i.e. educational institutes. These interventions would be successful only when the perceptions of its major stakeholder i.e. students are taken into consideration. Doing so will help in taking maximum advantage of India’s favorable demographic dividend.

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# A FRAMEWORK TOWARDS ICT APPROPRIATION IN VOLUNTARY ORGANIZATIONS

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## ABSTRACT

*As the roles and functions of voluntary organizations have significantly expanded in recent years, there is a growing concern over the need to transform the operation and structure of these organizations. ICT support in voluntary organizations is an interesting emergent field of research. The purpose of this study is to study the implementation of Information and Communication Technology (ICT) in voluntary organizations. The study was conducted in and around Pune. The objectives of the study were to study the usage and impact of ICT in voluntary organizations, to determine the issues and challenges they are facing. The findings summarized in this paper, are drawn from primary data collected from 107 voluntary organizations which are using ICT. The researcher has proposed suggestions based on findings. Based on the findings, conceptual background and earlier work in this area, the researcher has proposed framework for ICT implementation in voluntary organizations. The researcher has further suggested the direction on research leads and future trends.*

**Key words:** Voluntary Organizations, ICT, NGO.



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## 1. INTRODUCTION

Voluntary organizations have been generally defined as voluntary, autonomous, non-profit organizations or groups of citizens established to address various issues and problems in the society (Singh, 2001)

Voluntary organizations have their own advantages and disadvantages. Some of the advantages of voluntary organizations are:

- Voluntary associations are much closer to the more unfortunate and hindered area of the general public.
- Staff of the voluntary organizations is typically exceptionally motivated and philanthropic in their conduct.
- Voluntary associations can undoubtedly invigorate and prepare network assets and approach volunteers.
- They are increasingly viable in bringing individuals' support.
- Voluntary associations are fewer guidelines bound and are non-bureaucratic, non-formal and adaptable in their structure and activities.
- Voluntary segment has more noteworthy potential for advancements.
- Voluntary associations want to work in multi-sectorial system.
- Voluntary associations are motivation for making social union (Kumar, 1998).

Voluntary organizations are still in early stage of ICT adoption, in their organizational settings. There is a need of information technology services and applications that can be effectively embedded in organizational settings of voluntary organizations to achieve technological appropriation. ICT support in voluntary organizations is an interesting emergent field of research. There is awareness among community organizations to use technology in their activities but the complexity of technologies, lack of technological knowledge, lack of funds and lack of standards are big obstacles.

After having an interaction with the knowledgeable persons and stakeholders in voluntary organizations researcher gathered many issues concerned with ICT adoption in voluntary organizations which needs to be systematically studied, researcher found it necessary to study the various aspects involved in ICT implementation in voluntary organizations. The current research aims to investigate the current situation regarding the implementation of ICT by the voluntary organizations. Based on the investigation, ICT Framework for voluntary organizations is suggested.

### 1.1 Challenges of Voluntary Organizations

#### 1.1.1 Lack of Funds

Most of voluntary organizations discover challenges in getting adequate, and nonstop funding so as to do their work. Accessing proper donors is a noteworthy component of this challenge. Managing some particular donors funding conditions can be a tremendous challenge for voluntary organizations. Donors would prefer to see funding spent on direct unfortunate victims. The voluntary organizations are under consistent stress to hold overhead expenses down.

### ***1.1.2 Absence of Strategic Planning***

Many voluntary organizations suffer from the lack of a consistent, strategic plan that would facilitate success in their activities and mission. This renders them unable to effectively raise and exploit on financial support.

### ***1.1.3 Poor Governance and Networking***

An absence of effective administration is very regular in voluntary organizations. Many have a shortage of understanding concerning why they should have a Board and how to set one up. A founder might be excessively centered on running the voluntary organizations for their very own motivations; be that as it may, governance is foundational to transparency. Poor or disorganized networking is another real challenge, as it can cause duplicated endeavors, time ineffectiveness, conflicting techniques and an incapability to learn from experience. Many voluntary organizations don't strengthen the utilization of current technologies that could encourage better correspondence and networking. More effective use of technology can assist voluntary organizations in staying up-to-date of significant regional, national and global concerns.

### ***1.1.4 Poor Communication***

Voluntary organizations also identify that there is very poor communication within the sector. The majority of voluntary organizations have little or no access to reliable email and internet connections; they receive almost no literature on development problems and are generally unaware of issues of global, regional and national importance.

### ***1.1.5 Limited Capacity***

Limited capacity affects fundraising ability, governance, leadership and technical areas. Existence of quality standards can assist voluntary organizations to develop the required capacities. The speed of technology changes is also a challenge particularly in areas of ICT capacity.

### ***1.1.6 Development Approaches***

Many voluntary organizations support a “hardware” approach to development through building infrastructure and providing services instead of empowering people and institutions locally. In general, their development methodologies are not as flexible, sustainable and pertinent to the community as they could be.

## **1.2 Types of Voluntary Organizations**

Voluntary organization can be registered by many registration processes in India like trust, company, society or any valid formation. The registration process is different but the status of all these organizations is equal as voluntary organization.

### ***1.2.1 Trust- Registration under Public Trust Act***

A Trust can be set up to manage funds and to receive money for a particular purpose for the benefit of a wider community. They establish a formal relationship between the donors, the trustees who become the nominal owners of the trust property and the beneficiaries - the people who will benefit from the trust. Trusts can be set up quickly and cheaply. Trusts are non-democratic organizations because they do not tend to have a membership framework, although trustees may agree to report commonly and consult with a wider group of individuals. Trustees may be personally liable and not protected against private liability for contracts entered into on behalf of the confidence.

### ***1.2.2 Private Sector Companies (Sec 25) – Registration under Companies Act, 1956***

A private company structure is an increasingly popular choice for voluntary and community organisations. If you plan to manage employees, land, contracts and/or substantial amounts of financing, it is very suitable. A private company by guarantee is an incorporated organisation. This implies it has a distinct legal identity from its members. This legal structure limits the insolvency liability encountered by managers, except in instances of negligence or recklessness. This is the most flexible legal agreement, but the primary constraint is that it is not possible to issue stocks.

### ***1.2.3 Society – Registration under Registration Act, 1860***

In India, the Societies Registration Act, 1860 is a regulation that enables the registration of organizations usually engaged in the benefit of society—education, health, jobs, etc. Societies are formed by memorandum of association and registration. Minimum 7 members are required to get registered under this act.

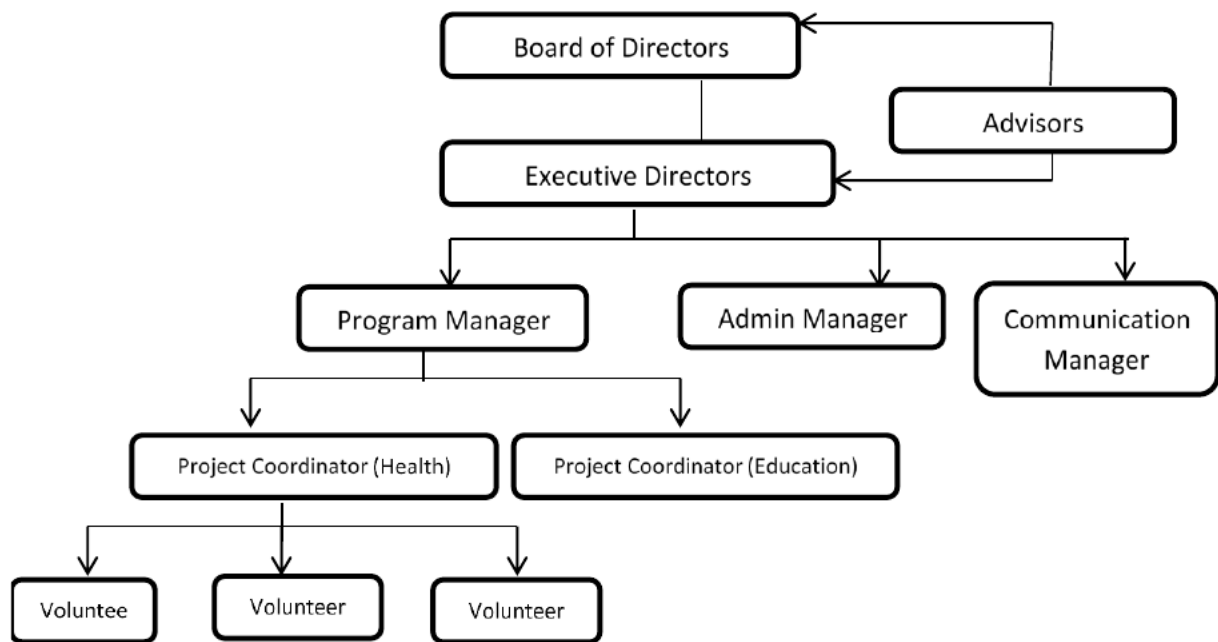
Voluntary Organizations' types can be understood by their level of operation.

#### *Types by level of operation*

- Community-based voluntary organizations (CBOs) are built out of people's own initiatives. They are responsible for helping significant segment of community and working to meet needs of such community. These can include various clubs, women's welfare organizations, and health organizations, religious or educational organizations.
- City-level voluntary organizations include organizations such as Rotary, lion's club, chambers of commerce and industry, coalitions of business, ethnic or educational groups, and associations of community organizations.
- State level voluntary organizations include state-level organizations, associations and groups. Some state organizations also work under the guidance of National and International voluntary organizations.
- National level voluntary organizations include national organizations such as the YMCAs/YWCAs, Bachpan Bachao Andolan, professional associations and similar groups. Some have state and city branches and assist local voluntary organizations.
- International voluntary organizations range from irreligious agencies such as Save the Children, SOS Children's Villages, OXFAM, Ford Foundation, Global march against child labor, and Rockefeller Foundation to religiously motivated groups. They can be responsible for funding local level voluntary organizations, institutions and projects and implementing the projects themselves. (Vaidya Surekha, 2014)

## **1.3 Voluntary Organizations: Organizational Structure**

The most effective organizational structure for a voluntary organization depends on the mission the voluntary organization achieves. Fundraising methods, use of volunteers, roles of the directors and involvement of members all play a role in determining the ideal organizational structure. The structure is divided into three functional areas—governance, programs, communication and administration – and then further subdivided within each area, depending on the purpose and goals of the voluntary organization.



**Figure 1** Organization structure of voluntary organizations

Source: Compiled by Researcher

### 1.4 Stakeholders of the Voluntary Organization

A stakeholder is an individual or group which has an interest that the voluntary organization fulfils its mission. Anyone who is interested or affected by the voluntary organization and its services is a stakeholder. Stakeholders of voluntary organization include the following:

- **Management-** It is a group of people who are responsible for the overall management, decision making, planning the direction and activities of the group and its performance. The management consists of board of directors and executive director assisted by advisors.

Boards are responsible for a number of functions, like hire and supervise the Executive Director, develop and approve budgets, etc. Board members will also be expected to champion the organization’s cause, and represent the organization to the larger community. Many voluntary organizations also expect board members to help raise fund for their projects

Executive Director, or sometimes called as Coordinator, Chief Operating Officer, or CEO, is responsible for the overall direction in which the organization runs, and the responsibility for managing the day-to-day activities of the organization. The Executive Director is also member of the board – known as its Executive Secretary who reports to the Board.

- **Employees-** Employees provide vital services to keep the voluntary organizations running and are important stakeholders for voluntary organizations. Employees are responsible for the day-to-day functioning, and implementing of its programs and projects. Staff members fall into three groups - responsible for activities related to (1) administration, (2) programs/projects and (3) communication.

Administrative activities are led by an administrative manager.

Program and project activities of an organization are led by a program manager.

Communications and dissemination activities are the responsibility of a communication manager.

Volunteers- Volunteers provide vital services to keep the voluntary organizations running and are important stakeholders for voluntary organizations. Volunteers contribute their time to work for organizations or causes. Volunteers donate their time, skills and expertise to provide services to benefit target groups or organization.

- Beneficiaries- The people and parties who actually use the services given by the voluntary organization.
- Donors- Those who help in funding the operations of the voluntary organization are the donors.
- Local Community- The surrounding community as a whole has a stake in how well a voluntary organization completes its mission and objectives.
- Other Voluntary Organizations- Other voluntary organizations with common interest.
- Partners- An association with various partners like corporate partners, media partners for collaborative efforts towards the achievement of mission of an organization.



**Figure 2** Stakeholders of voluntary organizations

Source: Compiled by Researcher

## **2. OBJECTIVES OF THE STUDY**

The current research aims to study use of ICT in Voluntary Organizations, to study issues and challenges of ICT implementation in Voluntary Organizations. It also studies impact of ICT implementation in voluntary organizations. The study suggests the framework for ICT adoption in voluntary organizations.

## **3. RESEARCH DESIGN**

This study was carried out with the help of Quantitative method. In order to attain research goals, the modes chosen to collect data are primary data and secondary data. Before initiating the actual data collection, the pilot study was conducted.

### **3.1 Pilot Study**

A pilot study was conducted for twenty voluntary organizations in which data was collected from managerial positions. The above survey was conducted to finalize the questionnaire. After the pilot study, the questionnaire was refined and primary data collection was done.

### **3.2 Primary Data**

Primary was collected from voluntary organization's employees including Directors, Admin Managers, and Program Managers etc. Informal talks and discussions were also carried out. The following approach/methodology was adopted for primary data collection in the present study.

- Designing of user-friendly and appropriate questionnaire and then distribution of the same amongst management of voluntary organizations.
- Briefing said organizations about the research work personally on telephone as well as by meeting personally with management members of voluntary organizations with prior appointments

### **3.3 Secondary Data**

The various sources of the secondary data collected for this study are various Referred Journals, Research Articles and Journals, Conference proceedings, Published Thesis and dissertations. In the data analysis stage, the Secondary data collected from these sources is used to support primary objectives and hypothesis.

### **3.4 Survey Method**

It is used for this research study. For exploring the data, interviews & discussions were also used as supportive techniques. The research throws light on the extent to which ICT is used by Voluntary Organizations and their satisfaction level. Research examines the issues faced by these organizations while adopting ICT. For undertaking analysis of use and impact of ICT in voluntary organizations, the study is restricted to the selected organizations in and around Pune (Maharashtra State – India)

### **3.5 Sample Design**

The sample selection plan was based on following criteria:

- Voluntary organizations which are using ICT for their day to day activities
- Voluntary organizations which are located in and around Pune city and deal with education of the various target groups.

Total number of voluntary organizations meeting the above mentioned criteria was approximately 250, so 107 voluntary organizations were selected. (Around 43% of the population). 150 organizations were randomly selected for the survey, out of these the data of 107 respondents was found to be consistent and complete. The data from 107 respondents was used for analysis. The organization selection is based on various lists published by authorized government organization Niti Aayog's portal NGO Darpan. (<http://niti.gov.in/content/ngo-darpan>)

### **3.6 Sampling Method**

The sampling technique adopted for the survey of stakeholders is stratified simple random sampling technique. To serve the purpose purposive sampling technique is used.

## **4. SUMMARY OF RESEARCH FINDINGS**

It was observed that, most of the beneficiaries of the voluntary organization are children who are from Slum areas, Adivasi area, Tribal Children, Poor and needy Children. It is observed that most of the voluntary organization does not conduct any ICT related training. It is found that ICT tool is mainly used for program implementation functionality followed by financial management. Lack of ICT training is highlighted issue by most of the respondents, followed by Monitoring, Evaluating, Feedback, Lack of maintenance support and Lack of funds. ICT impact is not as expected as many respondents dissatisfied about various major functions like Campaign Success, Volunteers Productivity, Volunteers Efficiency, Student Performance Cost Saving, Time Saving, and Better Control and Monitoring. Need of ICT tool is highlighted by almost all the respondents. It was noted that many of the respondents were not aware about availability of free ICT tools/software even though they believe that ICT tools enhances organizational functionality or productivity.

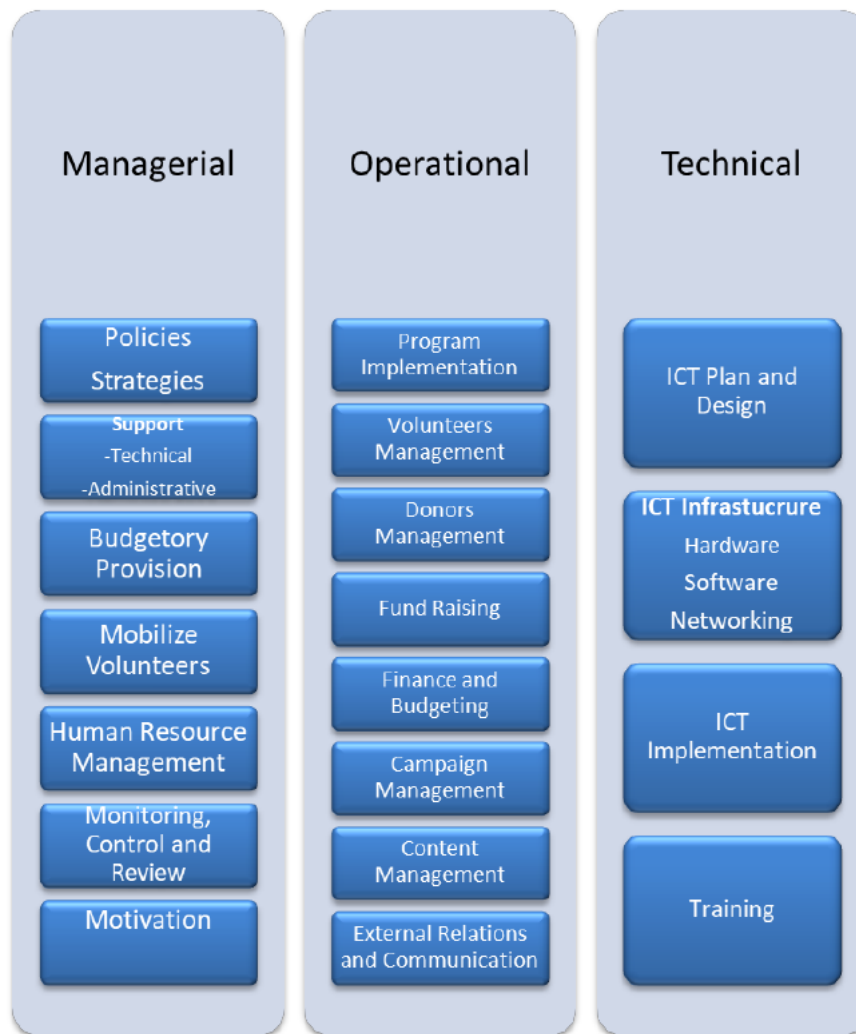
## **5. SUGGESTIONS**

The spread and reach of voluntary organizations is increasing in India. These organizations are still in early stage of ICT adoption in their organizational settings. Hence, the researcher would like to make the following recommendations based on the findings and conclusions.

- The personnel of voluntary organizations should be encouraged to use the ICT tools for various functionalities by means of rewards and recognition.
- ICT training Programs should be conducted for staff and volunteers on latest ICT tools.
- The study recommends that Open Source technologies need to be used by the voluntary organizations as it is cost effective.
- Voluntary organizations should look into 100% need analysis and execution of program using ICT for better performance of students. They should also use ICT tools for volunteer's management for better quality and time & pace flexibility.
- There is a need for collaborative efforts by voluntary organizations working for similar cause towards effective use of ICT in campaigns and fundraising so that all related stakeholders can access the information as and when needed.
- Awareness about use of ICT should be increased within the volunteers' community.
- Active collaboration of the stakeholders during the development and testing phases of the ICT implementation is necessary
- Based on findings researcher has suggested ICT framework for voluntary organizations based on open source technologies. Researcher has identified various parameters involved in designing this framework. They are as under

## A Framework Towards ICT Appropriation in Voluntary Organizations

- Management policies and strategies for successful implementation of ICT
  - Implementation and use of ICT for all functions of voluntary organizations
  - Management support to successfully implement ICT infrastructure, its easy access and maintenance
  - Management motivation for organizing ICT awareness and Training Programs
  - Involvement of target groups to understand their priorities and needs
  - Human resources management
  - It is very important to involve all stakeholders like volunteers, donors, other voluntary organizations in the phase of ICT implementation
  - Budgetary Provision for ICT implementation
  - Monitoring, Review and Control
  - ICT expert volunteers for developing ICT projects
  - Technical Support
- The framework is proposed based on three different components Managerial, Operational and Technical for effective implementation of ICT to ensure attainment of organizational goals.



**Figure 3** ICT Framework for voluntary organizations

Source: Compiled by Researcher



- The researcher has suggested use of open source ICT framework which consists of operational component, technical component, control points, users and stakeholders
  - Voluntary Organization- Operational Component- This component is defined as the mission of the existence of the organization that is accomplished by performing different operations in an organization
  - Voluntary Organization- Technical Component. An intellectual processes used by organization to automate the processes and to transform inputs into services.
  - Control Points- Control points works as tools for effective functioning. Their existence is important not only when you want to monitor the implementation of something new or different, but also when you want to be aware about effectiveness of a process all the time.
  - People/Users- The workforce and consumers of an organization that performs different operations.
  - Stakeholders- Stakeholders are those who have interests in the organization. Multiple stakeholders for an organization include the beneficiaries, donors, volunteers etc.
- ICT Roadmap for voluntary organizations. An ICT roadmap is a flexible planning technique to support strategic and long-range planning, by matching short-term and long-term goals with specific technology solutions.

**Table 1** ICT Roadmap

<b>Milestone</b>	<b>Duration</b>
Define Objectives, Mission and Scope	2 months
Selection of open source software	3 months
Checking Suitability	2 months
Infrastructure Availability	2 months
Training	2 months
Actual Implementation	5 months
Enhancement and Continuation	4 months
Total	20 months

## 6. AREA OF FUTURE STUDY

The researcher feels that further systematic studies need to be done in the following areas:

- The study of cost effectiveness of ICT infrastructure of voluntary organizations using open source software that will substantially enhance the performance because Open Source Software is freely available
- Effectiveness and Security issues relating to use of open source software in voluntary organizations
- A comparative study of leading voluntary organizations in Maharashtra with respect to ICT infrastructure and use of ICT in program implementation
- Evaluation of stakeholders' perception about the adoption of ICT in voluntary organizations

## 7. CONCLUSION

The objectives of the study were to study the usage and impact of ICT in voluntary organizations, to determine the issues and challenges they are facing. The findings summarized in this paper, are drawn from primary data collected from 107 voluntary organizations which are using ICT. The researcher has proposed suggestions based on findings. Based on the findings, conceptual background and earlier work in this area, the researcher has proposed framework for ICT implementation in voluntary organizations. The researcher has further suggested the direction on research leads and future trends.

The purpose of this study is to study the implementation of Information and Communication Technology (ICT) in voluntary organizations. The study was conducted in and around Pune. There is a growing concern over the need to transform the operation and structure of these organizations. ICT support in voluntary organizations is an interesting emergent field of research

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# STUDY OF USE OF E-HRM IN PERFORMANCE APPRAISAL PROCESS IN IT ORGANIZATIONS

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## ABSTRACT

*Today's working climate demands a great deal of commitment and efforts from Employees, who in turn naturally expect a great deal from their Employers. Today, Human Resource (HR) is not treated as a single function. It's a collection of highly specialized capabilities - each with distinct objectives, tasks and needs. Organizations have realized the growing importance of using Information Technology (IT) in leveraging their Human Resource (HR) functions. This takes the form of e-HRM (Electronic Human Resource Management). The e-HRM revolution relies on cutting edge information technology, ranging from Internet-enabled Human Resources Information Systems (HRIS) to corporate intranets and portals. This paper investigates the use of e-HRM in performance appraisal as one of the Human Resource Function in IT organizations. Human Resource Development (HRD) is the framework for helping employees to develop their personal and organizational skills, knowledge and abilities. Performance Appraisal is about improving performance and ultimate effectiveness. Employees are encouraged to look ahead to improve effectiveness, utilize strengths, minimize weaknesses and examine how potentials and aspirations should match up. The study provides insights into implementation of e-HRM with reference to performance appraisal. It discusses the impact of e-HRM on appraisal process. It attempts to identify implications for future research in this field.*

**Key words:** Human Resource (HR), Information technology (IT), Electronic Human Resource Management (e-HRM), Internet-enabled Human Resources Information Systems (HRIS), Performance Appraisal, Human Resource Department (HRD).

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## 1. INTRODUCTION

“Behind Every Successful organization are its Resources.” One of the main important resources of the organization is ‘HUMAN’. An Organizations’ success hinges both on 'high touch' and on 'high tech'. Organizations who have been striving for business excellence have realized that the core of any business excellence program has always been ‘people’.

Successful growing organizations have placed the combined development of information technology and human resources as their top priority.

The performance appraisal is the process of assessing employee performance by way of comparing present performance with already established standards which have been already communicated to employees, subsequently providing feedback to employees about their performance level for the purpose of improving their performance as needed by the organization. The very purpose of performance uprising is to know performance of employee, subsequently to decide whether training is needed to particular employee or to give promotion with additional pay hike. Every corporate sector uses performance appraisal as a tool for knowing about the employee and take decisions about particular employee.

IT Companies have started using information technology in their Human Resource Management functions to optimize their management and improve their efficiency. This paper explores the role of Information Technology (IT) in HRM precisely in the performance appraisal function of IT organizations.

## 2. THEORETICAL FRAMEWORK

Before an objective performance appraisal system can be developed, one must first perform a job analysis<sup>[6]</sup> to determine what tasks are actually performed on the job, the standards to which these tasks need to be performed, and the knowledge, skills, abilities, and other characteristics necessary in order to adequately perform these tasks. Job analysis is the systematic, empirical process of determining the exact nature of a job, including:

- The tasks and duties to be done;
- The knowledge, skills and abilities necessary to adequately perform these; and
- The criteria that distinguish between acceptable and unacceptable performance.

Job Analysis: According to DeCenzo & Robbins (2006)<sup>[1]</sup> “Job Analysis is a systematic exploration of the activities within a job. It defines and documents the duties, responsibilities and accountabilities of a job and the conditions under which a job is performed”. Job analysis is the process of studying and collecting information relating to the operations and responsibilities of a specific job. The immediate products of this analysis are job descriptions and job specifications. Hence, job analysis can be described as a process of collecting information about a job. The results of a job analysis are typically used in writing job descriptions and setting standards for use in performance appraisals.

Performance appraisals<sup>[6]</sup> need to be based on the tasks that are actually required to be performed on the job rather than on some general impression of the performance of the employee.

Dr. U.S.S. Shrivastav and Nimisha Sapra<sup>[2]</sup> in IJRIM Volume 2, Issue 4 have focused on Performance appraisal. They quote that Performance appraisal is a widely recognized process. Yet efforts to study and examine its effect on attitudinal outcomes are scarce. The present study has addressed this research gap. The study has contributed to the body of knowledge on automation of performance appraisal process and thus is benefiting the HRM practitioners and HRM scholars.

Armstrong and Baron (2005) <sup>[3]</sup> recommend following points:

- Training should be provided to both the evaluators and the employees.
- Transparency in the implementation of the system.
- Provision of continuous feedback to employees on their performance.
- Disciplinary measures should be taken on supervisors who do not provide continuous feedback to employees.

e-HRM<sup>[4]</sup> activities are



Figure 1

Many companies make use of web-based technology to evaluate the performance of an individual. This can be done either using the computer monitoring tool, wherein the complete working of an individual can be recorded, or through writing the reviews and generating the feedback on the employee's performance using the web portal <sup>[5]</sup>.

### 3. RESEARCH DESIGN

#### 3.1 Objectives

- To take the review of performance appraisal process implementation in e-HRM software.
- To study the automated processes used to streamline performance reviews and appraisal processes.

#### 3.2 Scope of study

This work is confined to study the appraisal process present in the organizations. It also visualizes real time scenarios in Industry. It explores some of the merits and demerits in existing system.

## 4. RESEARCH METHODOLOGY

### 4.1 Method used

A sample of 50 companies was selected for conducting the survey.

### 4.2 Sources of Data

Sample method is useful for data collection. The types of data collected were:

- Primary data
- Secondary data

#### 4.2.1 Primary data

Respondents for the survey were selected HR department employees including HR Executives, Sr. HR Executives, HR Managers and other HR team members. After receiving the questionnaire, fully filled and valid questionnaires were selected for the further research.

#### Questionnaires

130 questionnaires were distributed to HR Executives, Sr. HR Executives, HR Managers and other HR team members.

#### 4.2.2 Secondary data

Secondary data was collected from past records and manual of the company, books, internet etc. It is the data already collected, which is made available for reference purposes. In my research the secondary sources used are, various files and records maintained by organization, HR manual.

#### Sample size

121 questionnaires were considered out of 130 and Random Sampling Method is used for research work

#### Hypothesis

Performance Appraisal function is benefitted by the use of e- HRM in HR department.

## 5. DATA ANALYSIS

### 5.1 Use of e-HRM Software for Performance Appraisal

**Table 1** Use of e-HRM software for performance appraisal

Sr. No	Choice	Count	Percentage
1	Yes	91	75.21%
2	No	30	24.79%
	Total	121	100.00%



Based on the above table data following graph is depicted:

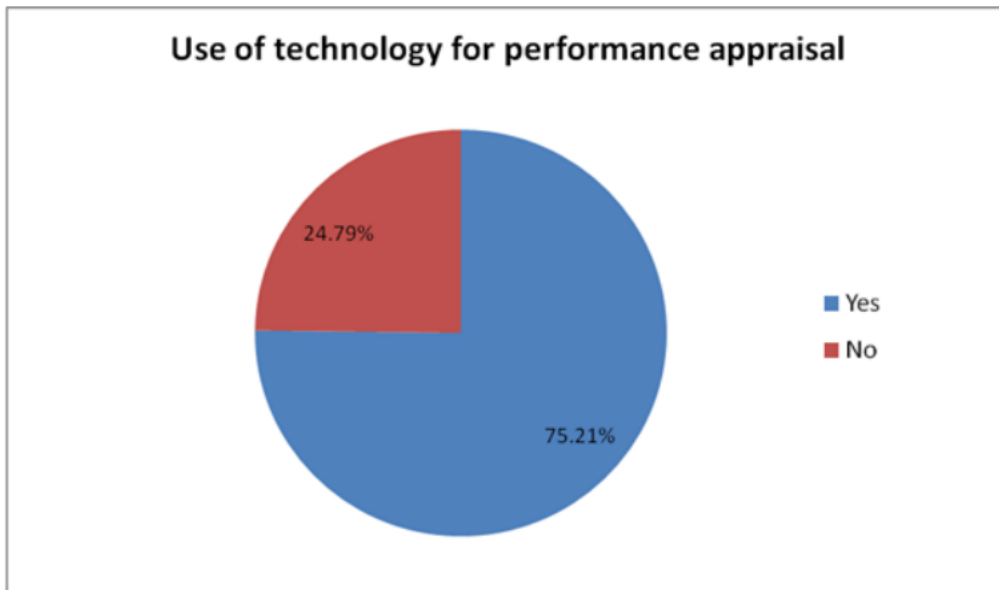


Figure 2 Use of e-HRM software for performance appraisal

### Observations

- From the above statistics it shows that due to extensive use of information technology, Appraisal process becomes easier to execute. In order to reduce the work pressure as well as for perfection in the appraisal process, use of software is appreciated.
- More than 75% responses have received regarding the use of technology in appraisal process of an employee.
- 24% responses says that the technology is not used for employee's performance appraisal process.

### 5.2 Providing Report on on-Going Feedback

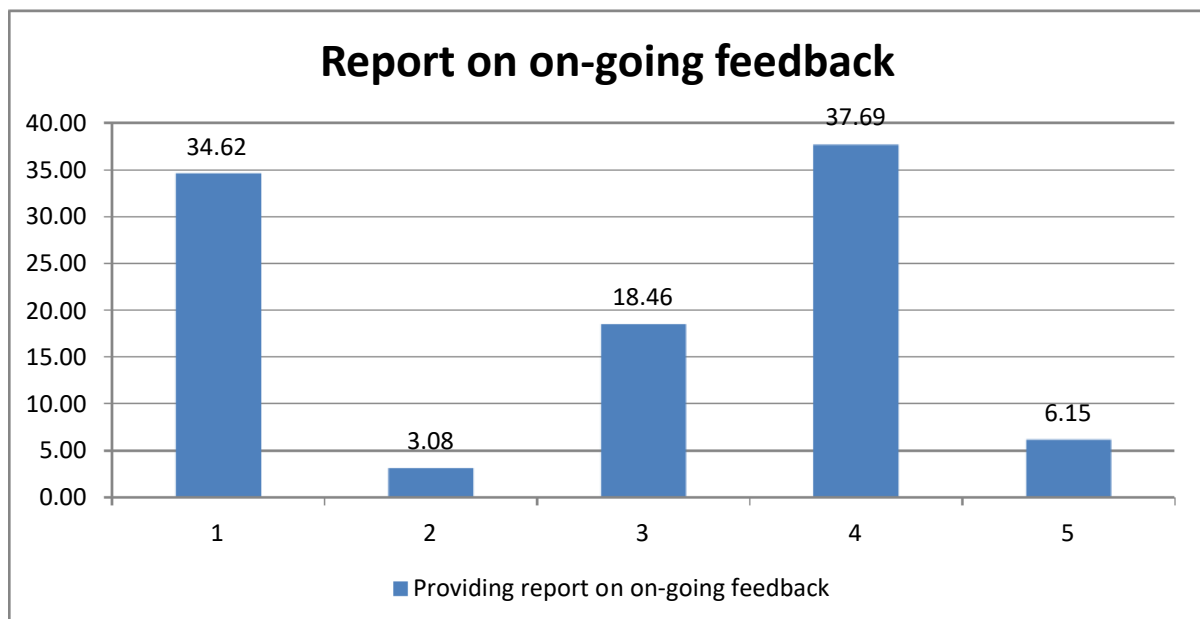
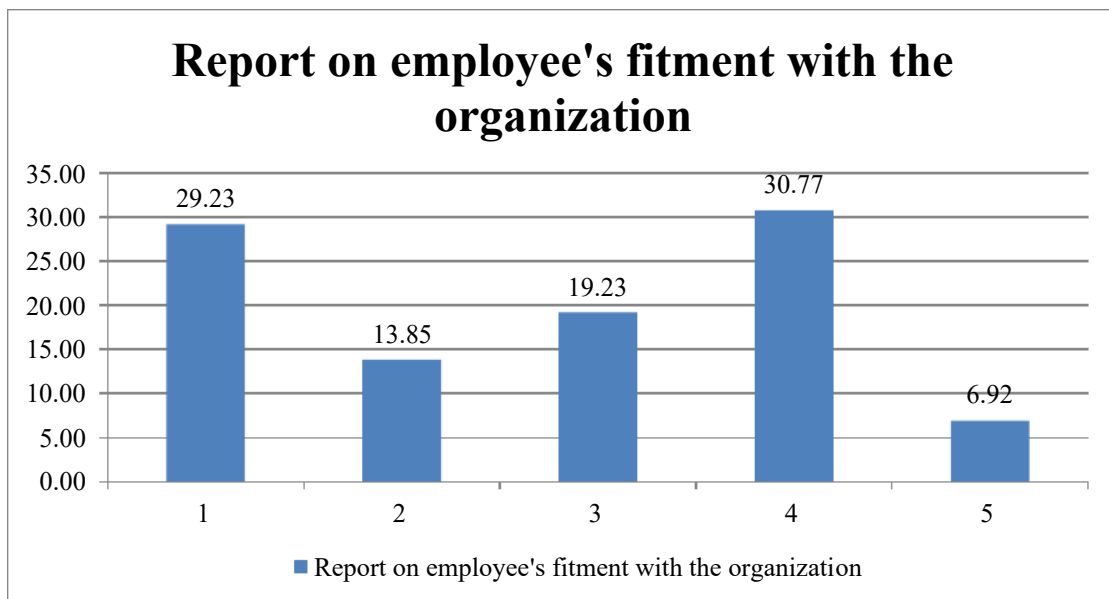


Figure 3 providing report on on-going feedback

**Observations**

- The goal of ongoing feedback is to identify where performance is effective and where performance needs improvement. Giving and receiving feedback is a two-way street; both the manager and the employee should be proactive by frequently seeking out and providing feedback.
- e-HRM software can generate the reports on on-going Feedback of participants.
- The above graph indicates various responses received from e-HRM software on on-going feedback of participants.
- From the graph it is clearly seen that more than 37% respondents say that they strongly agree on responses received from e-HRM software on on-going feedback of participants.
- More than 3% respondents say that they disagree on responses received from e-HRM software on on-going feedback of participants.
- 18% respondents have given neutral opinion.
- More than 6% respondents say that they are strongly agree and more than 7% respondents disagree on on-going Feedback of participants.
- Here the graph indicates that in all more than 34% respondents entered strongly disagree option for on on-going Feedback of participants.

**5.3 e-HRM S/W Generates Report on Whether Employee Fits with the Organization**



**Figure 4** e-HRM s/w generates report on whether employee fits with the organization

**Observations**

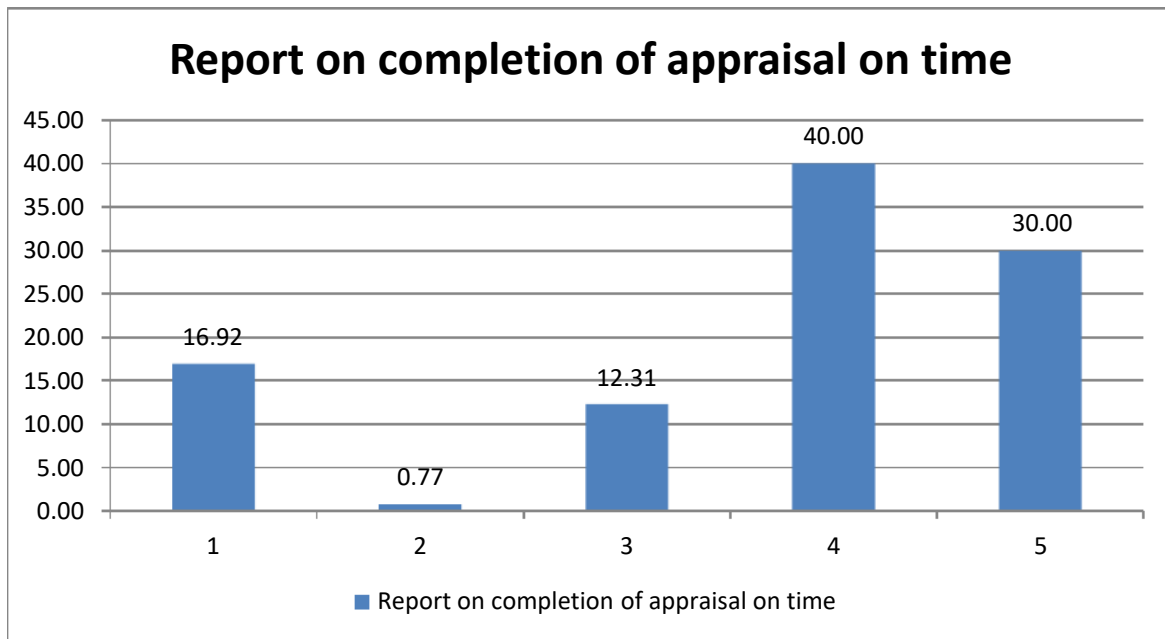
- e-HRM software can generate the report on fitment of the employee in the organization.
- The above graph indicates various responses received from e-HRM software on fitment of the employee in the organization.
- From the graph it is clearly seen that more than 29% respondents say that they strongly disagree on fitment of the employee in the organization.

- More than 30% respondents say that they agree on fitment of the employee in the organization.
- 19% respondents have given neutral opinion.
- More than 6% respondents say that they are strongly agree and more than 13% respondents are disagree on fitment of the employee in the organization.

**Analysis of various statements related to e-HRM software**

Here, many questions were raised regarding various functions of e-HRM software which uses technology in appraisal process. These functionalities are discussed as under:

**5.4 e-HRM S/W Enables us to Complete Appraisal on Time**



**Figure 5** e-HRM s/w enables us to complete appraisal on time

**Observations**

- The above graph indicates responses received regarding opinions about e-HRM software helping in completion of appraisal process on time.
- From the graph it is clearly seen that more than 30% respondents say that they are strongly agree on the e-HRM software helping in completion of appraisal process on time.
- More than 40% respondents agree on the e-HRM software helping in completion of appraisal process on time.
- More than 12% respondents have given neutral opinion.
- More than 16% respondents say that they are strongly disagree on the e-HRM software helping in completion of appraisal process on time.
- About 17% of the respondents say that they are dis agree on the e-HRM software reporting on superior-subordinate relationship.
- About 0.7% of the respondents say that they disagree on the e-HRM software helping in completion of appraisal process on time.
- From this analysis, it is clearly observed that 70% of the respondents agree on the opinion that e-HRM software is helping in completion of appraisal process on time.

### 5.5 e-HRM S/W Guarantee Accuracy in Appraisal Process

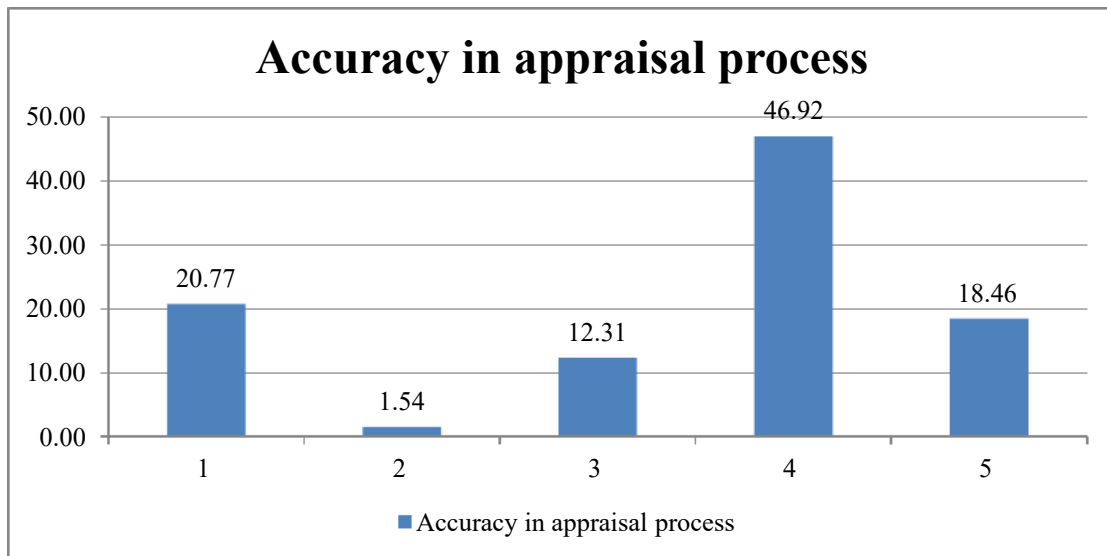


Figure 6 e-HRM s/w guarantee accuracy in appraisal process

#### Observations

- The above graph indicates responses received on e-HRM s/w which helps in getting guaranteed accuracy in appraisal process.
- From the graph it is clearly seen that more than 46% respondents say that they agree on e-HRM software’s help in getting guaranteed accuracy in appraisal process.
- More than 18% respondents say that they strongly agree on e-HRM software’s help in getting guaranteed accuracy in appraisal process.
- 12% respondents have given neutral opinion.
- More than 20% respondents say that they are strongly disagree and more than 1% respondents are disagree on e-HRM software’s help in getting guaranteed accuracy in appraisal process.
- The above analysis of the data indicates that more than 65% of the respondents say that they agree on e-HRM software’s role in getting guaranteed accuracy in appraisal process.

### 6. INTERPRETATIONS

Performance Appraisal function is benefitted by the use of e- HRM in HR department.

### 7. TEST STATISTICS

**Chi Square** =  $\sum [(O - E)^2 / E] \sim (m-1) (n-1)$  degrees of freedom

Where

O = Observed frequency, n = Number of columns

E = Expected frequency, m = Number of rows

**Observation**

**Table 2**

O <sub>i</sub>	E <sub>i</sub>	O <sub>i</sub> -E <sub>i</sub>	(O <sub>i</sub> -E <sub>i</sub> ) <sup>2</sup>	(O <sub>i</sub> -E <sub>i</sub> ) <sup>2</sup> /e <sub>i</sub> = Chi sqr
39	36.10461	2.89539	8.383283	0.232194
39	36.20906	2.79094	7.789346	0.215121
38.33333	36.20906	2.12427	4.512523	0.124624
38	34.53787	3.46213	11.98634	0.347049
32.5	33.60944	-1.10944	1.230857	0.036622
36	36.20906	-0.20906	0.043706	0.001207
9.75	11.57266	-1.82266	3.322089	0.287064
12.28571	11.57266	0.71305	0.50844	0.043935
12.33333	11.60614	0.72719	0.528805	0.045563
10.95	11.07047	-0.12047	0.014513	0.001311
11.13	10.77288	0.35712	0.127535	0.011838
10	11.60614	-1.60614	2.579686	0.222269
19.55	18.87818	0.67182	0.451342	0.023908
18.85714	18.9328	-0.07566	0.005724	0.000302
21.16667	18.9328	2.23387	4.990175	0.263573
10.07692	18.05897	-7.98205	63.71312	3.52806
23.33333	17.57352	5.75981	33.17541	1.887807
18.25	18.9328	-0.6828	0.466216	0.024625
34.25	39.1626	-4.9126	24.13364	0.616242
36.14286	39.27589	-3.13303	9.815877	0.249921
38.52	39.2759	-0.7559	0.571385	0.014548
49.6	37.46316	12.13684	147.3029	3.93194
21.66667	36.45609	-14.7894	218.7269	5.999737
50.65	39.27589	11.37411	129.3704	3.293888
17.5	23.90695	-6.40695	41.04901	1.717032
14.14286	23.97611	-9.83325	96.69281	4.032881
19.66667	23.97611	-4.30944	18.57127	0.774574
22.93	22.86952	0.06048	0.003658	0.00016
22.5	22.25475	0.24525	0.060148	0.002703
38.25	23.97611	14.27389	203.7439	8.497789
				36.42849

Number of rows = 6

Number of columns = 5

$(m-1) * (n-1) = 5 * 4 = 20$

### **Level of significance**

Chi-Square tabulated at 1% level of significance = 37.566

### **Inference**

Chi-Square calculated = 36.42849

Chi-Square tabulated is greater than Chi-Square calculated for 1% level of significance. Hence the hypothesis is tested and accepted.

## **8. CONCLUSIONS**

- Unique feature observed in the e-HRM software that it helps in reducing the work pressure as well as provides perfection in the appraisal process. There is provision of submitting the appeal after appraisal process through software.
- e-HRM software reduces paperwork and easily monitors & executes performance appraisal process.
- Appraisal process becomes easier to execute.
- Use of software is appreciated in appraisal process. HR department employees thus can focus on core HR functionalities more effectively

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## A Framework Design for Algorithmic IT Operations (AIOPS)

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### Abstract—

AIOPS is acronym for Algorithmic IT operations which was coined by Gartner. It represents automated solutions which consists of machine learning algorithms and techniques to solve unknown, critical, complex and hidden IT operational problems. It helps to intelligently classify log events, predict alerts and standard operating procedures (SOP) and automate solutions. Since past few years, AIOPS has been growing extremely, many organisations and vendors started exploring AIOPS solutions. Gartner recently redefined AIOPS as “Artificial Intelligence for IT Operations.”

AIOPS helps to improve IT system service quality and customer satisfaction. It also boost DevOps productivity and reduce human efforts and operational cost. In this technical research work, we first summarize what is AIOPS, its components, use cases, need of AIOPS platform and real-world challenges. We then propose a framework design for AIOPS platform based on our earlier research work and outcomes. AIOPS is still evolving which need continuous learning and improvement through scientific research and experiment work.

**Keywords** -AIOPS, DevOps, Machine Learning, Log Operations.

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### [1] INTRODUCTION

#### I. WHAT IS AIOPS?

AIOPS refers IT domain which manages and processes various system data of their IT environments using different resources and machine learning (ML) / artificial intelligence (AI) algorithms. As shown in Figure 1, AIOPS combines big data and machine learning techniques to automate complex IT operations which includes classification,



prediction, event correlation and anomaly detection. It is a continuous process of monitoring, learning, managing alerts / incidents and automating implementation of solutions. AIOps collects and processes historical as well as real time data which contains system logs, events, alerts and metrics. Most of organisations defines AIOps as per their understanding and requirements.

As per Gartner definition “AIOps is a platform which utilizes big data, machine learning algorithms to enhance IT operations (like system monitoring, and solution automation) with proactive approach, and more dynamic insight. AIOps platforms can enable parallel use of multiple data sources and data gathering methods, analytics ( historical and real-time) and presentations.” [1]

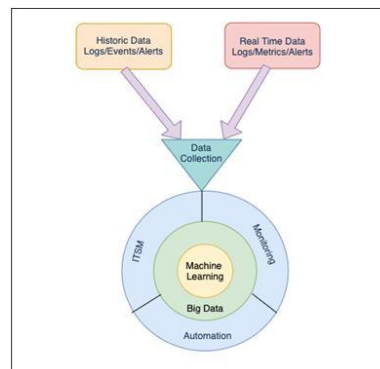


Figure 1 AIOps basic

AIOps platform bridges different IT Operations:

- IT Service Management
- Automation
- Monitoring

## II. COMPONENTS OF AIOps

- *Data Input Sources* - There are various data sources like monitoring events, metrics, incidents, logs etc.
- *Real Time Data Processing* - Systems which accesses and pre-processes input data from data sources in real-time.
- *Rules and Patterns Mining* - Systems which can detect find patterns from the pre-processed data to uncover hidden patterns, association and abnormalities.
- *Domain Algorithms* - Algorithms which allow domain based system to react automatically on detected abnormalities and variations from normal behaviour and it's causes.
- *Machine Learning / Artificial Intelligence* - It improves decision-making ability using Machine learning or Artificial Intelligence algorithms and techniques.
- *Automation* - It uses Machine learning or Artificial Intelligence algorithms results to automate standard operating procedures (SOP) to reduce DevOps workloads and improves systems availability and performance.

### III. USE CASES OF AIOPS

- *Prediction of outages and failures* - Analysis and prediction of warnings/alerts and outages based on supervised learnings using ML algorithms allow admins to take proactive actions to prevent it.
- *Event Correlation* - To troubleshoot system problems, it is critical to understand correlations between events.
- *Anomaly Detection*- Dynamic thresholds allow AIOps to determine what is a normal and abnormal activities.
- *Root Cause Analysis(RCA)* - Determining cause of problem by tracing it to root by using event correlation and log analysis to fix. It reduce Mean Time To Detect(MTTD) and Mean Time to Repair (MTTR).
- *Alarm Management*- AIOps identify false alerts and gives only legit alerts in case of anomaly detection.
- *Intelligent Remediation*- AIOps automate standard operating procedures (SOP) action to resolve problems.

### IV. WHY AIOPS?

IT industry has been evolved from desktop products to online services or applications. The way these services has been built and released are different from traditional desktop products, which brings up the complexity and importance of operational efficacy for online application services. Today's applications are complex and critical. Cloud computing has increased more complexity in application architecture and deployments. DevOps is a process of continuous development, integration and deployment of application services. In software industry Agile methodology and DevOps culture has been widely adopted in almost every organisation. Due to evolution and implementation of cloud computing, microservices, serverless technologies the scale and complexity of application services have increased drastically. Any mistake in this continuous process from designing architecture to deploying codebase and monitoring application can degrade system performance and impact on customer experience. It can also result in interruption of services which cost to business. To address these DevOps IT operation challenges using AI, the term AIOps came out from Gartner [2]. Generally, AIOps can help empowering software applications, engineers and DevOps to efficiently and effectively build and operate application services that are easy to support and maintain by using artificial intelligence and machine learning techniques. The outcome of AIOps is significant, ensuring high availability of services, maintaining quality of services and customer satisfaction, boosting productivity of engineers and DevOps, and reducing operational cost. Below are some major reasons for AIOps platform:

#### A. *Data volumes are large and disparate*

In this decade, we have seen data explosion. There are various sources of data generation due to digital devices, mobiles, IoT devices, Cloud computing etc. The velocity and volume of data is countless. This big data management is nightmare for DevOps and administrators. Building and processing ML models are time and resource consuming process, which ultimately cost to business.

#### B. *Manual Troubleshooting*

In IT operations, keeping system up and running is top most priority. If there are any interruptions or degradation to services, it creates all hands on deck situation for DevOps team. Manually troubleshooting any system through logs, events and alerts is like searching needle in haystack. It definitely increase mean time to detect (MTTD) and mean time to repair (MTTR) of business application which may causes long system downtime. Any system degradation or downtime may lead to business loss and ultimately lose customer trust.

### *C. Emerging Tools / Technologies*

There are plenty of tools and technologies are emerging on daily or weekly basis due to adaptation of agile and DevOps methodology, software / tools are getting build and deploy very quickly. Also microservices, serverless, cloud computing, big data and machine learning technologies adding more complexity towards IT operations. To cope up with these emerging tools and technologies is almost impossible for humankind.

### *D. Bombardment of Alarms*

As there is explosion of data and technologies, it generates tons of logs, events, alerts and alarms. Most of times, they are non-critical and false because of mis-configurations. Single issue can create many events and alerts, which confuses and overload monitoring systems. To handle these bombardment of logs and alarms is almost impossible for DevOps and admin teams without Machine Learning techniques.

## **V. AIOPSSChallenges**

### *A. Lack of innovation in methodologies and mindset*

To build AIOPsplatform, it requires business or domain specific experience to understand application and think holistically. It also need bettervisualisation about the whole system, problems, business perspective, data models, constraints and integration considerations. Today, there is lack of innovation methodologies that can guide people in different disciplineslike business stake holders, engineers, data scientists to build AIOPs solutions which leads to difficulty in mindset shift. AIOPs is a complex, multi component, continuous learning and improvements system.[3]

### *B. Need of changes in engineering to build and support AIOPs*

Traditional engineering standard practices does not fit currentbusiness requirements. Building AIOPsplatform needs significant engineering and operational efforts. AIOPsoriented engineering and operationsare still in early stage. The best practices, principles and design patterns are not defined in the IT industry yet. For example, AIOPs principles should include dataandlabel or tag quality monitoring. The quality and quantity of data available today cannot serve the needs of AIOPs solutions. Today major cloud services collectshuge amount of telemetry data every day/month, there still lacks representative and highquality data for building AIOPs solutions. A continuous improvement of data quality and quantity is necessary.[3]

### *C. Challengesin building ML models for AIOPs*

There are lot of challenges in building ML/AI model for AIOps solutions because those are not always seen in other typical ML/AI scenarios and solutions. To develop supervised machine learning model for AIOps, there are challenges like no clear data labels or lot of manual efforts to label and obtain high data quality [4], there are complex dependencies/relations among various components and services [5], also there are complicated feature engineering efforts required due to the high complexity of cloud computing service behaviours. In most of AIOps scenarios, there is difficulty in labelling a data, it is sometime feasible in only unsupervised machine learning models. For example, detecting anomalous behaviour of services [6].

## [2] RELATED WORKS

AIOps is a interdisciplinary research and innovation area. It is a long journey for IT industry to implement complete AIOps solutions. In this research, we focus on technical innovations and aspect that are required to achieve AIOps platform. However, AIOps research is not entirely new field. Many research works on software or data analytics can be represented as AIOps innovations.

### A. *Evolving from Traditional Systems to AIOps*

In this research, researcher proposed a AIOps system which adopts layered design with interoperability services between modules, which makes it well compatible with traditional systems. Researcher implemented their AIOps system with some considerations and deployed it in a large IT system environment with thousands of devices and achieved good results [7].

### B. *Reducing Incidents Using Correlation Approach*

In this work, researcher emphasis on discussing AIOps and explains the model needed to handle digital changes in IT operations. AIOps platform is useful for complex IT systems and infrastructures which require continuous monitoring and resolution in case of accidents. [8]

### C. *Self-Supervised Anomaly Detection from Distributed Traces*

The focus of this research is on anomaly detection based on distributed tracing records which contains information of services of distributed system. Detecting trace anomalies accurately is challenging due to large number of microservices and complex calls between them. Researcher proposed supervised method and task formulation for anomaly detection problem. The evaluation shows high accuracy and solid performance in experiments. [9]

## [3] AIOPS FRAMEWORK DESIGN

In Figure 2, we propose high level methodology of AIOps system. In IT organisation, there are lot of application system works for various business purposes. Those application systems continuously generates logs, metrics and incidents from database, network, application and OS technical stacks. Based on their severity, these inputs can be pre-processed and categories into error, warning or information. These data pre-processing transforms raw

unstructured logs, alerts into structured format. All these transformed structured data getting used as an input to AIOps system. AIOps apply various machine learning algorithms and techniques and produce different expected solutions like finding pattern or associations, prediction of Standard Operating Procedures (SOP) and clustering common feature data points which aids in troubleshooting and root cause analysis (RCA). AIOps is a complex, multi component, continuous learning and improvements system.

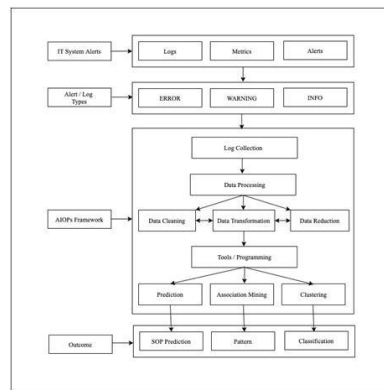


Figure 2 AIOps Framework Design

## Log Operations:

System logs are crucial component of any IT system. Logs records noteworthy events happened in the past such as user activity, resource usage, program execution status and duration, data changes, application status change etc. They provide a meaningful view of past and current states of complex IT system. Log data can only be trustworthy if it is accurate. [10]

As shown in Figure 3, there are various sources of logs like web or application servers, end users, database servers, digital devices, business applications, databases, Application Programming Interfaces(API), login activities etc. Logs can be collected at centralised place through different ways like monitoring tools, agent-based log collectors and APIs. Once logs are collected, it would get store at centralise location for further monitoring, analysis and processing.

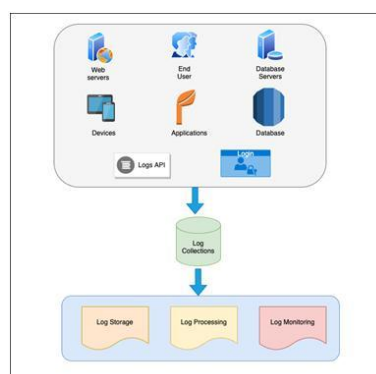


Figure 3 Log Operations

## [4] AIOPS FLOWCHART

A flowchart is a graphical representation of steps to complete the intended task. In Figure4, it shows flowchart of algorithm for AI Ops platform which work through different phases. It starts with IT system monitoring's of applications and databases to collect logs and event data. After pre-processing it gets ready for ML algorithms. Based on requirements, AI Ops framework apply ML algorithm like Association, Clustering, Prediction and gives efficient analysis which helps to reduce system operational problems and reduce MTTD and MTTR. AI Ops results can be used to implement provided recommendation through automations.

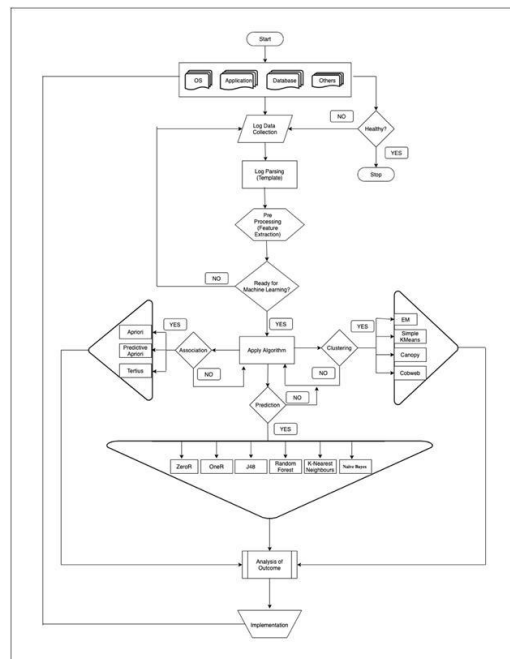


Figure 4 AI Ops Flowchart

## [5] AIOPS BENEFITS

- Simple to use : There is no configuration or ML experience required.
- Auto Detection: AI Ops continuously analyses streams of data and metrics to determine application behaviour.
- Quick Resolution: AI Ops help to resolve issues quickly with ML techniques.
- Reduce noise: AI Ops helps to overcome alarm fatigue by automatically correlating and grouping related anomalies.
- Reduce MTTD and MTTR: AI Ops helps to reduce mean time to detect and mean time to recover systems.

## [6] CONCLUSION

Machine learning or Artificial Intelligence techniques can be used to provide IT operations solutions. AI Ops platform should be built on this concept to solve IT operational challenges. AI Ops platforms use machine learning power to discover hidden relationships between log events and alerts.[11] Machine Learning algorithms efficiently predicts the Standard

Operating Procedures (SOP) based on different alerts triggered from various system sources.[12]

This paper addresses the problems of IT operational challenges by designing systematic algorithmic framework and flowchart. We addressed the IT operational problems by introducing new machine learning and log based platform – AIOps. The proposed approach opens a new possibility for Association mining and Clustering to detect patterns and sequences. AIOps also gives possibility for Classifications of log events and alerts to predict possible outages / problems in the system.

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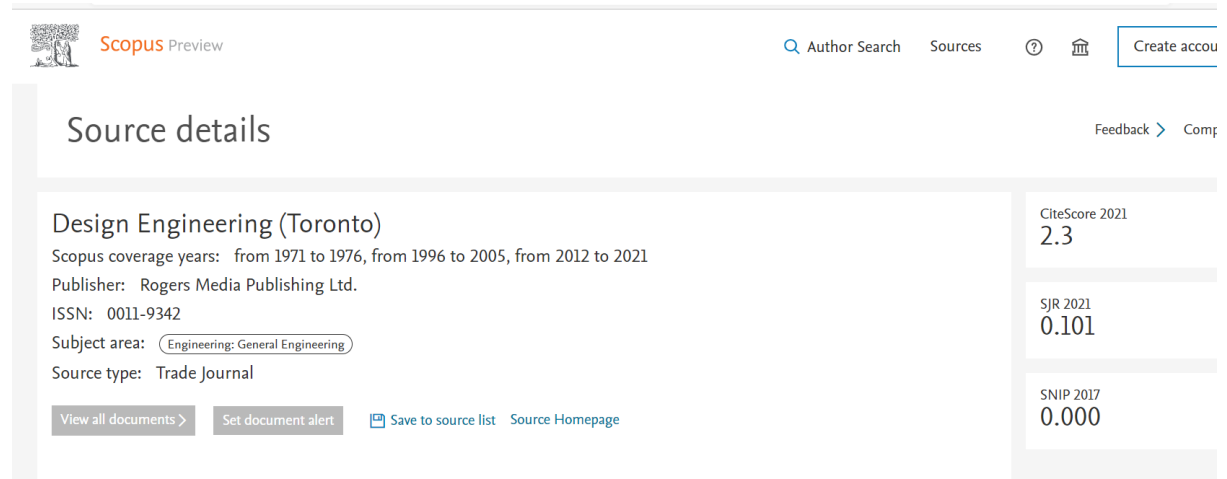
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**A comparative study of Word Embedding Techniques to extract features from Text**

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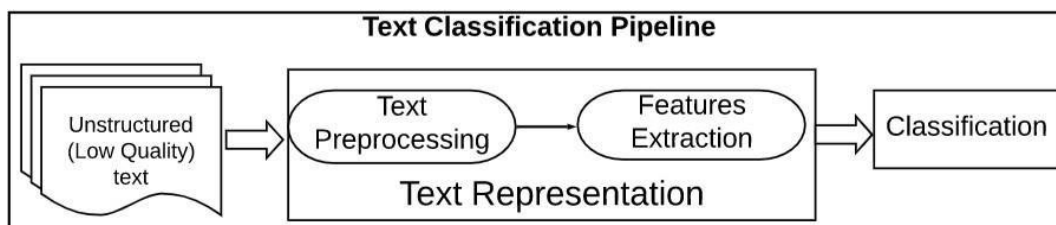
**Abstract:** Extract information from text into feature vectors is known as word embedding, which is used to represent the meaning of words into vector format. There have been no. of word embedding techniques developed that allow a computer to process natural language and compare the relationships between different words programmatically. In this paper, first, we introduce popular word embedding models and discuss desired properties of word model like similarity analysis, or the testing of words for synonymic relations, is used to compare several of these techniques to see which performs the best.

**Keywords:** Word embedding, Natural Language Processing, Neural Network, Machine Learning.

**1. Introduction:[1][9]**

In natural language processing (NLP) there are many algorithms used to achieve the best results, algorithms from Machine Learning (ML), Deep Learning (DL) and many others. The first issue you face in NLP is converting text to numbers that can be used in any algorithm a scientist chooses, but how to convert text to numbers? this is where Word Embedding algorithms come in picture.

Text-based data is increasing at a rapid rate, where the inferiority of the unstructured text is growing rapidly than structured text. Textual data is extremely common in many various domains whether social media, online forums, published articles and online reviews given online where people express their opinions and sentiments to some products or businesses. Text data is a rich source of getting information and gives more opportunity to explore valuable insights which cannot be achieved from quantitative data. The main aim of different NLP methods is to get a human-like understanding of the text. It helps to look at the vast amount of unstructured and low-quality text and find out appropriate insights. Couple with ML, it can formulate different models for the classification of low-quality text to give labels or obtain information based on prior training. Over the years text has been used in various applications such as email filtering, Irony and sarcasm detection document organization, sentiment and opinion mining prediction, hate speech detection, question answering, content mining, biomedical text mining and many more.



**2. Word Embedding:[2][8]**

Word embedding is a real-valued vector representation of words by embedding both semantic and syntactic meanings obtained from unlabelled large corpus. It is a powerful tool widely used in modern natural language processing (NLP) tasks, including semantic analysis, information retrieval, dependency parsing, question answering and machine translation. Learning a high- quality representation is extremely important for these tasks, yet the question “what is a good word embedding model” remains an open problem. As extensive NLP downstream tasks emerge, the demand for word embedding is growing significantly. As a result, lots of word

embedding methods are proposed while some of them share the same concept.

## 2.1 Desired Properties of Embedding Models:[2]

Different word embedding models yield different vector representations. There are a few properties that all good representations should aim for.

- Non-conflation
- Robustness Against Lexical Ambiguity
- Demonstration of Multifacetedness
- Reliability
- Good Geometry

## 3. Word embedding techniques:[7]

Below are the popular and simple word embedding methods to extract features from text are

- Bag of words
- TF-IDF
- Word2vec
- Glove embedding
- Fastest
- ELMO (Embeddings for Language models)

## 4. Feature Extraction Method:[1][7][4][8]

In this section, we discuss various popularly used feature extraction models. Different features of extraction models are proposed to address the problem of losing syntactic and semantic relationships between words. These methods have been adopted for different NLP related tasks. First, we present some classical models, followed by some famous representation learning models.

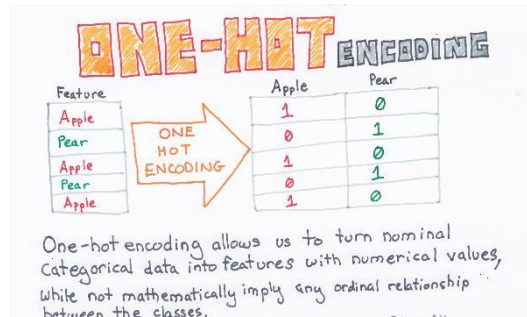
### 4.1 Classical Models

This section presents some of the classical models which were commonly used in earlier days for the text classification task. Frequency of words is the basis of this kind of words representation methods. In these methods, a text is transformed into a vector form which contains the number of the words appearing in a document.

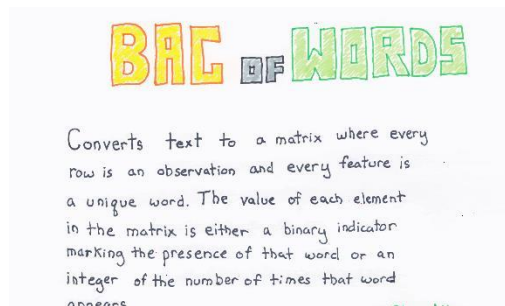
#### (1) Categorical word representation:

This is the simplest way to represent text. In this method, words are represented by a symbolic representation either "1" or "0".

- One hot encoding: The most straightforward method of text representation is one hot encoding. In one hot encoding, the dimension is the same amount of terms present in the vocabulary. Every term in vocabulary is represented as a binary variable such as 0 or 1, which means each word is made up of zeros and ones.



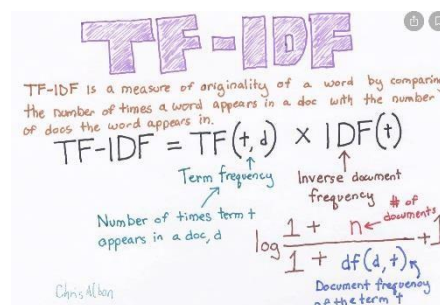
- Bag-of-Words (BoW): BoW is simply an extension of one-hot encoding. It adds up the one-hot representations of words in the sentence. The BOW method is used in many different areas such as NLP, computer vision (CV), and information retrieval (IR) etc.



(2) Weighted Word representation:

Here, we present the common methods for weighted word representations such as Term Frequency (TF) and Term Frequency-Inverse Document Frequency (TF-IDF). These are associated with categorical word representation methods but rather than only counting; weighted models feature numerical representations based on words frequency.

- Term Frequency (TF): Term frequency (TF), is the straightforward method of text feature extraction. TF calculates how often a word occurs in a document. A word can probably appear many times in large documents as compared to small ones. Hence, TF is computed by dividing the length of the document. In other words, TF of a word is computed by dividing it with the total number of words in the document.



Term Frequency-Inverse Document Frequency (TF-IDF): TF-IDF is presented to cut down the impact of common words such as 'the', 'and' etc. in the corpus. TF means Term frequency which is defined in the above section, and IDF is inverse document frequency which is a technique presented to be used with TF to reduce the effect of common words. IDF assigns a more weight to words with higher or lower frequencies. This combination of TF and IDF method is known as TF-IDF.

4.2 Representation Learning

The limitations of classical feature extraction methods make it use a limited for building a suitable model in ML. Due to this, different models have been presented in the past, which discovers the representations automatically

for downstream tasks such as classification. Such methods which discover features itself are called as feature learning or representation learning. In the area of NLP, unsupervised text representation methods like word embeddings have

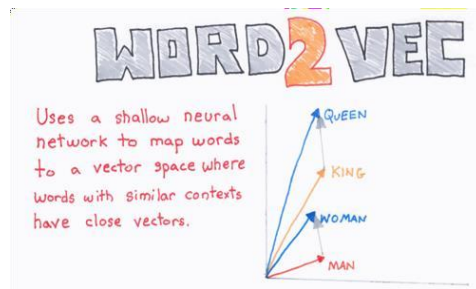
replaced categorical text representation methods. These word embeddings turned into very efficient representation methods to improve the performance of various downstream tasks due to having a previous knowledge for different ML models. Classical feature learning methods are replaced by these neural network-based methods thanks to their good representation learning capacity. Word embedding is a feature learning method where a word from the vocabulary is mapped to  $N$  dimensional vector. Many different words embedding algorithms have been presented.

(1) Continuous Words Representation (Non-Contextual Embeddings):

Word Embedding is NLP technique in which text from the corpus is mapped as the vectors. In other words, it is a type of learned representation which allows same meaning words to have the same representation. It is the distributed representation of a text (words and documents) which is a significant breakthrough for better performance for NLP related problems.

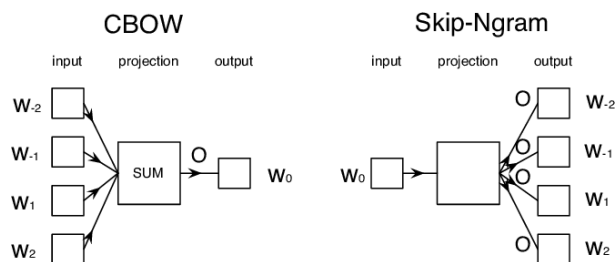
**Word2Vec**

Word2vec is an efficient analytical model used to transform the raw text into word embeddings. This model is predicated on words with similar semantics present within the same context. this will be modelled by placing a word during a high dimensional vector space then moving words closer supported their probabilities to seem within the same context. Two important methods are used to calculate these vectors like, Continuous Bag-of-Words model (CBOW) and Skip-Gram model. The advantage of this model is to handle huge volume of documents and provides the optimal results with word vectors.



**Continuous Bag of words (CBOW) [5]**

Continuous Bag of words (CBOW) gives words prediction of current work based on its context. CBOW communicates with the neighbouring words in the window



**Skip-Gram:**

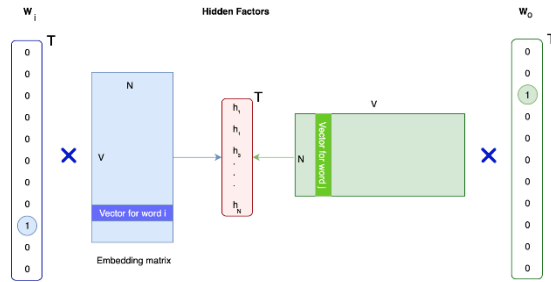
Skip-Gram is the reverse of CBOW model; prediction is given based on the central word after the training of context in skip-gram.

**GloVe**

The Global Vectors for Word Representation, or GloVe, calculation is an augmentation to the word2vec strategy for efficiently learning word vectors, created by Pennington, et al. at Stanford University. Conventional vector space models expose of words were produced utilizing matrix factorization strategies. GloVe is an approach to extracts both the novel measurements of matrix factorization procedures like LSA with the local context-based learning in word2vec. GloVe constructs an express word-context or word co-occurrence matrix

utilizing statistics over the entire text corpus .The outcome is a learning model is the better embeddings in terms of words.

**Word Order Vectors (Wove) [4]**



The next word embedding technique is Wove , a modification upon GloVe proposed by Cox in 2019 that was able to improve GloVe’s effectiveness in the analogy task by 9.7%. While GloVe does use word-weighting based on those words’ distance from the target word when creating the word vector, it does so by generating inclusive matrices. For an inclusive matrix, all words from the target word to the edge of the context window are considered and weighted according to their distance, resulting in a singular vector

**FastText [6]**

Bojanowski et al. [15] proposed FastText and is based on CBOW. When compared with other algorithms, FastText decreases the training time and maintains the performance. Previously mentioned algorithms assign a distinct representation to every word which introduces a limitation, especially in case of languages with sub-word level information/ OOV

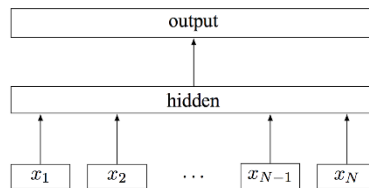
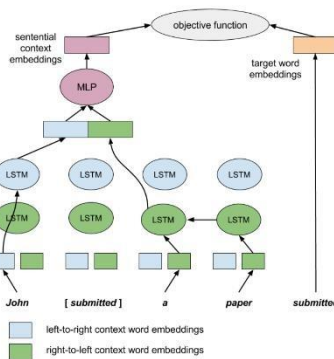


Figure 1: Model architecture of fastText for a sentence with N ngram features  $x_1, \dots, x_N$ . The features are embedded and averaged to form the hidden variable.

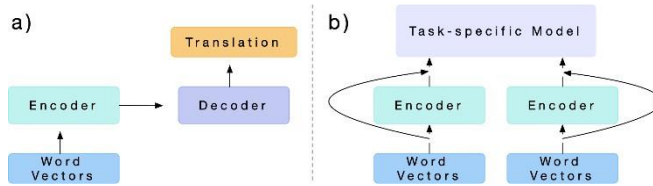
(2) Contextual word representations:

- Generic Context word representation (Context2Vec):

Generic Context word representation (Context2Vec) was proposed by Melamud in 2016 to generate context-dependent word representations. Their model is based on word2Vec’s CBOW model but replaces its average word representation within a fixed window with better and powerful Bi-directional LSTM neural network



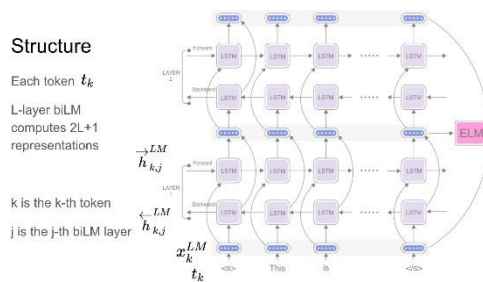
- Contextualized word representations Vectors (CoVe):



McCann presented their model contextualized word representations (CoVe) which is based on context2Vec. They used machine translation to build CoVe instead of the approach used in Word2Vec (skip-gram or CBOW) or Glove (Matrix factorization)

- Embedding from language Models (ELMo):

Peters et al. proposed Embedding from Language Models (ELMo), which gives deep contextual word representations.



### 5. Analysis of Word Embedding Models: [1][10]

Language Models	Semantics	Syntactical	Context	Out of Vocabulary
1-Hot encoding	[×]	[×]	[×]	[×]
BoW	[×]	[×]	[×]	[×]
TF	[×]	[×]	[×]	[×]
TF-IDF	[×]	[×]	[×]	[×]
Word2Vec	[✓]	[✓]	[×]	[×]
GloVe	[✓]	[✓]	[×]	[×]
FastText	[✓]	[✓]	[×]	[✓]
Context2Vec	[✓]	[✓]	[✓]	[✓]
CoVe	[✓]	[✓]	[✓]	[×]
ELMo	[✓]	[✓]	[✓]	[✓]

### 6. Comparison of Word Embedding Models [1][3]

Model	Architecture	Type	Pros	Cons
One Hot Encoding and BoW	-	Count based	Easy to compute Works with the unknown word Fundamental metric to extract terms	It does not capture the semantics syntactic info. Common words effect on the results Can not capture sentiment of words
TF and TF-IDF	-		Easy to compute Fundamental metric to extract the descriptive terms Because of IDF, common terms do not impact results	It does not capture the semantics syntactic info. Can not capture the sentiment of words
Word2Vec	Log Bilinear	Prediction based	It captures the text semantics syntactic Trained on huge corpus ( Pre-trained)	Fails to capture contextual information. It fails to capture OOV words Need huge corpus to learn
GloVe	Log Bilinear	Count based	Enforce vectors in the vector space to identify sub-linear relationships Smaller weight will not affect the training progress for common words pairs such as stop words	It fails to capture contextual information Memory utilization for storage It fails to capture OOV words Need huge corpus to learn (Pre-trained)
FastText	Log Bilinear	Prediction based	Works for rare words Address OOV words issue.	It fails to capture contextual information Memory consumption for storage Compared to GloVe and Word2Vec, it is more costly computationally.
Context2Vec CoVe ELMo	BiLSTM	Prediction based	i) It solves the contextual information issue	Improves performance Computationally is more expensive Require another word embedding for all LSTM and feed-forward layer

### 7. Conclusion:

The paper has presented multiple techniques used in word embedding and the models and techniques used in those techniques in an attempt to ease the pain of understanding and learning them, it is not considered a full material to learn everything about word embedding techniques but more like an introduction. The main aim of this research work is to analyse the performance of word embeddings algorithm. we have introduced various algorithms that enable us to capture rich information in text data and represent them as vectors for traditional frameworks. We firstly discussed classical methods of text representation. every method has their advantages like a Bag-Of-Words suitable for text classification, TF-IDF is for document classification, WOVe technique for synonyms and if you want semantic relation between words then go with word2vec. We have to choose embedding model depends upon the requirement and corpus.

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[10]<https://medium.com/sfu-csmp/nlp-word-embedding-techniques-for-text-analysis-ec4e91bb886f>
4. <https://medium.com/sfu-csmp/nlp-word-embedding-techniques-for-text-analysis-ec4e91bb886f>




Paper Title- "A comparative study of Word Embedding Techniques to extract features from Text "

Paper Link - <https://www.turcomat.org/index.php/turkbilmат/article/view/8101>



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## Designing Of A Conceptual Framework For Assessing The Performance Of Educational Sector Ngos.

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**ABSTRACT:** This research paper is written with the primary objective to design a framework for assessing the performance of educational sector NGOs. The challenges faced by the NGOs are often very different from the non-profits and hence are difficult to benchmark. Moreover, NGOs have goals and offer services that are more intangible making performance measurement even more challenging. NGOs are very diverse in nature in terms of projects employed, people, beneficiaries as well as strategic goals and objectives. Hence a general framework for performance measurement will not be effective for measuring the performance of these diverse NGOs. This paper will focus on studying and comparing the various frameworks available for measuring the performance of NGOs. After studying these models, the paper will aim towards designing a framework that can effectively assess and measure the performance of the NGOs working in educational sector. The framework will also list down the performance indicators that can be used in measuring the performance of these NGOs.

**KEYWORDS :** NGO, Non-profit organizations, performance measurement, accountability of NGOs, assessment of NGOs

### Introduction:

The number of NGOs are increasing rapidly in the recent years. They include wide variety of organizations working in healthcare, women empowerment, child education, environmental conservation, charitable organizations etc. All these NGOs share a common goal of adding value in lives of people that leads to better community & society as a whole. However, they surely differ from the traditional profit making organizations as their primary goal is not to make profits. While other organizations ultimate goal is to optimize profits, NGOs primarily exists to serve the society and their requirements. Hence objectives of NGOs are more intangible and complicated. NGOs are driven more for creating value to society and its impact on the society. However, NGOs too, like other organizations, are not spared from the increasing pressure for accountability and performance. Some NGOs also have to face pressures from the government as they have to keep a track of their funding services. NGOs have always understood the need to assess their performance. NGOs also understand that measuring their performance is crucial for continual stakeholder confidence and trust in their work. A huge number of frameworks have been developed for assessing the performance of organizations. Most of these are directed towards self-assessment with financial reporting mechanisms forming the basis of the assessment. Conducting external audits has been predominant method for evaluation. Some NGOs are also directing efforts for mission achievement. The conceptual framework designed in this paper is primarily focusing on the assessing the performance of the NGOs working in the education sector. The paper integrates the approaches take by the different performance measurement frameworks available to precisely define the performance parameters for NGOs in education sector. It is important for these NGOs to assess their performance for sustainability.

*Frameworks for performance measurement for NGOs: Comparative study*

### The Balanced Scorecard (BSC) for NGOs – Kaplan and Nortan

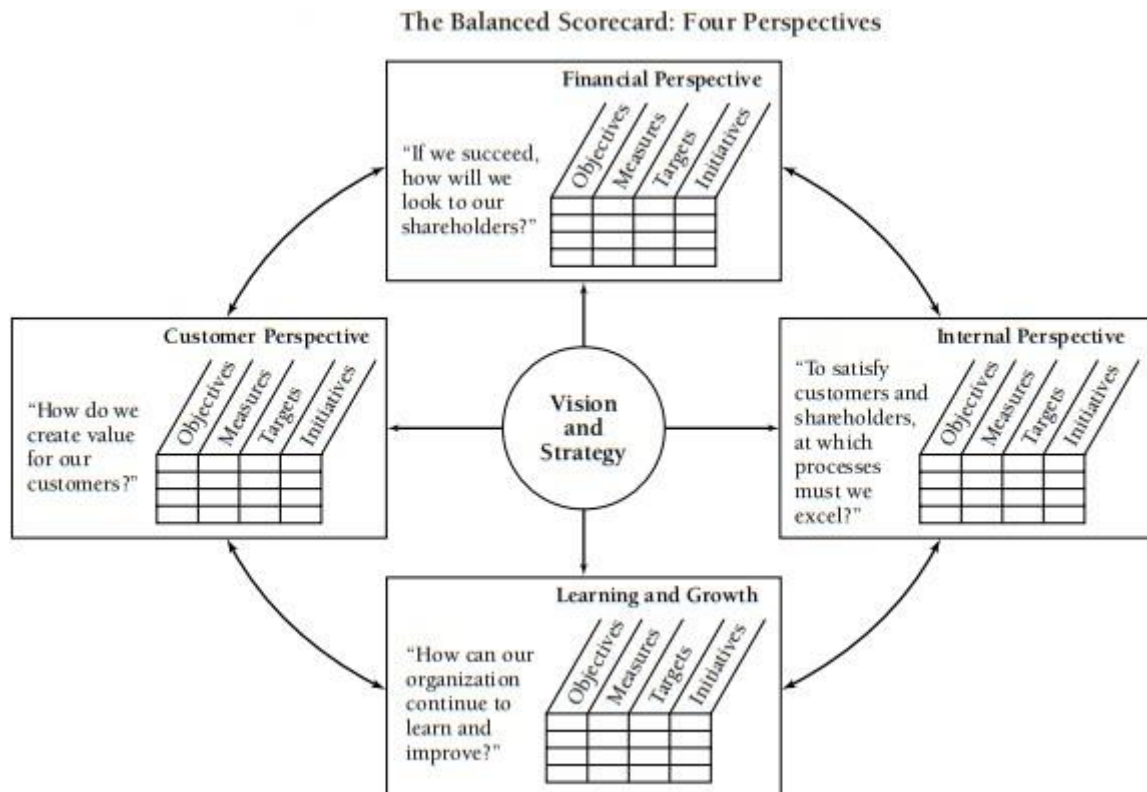
Kaplan and Norton revised the Balanced Score Card (BSC) in order to integrate the information flowing with the NGOs and measure its impact on organizations performance. The Balanced Scorecard presents 4 dimensions <sup>[1]</sup>:

1. Financial perspective
2. Internal perspective

3. Customer perspective
4. Learning, innovation and growth

These four dimensions were viewed as the key to financial performance of organizations in future. BSC justified the possibility to answer the 4 very basic questions that are very important for the sustainability of an organization [1][3]:

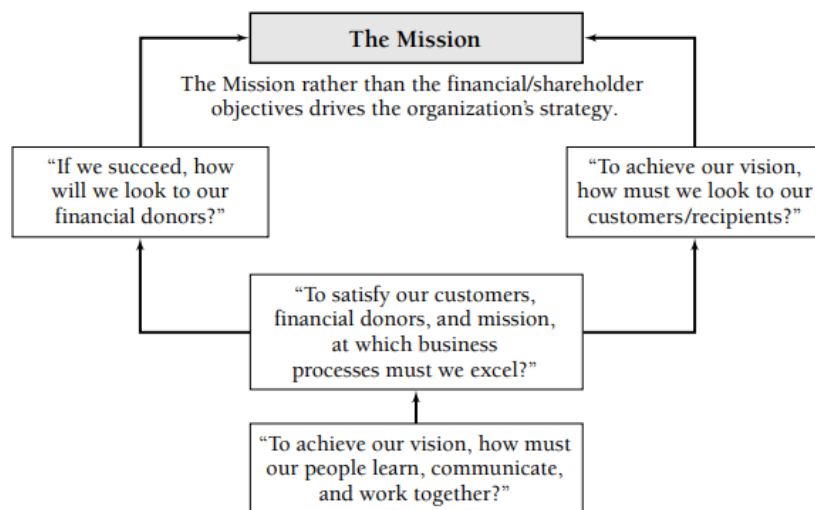
- How do customers see us? (Customer perspective),
- What must we excel at? (Internal perspective),
- Can we continue to improve and create value? (Innovation),
- How do we look to shareholders? (Financial)".



With BSC, managers could observe and focus only on certain measures that were actually affecting the organization's strategy while not investing on other loads of information. It allowed the organization to align their vision, mission, goals and strategies towards achieving financial success through its four perspectives. It focused exclusively on the measurement of strategic performance. Since the NGOs differ in nature, Kaplan revised the BSC framework for non-profit organizations. In this revision, organizational mission is placed on the top as a replacement for financial perspective and made organization's mission to focus on both, financial perspective as well as customer perspective. The major BSC characteristics are:

1. Allows to integrate a series of performance indicators on a single document.
2. The document is short and connects to the organizations information system for more details.
3. The indicators are categorized and each category captures distinctive perspective of organizations performance and all together are connected with the vision and organizations strategy.

### Adapting the Balanced Scorecard Framework to Nonprofit Organizations



#### *Limitations of the BSC framework*

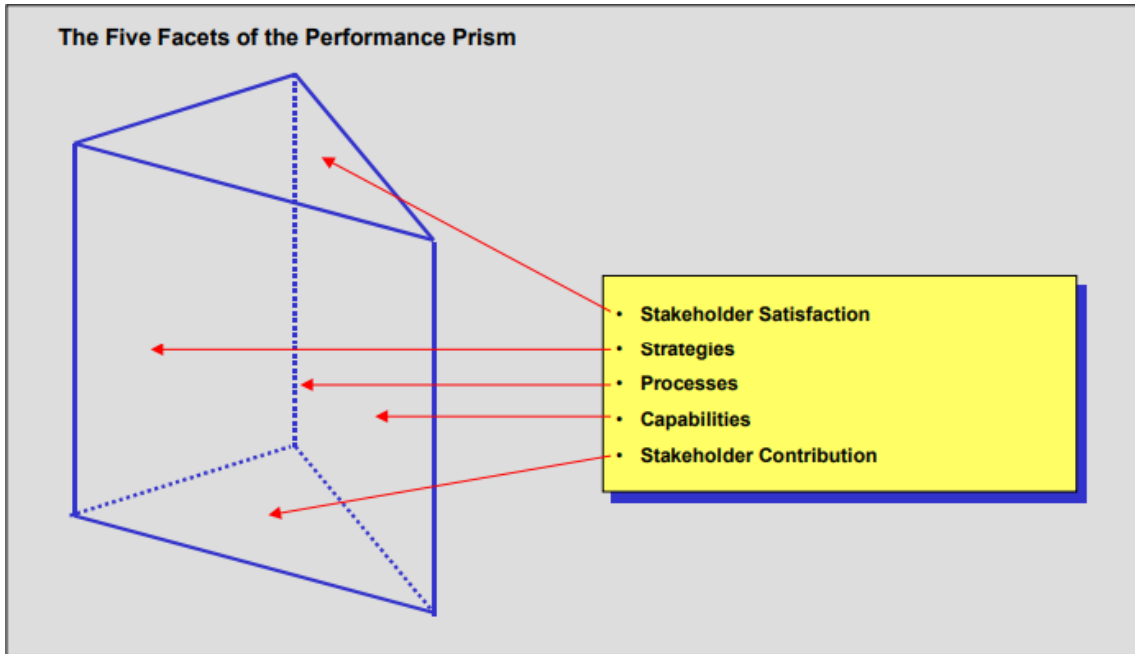
This model was criticised for focusing more on internal financial measures. The four perspectives defined in the model were also claimed to be more suitable for profit making organizations. BSC regarded that the final objective of the organization is to generate wealth for the stakeholders which contradicted the goals of NGOs. NGOs focus on creating value in and for the society and not wealth for its stakeholders. Unlike profit making organizations, NGOs attract two types of customers –

- beneficiaries who consumes and utilise the product/goods and services offered without paying for it
- donors – who provide resources that serve the beneficiaries.

Both the above customers are equally important for the NGOs and so is the fulfilment of their aspirations and requirements. Thus implementing BSC in NGOs fails as it cannot differentiate which customer segment should be given the priority.

#### **The Performance Prism Framework – Andy Neely, Chris Adams, Paul Crowe**

Neely, Adams and Paul in 2002, extended further the dimensional approach of Kaplan & Norton by adding to the stakeholders. BSC considered only two major stakeholders, namely customer and shareholders. Neely, Adams and Paul criticized BSC for this and stated that other stakeholders should also be considered, such as employees, suppliers etc. They opposed BSC stating that the strategies must be derived from the stakeholders and not vice versa. The Performance Prism focuses on relationships of the organization with its various stakeholders, the complexity of this relationship from the operating environment perspective. It diverts the management focus on parameters important for achieving success in long term and help in designing systems for performance measurement that are more relevant considering the working environment. The Performance Prism has 5 facets – the top facets are stakeholder's satisfaction and the stakeholder's contribution forms the bottom facet. The remaining facets are Processes, Strategies and Capabilities [2].



**The Performance Prism Framework**

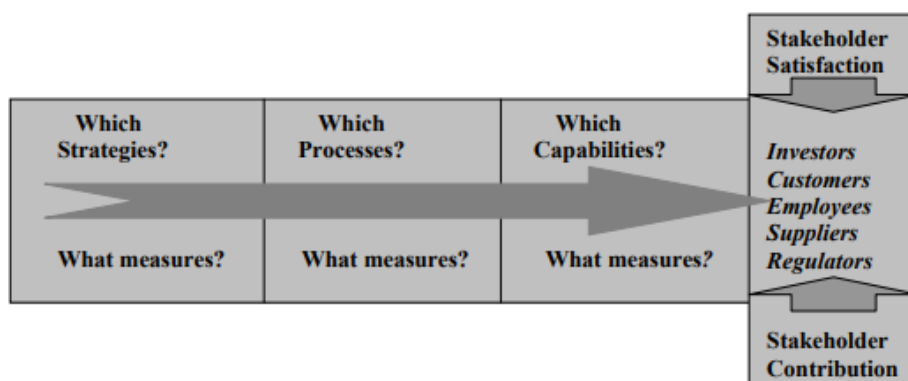
The Performance Prism integrates the above five facets and allows management to think by answering the five fundamental questions [2]:

1. Stakeholder Satisfaction: Who are our stakeholders and what do they want and need?
2. Stakeholder Contribution: What do we want and need from our stakeholders?
3. Strategies: What strategies do we need to put in place to satisfy these sets of wants and needs?
4. Processes: What processes do we need to put in place to satisfy these sets of wants and needs?
5. Capabilities: What capabilities – bundles of people, practices, technology and infrastructure – do we need to put in place to allow us to operate our processes more effectively and efficiently?

This provides a comprehensive framework that manages the organizational performance and allows them to build a structured performance framework.

*Limitations of The Performance Prism*

The Performance Prism does not emphasize on continuous improvement and strategy which are considered as crucial for sustainability of an organization. It lacks in correlating the operational and strategic indicators. It also fails in implementation as far as performance improvement is concerned.



**The Performance Prism**

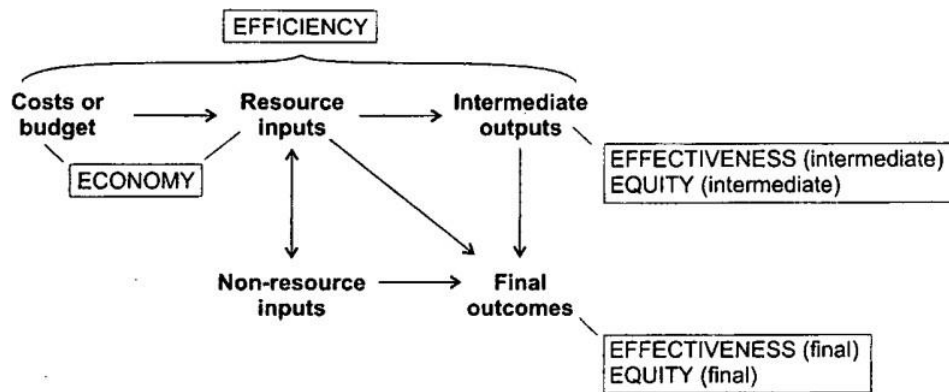
There are five interrelated perspectives in the Performance Prism framework

**The “Production of Welfare” Framework – Kendall and Knapp**

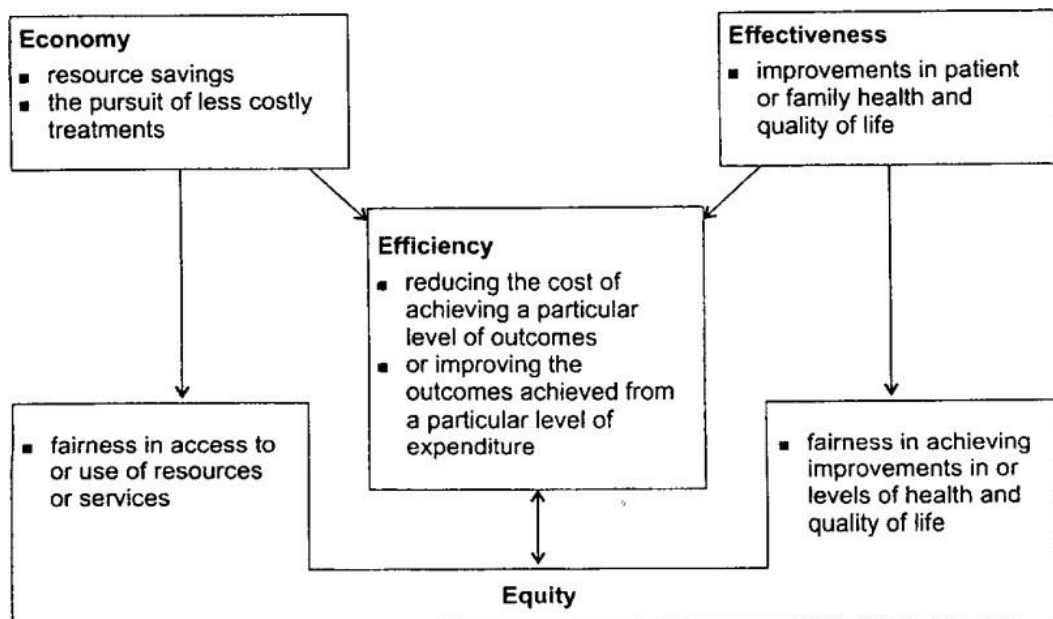
The “Production of Welfare (POW)” framework describes the processes used for service delivery and activity. It focuses on purpose, factors and process giving significance to the context in which they have been developed. The five main elements of POW are [2]:

- Resource inputs: employees, volunteers, capital and other members.
- Cost of resource inputs or budget allocated to purchase resource inputs in addition to recognition of opportunity cost
- Non-resource inputs: impact on outcome achievement without identifiable cost
- Intermediate outcomes: volumes of service output, mostly with dimension of quality.
- Final outcome: welfare, quality of life changes over time

The amount and quality of services delivered (intermediate-outputs) affect ('produce') final outcomes, which are made possible by a combination of resource and non-resource inputs. Spending money (budget costs) and/or diverting resources from other purposes are two ways to obtain resources (opportunity costs). POW should be able to accommodate a wide range of theoretical principles, evaluative methods, professional priorities, and stakeholder goals as a basic organising structure. The POW framework helped to describe and define four requirements that have become common currency in public management discussions in the UK in its original formulations: Economy, effectiveness, performance, and equity are all words that come to mind when thinking about economics. The following figures explain the same.



**The production of welfare and the 4 Es**



**Figure : Evaluative criteria**

**The Malcolm Baldrige Excellence Framework for Non-profits**

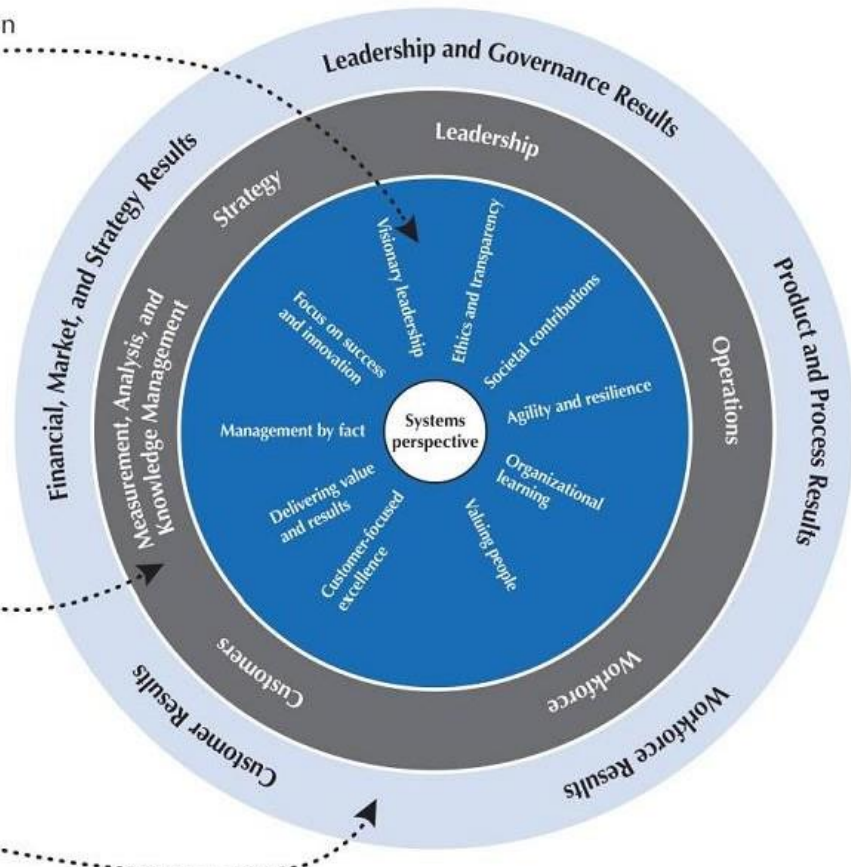
This framework is largely used by non-profits working in the sector of education and health care. It is not only used for assessment, performance management but also to achieve excellence. The framework offers an overall organization-wide perspective to optimize an entire system rather than focus just on parts & processes for excellence. It allows organization to achieve desired goals, improve and excel results, develop competitiveness by aligning processes, plans, people, decisions, actions, and results. It includes: Criteria for Performance Excellence (CPE), core values and concepts that are interrelated and a scoring system to measure the organizations maturity<sup>[5]</sup>.

**The Role of Core Values and Concepts**

The Baldrige Criteria build on core values and concepts...

which are embedded in systematic processes... (Criteria categories 1–6)

yielding performance results. (Criteria category 7)



From Baldrige Performance Excellence Program. 2021. 2021–2022 Baldrige Excellence Framework: Proven Leadership and Management Practices for High Performance. Gaithersburg, MD: U.S. Department of Commerce, National Institute of Standards and Technology. <https://www.nist.gov/baldrige>.

## Designing Of A Conceptual Framework For Assessing The Performance Of Educational Sector Ngos.

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### Comparative study:

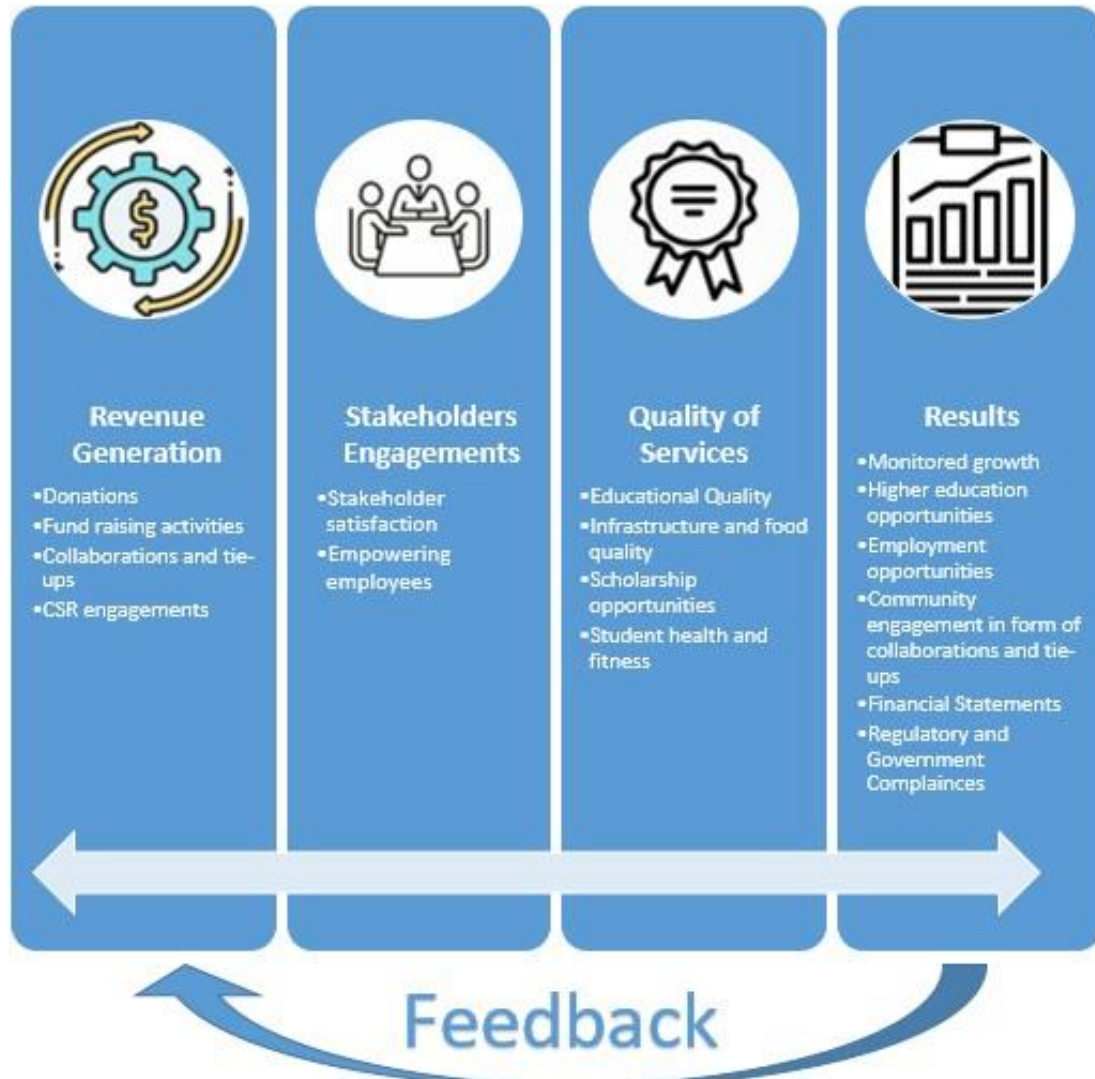
Framework	Focus on	Perspectives or Factors under study	Limitations
<b>Balanced Scorecard</b> <sup>[1]</sup>	Financial aspect & organizational mission	Customer, Financial, Growth and Internal	Only considers customers or donors and not all stakeholders Only focuses on financial outcomes
<b>The Performance Prism Framework</b> <sup>[2]</sup>	The stakeholders	Process, Strategy, Capabilities, stakeholder's contribution and satisfaction	Difficult to implement Does not work on profit maximization
<b>The Production of Welfare Framework</b> <sup>[3]</sup>	Purpose, factors and processes	Resource inputs, Cost of resource inputs, Non-resource inputs, Intermediate outcomes, Final outcome	Focused only on processes and service delivery Does not focus on financial aspect or stakeholder satisfaction
<b>The Malcolm Baldrige Excellence Framework for Non-profits</b> <sup>[5]</sup>	Assessment and excellence, focus on results	Core values, interrelated concepts and scoring system	Dependant on the willingness of leaders and ability for adoption Commitment for long term required by leaders

*The conceptual framework:*



The factors that are important and used by the management in decision making as well as factors affecting the performance have to be combined together to form a conceptual framework. As discussed earlier, the primary objective of NGOs is not to maximize profits. However, profits cannot be ignored as well. For NGOs working in education sector, it is crucial to assess the quality of service as well as the satisfaction of stakeholders like beneficiaries, donors, employee, parents, volunteers etc. They have to be driven by the mission and their outcomes have to be measurable. They will have to develop strategies that help them improve their organizational capabilities in terms of revenue generation activities, CSR engagements and other collaborations, mission accomplishment, and the quality of services. All this will facilitate NGOs to reach their ultimate goal of adding value to society. This value to society should also be measured either by qualitative or by quantitative measures. The extent to which that can add value to the society will finally count towards their effectiveness and sustainability.

The framework presented in this paper aims to benchmark and assess performance of NGOs working in the



education sector by considering the above listed primary dimensions/factors. It also dives in one level deeper to understand the various performance indicators that can be used to measure these dimensions. The framework will help in answering the basic questions:

1. What efforts are taken by the NGOs for generating the revenue? Are they measured and effective?
2. How much is the stakeholder engagement & participation?
3. What is the quality of service offered to the stakeholders? Are the stakeholders satisfied with these services?
4. How is the NGO adding value to the society and the stakeholders? Are the results measurable?

*Conclusion:*

From the frameworks studied and listed above, it is evident that there is no one framework that will suit all the different NGOs (working in diverse sectors) or can measure the overall performance of these organizations. Some

## Designing Of A Conceptual Framework For Assessing The Performance Of Educational Sector Ngos.

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frameworks focus only on the financial aspects, some focus on the stakeholder's satisfaction levels while others focus on effectiveness for achieving the outcomes. Considering the diversity of NGOs in terms of stakeholders, activities, goals and projects undertaken, mission, no one model can be applied to measure performance of NGOs working for various. Also, study shows that these frameworks cannot provide a total solution for measuring the performance of NGOs. However, each one commonly agrees on the complexity of performance measurement systems in NGOs. Hence there is a need to design, develop and test a framework that that effectively assess and measure the performance of NGOs working in education sector.

The framework suggested in this paper are based on the fundamental principle of service quality, stakeholder satisfaction, fund raising capacities and results attainment. This framework will help NGOs in education sector to monitor and assess their performance on the basis of above factors. The framework can also be modified to accommodate other dimensions according to the type of organization.

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## Performance of MyNET Model on Handwriting Biometrics

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### **ABSTRACT:**

This paper is in the continuation of Writer Identification using Neural Network[1]. Offline signature identification is the challenging task till date. Unlike to verification problem of one-to-onemapping, identification maps single with rest them to identify the signer. For this process we model a model using convolution neural network. This paper explains the performance of MyNET model on MyNET offline signature dataset which consists of 434 writers 20 signatures each.

**Keywords:**Signature Identification, CNN, Handwriting Biometrics, MyNET, neural network

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### **Introduction:**

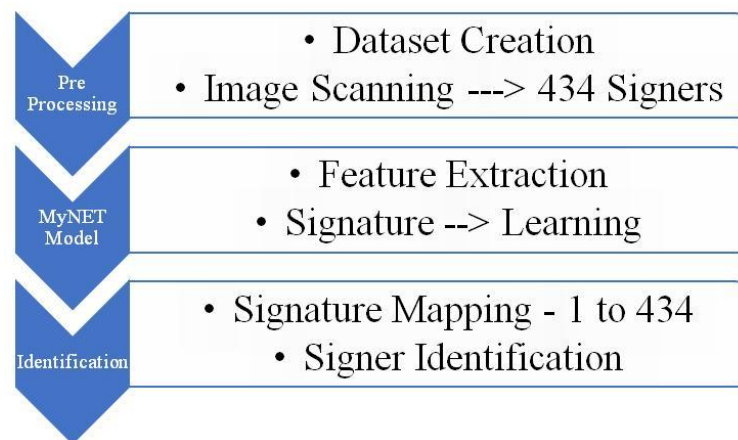
Biometric systems play major role in different applications. The two main important biometrics widely used are fingerprint scanner and iris scanner with many applications in different areas such attendance monitoring to security access controls. Handwriting biometrics usually referred as signature is mainly used largely in banking and legal application thought the globe. But due to their performance issues they are less used.[2][3]

There are two major problems associated with handwriting biometrics. They are namely, i) Writer Identification ii) Signature Verification. The writer identification is based on the identifying the signer from previous set of signatures available. For the process of identification current signatures is mapped with every signer's signature and based on matching pattens the writer is identified. Instead in signature verification process claims are made based on the signer

and only the process maps current signature with the only claimed signer's signature available. If the matching patterns is more that desired the verification confirms the signer to be valid.[4][5]

There are mainly two major techniques used in handwriting biometrics mainly, i) Offline and ii) Online. In offline, signatures are generally made on the piece of the paper and then they are computerized using scanners and then process with image processing techniques. On the other hand, in online signatures are captured using devices such as digitizers and then are process based on the parameters recorded during the acquisition process. Due to the advantage of acquiring the parameters using digitizers online techniques provided more accurate results compared to offline.[6][7]

## Proposed Architecture:



*Figure 1 Identification Process*

In order to study the performance which will identify the signer the following architecture has been implemented and performance was recorded.

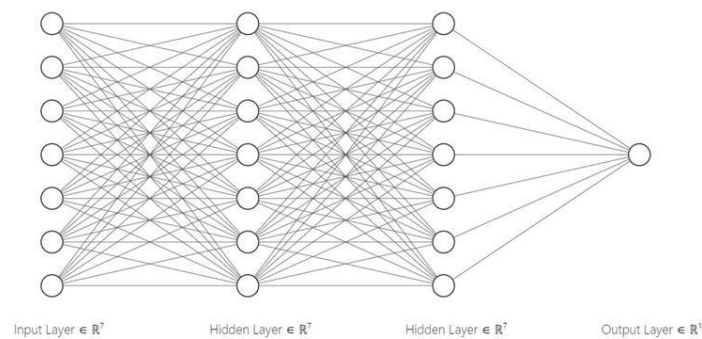
There are three major processes as shown in figure 1.

### 1. Dataset Creation

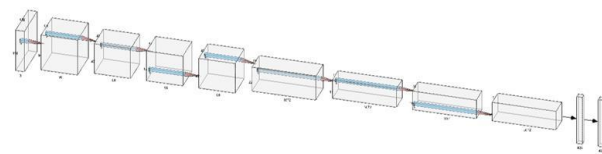
There are several existing datasets available for offline signature verification. Major of the datasets were on mixed mode i.e., offline and online. In the previous research work we have found the offline signatures datasets have signatures varies from 300 to 3000[1]. Hence, we proceeded to create a larger dataset with at least 8000 genuine signatures.

20 signatures of each signer were collected using page and paper method. Then using HP scanner with 1200 dpi each signature scanned and store separately with coding separate numeral for each signer. In this process we collected signatures from 500 signers. After implementing selection process for each signature 8680 signatures of 434 signer's 20 each were shortlisted for further process. With these signature MyNET signature dataset created.

## 2. MyNET Model



*Figure 2 MyNET Neural Network Architecture*



*Figure 3 MyNET Framework Architecture*

- Image Preprocessing – Each signer’s signature images were of different sizes. All images were resized for common input size [224 224]. The colour images were converted to grey scaled images.
- Convolution Neural Network[8] – Each signature image was processed for convolution with 5 by5 filter matrix and such 96 different random filters were used to create 96 filter maps. Followed by ReLu Activation functions to remove negative values. We have done down sampling of these images further using max-pooling layer. Since the filter numbers are large, we have use mini-batch normalization to speed CNN training further.
- Multiple Convolutions – 32 Grouped convolutions were implemented with ReLu and Average pooling for performance and speed improvement. Further cross-normalization was implemented channel wise. Additionally, drop-out layer added at the end to randomize the values to improve the performance of the network.

### **Experimentation:**

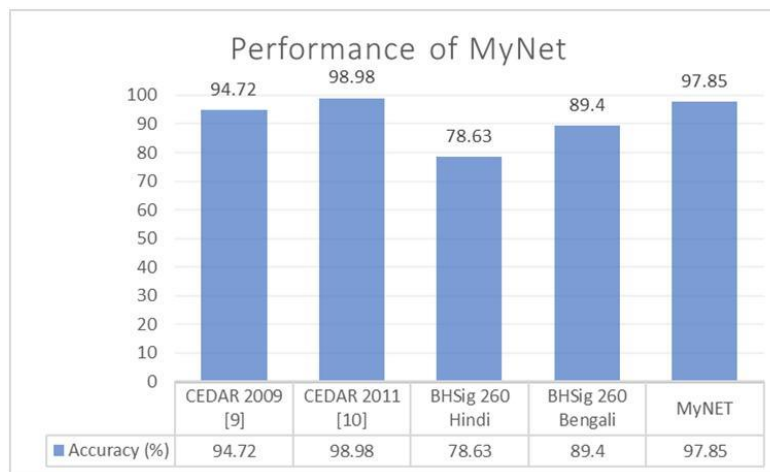
## 3. Identification

To study the performance of our MyNET model for the process of signer identification we have used our own dataset MyNet with 434 signers. Our objective was to identify the signer from the set of signatures available. Hence, we have implemented writer dependent signer identification. From the dataset randomly signatures were split into two different set for the process of training and validation. 21 different sets of 352 signatures each were created and MyNET model

implemented with cross validation. Since all of the signatures where genuine accuracy of signer identification was measured for each set.

## Results:

Considering new era of computation with enhancement into computation technologies, a larger dataset always important for research advancement. MyNET dataset with 9000+ genuine signatures without any synthetic signature creation could be larger dataset in this category. The performance of MyNET Model with larger dataset gives promising results for further research work. Below Table shows performance of MyNET model on different datasets with accuracy.



*Figure 4 Performance of MyNET on different datasets*

Based on the performance of MyNET Model on different dataset given in the above table we state of results as follows:

1. The performance of MyNET is promising on CEDAR datasets.
2. The performance of MyNET on BHSig 260 varies a lot with different Indic Scripts. In Hindi, performance has reduced below 80. This indicates to research further to improve the performance.
3. Compared to the performance with other Bengali shows less performance but considering other literature its still promising.
4. The accuracy of MyNET model on MyNET dataset and other as mentioned above proves the stability of the model with some variation to Hindi.

## Conclusion:

Handwriting biometric framework based on convolution neural network showed high accuracy performance on different datasets. The parameters could be further tunes to improve the

performance to other scripts as well. This model can be further implemented in real life application for signer identification.

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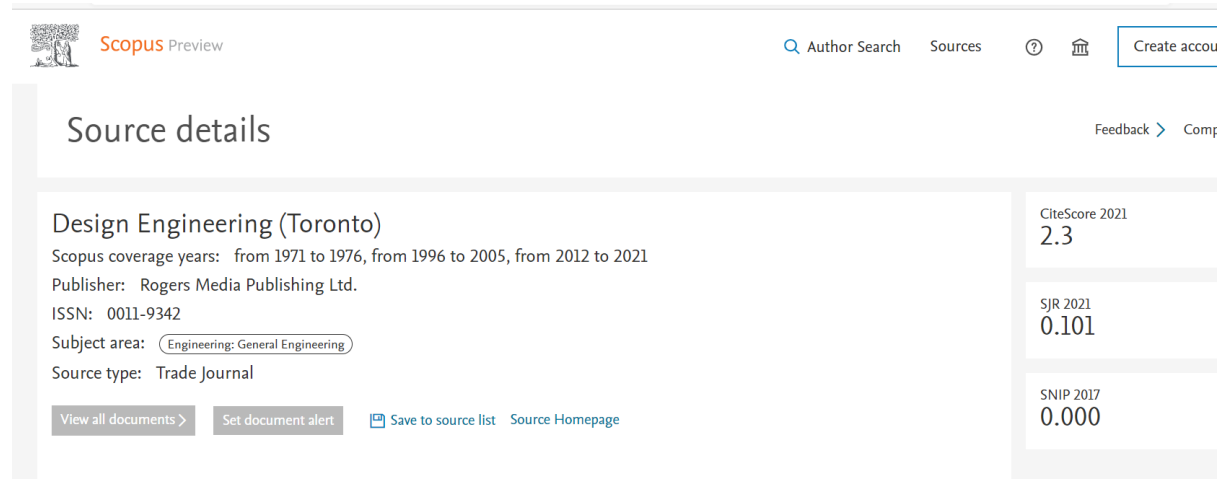
Paper Title- "Performance of MyNET Model on Handwriting Biometrics"

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## To simulate AODV, DSR, GRP and OLSR routing protocols of VANET and study the performance indicators using Opnet Modeler 14.5

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**Abstract** - Wireless technology is developing very fast. VANET is an evolving technology in the field of wireless communication and with the advancement it will contribute more to the smart transportation system in days to come. Quality of service in Vehicular ad-hoc Network (VANET) is primarily dependent on routing protocols. Maximum throughput, minimum packet loss and controlled overhead are the major ultimate objectives of each proposed routing protocol. VANET gives a communication framework that has enhanced the traffic service. Data sharing in this system is time sensitive and require quick and vigorous network connection forming. VANET is serving the said purposes but there are some issues and challenges like efficient handling of fast handovers for audio applications. Therefore, in this paper recently proposed routing protocols along with their pros and cons are discussed. VANET routing protocols are simulated using Opnet simulator and key performance Indicators were assessed. Simulation is performed to check the delays and throughput comparisons between the routing protocols.

**Keywords:** VANET, Opnet, Simulation, Routing Protocols, ad-hoc network

### 1. Introduction

VANET is the short form of Vehicular Ad-hoc Network, it is subclass of network of MANET type. The main characteristics of the VANETs are as follows: heterogeneous communication range, mobility of the vehicles, geographically constrained topology, time varying vehicle density, frequently disconnected network, dynamic topology, and the vehicles being the components that build the network. The VANET routing protocols need to be designed considering factors such as the security, mobility and scalability of vehicular communication. The goal of VANET architecture is to allow the connection between vehicles or between vehicles and fixed road side units to have a smooth communication possible.

For routing protocols Key Performance Indicators (KPIs) are essential like (Delay, No. of Hops, Retransmission Attempts, Traffic Received, Throughput); it is not necessary that the network should have the best results in all KPIs, but they must be realistic, and provide acceptable results in all KPIs, and during the decision taking part all the KPIs must be prioritized based on the required solution.

Specific applications like audio and video requires better handoffs and packet transmission across the network. In this paper, a simulation using the Opnet modeler for the most popular VANET routing protocols for a voice enabled service network will be done to obtain the best KPIs from its perspective and choose the best one based on the KPIs.

### 2. VANET routing protocols

#### 2.1. AODV

AODV (Ad-hoc On-demand Distance Vector) is a loop-free routing protocol for ad-hoc networks. It is designed to be self-starting in an environment of mobile nodes, withstanding a variety of network behaviors such as node mobility, link failures and packet losses. The information is only transmitted between nodes in an on demand mode.

#### Advantages

- Routes are established on demand and destination sequence numbers are used to find the latest route to the destination.
- AODV can be used in large VANET networks.
- Any failure in the VANET links is handled in a prompt way by the AODV.
- The connection setup delay is lower.

- Distance Sequence Number is providing recent route to the destination node.

#### Disadvantages

- It expends extra bandwidth, because of proactive beaoning high control overhead is occurring when many route reply packets for a single path.
- Compared to other approaches, high processing time is required for the connection initiation and the first attempt to set the path.
- Route inconsistency may occur when old entries are included in intermediate nodes.

#### 2.2. DSR

The DSR protocol utilizes source routing and maintains functional paths. It consists of route detection and route servicing. Route Discovery determines the optimum path for a transmission between a given source and destination. Route Maintenance ensures that the transmission path remains optimum and loop-free as network conditions change, even if this requires changing the route during a transmission.

#### Advantages

- In DSR protocol no proactive updates are desired.
- Route caching can reduce route discovery.
- The DSR protocol is Beacon less.

#### Disadvantages

- When the links get down it can't be reformed locally.
- The performance of DSR protocol views declining in highly mobile VANET.
- DSR is not scalable to large networks.
- The connection setup delay is higher

#### 2.3. OLSR

The Optimized Link State Routing Protocol (OLSR) is an IP routing protocol optimized for mobile ad hoc networks, which can also be used on other wireless ad hoc networks. It means optimized link state routing which means a routing protocol using the proactive mode. In this, whenever any change in the topology occur, MPR (multipoint relay) are responsible to generate and forward the topology information to selected nodes. OLSR operation fundamentally consists of servicing and updating information in a set of tables. The tables are managing the route calculation itself as well.

#### Advantages

- Suitable with data intensive application as it has less average end-to-end delay.
- Doesn't require central administrative system to handle routing process

#### Disadvantages

- The control message overhead gets increased with increased in mobile hosts.
- In OLSR, large amount of bandwidth and CPU power is required to compute the optimal path.

#### 2.4. GRP

GRP routing is used into two approaches. In greedy forwarding, the data is sent to the closest neighbor of the destination node; the second approach is perimeter routing which implies planner graph traversal concept.

#### Advantages

- Route discovery and management is not required.
- GRP supports scalability
- Suitable for high node mobility pattern

#### Disadvantages

- The protocol requires position determining services.
- GPS devices don't work in tunnel

#### 3. Simulation setup and metrics

To monitor different performance matrices related to all four routing protocols in VANET environment, we have simulated some scenarios with the help of OPNET modeler 14.5. This scenario consists of 40 nodes enabled with voice application. The area considered for simulation is 10 km X 10 km. For the application designation we have included the Application config and Profile config to set the applications (voice) used by the nodes. Subsequently, we changed the routing protocol of all the nodes to all the routing protocols i.e. AODV, DRS, OLSR and GRP consecutively. The metrics considered for observation are throughput, media access delay, network load, traffic drop and delay. The seed value considered for simulation is 128.

#### 4. Simulation Results

4.1 Throughput – fig. (1) Depicts the throughput of the network. The simulation runs for the entire duration which generates result in time\_average mode, specifies OLSR has maximum throughput, than AODV. GRP protocol gives minimum throughput, whereas DSR remains behind to AODV.

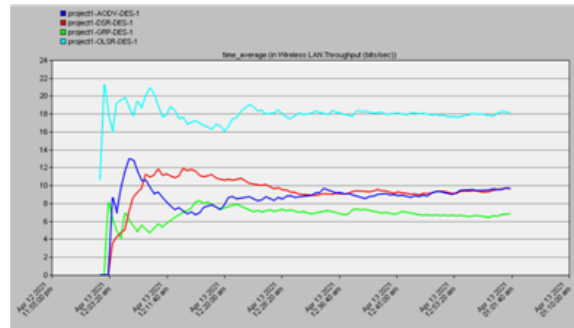


fig. (1) Throughput in the network

4.2 Network Load – as depicted in fig. (2) The network load for AODV and DSR is equal minimum at approx. 10 min. of the experiment. Further the network load increases steadily throughout the execution. At the same time interval, GRP has 1000 bits/sec network load, further remains constant. The OLSR has maximum network load 2200 bits/sec.

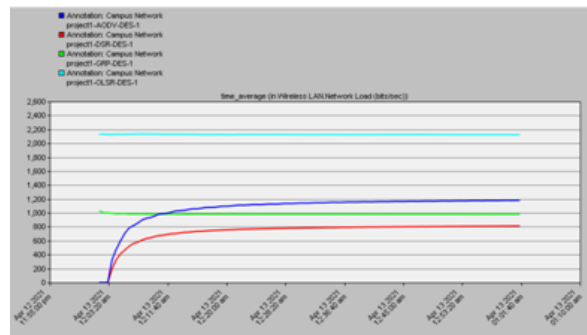


fig. (2) Network Load in the network

4.3 Media Access Delay – GRP protocol has maximum peak of Media Access Delay at around 20% time of the execution; further the delay gets decreasing. OLSR and DSR have gradual increase in their delays. AODV protocol has minimum delay and it remains consistent throughout the experiment, as shown in fig. (3).

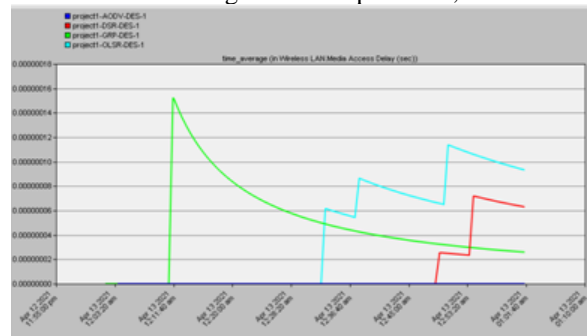


fig. (3) Media Access Delay in the network

4.4 Traffic Dropped – fig. (4) Specifies OLSR protocol has the maximum packets traffic drop. Other protocols AODV, DSR and GRP have minimum packets traffic drop.

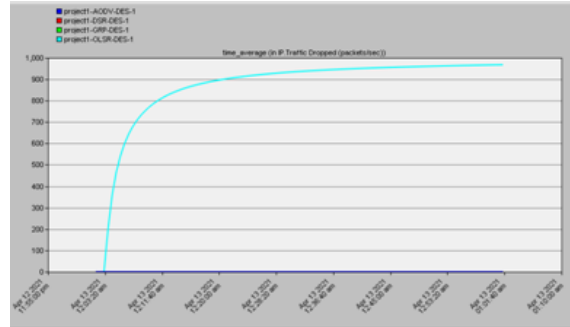


fig. (4) Traffic Dropped in the network

4.5 Delay – All protocols have propagation after 10% of execution time, DSR has minimum delay 0.00024 s, which remains constant further. OLSR and AODV protocols are having slightly higher delay than DSR and it remains constant in execution. The GRP protocol has highest delay peak 0.00030 s, which further gets decreases until reaches to 0.00026 s.

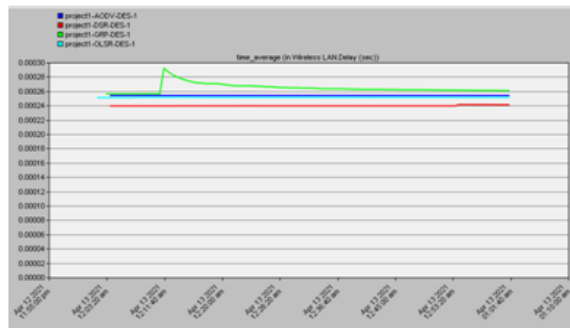


fig. (5) Delay in the network

## 5. Conclusion

In this work, simulation based analysis has been carried out to analyze the VANET system performance using different routing protocols. In this paper, we have reviewed many studies related to routing protocols. As per the research completed, AODV proved to be the best routing protocol in VANET environment. The proposed simulated results may be serving as guidelines for design of modern traffic control mechanisms which follows safety application, faster data packet dissemination and intermittent connection problem in VANETs.

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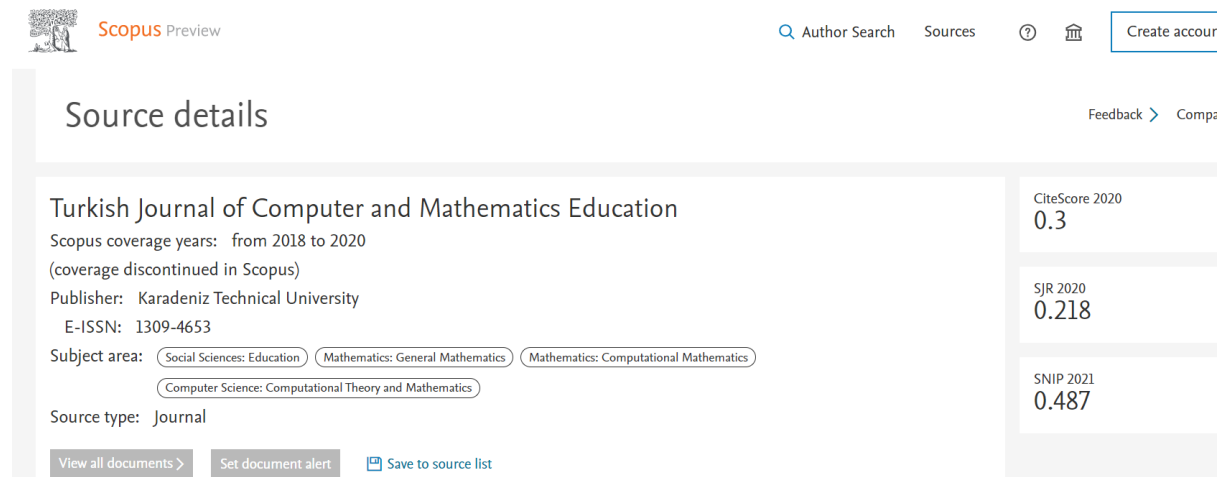
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## QoS Routing Protocols for Aeronautical Ad hoc Networks : a Survey

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**Abstract:** In Aeronautical ad hoc networks which is one of the family member of wireless ad hoc network and subset of MANET and VANET due to Some factors like high mobility, multi-hop communication and huge geographical area and therefore Quality of Service (QoS) routing is a critical issue. Some researchers have been done performance and comparison study to provide QoS assurances in AANET routing protocols. In current years some of QoS routing protocols with distinguishing capabilities were proposed for AANET .This paper presents a survey of some of these protocols which include a overview of all elements, evaluation parameters and recourses of QoS routing which can be affecting the performance.

**Keywords:** QoS ,AANET, routing protocols

### Introduction:

Aeronautical ad hoc network (AANET) is highly dynamic mobile ad hoc network between aircrafts, which enables communion among ground station and air perceive information. Research study have showed that it is possible to set up a mobile ad hoc network among the aircraft thus providing a multi- hop communication link between the airliner and the ground base station. Compared with the normal ad hoc networks, the airliners in AANET move at a very high speed, typically 700km/h to 1000km/h [1]. So the multi-hop communications in AANET are extremely unbalanced due to the frequent network topology changes.

Airplanes are connected through wireless links to build a live and on-the-fly network called a Aeronautical Mobile Ad-hoc Network (AANET). The airplanes (nodes) communicate among themselves and act as both hosts and routers. Hence, maintaining appropriate Quality of Service (QoS) for AANETs is a complex task due to the dynamic behaviour of the network topology. Commonly, QoS for a network is measured in terms of the guaranteed amount of data which a network transfers from source to destination within specific time. The QoS is identified as a set of measurable pre-specified service requirements; such as delay, bandwidth, probability of packet loss, and delay variance (Jitter). The traffic types in aeronautical ad-hoc networks are quite different from other infrastructures and the use of wireless technologies in AANETs make the QoS approaches more complex.

Basically, Wireless ad hoc network is more and more utilized in the military aeronautical network communication domain, such as High Frequency Intra Task Force (HF-ITF) developed by the Office of Navy Research (ONR), its objective is quickly realizing interoperability between the navy and the air with lower cost. DARPA and Air Force Research Laboratory (AFRL) commissioned Rockwell Collins to be chargeable for the tactical focused on community technology (TTNT), to attain the speedy discovery of time touchy objectives and well timed attacking [2], [3]

Accordingly, such networks are annoying to have unique capabilities; i.e., independent architecture, allotted operation, multi-hop routing, reconfigurable topology, fluctuating hyperlink capacity, and mild weight terminals. Thus, several interesting issues can be technically involved when designing AANETs; such as security, routing, reliability, internetworking, and power consumption due to the shared nature of the high mobility ,Frequent topology change ,limited bandwidth,node density and Sparse distribution of the ground stations. Therefore, providing suitable QoS for delivery of real-time communications in AANETs is more challenging.

In this paper, we have provided the theoretical study of issues and challenges for QoS protocol in AANETs which have been found after study of previous research papers, we also presented routing protocols specially consider for AANET as it has been found that current routing protocols which are being used for MANET are



not able to cope with AANETs environment.

## **ISSUES AND CHALLENGES FOR QOS PROTOCOL IN AANET**

### **A. Mobility**

There is a strong need for providing connectivity in aircraft, so that they can continuously communicate with other devices attached to the Internet, at any time and anywhere. However, the connectivity of the network may be frequently interrupted due to the excessive pace of aircraft [4] and sometime interrupted by weather, highly-dynamic wireless channel fluctuations as well as changing topology [5]. Hence, the network protocols of AANETs have to be more flexible. The inevitable delay problems due to routing over large geographical distances and the connectivity troubles because of the frequent setup and breakup of verbal exchange hyperlinks amongst plane require extraordinarily strong answers to help excessive mobility.

### **B. Congestion**

AANETs are intended for providing Internet access, it required all multi-hop traffic to flow through the GSs, gateway congestion may be caused at or among the aircraft near these Ground Stations. Moreover, by efficiently allocating flows, the traffic may be balanced amongst the gateways to avoid congestion as well as routing of packet in the network, the path between an aircraft and a gateway determines the service which is provided by the gateway to the aircraft. The approaches of Internet gateway allocation, routing and scheduling which minimizing the common packet delay within the network.

### **C. Threats**

It is extremely critical to secure AANETs from every conceivable threat. Generally, the security threats to aircraft networks are internal and external ones. Internal safety threats originate from the in- cabin passenger community. On the other hand, the external security threat is caused by the security vulnerabilities of the communication links [7]. In the future, available radio spectrum will become more scarce. However, the signal transmissions in AANETs take place over A2A, A2G and A2S across airports, populated and unpopulated areas, each having different bandwidth requirements

### **D. Decentralized control:**

The aeronautical network is set up spontaneously and all nodes may join or leave the network anytime. So there may not be any centralized control on the nodes which causes increased algorithm's overhead and complexity, as QoS state information must be disseminated efficiently.

### **E. Unpredictable channel:**

The bit mistakes are the primary hassle which arises due to the unreliable wi-fi channels. These channels motive excessive bit blunders price and that is because of excessive interference, thermal noise, multipath fading effects, and so on. This ends in low packet delivery ratio.

### **F. Data Loss:**

It refers when the data is loss or packet loss when the data is send from sender to receiver due to distortion.

### **G. Route Maintenance:**

The maintenance of network state information is very difficult due to the frequent changes in the network topology and changing behaviour of the communication medium. During the data transfer process the predefined routing path may be broke so that it is become important to focus on maintenance and reconstruction of routing paths with minimal overhead and delay required. The QoS aware routing would require the reservation of resources at the intermediate nodes[8].

## **EVALUTION PARAMETERS FOR QOS ROUTING PROTOCOLS**

As different applications have different requirements, the services required by them and the associated QoS parameters differ from application to application as per their service requirement. For example, in multimedia applications, bandwidth, delay and delay-jitter are the key QoS parameters, whereas military applications have stringent security requirement. The following is a sample of the metrics commonly used by applications to specify QoS requirement to the routing protocol.

### **A. Throughput –**

In AANET throughput is defined as rate of how much data can be transferred from source to destination within a given timeframe over the wireless infrastructure and it is measured by how many packets arrive at destinations . Throughput generally measured in bits per second or data packets per second/per timeframe.

Throughput = Total packet received/ amount of forwarded packet over certain time interval

### **B. Dropped Packets –**

Dropped packets are the number of packets that sent from the source node and unable to reach the destination node successfully.

Dropped packets = sent packets – received packets

### **C. Mean inter arrival time -**

- Mean inter-arrival time is the summation of inter-arrival times of packet divided by the number of received packets and can be computed by the following equation

$$av = (\sum ai/n)$$

### **D. Average end to end delay-**

End-to-end delay refers to the time taken for a packet to be transmitted across a network from source to destination.

The average end to end delay can be calculated by summing the times taken by all received packets divided by its total numbers.

Average E-2-E =  $\frac{\sum(\text{received time-sent time})}{\sum(\text{number of packets})}$

#### **E. Jitter –**

Jitter in ad hoc networks is the **variation in the latency on a packet flow between two nodes**, when some packets take longer to travel from one node to the other. Network congestion, timing drift and route changes may affect jitter.

The basic standard term is "packet delay variation" (PDV) which is an important quality of service (QoS) factor in evaluation of network performance.

Jitter (J) =  $D_{i+1} - D_i$  where  $D_{i+1}$  is the delay of  $i+1$  packet and  $D_i$  is the delay of  $i$ th packet.

#### **F. Packet delivery fraction (PDF) –**

Packet delivery fraction (PDF) can be measured as the ratio of the delivered packets at destination to the packets sent from the source node.

PDF =  $100 * (\text{Number of received packets} / \text{Number of sent packets})$

#### **ROUTING PROTOCOLS IN AANETS:**

After a lot of relevant survey of Adhoc networks, we observed that some traditional MANETs routing protocols are not effective to meet QoS implementation in AANETs due to its very high mobility of aircraft nodes and large geographical area.

So, there is a need to find out suitable routing protocols for these highly dynamic Ad-hoc networks. Here, we present some of the protocols which may be implemented in these networks.

#### **Open Shortest Path First (OSPF):**

Open Shortest Path First (OSPF) internet routing protocol which is designed based on link-state algorithm. OSPF is used to find the best path between the source and the destination router using its own Shortest Path First. OSPF is developed by Internet Engineering Task Force (IETF) which is one of the Interior Gateway Protocol (IGP), i.e, the protocol which aims at moving the packet within a large autonomous system. It is described as OSPF Version 2 in RFC 2328 (1998) for IPv4. If timer settings are reduced then there will be a decrease in packet loss during link failures. The overhead can also be reduced to meet out the problem of scalability.

#### **Multi-Meshed Tree (MT) Protocol:**

This approach is basically a combination of clustering, reactive and proactive routing schemes[9]. This protocol has been evaluated for strong connectivity amongst distinctly dynamic. This is hybrid approach of proactive Multi-Meshed Tree (MMT) and Reactive Multi-Mesh Tree (RMMT) is employed for inter-cluster routing. This protocol has outperformed other protocols in terms of success rate percentage, End-to-End packet latency, and file transfer delay.

#### **Predictive-OLSR (P-OLSR):**

This protocol makes use of GPS data available on board in aircraft which is able to track changes in highly dynamic network. For highly mobile Aircrafts Networks, geographic routing protocols can prove to be very successful as this GPS data can be obtained from airplanes. Some researchers proven that P-OLSR outperforms OLSR for frequent topology changes by the experimental and simulation results.

#### **Reactive-Greedy-Reactive (RGR) Protocol:**

Reactive-Greedy-Reactive (RGR) is a routing protocol designed for UAANETs. RGR covers both the characteristics of topology-based protocols and position-based protocols. RGR is a combination of AODV and GGF with no recovery strategy. This is a promising routing protocol for high mobility and dense scenarios. The concept of scoped flooding and mobility prediction will be used to improve the original RGR protocol [11].

#### **AeroRP:**

AeroRP is a geographic routing protocol that can be configured to run on one of three modes: ad-hoc mode, GS-location mode, and GS-topology mode. In addition, It has two parallel phases: neighbour discovery and data forwarding. This is another geographical protocol for highly dynamic networks for AANETs geographical information can be helpful for improved routing. AeroRP also is very helpful for improved accuracy, less delay and overhead, etc.

#### **DREAM (Distance Routing Effect Algorithm for Mobility):**

Here, the frequency of sharing of location information among the nodes is decided on the basis of inter-node distance and how fast the individual nodes are moving. More the nodes apart from each other, the less often position updates need to be shared. This way DREAM optimizes the rate of generation of control messages [12].

#### **Location-Aided Routing (LAR):**

It is also based on the concept of wedge zone which is referred to as the request zone as used in the DREAM.

This request zone is used to forward the route request instead of data packets[13, 14]. There are two different methods to decide if a node is in the request zone. In the first method, the sender sends a route request containing the coordinates of a rectangular area which has the request zone. A node receiving this request message will discard it if it is not in the rectangle and forward it if it is. In the second method, the request zone is not defined explicitly but instead, the packet is forwarded based on the distance between the sender and destination nodes.

#### **Optimized Link State Routing (OLSR):**

OLSR is a proactive link-state protocol this routing protocol uses HELLO messages and topology control (TC) messages to discover neighbour node [14]. The HELLO messages are used to find out the neighbour nodes in direct connection (i.e. one hop). While Topology Control messages are used to build a topology information base. This protocol can be used for ad-hoc networks having bandwidth and neighbour mobility. OLSR uses the Multi-point Relay (MPR) technique to reduce control traffic overhead.

#### **Conclusion**

In this paper, we have presented a survey of QoS aware routing protocols for aeronautical mobile adhoc networks. A lot of research has been done in this field. However the different protocols discussed in the paper are very effective and useful for new researchers to identify topics for further research. The QoS routing in an ad hoc network is a challenging task due to inherent characteristics of such a network. Here, following points are covered in this paper: 1) A review of the basic concepts and challenges of QoS routing in AANETs. 2) evaluation metrics for qos routing protocols and 3) The classification of the routing protocols has been done.

The protocols are selected in such a way so as to highlight many different approaches to QoS routing in AANETs, so as to explore the future areas of research. All the QoS routing protocols discussed above can further be explored in many prospective to improve their performance.

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# Automated Test Script Generation Framework

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## ABSTRACT

In software testing test cases can be designed either manually or automatically. In this paper, we are introducing a framework for automatic test data generation. We put a large emphasis on automating the software testing process to generate the test cases that produce more complex code with less effort using some intelligent techniques like natural language processing.

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## KEYWORDS

Software testing, Natural language Processing (NLP), automated test case. Generating test script

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## 1. INTRODUCTION

Software testing is an activity to ensure quality in software systems. It is an important but expensive activity in the software development lifecycle. It is used to strengthen the quality of the product before delivering it to the client.

However, software testing is costly. Statistics say that 50% of the total cost of software development is devoted to software testing even if it is more in the case of critical software [1]. Automation Software Testing involves different activities like selection of test tools, defining the scope of automation, planning, design, development, execution, and maintenance, etc. Good

quality software can be made by using an efficient test method. The problem is how to reduce the software testing work while ensuring good quality software. Some solutions involve software execution automation tools, outsourcing the testing tasks at lower labor rates. Such solutions still depend upon individual skills in the generation of the test cases. [2]

In automation software testing tools test execution involves running tests on a computer system manually. Such solutions still depend on the programming skills of the tester to write the test script. In this paper, we focused on the automatic generation of test scripts rather than writing it manually.

## 2. MOTIVATION

Software engineering research puts a large emphasis on automating the software development process that produces large and complex quantities of code with less effort [1]. For software testing, we need to find advanced intelligent support procedures to automate the testing process [3]. In spite of continuous effort till today automated testing has limited impact in the industry, where the test generation activity remains largely done manually. Automation testing requires expertise in multiple languages and technologies, also it requires manual intervention to create test script, to execute, monitor and maintain automated tests. What we need is 100% automated testing to reduce the overall cost of software development with high quality [1]. Most of the times, design and maintenance takes the majority of the time allocated for automation of test scenarios and there is an extra cost for maintenance of the test automation team and training on specific tools being implemented.

One of the phases in automation testing is test-case design in which the human tester uses written (formal) requirements, written often in natural language (NL), to derive a set of test cases. There are many approaches proposed in the different literatures to reduce these manual efforts for conversion of natural-language requirements into automated test cases using NLP, using UML or code.

NLP is Natural language processing (NLP) is an area of computer science and artificial intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to process and analyse natural language data. The high-level design idea of using NLP is to generate automated test cases from a test scenario. A number of test data generation techniques such as random test data generator, path oriented test data generator, goal-oriented test data generator, and intelligent test data generator have been automated [1].

## 3. AUTOMATED TEST SCRIPT GENERATION FRAMEWORK

Our framework is basically designed for keyword-driven testing. In this Framework manually written test cases will be processed by using intelligent techniques called NLP, in which we identify low- level as well as high-level keywords, implement the keywords as executable, create the test cases, create the driver scripts and execute the automation test scripts. This driver script which we generally create manually will be implemented automatically through this framework.

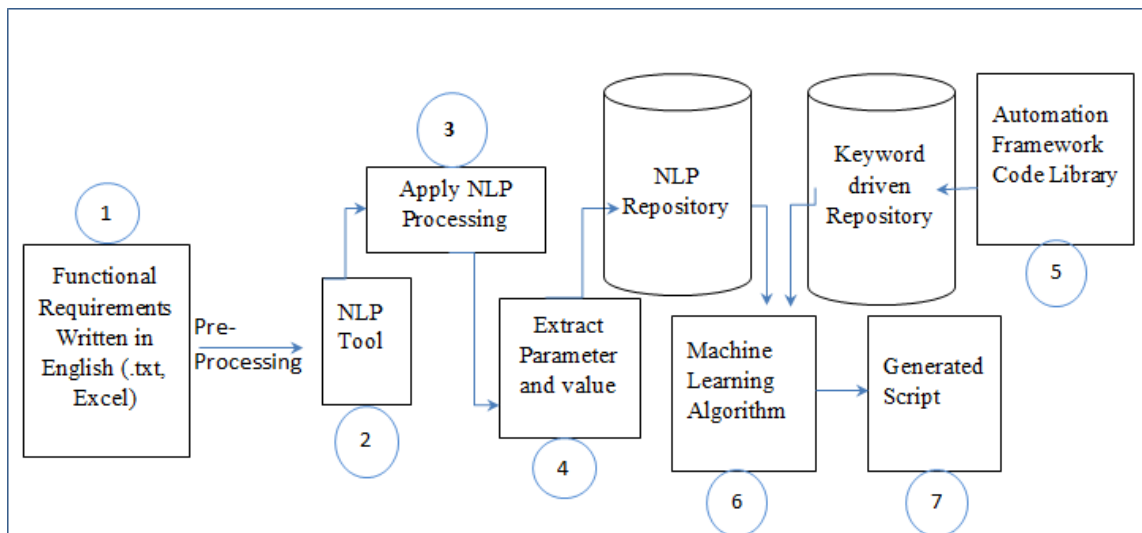


Fig. 1- Automated Test Script Generation Framework

This Automated Test Script Generation Framework follows some set of steps which are as below.

1. In the first step Natural Language parser will parse the functional requirement document, which content a test scenario with attributes expressed in natural language. This document is the input to the system.
2. In step two NLP tool will process the document. The Parser will parse the user test cases/test scenario written in natural language (English).
- 3 The NLP tool will parse the morphologic, syntactic and semantic approaches requirement of the document [4].

Through this parsing, we will extract the object, its value, and the handler. This information is used to match with available test building blocks of testing, and store them into an NLP repository.

4. In this framework, we are having another repository called Keyword Driven Framework Repository that will get data from the automation testing keyword driven framework. This will store the keywords and other parameters into the repository according to our selected keyword driven automation tool. The idea behind the Keyword Driven approach in automation testing is to separate the coding from the test case & test step. This method helps a non-technical person to understand the automation very well [6]. In the keyword driven test framework, all the operations and instructions are written in some external file like .CSV file. Example of .csv file is

Keyword	Locator	Locator Value	Parameter
Navigate			https://www.flipkart.com/



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SendKeys	xpath	xpath [contains(text(), 'Enter your email')]	YOUR USER NAME
Click	xpath	[contains(text(),'Next' )]	
SendKeys	id	Password	YOUR PASS WORD
Click	xpath		Sign in

Table 1. Example of .CSV file

This type of data will be maintained into keyword driven framework repository.

5. Our framework will get the data from both repositories, first Repository is the repository in which we collected the parse data i.e. NLP Repository and another is the Keyword Driven Framework Repository, in which collected the data from Keyword Driven Testing Framework. This framework will map the data from both the repositories and it will apply Machine learning techniques.

6. After performing Machine Learning algorithms this framework will generate an automated test script. This will be the output of our framework. And this generated file can be an input for automation testing tools.

#### 4.

### CONCLUSION

This framework is developed for automatic generation of test scripts for automation software testing in keyword driven approach. This will reduce the task of manually writing the test script for automation testing framework. This will reduce test-generation efforts and will save the cost and time. This will also save the time of the tester for learning new programming skills which are required to generate test scripts.

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## A Framework Design for Algorithmic IT Operations (AIOPS)

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### Abstract—

AIOPS is acronym for Algorithmic IT operations which was coined by Gartner. It represents automated solutions which consists of machine learning algorithms and techniques to solve unknown, critical, complex and hidden IT operational problems. It helps to intelligently classify log events, predict alerts and standard operating procedures (SOP) and automate solutions. Since past few years, AIOPS has been growing extremely, many organisations and vendors started exploring AIOPS solutions. Gartner recently redefined AIOPS as “Artificial Intelligence for IT Operations.”

AIOPS helps to improve IT system service quality and customer satisfaction. It also boost DevOps productivity and reduce human efforts and operational cost. In this technical research work, we first summarize what is AIOPS, its components, use cases, need of AIOPS platform and real-world challenges. We then propose a framework design for AIOPS platform based on our earlier research work and outcomes. AIOPS is still evolving which need continuous learning and improvement through scientific research and experiment work.

**Keywords** -AIOPS, DevOps, Machine Learning, Log Operations.

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### [1] INTRODUCTION

#### I. WHAT IS AIOPS?

AIOPS refers IT domain which manages and processes various system data of their IT environments using different resources and machine learning (ML) / artificial intelligence (AI) algorithms. As shown in Figure 1, AIOPS combines big data and machine learning techniques to automate complex IT operations which includes classification,

prediction, event correlation and anomaly detection. It is a continuous process of monitoring, learning, managing alerts / incidents and automating implementation of solutions. AIOps collects and processes historical as well as real time data which contains system logs, events, alerts and metrics. Most of organisations defines AIOps as per their understanding and requirements.

As per Gartner definition “AIOps is a platform which utilizes big data, machine learning algorithms to enhance IT operations (like system monitoring, and solution automation) with proactive approach, and more dynamic insight. AIOps platforms can enable parallel use of multiple data sources and data gathering methods, analytics ( historical and real-time) and presentations.” [1]

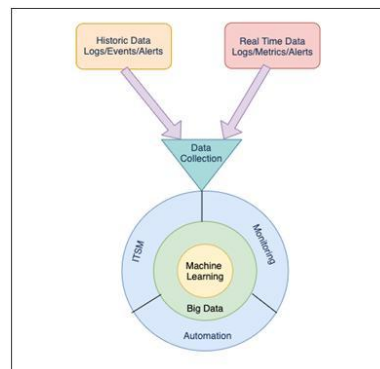


Figure 1 AIOps basic

AIOps platform bridges different IT Operations:

- IT Service Management
- Automation
- Monitoring

## II. COMPONENTS OF AIOps

- *Data Input Sources* - There are various data sources like monitoring events, metrics, incidents, logs etc.
- *Real Time Data Processing* - Systems which accesses and pre-processes input data from data sources in real-time.
- *Rules and Patterns Mining* - Systems which can detect find patterns from the pre-processed data to uncover hidden patterns, association and abnormalities.
- *Domain Algorithms* - Algorithms which allow domain based system to react automatically on detected abnormalities and variations from normal behaviour and it's causes.
- *Machine Learning / Artificial Intelligence* - It improves decision-making ability using Machine learning or Artificial Intelligence algorithms and techniques.
- *Automation* - It uses Machine learning or Artificial Intelligence algorithms results to automate standard operating procedures (SOP) to reduce DevOps workloads and improves systems availability and performance.

### III. USE CASES OF AIOPS

- *Prediction of outages and failures* - Analysis and prediction of warnings/alerts and outages based on supervised learnings using ML algorithms allow admins to take proactive actions to prevent it.
- *Event Correlation* - To troubleshoot system problems, it is critical to understand correlations between events.
- *Anomaly Detection*- Dynamic thresholds allow AIOps to determine what is a normal and abnormal activities.
- *Root Cause Analysis(RCA)* - Determining cause of problem by tracing it to root by using event correlation and log analysis to fix. It reduce Mean Time To Detect(MTTD) and Mean Time to Repair (MTTR).
- *Alarm Management*- AIOps identify false alerts and gives only legit alerts in case of anomaly detection.
- *Intelligent Remediation*- AIOps automate standard operating procedures (SOP) action to resolve problems.

### IV. WHY AIOPS?

IT industry has been evolved from desktop products to online services or applications. The way these services has been built and released are different from traditional desktop products, which brings up the complexity and importance of operational efficacy for online application services. Today's applications are complex and critical. Cloud computing has increased more complexity in application architecture and deployments. DevOps is a process of continuous development, integration and deployment of application services. In software industry Agile methodology and DevOps culture has been widely adopted in almost every organisation. Due to evolution and implementation of cloud computing, microservices, serverless technologies the scale and complexity of application services have increased drastically. Any mistake in this continuous process from designing architecture to deploying codebase and monitoring application can degrade system performance and impact on customer experience. It can also result in interruption of services which cost to business. To address these DevOps IT operation challenges using AI, the term AIOps came out from Gartner [2]. Generally, AIOps can help empowering software applications, engineers and DevOps to efficiently and effectively build and operate application services that are easy to support and maintain by using artificial intelligence and machine learning techniques. The outcome of AIOps is significant, ensuring high availability of services, maintaining quality of services and customer satisfaction, boosting productivity of engineers and DevOps, and reducing operational cost. Below are some major reasons for AIOps platform:

#### A. *Data volumes are large and disparate*

In this decade, we have seen data explosion. There are various sources of data generation due to digital devices, mobiles, IoT devices, Cloud computing etc. The velocity and volume of data is countless. This big data management is nightmare for DevOps and administrators. Building and processing ML models are time and resource consuming process, which ultimately cost to business.

#### B. *Manual Troubleshooting*

In IT operations, keeping system up and running is top most priority. If there are any interruptions or degradation to services, it creates all hands on deck situation for DevOps team. Manually troubleshooting any system through logs, events and alerts is like searching needle in haystack. It definitely increase mean time to detect (MTTD) and mean time to repair (MTTR) of business application which may causes long system downtime. Any system degradation or downtime may lead to business loss and ultimately lose customer trust.

### *C. Emerging Tools / Technologies*

There are plenty of tools and technologies are emerging on daily or weekly basis due to adaptation of agile and DevOps methodology, software / tools are getting build and deploy very quickly. Also microservices, serverless, cloud computing, big data and machine learning technologies adding more complexity towards IT operations. To cope up with these emerging tools and technologies is almost impossible for humankind.

### *D. Bombardment of Alarms*

As there is explosion of data and technologies, it generates tons of logs, events, alerts and alarms. Most of times, they are non-critical and false because of mis-configurations. Single issue can create many events and alerts, which confuses and overload monitoring systems. To handle these bombardment of logs and alarms is almost impossible for DevOps and admin teams without Machine Learning techniques.

## **V. AIOPSSChallenges**

### *A. Lack of innovation in methodologies and mindset*

To build AIOpsplatform, it requires business or domain specific experience to understand application and think holistically. It also need bettervisualisation about the whole system, problems, business perspective, data models, constraints and integration considerations. Today, there is lack of innovation methodologies that can guide people in different disciplineslike business stake holders, engineers, data scientists to build AIOps solutions which leads to difficulty in mindset shift. AIOps is a complex, multi component, continuous learning and improvements system.[3]

### *B. Need of changes in engineering to build and support AIOps*

Traditional engineering standard practices does not fit currentbusiness requirements. Building AIOpsplatform needs significant engineering and operational efforts. AIOpsoriented engineering and operationsare still in early stage. The best practices, principles and design patterns are not defined in the IT industry yet. For example, AIOps principles should include dataandlabel or tag quality monitoring. The quality and quantity of data available today cannot serve the needs of AIOps solutions. Today major cloud services collectshuge amount of telemetry data every day/month, there still lacks representative and highquality data for building AIOps solutions. A continuous improvement of data quality and quantity is necessary.[3]

### *C. Challengesin building ML models for AIOps*

There are lot of challenges in building ML/AI model for AIOps solutions because those are not always seen in other typical ML/AI scenarios and solutions. To develop supervised machine learning model for AIOps, there are challenges like no clear data labels or lot of manual efforts to label and obtain high data quality [4], there are complex dependencies/relations among various components and services [5], also there are complicated feature engineering efforts required due to the high complexity of cloud computing service behaviours. In most of AIOps scenarios, there is difficulty in labelling a data, it is sometime feasible in only unsupervised machine learning models. For example, detecting anomalous behaviour of services [6].

## [2] RELATED WORKS

AIOps is a interdisciplinary research and innovation area. It is a long journey for IT industry to implement complete AIOps solutions. In this research, we focus on technical innovations and aspect that are required to achieve AIOps platform. However, AIOps research is not entirely new field. Many research works on software or data analytics can be represented as AIOps innovations.

### A. *Evolving from Traditional Systems to AIOps*

In this research, researcher proposed a AIOps system which adopts layered design with interoperability services between modules, which makes it well compatible with traditional systems. Researcher implemented their AIOps system with some considerations and deployed it in a large IT system environment with thousands of devices and achieved good results [7].

### B. *Reducing Incidents Using Correlation Approach*

In this work, researcher emphasis on discussing AIOps and explains the model needed to handle digital changes in IT operations. AIOps platform is useful for complex IT systems and infrastructures which require continuous monitoring and resolution in case of accidents. [8]

### C. *Self-Supervised Anomaly Detection from Distributed Traces*

The focus of this research is on anomaly detection based on distributed tracing records which contains information of services of distributed system. Detecting trace anomalies accurately is challenging due to large number of microservices and complex calls between them. Researcher proposed supervised method and task formulation for anomaly detection problem. The evaluation shows high accuracy and solid performance in experiments. [9]

## [3] AIOPS FRAMEWORK DESIGN

In Figure 2, we propose high level methodology of AIOps system. In IT organisation, there are lot of application system works for various business purposes. Those application systems continuously generates logs, metrics and incidents from database, network, application and OS technical stacks. Based on their severity, these inputs can be pre-processed and categories into error, warning or information. These data pre-processing transforms raw





## [4] AIOPS FLOWCHART

A flowchart is a graphical representation of steps to complete the intended task. In Figure 4, it shows flowchart of algorithm for AI Ops platform which work through different phases. It starts with IT system monitoring's of applications and databases to collect logs and event data. After pre-processing it gets ready for ML algorithms. Based on requirements, AI Ops framework apply ML algorithm like Association, Clustering, Prediction and gives efficient analysis which helps to reduce system operational problems and reduce MTTD and MTTR. AI Ops results can be used to implement provided recommendation through automations.

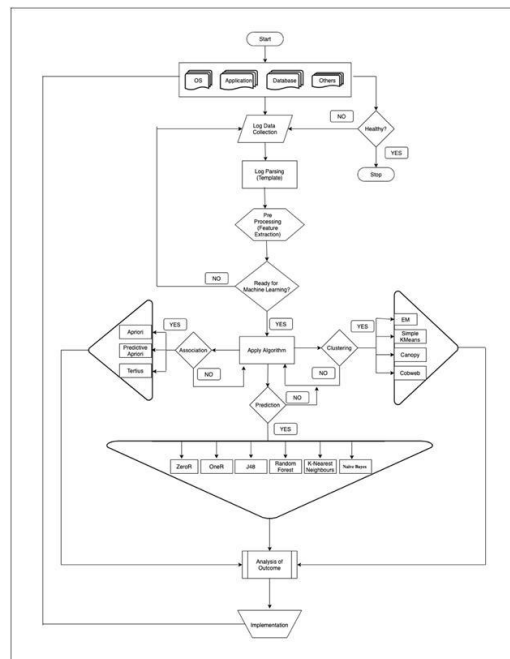


Figure 4 AI Ops Flowchart

## [5] AIOPS BENEFITS

- Simple to use : There is no configuration or ML experience required.
- Auto Detection: AI Ops continuously analyses streams of data and metrics to determine application behaviour.
- Quick Resolution: AI Ops help to resolve issues quickly with ML techniques.
- Reduce noise: AI Ops helps to overcome alarm fatigue by automatically correlating and grouping related anomalies.
- Reduce MTTD and MTTR: AI Ops helps to reduce mean time to detect and mean time to recover systems.

## [6] CONCLUSION

Machine learning or Artificial Intelligence techniques can be used to provide IT operations solutions. AI Ops platform should be built on this concept to solve IT operational challenges. AI Ops platforms use machine learning power to discover hidden relationships between log events and alerts.[11] Machine Learning algorithms efficiently predicts the Standard

Operating Procedures (SOP) based on different alerts triggered from various system sources.[12]

This paper addresses the problems of IT operational challenges by designing systematic algorithmic framework and flowchart. We addressed the IT operational problems by introducing new machine learning and log based platform – AIOps. The proposed approach opens a new possibility for Association mining and Clustering to detect patterns and sequences. AIOps also gives possibility for Classifications of log events and alerts to predict possible outages / problems in the system.

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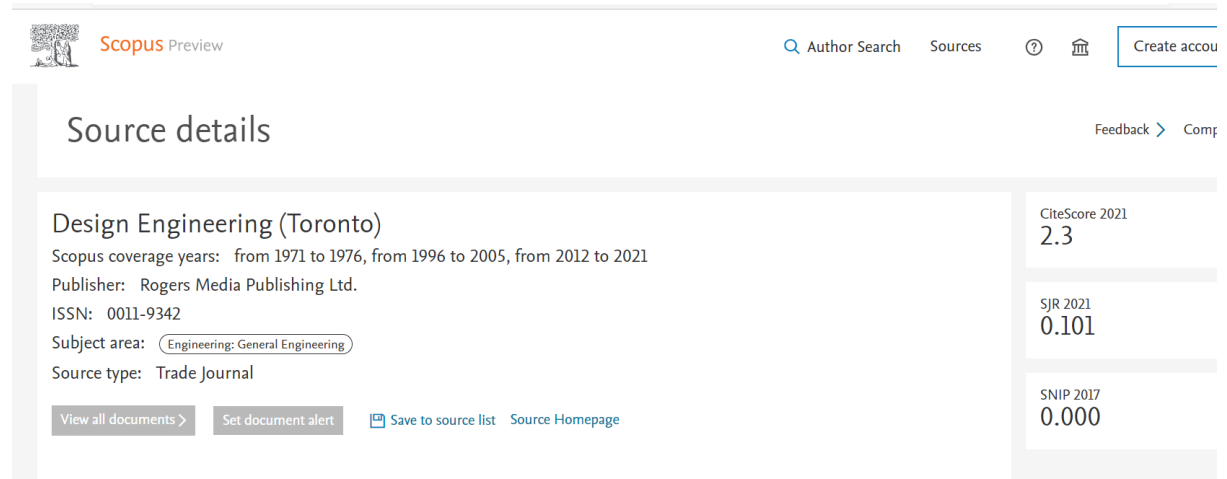
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## Performance of MyNET Model on Handwriting Biometrics

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### ABSTRACT:

This paper is in the continuation of Writer Identification using Neural Network[1]. Offline signature identification is the challenging task till date. Unlike to verification problem of one-to-onemapping, identification maps single with rest them to identify the signer. For this process we model a model using convolution neural network. This paper explains the performance of MyNET model on MyNET offline signature dataset which consists of 434 writers 20 signatures each.

**Keywords:**Signature Identification, CNN, Handwriting Biometrics, MyNET, neural network

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### Introduction:

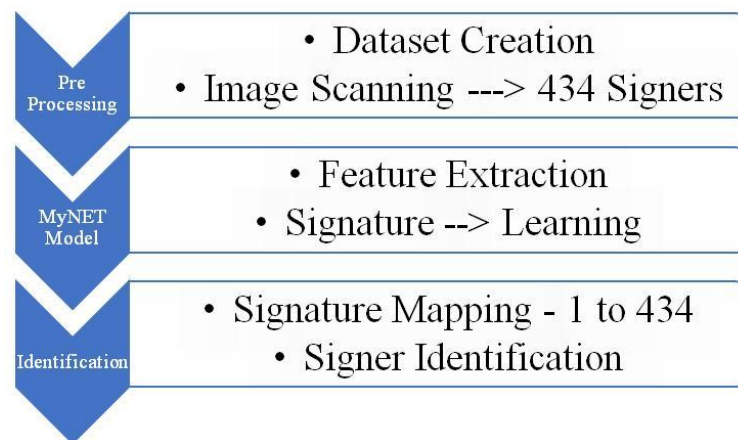
Biometric systems play major role in different applications. The two main important biometrics widely used are fingerprint scanner and iris scanner with many applications in different areas such attendance monitoring to security access controls. Handwriting biometrics usually referred as signature is mainly used largely in banking and legal application thought the globe. But due to their performance issues they are less used.[2][3]

There are two major problems associated with handwriting biometrics. They are namely, i) Writer Identification ii) Signature Verification. The writer identification is based on the identifying the signer from previous set of signatures available. For the process of identification current signatures is mapped with every signer's signature and based on matching pattens the writer is identified. Instead in signature verification process claims are made based on the signer

and only the process maps current signature with the only claimed signer's signature available. If the matching patterns is more that desired the verification confirms the signer to be valid.[4][5]

There are mainly two major techniques used in handwriting biometrics mainly, i) Offline and ii) Online. In offline, signatures are generally made on the piece of the paper and then they are computerized using scanners and then process with image processing techniques. On the other hand, in online signatures are captured using devices such as digitizers and then are process based on the parameters recorded during the acquisition process. Due to the advantage of acquiring the parameters using digitizers online techniques provided more accurate results compared to offline.[6][7]

## Proposed Architecture:



*Figure 1 Identification Process*

In order to study the performance which will identify the signer the following architecture has been implemented and performance was recorded.

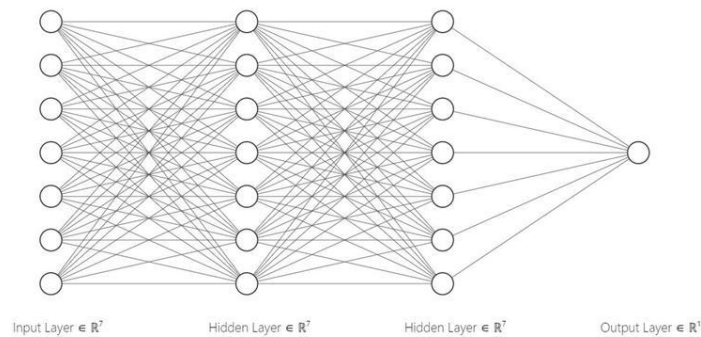
There are three major processes as shown in figure 1.

### 1. Dataset Creation

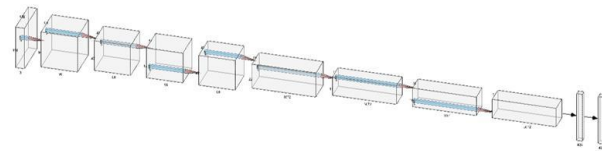
There are several existing datasets available for offline signature verification. Major of the datasets were on mixed mode i.e., offline and online. In the previous research work we have found the offline signatures datasets have signatures varies from 300 to 3000[1]. Hence, we proceeded to create a larger dataset with at least 8000 genuine signatures.

20 signatures of each signer were collected using page and paper method. Then using HP scanner with 1200 dpi each signature scanned and store separately with coding separate numeral for each signer. In this process we collected signatures from 500 signers. After implementing selection process for each signature 8680 signatures of 434 signer's 20 each were shortlisted for further process. With these signature MyNET signature dataset created.

## 2. MyNET Model



*Figure 2 MyNET Neural Network Architecture*



*Figure 3 MyNET Framework Architecture*

- Image Preprocessing – Each signer’s signature images were of different sizes. All images were resized for common input size [224 224]. The colour images were converted to grey scaled images.
- Convolution Neural Network[8] – Each signature image was processed for convolution with 5 by5 filter matrix and such 96 different random filters were used to create 96 filter maps. Followed by ReLu Activation functions to remove negative values. We have done down sampling of these images further using max-pooling layer. Since the filter numbers are large, we have use mini-batch normalization to speed CNN training further.
- Multiple Convolutions – 32 Grouped convolutions were implemented with ReLu and Average pooling for performance and speed improvement. Further cross-normalization was implemented channel wise. Additionally, drop-out layer added at the end to randomize the values to improve the performance of the network.

### **Experimentation:**

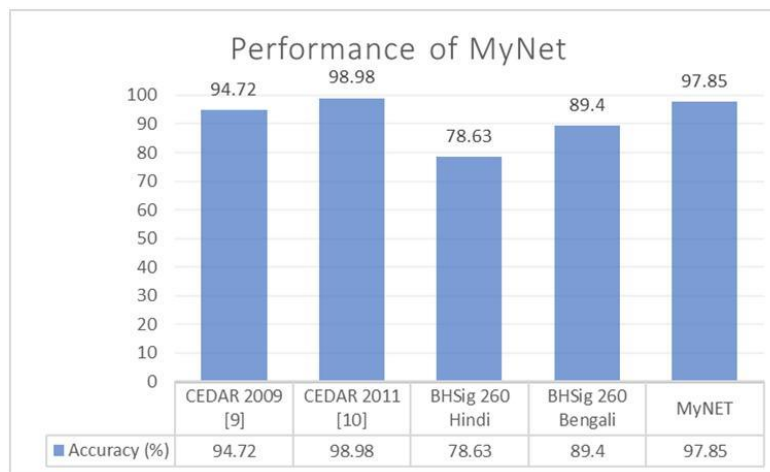
## 3. Identification

To study the performance of our MyNET model for the process of signer identification we have used our own dataset MyNet with 434 signers. Our objective was to identify the signer from the set of signatures available. Hence, we have implemented writer dependent signer identification. From the dataset randomly signatures were split into two different set for the process of training and validation. 21 different sets of 352 signatures each were created and MyNET model

implemented with cross validation. Since all of the signatures where genuine accuracy of signer identification was measured for each set.

## Results:

Considering new era of computation with enhancement into computation technologies, a larger dataset always important for research advancement. MyNET dataset with 9000+ genuine signatures without any synthetic signature creation could be larger dataset in this category. The performance of MyNET Model with larger dataset gives promising results for further research work. Below Table shows performance of MyNET model on different datasets with accuracy.



*Figure 4 Performance of MyNET on different datasets*

Based on the performance of MyNET Model on different dataset given in the above table we state of results as follows:

1. The performance of MyNET is promising on CEDAR datasets.
2. The performance of MyNET on BHSig 260 varies a lot with different Indic Scripts. In Hindi, performance has reduced below 80. This indicates to research further to improve the performance.
3. Compared to the performance with other Bengali shows less performance but considering other literature its still promising.
4. The accuracy of MyNET model on MyNET dataset and other as mentioned above proves the stability of the model with some variation to Hindi.

## Conclusion:

Handwriting biometric framework based on convolution neural network showed high accuracy performance on different datasets. The parameters could be further tunes to improve the



performance to other scripts as well. This model can be further implemented in real life application for signer identification.

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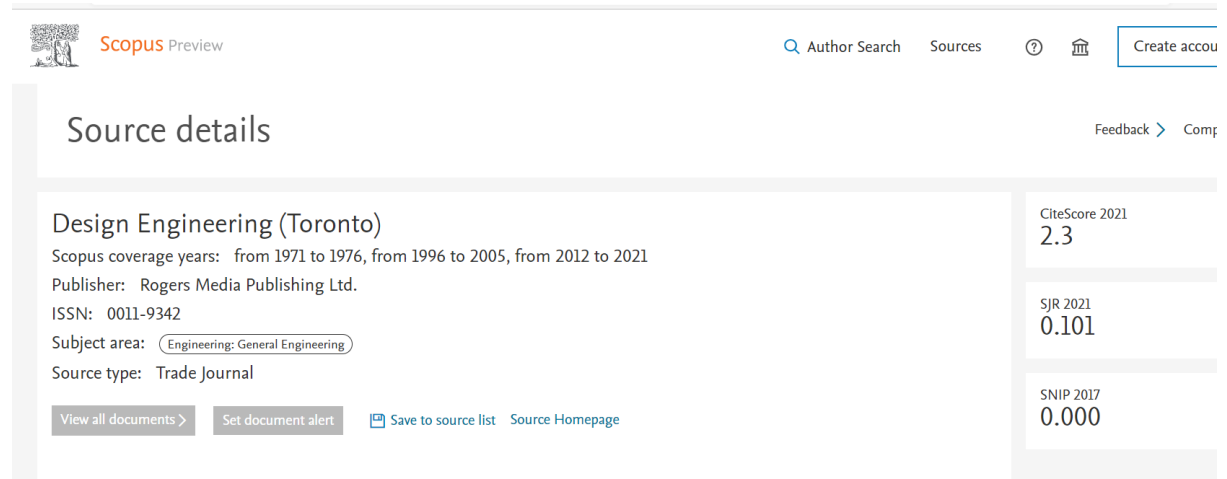
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# Automated Test Script Generation Framework

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## ABSTRACT

In software testing test cases can be designed either manually or automatically. In this paper, we are introducing a framework for automatic test data generation. We put a large emphasis on automating the software testing process to generate the test cases that produce more complex code with less effort using some intelligent techniques like natural language processing.

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## KEYWORDS

Software testing, Natural language Processing (NLP), automated test case. Generating test script

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## 1. INTRODUCTION

Software testing is an activity to ensure quality in software systems. It is an important but expensive activity in the software development lifecycle. It is used to strengthen the quality of the product before delivering it to the client.

However, software testing is costly. Statistics say that 50% of the total cost of software development is devoted to software testing even if it is more in the case of critical software [1]. Automation Software Testing involves different activities like selection of test tools, defining the scope of automation, planning, design, development, execution, and maintenance, etc. Good

quality software can be made by using an efficient test method. The problem is how to reduce the software testing work while ensuring good quality software. Some solutions involve software execution automation tools, outsourcing the testing tasks at lower labor rates. Such solutions still depend upon individual skills in the generation of the test cases. [2]

In automation software testing tools test execution involves running tests on a computer system manually. Such solutions still depend on the programming skills of the tester to write the test script. In this paper, we focused on the automatic generation of test scripts rather than writing it manually.

## 2. MOTIVATION

Software engineering research puts a large emphasis on automating the software development process that produces large and complex quantities of code with less effort [1]. For software testing, we need to find advanced intelligent support procedures to automate the testing process [3]. In spite of continuous effort till today automated testing has limited impact in the industry, where the test generation activity remains largely done manually. Automation testing requires expertise in multiple languages and technologies, also it requires manual intervention to create test script, to execute, monitor and maintain automated tests. What we need is 100% automated testing to reduce the overall cost of software development with high quality [1]. Most of the times, design and maintenance takes the majority of the time allocated for automation of test scenarios and there is an extra cost for maintenance of the test automation team and training on specific tools being implemented.

One of the phases in automation testing is test-case design in which the human tester uses written (formal) requirements, written often in natural language (NL), to derive a set of test cases. There are many approaches proposed in the different literatures to reduce these manual efforts for conversion of natural-language requirements into automated test cases using NLP, using UML or code.

NLP is Natural language processing (NLP) is an area of computer science and artificial intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to process and analyse natural language data. The high-level design idea of using NLP is to generate automated test cases from a test scenario. A number of test data generation techniques such as random test data generator, path oriented test data generator, goal-oriented test data generator, and intelligent test data generator have been automated [1].

## 3. AUTOMATED TEST SCRIPT GENERATION FRAMEWORK

Our framework is basically designed for keyword-driven testing. In this Framework manually written test cases will be processed by using intelligent techniques called NLP, in which we identify low- level as well as high-level keywords, implement the keywords as executable, create the test cases, create the driver scripts and execute the automation test scripts. This driver script which we generally create manually will be implemented automatically through this framework.

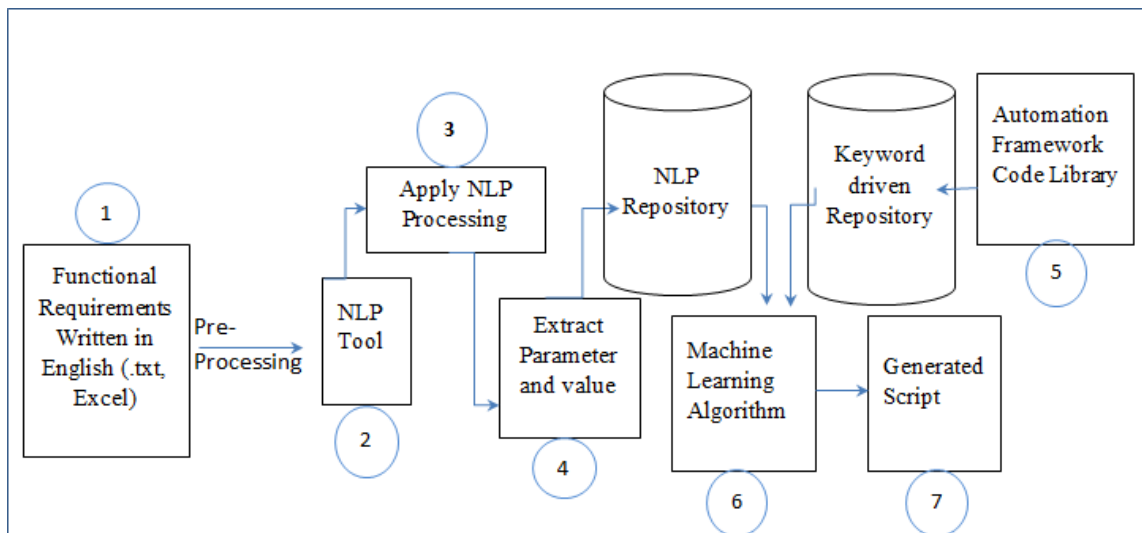


Fig. 1- Automated Test Script Generation Framework

This Automated Test Script Generation Framework follows some set of steps which are as below.

1. In the first step Natural Language parser will parse the functional requirement document, which content a test scenario with attributes expressed in natural language. This document is the input to the system.
2. In step two NLP tool will process the document. The Parser will parse the user test cases/test scenario written in natural language (English).
- 3 The NLP tool will parse the morphologic, syntactic and semantic approaches requirement of the document [4].

Through this parsing, we will extract the object, its value, and the handler. This information is used to match with available test building blocks of testing, and store them into an NLP repository.

4. In this framework, we are having another repository called Keyword Driven Framework Repository that will get data from the automation testing keyword driven framework. This will store the keywords and other parameters into the repository according to our selected keyword driven automation tool. The idea behind the Keyword Driven approach in automation testing is to separate the coding from the test case & test step. This method helps a non-technical person to understand the automation very well [6]. In the keyword driven test framework, all the operations and instructions are written in some external file like .CSV file. Example of .csv file is

Keyword	Locator	Locator Value	Parameter
Navigate			https://www.flipkart.com/

---

SendKeys	xpath	xpath [contains(text(), 'Enter your email')]	YOUR USER NAME
Click	xpath	[contains(text(),'Next' )]	
SendKeys	id	Password	YOUR PASS WORD
Click	xpath		Sign in

Table 1. Example of .CSV file

This type of data will be maintained into keyword driven framework repository.

5. Our framework will get the data from both repositories, first Repository is the repository in which we collected the parse data i.e. NLP Repository and another is the Keyword Driven Framework Repository, in which collected the data from Keyword Driven Testing Framework. This framework will map the data from both the repositories and it will apply Machine learning techniques.

6. After performing Machine Learning algorithms this framework will generate an automated test script. This will be the output of our framework. And this generated file can be an input for automation testing tools.

#### 4.

### CONCLUSION

This framework is developed for automatic generation of test scripts for automation software testing in keyword driven approach. This will reduce the task of manually writing the test script for automation testing framework. This will reduce test-generation efforts and will save the cost and time. This will also save the time of the tester for learning new programming skills which are required to generate test scripts.

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- 
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# FACTORS AFFECTING EMPLOYABILITY – A STUDENT’S PERSPECTIVE

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## ABSTRACT

*The basic objective of the Master of Computer Application (MCA) program is to provide a steady stream of necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into rapidly expanding world of Information Technology. Current MCA Curriculum is built on the implementation of the Choice Based Credit System (CBCS) and Grading System. Curriculum also gives emphasis on identifying industrial expectations and institutional reparation for meeting industrial needs. These interventions would be successful only when the perceptions of its major stakeholder i.e. students are taken into consideration. Doing so will help in taking maximum advantage of India’s favorable demographic dividend.*

**Key words:** Master of Computer Application (MCA), Choice Based Credit System (CBCS), stakeholder.

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<http://iaeme.com/Home/issue/IJM?Volume=11&Issue=8>

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## 1. INTRODUCTION

India has witnessed a massive transformation in its educational system in the 21st century and is flourishing with well-designed form of it. Management education in India is not very old. After the establishment of the IITs, there was awful need for similar establishments in the field of management education. Thus, Indian Institute of Management Ahmadabad came into existence. After that many institutions started which are offering various professional courses including management programs like Master in Computer Application (MCA).

Management education gives emphasis on developing a broad range of managerial knowledge and abilities amongst the students. The basic objective of the Master of Computer Application (MCA) program is to provide a steady stream of necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into rapidly expanding world of Information Technology. Current MCA Curriculum is built on the implementation of the Choice Based Credit System (CBCS) and Grading System. Curriculum also gives emphasis on identifying industrial expectations and institutional reparation for meeting industrial needs.

Students' employability is a key concern for the institutions offering higher education. Focused and timely efforts of institution and students towards employability will give positive results. Many factors are associated with employability. Most of the international companies need MCAs who are flexible, trainable with an innovative attitude and who will serve as change agents in the business.

Employability skills focus more on performance of the candidates on the job and this requires a set of skills that match the job. To become employable, in addition to subject-specific job skills, student need to have problem solving, planning and organizing, innovation, learnability, technology skills, self-management skills, interpersonal skills, leadership skills, team building and communication skills. This paper sheds light on the study of employability skills of MCA students from their own perspective.

## 2. LITERATURE REVIEW

Employability is explained by Lee Harvey as an attempt to get a job in stipulated time, more specifically after defined period after graduation, or an ability to fit our self as per company needs (Mishra *et.al.* 2016).

Another approach given by Hillage and Pollard to look at employability is the capability to get primary employment, sustaining and upgrading oneself with new employment if needed. The primary factors that are needed are in-depth knowledge, abilities and right attitude. They have proposed three types of skills i. Baseline Skills These are simple skills and personal qualities like trustworthiness and integrity ii. Intermediate Skills - It consists of professional skills, like communication skills, problem solving skills etc. iii. High level Skills –these are specific skills related to performance in the industry such as self-management, team work, commercial alertness etc. Thus, employability skills are person dependent and environment dependent (Mohapatra *et.al.* 2019).

Talking about the employability of male and female students from post graduate management programs, India Skills Report 2019-20 claims that female employability showed an upward trend, climbing from 38 per cent in 2017; 46 per cent in 2018 and registering 47 per cent in the year 2020. Of these, the most employable candidates are MBA students with 54 per cent as against 40 per cent of Engineering and MCA in the last two years i.e., 2018 and 2019.[10]

Information and communication technology (ICT) is very important in today's era. The most important skills with which a student can get ready to face or solve the critical issues in the industries is technological skills. ICT skills are vital and should form a major part of institutional strategy in providing better quality students. This skill is an important factor in inhibiting the learning of the students from developing communities. If technology literacy is not recognized or dealt with, the lack of technology skills may discourage the efforts to use e-learning in bridging the digital divide (Mohapatra *et.al.* 2019).

In the study of role of employability skills in management education, MCA students are the integral part management education. Human resources are considered to be the biggest asset for any nation. Fortunately, India has this demographic dividend. To take the advantage of this

demographic dividend, skills of the students must be upgraded through innovative initiatives. (Asirvatham *et.al.* 2017)

The objective of this study is to explore and understand student’s perception regarding importance of various skills that are required for being employable.

### 3. METHODS

#### 3.1 Sample

Survey method was adopted to explore student’s perspective on factors affecting their employability. Data was collected through a survey of 187 respondents studying in first, second and final year of their Master Degree (MCA). For collecting the data Google form was made and sent to students. Out of 300 forms sent online, 187 responses were received by data collection deadline.

Out of 187 respondents, 101 were male. The average age of respondents is 23 years.

#### 3.2 Measure

For understating the factors that affects employability of students, various items/statements were prepared based on the review of previous literature and students were asked to rate each item on the scale of 5 (0 = not at all important to 4 = Extremely Important). Total 48 items/statements were given. Sample items include “*I can speak and write clearly so that others understand*”, “*I recognize the many dimensions of a problem and can determine a root cause*”, “*I am good at managing time and priorities – setting timelines*”, “*I usually come up with creative and innovative ideas during group work*”, “*I am able to adapt to act in new situations*”, “*I am successful in resolving conflicts with others*”, “*Initiates change to enhance productivity*”.

### 4. ANALYSIS & RESULTS

#### 4.1 Exploratory Factor Analysis

Factor analysis is an interdependence technique, whose primary purpose is to define the underlying structure among the variables in the analysis (Hair, Anderson, Tatham, Black, 1995). It is a multivariate statistical procedure that has many uses. Factor analysis reduces a large number of variables into a smaller set of variables (also referred to as factors). It also provides construct validity evidence of self - reporting scales (Gorsuch, 1983; Hair, Anderson, Tatham, Black, 1995; Tabachnick & Fidell, 2007; Thompson, 2004)

In Exploratory Factor Analysis, the investigator has no expectations of the number or nature of the variables and as the title suggests, is exploratory in nature. That is, it allows the researcher to explore the main dimensions to generate a theory or model from a relatively large set of latent constructs often represented by a set of items (Pett, Lackey, Sullivan, 2003; Henson & Roberts, 2006; Thompson, 2004).

In this study we tried to explore the factors that affects employability from student’s perspective, exploratory factor analysis (EFA) was used to examine and understand the structure and relationship between variables.

**Table 1** Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett’s Test of Sphericity

<b>KMO and Bartlett's Test</b>		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.899
Bartlett's Test of Sphericity	Approx. Chi-Square	5054.170
	df	171
	Sig.	.000

The KMO measure indicates adequacy level of 0.899 and Bartlett’s Test of Sphericity was significant ( $p = .000$ ), validating the data for analysis.

The factor structure of the 48 item scale was examined. The Rotated Component Matrix shows the factor loadings for each variable (Table 1.2). Factor loadings  $> .5$  are shown in the table.

Based on these factor loadings, 6 items loaded strongly on Factor 1, which represents “Team Player Skills”. Items 30 to 36, all loaded strongly on Factor 2, which represents “Time Management Skills”. Item 37 to item 39 and items 43 to 46 and item 48 loaded strongly on factor 3, which represents “Adaptability and Interpersonal Skills”. Item 1, 2, 4,5,21 & 47 loaded highly on factor 4 which represents “Communication Skills”. Items 3, 6 and 8 loaded highly on Factor 5 which represents “Problem Solving Skills”. Items 15 to item 20 loaded highly on Factor 6 which represents “Planning & Creativity Skills”. Items 7, 41 and 42 loaded highly on Factor 7 which represents “Assertiveness Skills”. Items 22 to 24 loaded highly on Factor 8 which represents “Ability to learn”. While, items 26 to items 29 loaded highly on Factor 9 which represents “Technology Skills”.

**Table 2** Factor structure of Employability scale

**Rotated Component Matrix**

	Components								
	1	2	3	4	5	6	7	8	9
Item 1				.589					
Item 2				.587					
Item 3					.625				
Item 4				.560					
Item 5				.550					
Item 6					.717				
Item 7							.517		
Item 8					.599				
Item 9	.619								
Item 10	.812								
Item 11	.583								
Item 12	.803								
Item 13	.714								
Item 14	.660								
Item 15						.574			
Item 16						.403			
Item 17						.448			
Item 18						.620			
Item 19						.649			

### Factors Affecting Employability – A Student’s Perspective

Item 20						.560			
Item 21				.558					
Item 22								.604	
Item 23								.604	
Item 24								.696	
Item 25									.633
Item 26									.610
Item 27									.641
Item 28									.720
Item 29									
Item 30		.505							
Item 31		.535							
Item 32		.564							
Item 33		.731							
Item 34		.693							
Item 35		.612							
Item 36		.568							
Item 37			.652						
Item 38			.608						
Item 39			.598						
Item 40									
Item 41							.587		
Item 42							.545		
Item 43			.702						
Item 44			.580						
Item 45			.509						
Item 46			.534						
Item 47				.599					
Item 48			.536						
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.									

The factor structure that was extracted from the above given EFA is represented in following diagram.

## 4.2 Derived Research Model

The derived research model is presented in Figure

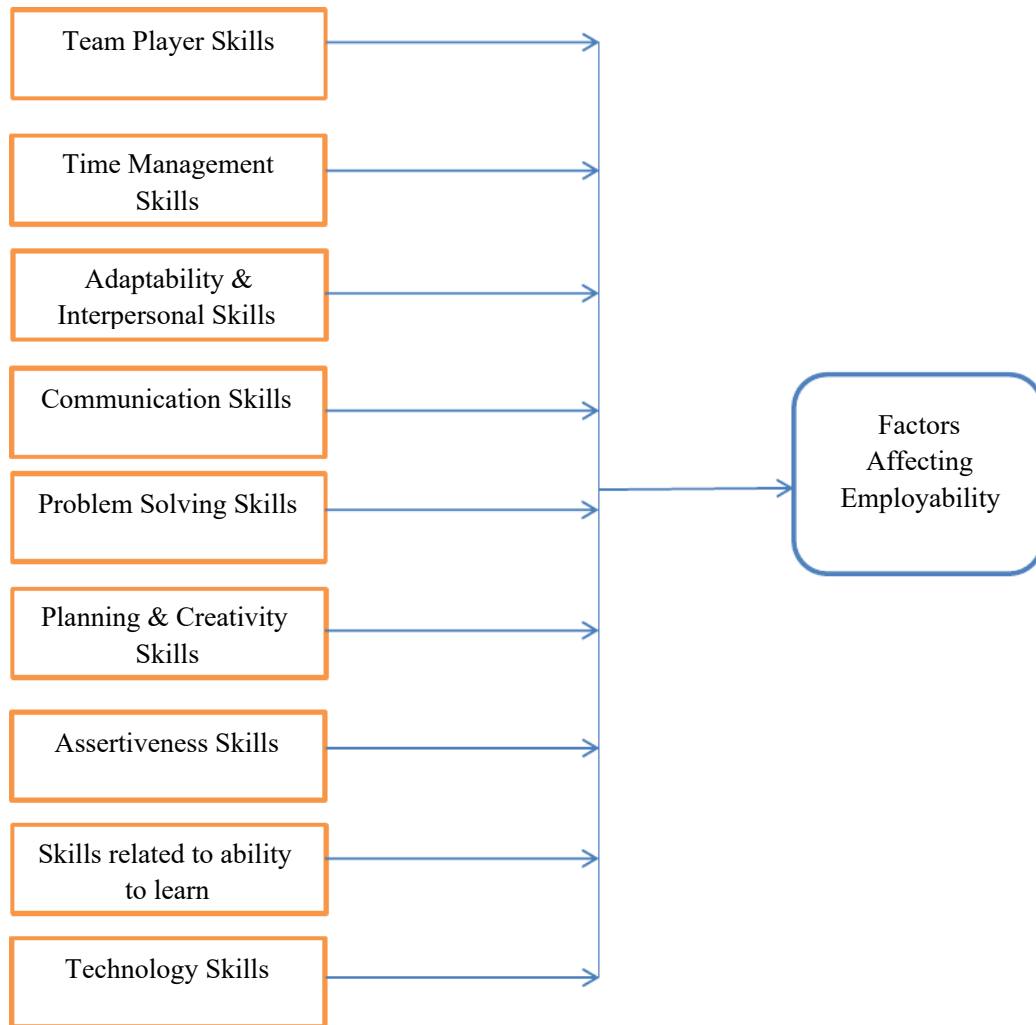


Figure 1 Research Model

## 5. DISCUSSION & IMPLICATIONS

The study to find out factors that are important for employability from students' perspective has derived nine factors/ skills. These skills can be further divided into three categories i.e. Baseline Skills, Intermediate Skills and High level Skills (Mohapatra *et.al.* 2019).

Out of all the skills derived in this study assertiveness Skills, ability to learn, Time Management skills and adaptability and interpersonal skills fall in the category of baseline skills. Communication skills and problem solving skills are from intermediate skills category. While, high level skills category includes skills like, technology skills, team player skills and planning & creativity skills.

Baseline skills like time management and interpersonal skills are highly in demand by employers irrespective of industry. It is claimed that even in technical area like IT and engineering talent requirement of baseline skills is ever increasing [11]. Additionally, it is found that Intermediate Skills like Communication Skills and Problem Solving Skills are few of the highly sought after skills from employers in IT candidates [12]. Whereas, High level Skills like Technology Skills are considered to be the foundation for employability in IT industry.

The categorized skills received from the students through above research must be evaluated with the Industrial Requirements. The fitment of these skills with precise Industry requirements is of vital importance. If needed from Industry viewpoint, addition of supplementary skills and imparting its training to students can be thought of. To enhance the placements, these skills can be fine-tuned with the MCA curriculum. Curriculum amendments can be done if possible. Along with amendments in curriculum, Institutes can undertake Employability Enhancement Programs (EEP) for students partnering with Industries. One to one student mentoring can also be done which can be supplemented with SWOT analysis. All these efforts would take the students to achieve their placement goals in general and successful career paths in particular.

## 6. SCOPE FOR FUTURE RESEARCH

Further research studies can be conducted in the direction of suggesting implementation methodologies for skill enhancement of management students. Student’s family background and geographical area from which they belong has influence on skills possessed by them. Hence these factors can be taken into consideration for in-depth study. Industry specific skills study can also be conducted.

## 7. CONCLUSION

In today’s global context where challenges of business sustainability are increasing, management education has a crucial role to play. In ever changing business environment, most of the organizations today are looking for young talent from management and technology specializations that possess not only good domain knowledge but also exhibit skills like adaptability, flexibility and effective interpersonal skills. The gap between demand and supply in employment market is increasing. Though the number of graduates entering the job market is ever rising, the quality of these young graduates is questionable. To bridge the gap of skill shortage in industry, active interventions are needed from the supply side i.e. educational institutes. These interventions would be successful only when the perceptions of its major stakeholder i.e. students are taken into consideration. Doing so will help in taking maximum advantage of India’s favorable demographic dividend.

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# A FRAMEWORK TOWARDS ICT APPROPRIATION IN VOLUNTARY ORGANIZATIONS

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## ABSTRACT

*As the roles and functions of voluntary organizations have significantly expanded in recent years, there is a growing concern over the need to transform the operation and structure of these organizations. ICT support in voluntary organizations is an interesting emergent field of research. The purpose of this study is to study the implementation of Information and Communication Technology (ICT) in voluntary organizations. The study was conducted in and around Pune. The objectives of the study were to study the usage and impact of ICT in voluntary organizations, to determine the issues and challenges they are facing. The findings summarized in this paper, are drawn from primary data collected from 107 voluntary organizations which are using ICT. The researcher has proposed suggestions based on findings. Based on the findings, conceptual background and earlier work in this area, the researcher has proposed framework for ICT implementation in voluntary organizations. The researcher has further suggested the direction on research leads and future trends.*

**Key words:** Voluntary Organizations, ICT, NGO.

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## 1. INTRODUCTION

Voluntary organizations have been generally defined as voluntary, autonomous, non-profit organizations or groups of citizens established to address various issues and problems in the society (Singh, 2001)

Voluntary organizations have their own advantages and disadvantages. Some of the advantages of voluntary organizations are:

- Voluntary associations are much closer to the more unfortunate and hindered area of the general public.
- Staff of the voluntary organizations is typically exceptionally motivated and philanthropic in their conduct.
- Voluntary associations can undoubtedly invigorate and prepare network assets and approach volunteers.
- They are increasingly viable in bringing individuals' support.
- Voluntary associations are fewer guidelines bound and are non-bureaucratic, non-formal and adaptable in their structure and activities.
- Voluntary segment has more noteworthy potential for advancements.
- Voluntary associations want to work in multi-sectorial system.
- Voluntary associations are motivation for making social union (Kumar, 1998).

Voluntary organizations are still in early stage of ICT adoption, in their organizational settings. There is a need of information technology services and applications that can be effectively embedded in organizational settings of voluntary organizations to achieve technological appropriation. ICT support in voluntary organizations is an interesting emergent field of research. There is awareness among community organizations to use technology in their activities but the complexity of technologies, lack of technological knowledge, lack of funds and lack of standards are big obstacles.

After having an interaction with the knowledgeable persons and stakeholders in voluntary organizations researcher gathered many issues concerned with ICT adoption in voluntary organizations which needs to be systematically studied, researcher found it necessary to study the various aspects involved in ICT implementation in voluntary organizations. The current research aims to investigate the current situation regarding the implementation of ICT by the voluntary organizations. Based on the investigation, ICT Framework for voluntary organizations is suggested.

### 1.1 Challenges of Voluntary Organizations

#### 1.1.1 Lack of Funds

Most of voluntary organizations discover challenges in getting adequate, and nonstop funding so as to do their work. Accessing proper donors is a noteworthy component of this challenge. Managing some particular donors funding conditions can be a tremendous challenge for voluntary organizations. Donors would prefer to see funding spent on direct unfortunate victims. The voluntary organizations are under consistent stress to hold overhead expenses down.

### ***1.1.2 Absence of Strategic Planning***

Many voluntary organizations suffer from the lack of a consistent, strategic plan that would facilitate success in their activities and mission. This renders them unable to effectively raise and exploit on financial support.

### ***1.1.3 Poor Governance and Networking***

An absence of effective administration is very regular in voluntary organizations. Many have a shortage of understanding concerning why they should have a Board and how to set one up. A founder might be excessively centered on running the voluntary organizations for their very own motivations; be that as it may, governance is foundational to transparency. Poor or disorganized networking is another real challenge, as it can cause duplicated endeavors, time ineffectiveness, conflicting techniques and an incapability to learn from experience. Many voluntary organizations don't strengthen the utilization of current technologies that could encourage better correspondence and networking. More effective use of technology can assist voluntary organizations in staying up-to-date of significant regional, national and global concerns.

### ***1.1.4 Poor Communication***

Voluntary organizations also identify that there is very poor communication within the sector. The majority of voluntary organizations have little or no access to reliable email and internet connections; they receive almost no literature on development problems and are generally unaware of issues of global, regional and national importance.

### ***1.1.5 Limited Capacity***

Limited capacity affects fundraising ability, governance, leadership and technical areas. Existence of quality standards can assist voluntary organizations to develop the required capacities. The speed of technology changes is also a challenge particularly in areas of ICT capacity.

### ***1.1.6 Development Approaches***

Many voluntary organizations support a “hardware” approach to development through building infrastructure and providing services instead of empowering people and institutions locally. In general, their development methodologies are not as flexible, sustainable and pertinent to the community as they could be.

## **1.2 Types of Voluntary Organizations**

Voluntary organization can be registered by many registration processes in India like trust, company, society or any valid formation. The registration process is different but the status of all these organizations is equal as voluntary organization.

### ***1.2.1 Trust- Registration under Public Trust Act***

A Trust can be set up to manage funds and to receive money for a particular purpose for the benefit of a wider community. They establish a formal relationship between the donors, the trustees who become the nominal owners of the trust property and the beneficiaries - the people who will benefit from the trust. Trusts can be set up quickly and cheaply. Trusts are non-democratic organizations because they do not tend to have a membership framework, although trustees may agree to report commonly and consult with a wider group of individuals. Trustees may be personally liable and not protected against private liability for contracts entered into on behalf of the confidence.

### ***1.2.2 Private Sector Companies (Sec 25) – Registration under Companies Act, 1956***

A private company structure is an increasingly popular choice for voluntary and community organisations. If you plan to manage employees, land, contracts and/or substantial amounts of financing, it is very suitable. A private company by guarantee is an incorporated organisation. This implies it has a distinct legal identity from its members. This legal structure limits the insolvency liability encountered by managers, except in instances of negligence or recklessness. This is the most flexible legal agreement, but the primary constraint is that it is not possible to issue stocks.

### ***1.2.3 Society – Registration under Registration Act, 1860***

In India, the Societies Registration Act, 1860 is a regulation that enables the registration of organizations usually engaged in the benefit of society—education, health, jobs, etc. Societies are formed by memorandum of association and registration. Minimum 7 members are required to get registered under this act.

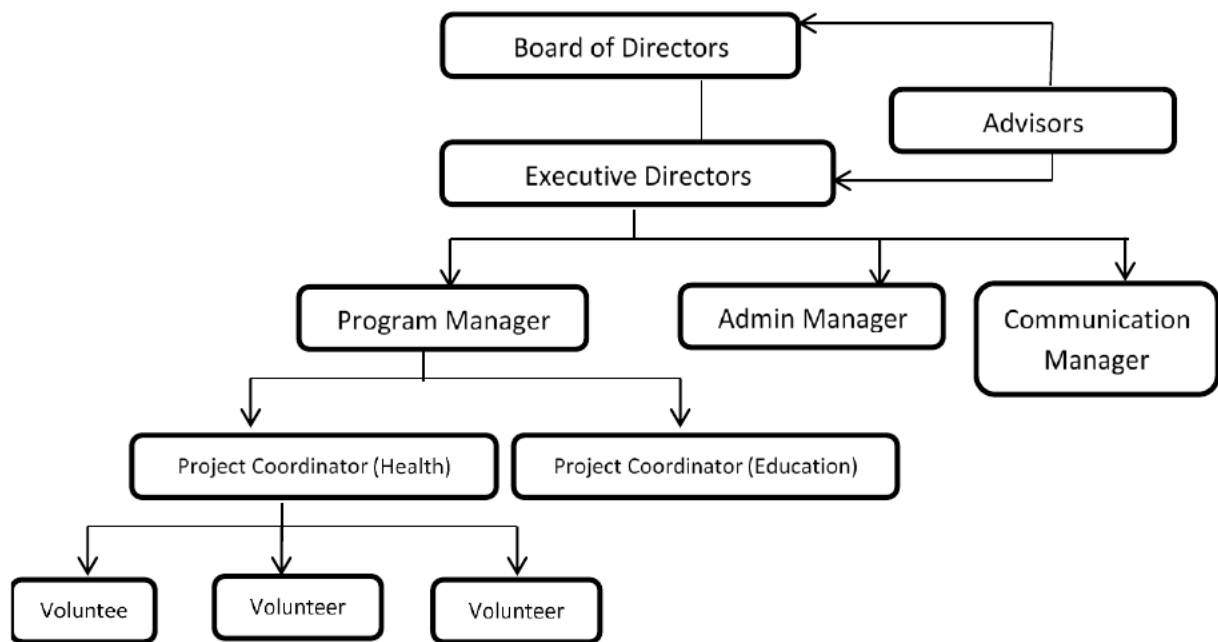
Voluntary Organizations' types can be understood by their level of operation.

#### *Types by level of operation*

- Community-based voluntary organizations (CBOs) are built out of people's own initiatives. They are responsible for helping significant segment of community and working to meet needs of such community. These can include various clubs, women's welfare organizations, and health organizations, religious or educational organizations.
- City-level voluntary organizations include organizations such as Rotary, lion's club, chambers of commerce and industry, coalitions of business, ethnic or educational groups, and associations of community organizations.
- State level voluntary organizations include state-level organizations, associations and groups. Some state organizations also work under the guidance of National and International voluntary organizations.
- National level voluntary organizations include national organizations such as the YMCAs/YWCAs, Bachpan Bachao Andolan, professional associations and similar groups. Some have state and city branches and assist local voluntary organizations.
- International voluntary organizations range from irreligious agencies such as Save the Children, SOS Children's Villages, OXFAM, Ford Foundation, Global march against child labor, and Rockefeller Foundation to religiously motivated groups. They can be responsible for funding local level voluntary organizations, institutions and projects and implementing the projects themselves. (Vaidya Surekha, 2014)

## **1.3 Voluntary Organizations: Organizational Structure**

The most effective organizational structure for a voluntary organization depends on the mission the voluntary organization achieves. Fundraising methods, use of volunteers, roles of the directors and involvement of members all play a role in determining the ideal organizational structure. The structure is divided into three functional areas—governance, programs, communication and administration – and then further subdivided within each area, depending on the purpose and goals of the voluntary organization.



**Figure 1** Organization structure of voluntary organizations

Source: Compiled by Researcher

### 1.4 Stakeholders of the Voluntary Organization

A stakeholder is an individual or group which has an interest that the voluntary organization fulfils its mission. Anyone who is interested or affected by the voluntary organization and its services is a stakeholder. Stakeholders of voluntary organization include the following:

- **Management-** It is a group of people who are responsible for the overall management, decision making, planning the direction and activities of the group and its performance. The management consists of board of directors and executive director assisted by advisors.

Boards are responsible for a number of functions, like hire and supervise the Executive Director, develop and approve budgets, etc. Board members will also be expected to champion the organization’s cause, and represent the organization to the larger community. Many voluntary organizations also expect board members to help raise fund for their projects

Executive Director, or sometimes called as Coordinator, Chief Operating Officer, or CEO, is responsible for the overall direction in which the organization runs, and the responsibility for managing the day-to-day activities of the organization. The Executive Director is also member of the board – known as its Executive Secretary who reports to the Board.

- **Employees-** Employees provide vital services to keep the voluntary organizations running and are important stakeholders for voluntary organizations. Employees are responsible for the day-to-day functioning, and implementing of its programs and projects. Staff members fall into three groups - responsible for activities related to (1) administration, (2) programs/projects and (3) communication.

Administrative activities are led by an administrative manager.

Program and project activities of an organization are led by a program manager.

Communications and dissemination activities are the responsibility of a communication manager.

Volunteers- Volunteers provide vital services to keep the voluntary organizations running and are important stakeholders for voluntary organizations. Volunteers contribute their time to work for organizations or causes. Volunteers donate their time, skills and expertise to provide services to benefit target groups or organization.

- Beneficiaries- The people and parties who actually use the services given by the voluntary organization.
- Donors- Those who help in funding the operations of the voluntary organization are the donors.
- Local Community- The surrounding community as a whole has a stake in how well a voluntary organization completes its mission and objectives.
- Other Voluntary Organizations- Other voluntary organizations with common interest.
- Partners- An association with various partners like corporate partners, media partners for collaborative efforts towards the achievement of mission of an organization.



**Figure 2** Stakeholders of voluntary organizations

Source: Compiled by Researcher

## **2. OBJECTIVES OF THE STUDY**

The current research aims to study use of ICT in Voluntary Organizations, to study issues and challenges of ICT implementation in Voluntary Organizations. It also studies impact of ICT implementation in voluntary organizations. The study suggests the framework for ICT adoption in voluntary organizations.

## **3. RESEARCH DESIGN**

This study was carried out with the help of Quantitative method. In order to attain research goals, the modes chosen to collect data are primary data and secondary data. Before initiating the actual data collection, the pilot study was conducted.

### **3.1 Pilot Study**

A pilot study was conducted for twenty voluntary organizations in which data was collected from managerial positions. The above survey was conducted to finalize the questionnaire. After the pilot study, the questionnaire was refined and primary data collection was done.

### **3.2 Primary Data**

Primary was collected from voluntary organization's employees including Directors, Admin Managers, and Program Managers etc. Informal talks and discussions were also carried out. The following approach/methodology was adopted for primary data collection in the present study.

- Designing of user-friendly and appropriate questionnaire and then distribution of the same amongst management of voluntary organizations.
- Briefing said organizations about the research work personally on telephone as well as by meeting personally with management members of voluntary organizations with prior appointments

### **3.3 Secondary Data**

The various sources of the secondary data collected for this study are various Referred Journals, Research Articles and Journals, Conference proceedings, Published Thesis and dissertations. In the data analysis stage, the Secondary data collected from these sources is used to support primary objectives and hypothesis.

### **3.4 Survey Method**

It is used for this research study. For exploring the data, interviews & discussions were also used as supportive techniques. The research throws light on the extent to which ICT is used by Voluntary Organizations and their satisfaction level. Research examines the issues faced by these organizations while adopting ICT. For undertaking analysis of use and impact of ICT in voluntary organizations, the study is restricted to the selected organizations in and around Pune (Maharashtra State – India)

### **3.5 Sample Design**

The sample selection plan was based on following criteria:

- Voluntary organizations which are using ICT for their day to day activities
- Voluntary organizations which are located in and around Pune city and deal with education of the various target groups.



Total number of voluntary organizations meeting the above mentioned criteria was approximately 250, so 107 voluntary organizations were selected. (Around 43% of the population). 150 organizations were randomly selected for the survey, out of these the data of 107 respondents was found to be consistent and complete. The data from 107 respondents was used for analysis. The organization selection is based on various lists published by authorized government organization Niti Aayog's portal NGO Darpan. (<http://niti.gov.in/content/ngo-darpan>)

### **3.6 Sampling Method**

The sampling technique adopted for the survey of stakeholders is stratified simple random sampling technique. To serve the purpose purposive sampling technique is used.

## **4. SUMMARY OF RESEARCH FINDINGS**

It was observed that, most of the beneficiaries of the voluntary organization are children who are from Slum areas, Adivasi area, Tribal Children, Poor and needy Children. It is observed that most of the voluntary organization does not conduct any ICT related training. It is found that ICT tool is mainly used for program implementation functionality followed by financial management. Lack of ICT training is highlighted issue by most of the respondents, followed by Monitoring, Evaluating, Feedback, Lack of maintenance support and Lack of funds. ICT impact is not as expected as many respondents dissatisfied about various major functions like Campaign Success, Volunteers Productivity, Volunteers Efficiency, Student Performance Cost Saving, Time Saving, and Better Control and Monitoring. Need of ICT tool is highlighted by almost all the respondents. It was noted that many of the respondents were not aware about availability of free ICT tools/software even though they believe that ICT tools enhances organizational functionality or productivity.

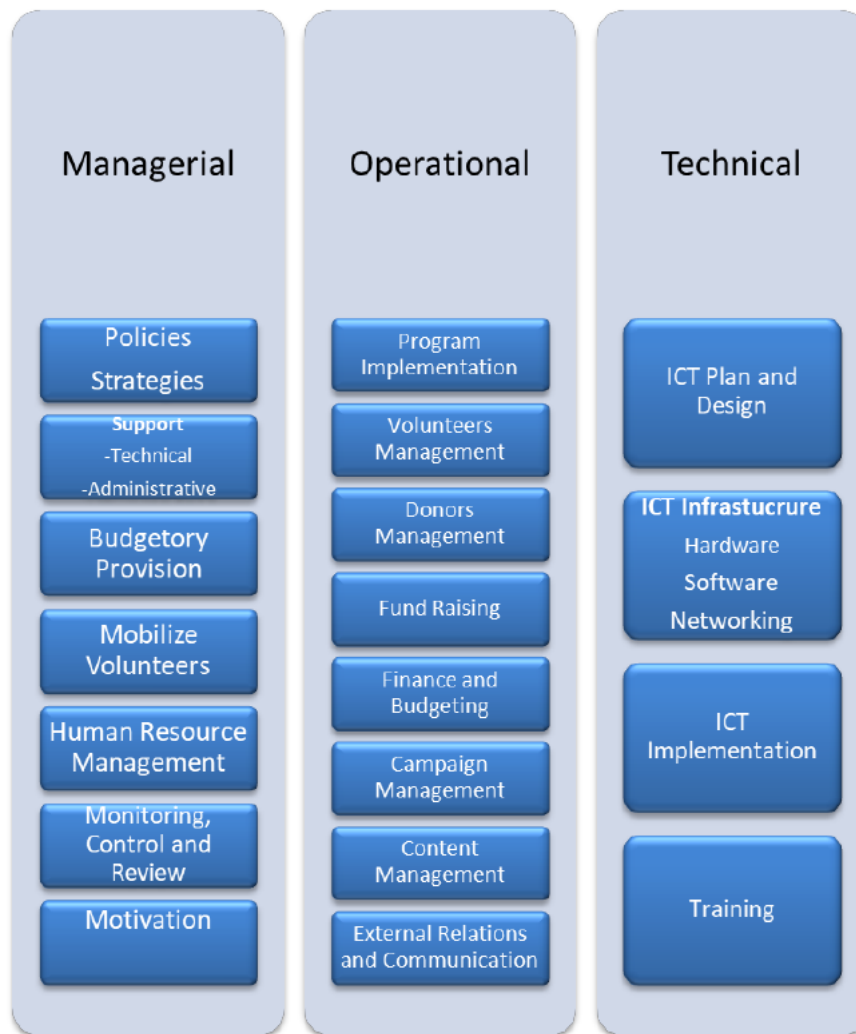
## **5. SUGGESTIONS**

The spread and reach of voluntary organizations is increasing in India. These organizations are still in early stage of ICT adoption in their organizational settings. Hence, the researcher would like to make the following recommendations based on the findings and conclusions.

- The personnel of voluntary organizations should be encouraged to use the ICT tools for various functionalities by means of rewards and recognition.
- ICT training Programs should be conducted for staff and volunteers on latest ICT tools.
- The study recommends that Open Source technologies need to be used by the voluntary organizations as it is cost effective.
- Voluntary organizations should look into 100% need analysis and execution of program using ICT for better performance of students. They should also use ICT tools for volunteer's management for better quality and time & pace flexibility.
- There is a need for collaborative efforts by voluntary organizations working for similar cause towards effective use of ICT in campaigns and fundraising so that all related stakeholders can access the information as and when needed.
- Awareness about use of ICT should be increased within the volunteers' community.
- Active collaboration of the stakeholders during the development and testing phases of the ICT implementation is necessary
- Based on findings researcher has suggested ICT framework for voluntary organizations based on open source technologies. Researcher has identified various parameters involved in designing this framework. They are as under

## A Framework Towards ICT Appropriation in Voluntary Organizations

- Management policies and strategies for successful implementation of ICT
  - Implementation and use of ICT for all functions of voluntary organizations
  - Management support to successfully implement ICT infrastructure, its easy access and maintenance
  - Management motivation for organizing ICT awareness and Training Programs
  - Involvement of target groups to understand their priorities and needs
  - Human resources management
  - It is very important to involve all stakeholders like volunteers, donors, other voluntary organizations in the phase of ICT implementation
  - Budgetary Provision for ICT implementation
  - Monitoring, Review and Control
  - ICT expert volunteers for developing ICT projects
  - Technical Support
- The framework is proposed based on three different components Managerial, Operational and Technical for effective implementation of ICT to ensure attainment of organizational goals.



**Figure 3** ICT Framework for voluntary organizations

Source: Compiled by Researcher

- The researcher has suggested use of open source ICT framework which consists of operational component, technical component, control points, users and stakeholders
  - Voluntary Organization- Operational Component- This component is defined as the mission of the existence of the organization that is accomplished by performing different operations in an organization
  - Voluntary Organization- Technical Component. An intellectual processes used by organization to automate the processes and to transform inputs into services.
  - Control Points- Control points works as tools for effective functioning. Their existence is important not only when you want to monitor the implementation of something new or different, but also when you want to be aware about effectiveness of a process all the time.
  - People/Users- The workforce and consumers of an organization that performs different operations.
  - Stakeholders- Stakeholders are those who have interests in the organization. Multiple stakeholders for an organization include the beneficiaries, donors, volunteers etc.
- ICT Roadmap for voluntary organizations. An ICT roadmap is a flexible planning technique to support strategic and long-range planning, by matching short-term and long-term goals with specific technology solutions.

**Table 1** ICT Roadmap

<b>Milestone</b>	<b>Duration</b>
Define Objectives, Mission and Scope	2 months
Selection of open source software	3 months
Checking Suitability	2 months
Infrastructure Availability	2 months
Training	2 months
Actual Implementation	5 months
Enhancement and Continuation	4 months
Total	20 months

## 6. AREA OF FUTURE STUDY

The researcher feels that further systematic studies need to be done in the following areas:

- The study of cost effectiveness of ICT infrastructure of voluntary organizations using open source software that will substantially enhance the performance because Open Source Software is freely available
- Effectiveness and Security issues relating to use of open source software in voluntary organizations
- A comparative study of leading voluntary organizations in Maharashtra with respect to ICT infrastructure and use of ICT in program implementation
- Evaluation of stakeholders' perception about the adoption of ICT in voluntary organizations

## 7. CONCLUSION

The objectives of the study were to study the usage and impact of ICT in voluntary organizations, to determine the issues and challenges they are facing. The findings summarized in this paper, are drawn from primary data collected from 107 voluntary organizations which are using ICT. The researcher has proposed suggestions based on findings. Based on the findings, conceptual background and earlier work in this area, the researcher has proposed framework for ICT implementation in voluntary organizations. The researcher has further suggested the direction on research leads and future trends.

The purpose of this study is to study the implementation of Information and Communication Technology (ICT) in voluntary organizations. The study was conducted in and around Pune. There is a growing concern over the need to transform the operation and structure of these organizations. ICT support in voluntary organizations is an interesting emergent field of research

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# STUDY OF USE OF E-HRM IN PERFORMANCE APPRAISAL PROCESS IN IT ORGANIZATIONS

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## ABSTRACT

*Today's working climate demands a great deal of commitment and efforts from Employees, who in turn naturally expect a great deal from their Employers. Today, Human Resource (HR) is not treated as a single function. It's a collection of highly specialized capabilities - each with distinct objectives, tasks and needs. Organizations have realized the growing importance of using Information Technology (IT) in leveraging their Human Resource (HR) functions. This takes the form of e-HRM (Electronic Human Resource Management). The e-HRM revolution relies on cutting edge information technology, ranging from Internet-enabled Human Resources Information Systems (HRIS) to corporate intranets and portals. This paper investigates the use of e-HRM in performance appraisal as one of the Human Resource Function in IT organizations. Human Resource Development (HRD) is the framework for helping employees to develop their personal and organizational skills, knowledge and abilities. Performance Appraisal is about improving performance and ultimate effectiveness. Employees are encouraged to look ahead to improve effectiveness, utilize strengths, minimize weaknesses and examine how potentials and aspirations should match up. The study provides insights into implementation of e-HRM with reference to performance appraisal. It discusses the impact of e-HRM on appraisal process. It attempts to identify implications for future research in this field.*

**Key words:** Human Resource (HR), Information technology (IT), Electronic Human Resource Management (e-HRM), Internet-enabled Human Resources Information Systems (HRIS), Performance Appraisal, Human Resource Department (HRD).

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## 1. INTRODUCTION

“Behind Every Successful organization are its Resources.” One of the main important resources of the organization is ‘HUMAN’. An Organizations’ success hinges both on 'high touch' and on 'high tech'. Organizations who have been striving for business excellence have realized that the core of any business excellence program has always been ‘people’.

Successful growing organizations have placed the combined development of information technology and human resources as their top priority.

The performance appraisal is the process of assessing employee performance by way of comparing present performance with already established standards which have been already communicated to employees, subsequently providing feedback to employees about their performance level for the purpose of improving their performance as needed by the organization. The very purpose of performance uprising is to know performance of employee, subsequently to decide whether training is needed to particular employee or to give promotion with additional pay hike. Every corporate sector uses performance appraisal as a tool for knowing about the employee and take decisions about particular employee.

IT Companies have started using information technology in their Human Resource Management functions to optimize their management and improve their efficiency. This paper explores the role of Information Technology (IT) in HRM precisely in the performance appraisal function of IT organizations.

## 2. THEORETICAL FRAMEWORK

Before an objective performance appraisal system can be developed, one must first perform a job analysis<sup>[6]</sup> to determine what tasks are actually performed on the job, the standards to which these tasks need to be performed, and the knowledge, skills, abilities, and other characteristics necessary in order to adequately perform these tasks. Job analysis is the systematic, empirical process of determining the exact nature of a job, including:

- The tasks and duties to be done;
- The knowledge, skills and abilities necessary to adequately perform these; and
- The criteria that distinguish between acceptable and unacceptable performance.

Job Analysis: According to DeCenzo & Robbins (2006)<sup>[1]</sup> “Job Analysis is a systematic exploration of the activities within a job. It defines and documents the duties, responsibilities and accountabilities of a job and the conditions under which a job is performed”. Job analysis is the process of studying and collecting information relating to the operations and responsibilities of a specific job. The immediate products of this analysis are job descriptions and job specifications. Hence, job analysis can be described as a process of collecting information about a job. The results of a job analysis are typically used in writing job descriptions and setting standards for use in performance appraisals.

Performance appraisals<sup>[6]</sup> need to be based on the tasks that are actually required to be performed on the job rather than on some general impression of the performance of the employee.

Dr. U.S.S. Shrivastav and Nimisha Sapra<sup>[2]</sup> in IJRIM Volume 2, Issue 4 have focused on Performance appraisal. They quote that Performance appraisal is a widely recognized process. Yet efforts to study and examine its effect on attitudinal outcomes are scarce. The present study has addressed this research gap. The study has contributed to the body of knowledge on automation of performance appraisal process and thus is benefiting the HRM practitioners and HRM scholars.



Armstrong and Baron (2005) <sup>[3]</sup> recommend following points:

- Training should be provided to both the evaluators and the employees.
- Transparency in the implementation of the system.
- Provision of continuous feedback to employees on their performance.
- Disciplinary measures should be taken on supervisors who do not provide continuous feedback to employees.

e-HRM<sup>[4]</sup> activities are



Figure 1

Many companies make use of web-based technology to evaluate the performance of an individual. This can be done either using the computer monitoring tool, wherein the complete working of an individual can be recorded, or through writing the reviews and generating the feedback on the employee's performance using the web portal <sup>[5]</sup>.

### 3. RESEARCH DESIGN

#### 3.1 Objectives

- To take the review of performance appraisal process implementation in e-HRM software.
- To study the automated processes used to streamline performance reviews and appraisal processes.

#### 3.2 Scope of study

This work is confined to study the appraisal process present in the organizations. It also visualizes real time scenarios in Industry. It explores some of the merits and demerits in existing system.

## 4. RESEARCH METHODOLOGY

### 4.1 Method used

A sample of 50 companies was selected for conducting the survey.

### 4.2 Sources of Data

Sample method is useful for data collection. The types of data collected were:

- Primary data
- Secondary data

#### 4.2.1 Primary data

Respondents for the survey were selected HR department employees including HR Executives, Sr. HR Executives, HR Managers and other HR team members. After receiving the questionnaire, fully filled and valid questionnaires were selected for the further research.

#### Questionnaires

130 questionnaires were distributed to HR Executives, Sr. HR Executives, HR Managers and other HR team members.

#### 4.2.2 Secondary data

Secondary data was collected from past records and manual of the company, books, internet etc. It is the data already collected, which is made available for reference purposes. In my research the secondary sources used are, various files and records maintained by organization, HR manual.

#### Sample size

121 questionnaires were considered out of 130 and Random Sampling Method is used for research work

#### Hypothesis

Performance Appraisal function is benefitted by the use of e- HRM in HR department.

## 5. DATA ANALYSIS

### 5.1 Use of e-HRM Software for Performance Appraisal

**Table 1** Use of e-HRM software for performance appraisal

Sr. No	Choice	Count	Percentage
1	Yes	91	75.21%
2	No	30	24.79%
	Total	121	100.00%

Based on the above table data following graph is depicted:

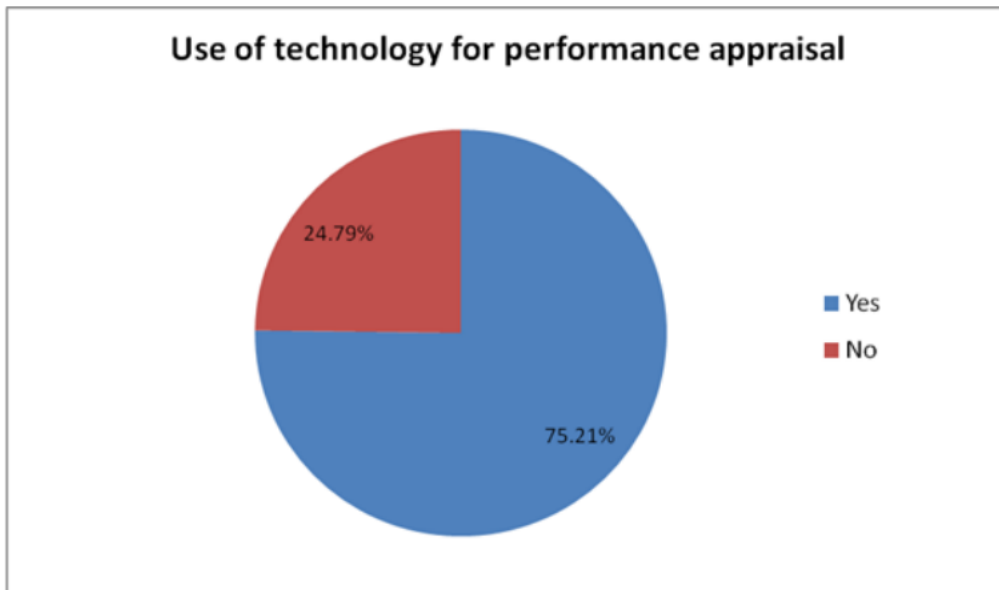


Figure 2 Use of e-HRM software for performance appraisal

### Observations

- From the above statistics it shows that due to extensive use of information technology, Appraisal process becomes easier to execute. In order to reduce the work pressure as well as for perfection in the appraisal process, use of software is appreciated.
- More than 75% responses have received regarding the use of technology in appraisal process of an employee.
- 24% responses says that the technology is not used for employee's performance appraisal process.

### 5.2 Providing Report on on-Going Feedback

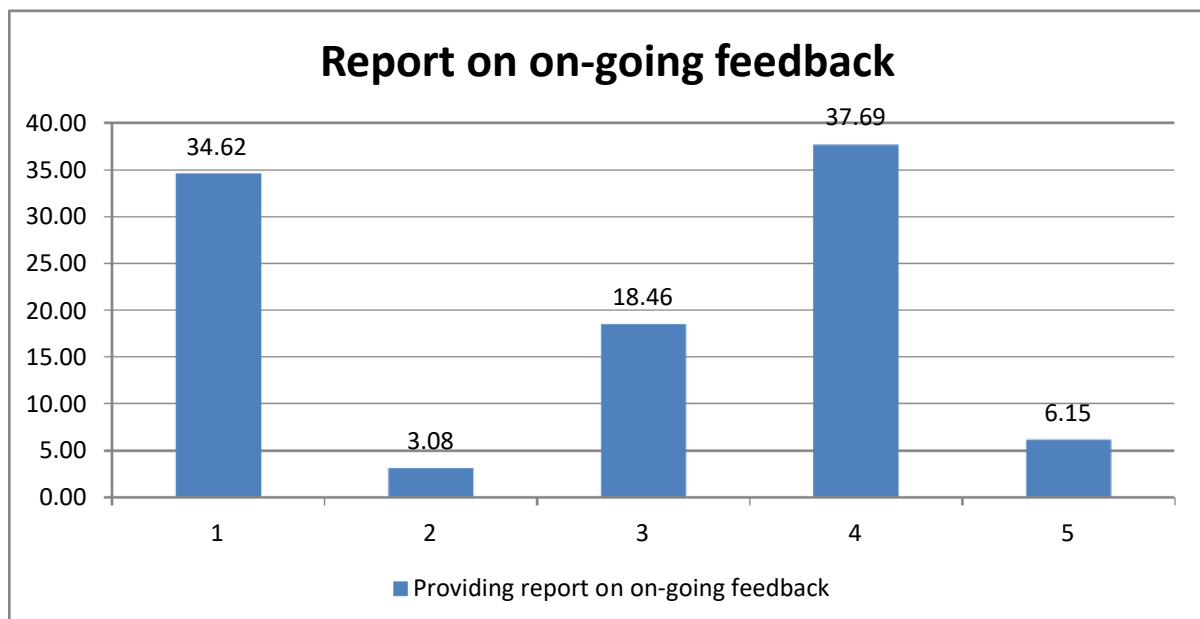
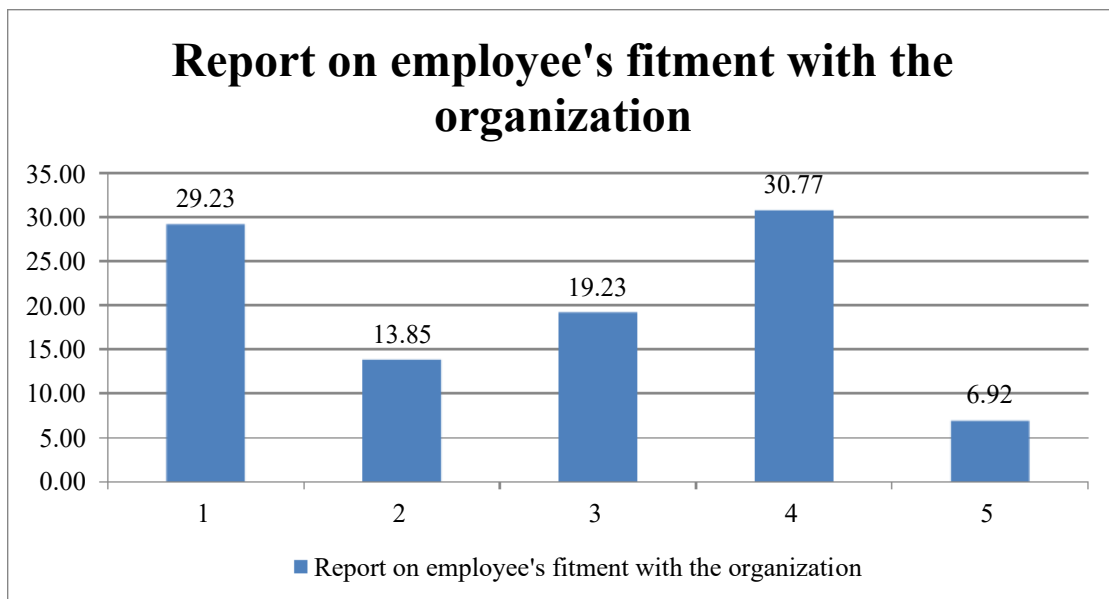


Figure 3 providing report on on-going feedback

**Observations**

- The goal of ongoing feedback is to identify where performance is effective and where performance needs improvement. Giving and receiving feedback is a two-way street; both the manager and the employee should be proactive by frequently seeking out and providing feedback.
- e-HRM software can generate the reports on on-going Feedback of participants.
- The above graph indicates various responses received from e-HRM software on on-going feedback of participants.
- From the graph it is clearly seen that more than 37% respondents say that they strongly agree on responses received from e-HRM software on on-going feedback of participants.
- More than 3% respondents say that they disagree on responses received from e-HRM software on on-going feedback of participants.
- 18% respondents have given neutral opinion.
- More than 6% respondents say that they are strongly agree and more than 7% respondents disagree on on-going Feedback of participants.
- Here the graph indicates that in all more than 34% respondents entered strongly disagree option for on on-going Feedback of participants.

**5.3 e-HRM S/W Generates Report on Whether Employee Fits with the Organization**



**Figure 4** e-HRM s/w generates report on whether employee fits with the organization

**Observations**

- e-HRM software can generate the report on fitment of the employee in the organization.
- The above graph indicates various responses received from e-HRM software on fitment of the employee in the organization.
- From the graph it is clearly seen that more than 29% respondents say that they strongly disagree on fitment of the employee in the organization.

- More than 30% respondents say that they agree on fitment of the employee in the organization.
- 19% respondents have given neutral opinion.
- More than 6% respondents say that they are strongly agree and more than 13% respondents are disagree on fitment of the employee in the organization.

#### Analysis of various statements related to e-HRM software

Here, many questions were raised regarding various functions of e-HRM software which uses technology in appraisal process. These functionalities are discussed as under:

#### 5.4 e-HRM S/W Enables us to Complete Appraisal on Time

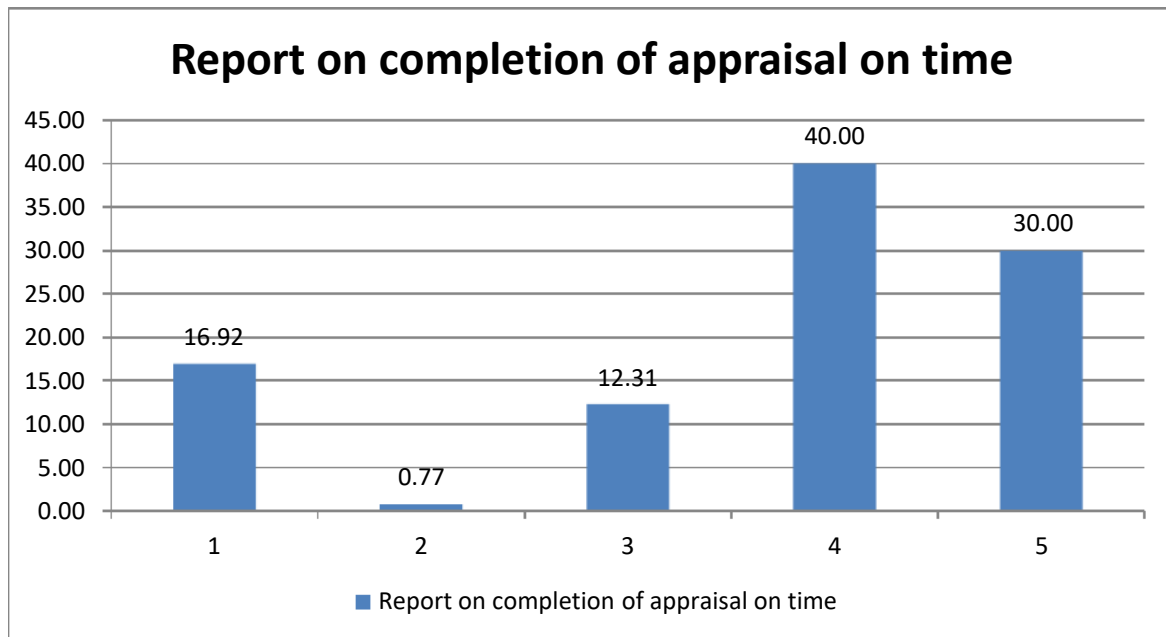


Figure 5 e-HRM s/w enables us to complete appraisal on time

#### Observations

- The above graph indicates responses received regarding opinions about e-HRM software helping in completion of appraisal process on time.
- From the graph it is clearly seen that more than 30% respondents say that they are strongly agree on the e-HRM software helping in completion of appraisal process on time.
- More than 40% respondents agree on the e-HRM software helping in completion of appraisal process on time.
- More than 12% respondents have given neutral opinion.
- More than 16% respondents say that they are strongly disagree on the e-HRM software helping in completion of appraisal process on time.
- About 17% of the respondents say that they are disagree on the e-HRM software reporting on superior-subordinate relationship.
- About 0.7% of the respondents say that they disagree on the e-HRM software helping in completion of appraisal process on time.
- From this analysis, it is clearly observed that 70% of the respondents agree on the opinion that e-HRM software is helping in completion of appraisal process on time.

### 5.5 e-HRM S/W Guarantee Accuracy in Appraisal Process

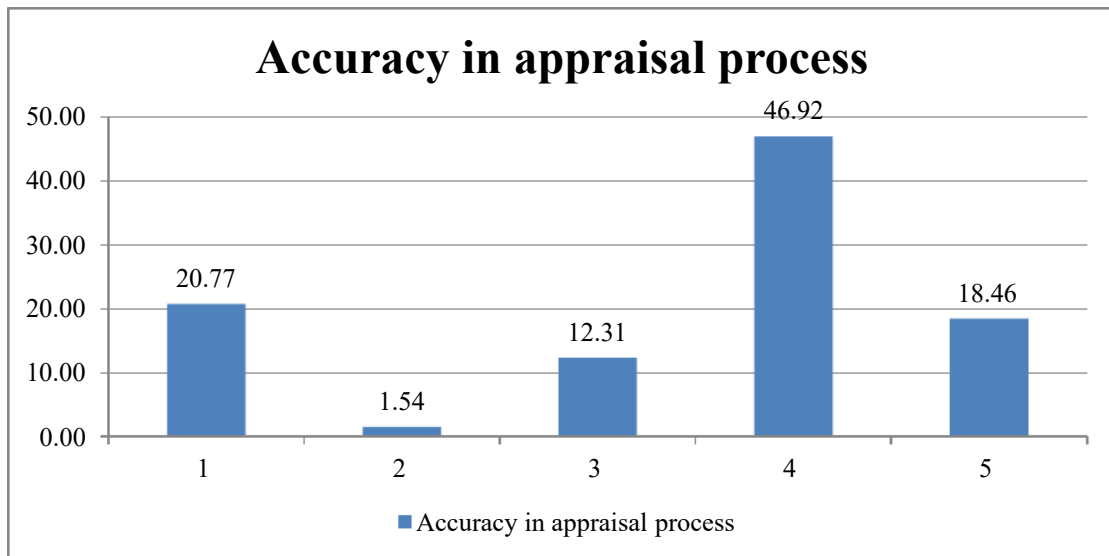


Figure 6 e-HRM s/w guarantee accuracy in appraisal process

#### Observations

- The above graph indicates responses received on e-HRM s/w which helps in getting guaranteed accuracy in appraisal process.
- From the graph it is clearly seen that more than 46% respondents say that they agree on e-HRM software’s help in getting guaranteed accuracy in appraisal process.
- More than 18% respondents say that they strongly agree on e-HRM software’s help in getting guaranteed accuracy in appraisal process.
- 12% respondents have given neutral opinion.
- More than 20% respondents say that they are strongly disagree and more than 1% respondents are disagree on e-HRM software’s help in getting guaranteed accuracy in appraisal process.
- The above analysis of the data indicates that more than 65% of the respondents say that they agree on e-HRM software’s role in getting guaranteed accuracy in appraisal process.

### 6. INTERPRETATIONS

Performance Appraisal function is benefitted by the use of e- HRM in HR department.

### 7. TEST STATISTICS

**Chi Square** =  $\sum [(O - E)^2 / E] \sim (m-1) (n-1)$  degrees of freedom

Where

O = Observed frequency, n = Number of columns

E = Expected frequency, m = Number of rows

**Observation**

**Table 2**

O <sub>i</sub>	E <sub>i</sub>	O <sub>i</sub> -E <sub>i</sub>	(O <sub>i</sub> -E <sub>i</sub> ) <sup>2</sup>	(O <sub>i</sub> -E <sub>i</sub> ) <sup>2</sup> /e <sub>i</sub> = Chi sq
39	36.10461	2.89539	8.383283	0.232194
39	36.20906	2.79094	7.789346	0.215121
38.33333	36.20906	2.12427	4.512523	0.124624
38	34.53787	3.46213	11.98634	0.347049
32.5	33.60944	-1.10944	1.230857	0.036622
36	36.20906	-0.20906	0.043706	0.001207
9.75	11.57266	-1.82266	3.322089	0.287064
12.28571	11.57266	0.71305	0.50844	0.043935
12.33333	11.60614	0.72719	0.528805	0.045563
10.95	11.07047	-0.12047	0.014513	0.001311
11.13	10.77288	0.35712	0.127535	0.011838
10	11.60614	-1.60614	2.579686	0.222269
19.55	18.87818	0.67182	0.451342	0.023908
18.85714	18.9328	-0.07566	0.005724	0.000302
21.16667	18.9328	2.23387	4.990175	0.263573
10.07692	18.05897	-7.98205	63.71312	3.52806
23.33333	17.57352	5.75981	33.17541	1.887807
18.25	18.9328	-0.6828	0.466216	0.024625
34.25	39.1626	-4.9126	24.13364	0.616242
36.14286	39.27589	-3.13303	9.815877	0.249921
38.52	39.2759	-0.7559	0.571385	0.014548
49.6	37.46316	12.13684	147.3029	3.93194
21.66667	36.45609	-14.7894	218.7269	5.999737
50.65	39.27589	11.37411	129.3704	3.293888
17.5	23.90695	-6.40695	41.04901	1.717032
14.14286	23.97611	-9.83325	96.69281	4.032881
19.66667	23.97611	-4.30944	18.57127	0.774574
22.93	22.86952	0.06048	0.003658	0.00016
22.5	22.25475	0.24525	0.060148	0.002703
38.25	23.97611	14.27389	203.7439	8.497789
				36.42849

Number of rows = 6

Number of columns = 5

$(m-1) * (n-1) = 5 * 4 = 20$

### **Level of significance**

Chi-Square tabulated at 1% level of significance = 37.566

### **Inference**

Chi-Square calculated = 36.42849

Chi-Square tabulated is greater than Chi-Square calculated for 1% level of significance. Hence the hypothesis is tested and accepted.

## **8. CONCLUSIONS**

- Unique feature observed in the e-HRM software that it helps in reducing the work pressure as well as provides perfection in the appraisal process. There is provision of submitting the appeal after appraisal process through software.
- e-HRM software reduces paperwork and easily monitors & executes performance appraisal process.
- Appraisal process becomes easier to execute.
- Use of software is appreciated in appraisal process. HR department employees thus can focus on core HR functionalities more effectively

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## To simulate AODV, DSR, GRP and OLSR routing protocols of VANET and study the performance indicators using Opnet Modeler 14.5

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**Abstract** - Wireless technology is developing very fast. VANET is an evolving technology in the field of wireless communication and with the advancement it will contribute more to the smart transportation system in days to come. Quality of service in Vehicular ad-hoc Network (VANET) is primarily dependent on routing protocols. Maximum throughput, minimum packet loss and controlled overhead are the major ultimate objectives of each proposed routing protocol. VANET gives a communication framework that has enhanced the traffic service. Data sharing in this system is time sensitive and require quick and vigorous network connection forming. VANET is serving the said purposes but there are some issues and challenges like efficient handling of fast handovers for audio applications. Therefore, in this paper recently proposed routing protocols along with their pros and cons are discussed. VANET routing protocols are simulated using Opnet simulator and key performance Indicators were assessed. Simulation is performed to check the delays and throughput comparisons between the routing protocols.

**Keywords:** VANET, Opnet, Simulation, Routing Protocols, ad-hoc network

### 1. Introduction

VANET is the short form of Vehicular Ad-hoc Network, it is subclass of network of MANET type. The main characteristics of the VANETs are as follows: heterogeneous communication range, mobility of the vehicles, geographically constrained topology, time varying vehicle density, frequently disconnected network, dynamic topology, and the vehicles being the components that build the network. The VANET routing protocols need to be designed considering factors such as the security, mobility and scalability of vehicular communication. The goal of VANET architecture is to allow the connection between vehicles or between vehicles and fixed road side units to have a smooth communication possible.

For routing protocols Key Performance Indicators (KPIs) are essential like (Delay, No. of Hops, Retransmission Attempts, Traffic Received, Throughput); it is not necessary that the network should have the best results in all KPIs, but they must be realistic, and provide acceptable results in all KPIs, and during the decision taking part all the KPIs must be prioritized based on the required solution.

Specific applications like audio and video requires better handoffs and packet transmission across the network. In this paper, a simulation using the Opnet modeler for the most popular VANET routing protocols for a voice enabled service network will be done to obtain the best KPIs from its perspective and choose the best one based on the KPIs.

### 2. VANET routing protocols

#### 2.1. AODV

AODV (Ad-hoc On-demand Distance Vector) is a loop-free routing protocol for ad-hoc networks. It is designed to be self-starting in an environment of mobile nodes, withstanding a variety of network behaviors such as node mobility, link failures and packet losses. The information is only transmitted between nodes in an on demand mode.

#### Advantages

- Routes are established on demand and destination sequence numbers are used to find the latest route to the destination.
- AODV can be used in large VANET networks.
- Any failure in the VANET links is handled in a prompt way by the AODV.
- The connection setup delay is lower.

- Distance Sequence Number is providing recent route to the destination node.

#### Disadvantages

- It expends extra bandwidth, because of proactive beaoning high control overhead is occurring when many route reply packets for a single path.
- Compared to other approaches, high processing time is required for the connection initiation and the first attempt to set the path.
- Route inconsistency may occur when old entries are included in intermediate nodes.

#### 2.2. DSR

The DSR protocol utilizes source routing and maintains functional paths. It consists of route detection and route servicing. Route Discovery determines the optimum path for a transmission between a given source and destination. Route Maintenance ensures that the transmission path remains optimum and loop-free as network conditions change, even if this requires changing the route during a transmission.

#### Advantages

- In DSR protocol no proactive updates are desired.
- Route caching can reduce route discovery.
- The DSR protocol is Beacon less.

#### Disadvantages

- When the links get down it can't be reformed locally.
- The performance of DSR protocol views declining in highly mobile VANET.
- DSR is not scalable to large networks.
- The connection setup delay is higher

#### 2.3. OLSR

The Optimized Link State Routing Protocol (OLSR) is an IP routing protocol optimized for mobile ad hoc networks, which can also be used on other wireless ad hoc networks. It means optimized link state routing which means a routing protocol using the proactive mode. In this, whenever any change in the topology occur, MPR (multipoint relay) are responsible to generate and forward the topology information to selected nodes. OLSR operation fundamentally consists of servicing and updating information in a set of tables. The tables are managing the route calculation itself as well.

#### Advantages

- Suitable with data intensive application as it has less average end-to-end delay.
- Doesn't require central administrative system to handle routing process

#### Disadvantages

- The control message overhead gets increased with increased in mobile hosts.
- In OLSR, large amount of bandwidth and CPU power is required to compute the optimal path.

#### 2.4. GRP

GRP routing is used into two approaches. In greedy forwarding, the data is sent to the closest neighbor of the destination node; the second approach is perimeter routing which implies planner graph traversal concept.

#### Advantages

- Route discovery and management is not required.
- GRP supports scalability
- Suitable for high node mobility pattern

#### Disadvantages

- The protocol requires position determining services.
- GPS devices don't work in tunnel

#### 3. Simulation setup and metrics

To monitor different performance matrices related to all four routing protocols in VANET environment, we have simulated some scenarios with the help of OPNET modeler 14.5. This scenario consists of 40 nodes enabled with voice application. The area considered for simulation is 10 km X 10 km. For the application designation we have included the Application config and Profile config to set the applications (voice) used by the nodes. Subsequently, we changed the routing protocol of all the nodes to all the routing protocols i.e. AODV, DRS, OLSR and GRP consecutively. The metrics considered for observation are throughput, media access delay, network load, traffic drop and delay. The seed value considered for simulation is 128.

#### 4. Simulation Results

4.1 Throughput – fig. (1) Depicts the throughput of the network. The simulation runs for the entire duration which generates result in time\_average mode, specifies OLSR has maximum throughput, than AODV. GRP protocol gives minimum throughput, whereas DSR remains behind to AODV.

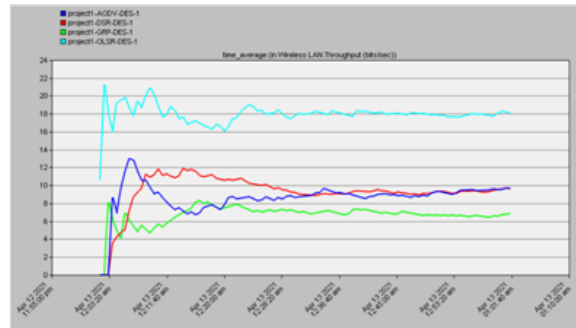


fig. (1) Throughput in the network

4.2 Network Load – as depicted in fig. (2) The network load for AODV and DSR is equal minimum at approx. 10 min. of the experiment. Further the network load increases steadily throughout the execution. At the same time interval, GRP has 1000 bits/sec network load, further remains constant. The OLSR has maximum network load 2200 bits/sec.

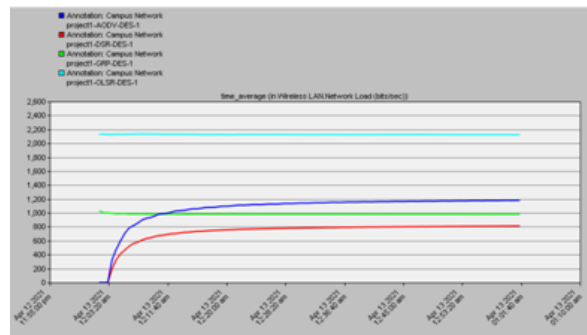


fig. (2) Network Load in the network

4.3 Media Access Delay – GRP protocol has maximum peak of Media Access Delay at around 20% time of the execution; further the delay gets decreasing. OLSR and DSR have gradual increase in their delays. AODV protocol has minimum delay and it remains consistent throughout the experiment, as shown in fig. (3).

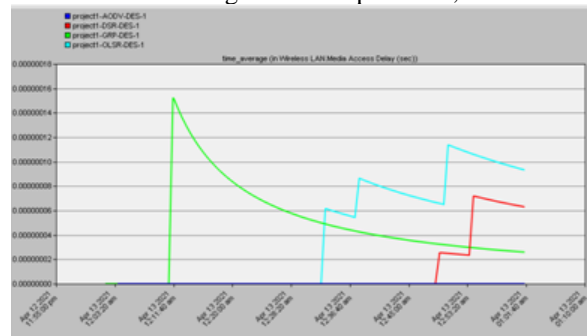


fig. (3) Media Access Delay in the network

4.4 Traffic Dropped – fig. (4) Specifies OLSR protocol has the maximum packets traffic drop. Other protocols AODV, DSR and GRP have minimum packets traffic drop.

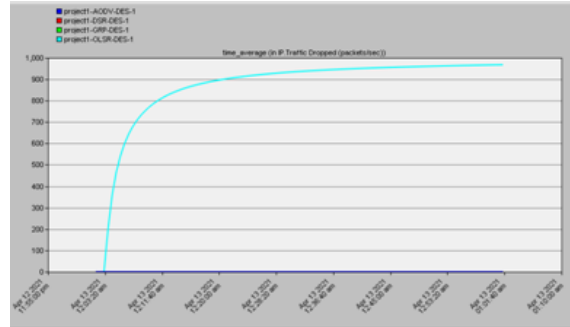


fig. (4) Traffic Dropped in the network

4.5 Delay – All protocols have propagation after 10% of execution time, DSR has minimum delay 0.00024 s, which remains constant further. OLSR and AODV protocols are having slightly higher delay than DSR and it remains constant in execution. The GRP protocol has highest delay peak 0.00030 s, which further gets decreases until reaches to 0.00026 s.

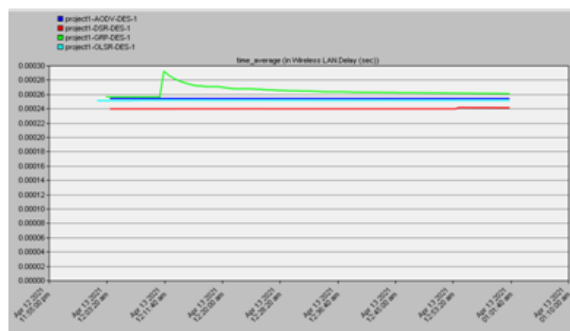


fig. (5) Delay in the network

## 5. Conclusion

In this work, simulation based analysis has been carried out to analyze the VANET system performance using different routing protocols. In this paper, we have reviewed many studies related to routing protocols. As per the research completed, AODV proved to be the best routing protocol in VANET environment. The proposed simulated results may be serving as guidelines for design of modern traffic control mechanisms which follows safety application, faster data packet dissemination and intermittent connection problem in VANETs.

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## QoS Routing Protocols for Aeronautical Ad hoc Networks : a Survey

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**Abstract:** In Aeronautical ad hoc networks which is one of the family member of wireless ad hoc network and subset of MANET and VANET due to Some factors like high mobility, multi-hop communication and huge geographical area and therefore Quality of Service (QoS) routing is a critical issue. Some researchers have been done performance and comparison study to provide QoS assurances in AANET routing protocols. In current years some of QoS routing protocols with distinguishing capabilities were proposed for AANET .This paper presents a survey of some of these protocols which include a overview of all elements, evaluation parameters and recourses of QoS routing which can be affecting the performance.

**Keywords:** QoS ,AANET, routing protocols

### Introduction:

Aeronautical ad hoc network (AANET) is highly dynamic mobile ad hoc network between aircrafts, which enables communion among ground station and air perceive information. Research study have showed that it is possible to set up a mobile ad hoc network among the aircraft thus providing a multi- hop communication link between the airliner and the ground base station. Compared with the normal ad hoc networks, the airliners in AANET move at a very high speed, typically 700km/h to 1000km/h [1]. So the multi-hop communications in AANET are extremely unbalanced due to the frequent network topology changes.

Airplanes are connected through wireless links to build a live and on-the-fly network called a Aeronautical Mobile Ad-hoc Network (AANET). The airplanes (nodes) communicate among themselves and act as both hosts and routers. Hence, maintaining appropriate Quality of Service (QoS) for AANETs is a complex task due to the dynamic behaviour of the network topology. Commonly, QoS for a network is measured in terms of the guaranteed amount of data which a network transfers from source to destination within specific time. The QoS is identified as a set of measurable pre-specified service requirements; such as delay, bandwidth, probability of packet loss, and delay variance (Jitter). The traffic types in aeronautical ad-hoc networks are quite different from other infrastructures and the use of wireless technologies in AANETs make the QoS approaches more complex.

Basically, Wireless ad hoc network is more and more utilized in the military aeronautical network communication domain, such as High Frequency Intra Task Force (HF-ITF) developed by the Office of Navy Research (ONR), its objective is quickly realizing interoperability between the navy and the air with lower cost. DARPA and Air Force Research Laboratory (AFRL) commissioned Rockwell Collins to be chargeable for the tactical focused on community technology (TTNT), to attain the speedy discovery of time touchy objectives and well timed attacking [2], [3]

Accordingly, such networks are annoying to have unique capabilities; i.e., independent architecture, allotted operation, multi-hop routing, reconfigurable topology, fluctuating hyperlink capacity, and mild weight terminals. Thus, several interesting issues can be technically involved when designing AANETs; such as security, routing, reliability, internetworking, and power consumption due to the shared nature of the high mobility ,Frequent topology change ,limited bandwidth,node density and Sparse distribution of the ground stations. Therefore, providing suitable QoS for delivery of real-time communications in AANETs is more challenging.

In this paper, we have provided the theoretical study of issues and challenges for QoS protocol in AANETs which have been found after study of previous research papers, we also presented routing protocols specially consider for AANET as it has been found that current routing protocols which are being used for MANET are



not able to cope with AANETs environment.

## **ISSUES AND CHALLENGES FOR QOS PROTOCOL IN AANET**

### **A. Mobility**

There is a strong need for providing connectivity in aircraft, so that they can continuously communicate with other devices attached to the Internet, at any time and anywhere. However, the connectivity of the network may be frequently interrupted due to the excessive pace of aircraft [4] and sometime interrupted by weather, highly-dynamic wireless channel fluctuations as well as changing topology [5]. Hence, the network protocols of AANETs have to be more flexible. The inevitable delay problems due to routing over large geographical distances and the connectivity troubles because of the frequent setup and breakup of verbal exchange hyperlinks amongst plane require extraordinarily strong answers to help excessive mobility.

### **B. Congestion**

AANETs are intended for providing Internet access, it required all multi-hop traffic to flow through the GSs, gateway congestion may be caused at or among the aircraft near these Ground Stations. Moreover, by efficiently allocating flows, the traffic may be balanced amongst the gateways to avoid congestion as well as routing of packet in the network, the path between an aircraft and a gateway determines the service which is provided by the gateway to the aircraft. The approaches of Internet gateway allocation, routing and scheduling which minimizing the common packet delay within the network.

### **C. Threats**

It is extremely critical to secure AANETs from every conceivable threat. Generally, the security threats to aircraft networks are internal and external ones. Internal safety threats originate from the in-cabin passenger community. On the other hand, the external security threat is caused by the security vulnerabilities of the communication links [7]. In the future, available radio spectrum will become more scarce. However, the signal transmissions in AANETs take place over A2A, A2G and A2S across airports, populated and unpopulated areas, each having different bandwidth requirements

### **D. Decentralized control:**

The aeronautical network is set up spontaneously and all nodes may join or leave the network anytime. So there may not be any centralized control on the nodes which causes increased algorithm's overhead and complexity, as QoS state information must be disseminated efficiently.

### **E. Unpredictable channel:**

The bit mistakes are the primary hassle which arises due to the unreliable wi-fi channels. These channels motive excessive bit blunders price and that is because of excessive interference, thermal noise, multipath fading effects, and so on. This ends in low packet delivery ratio.

### **F. Data Loss:**

It refers when the data is loss or packet loss when the data is send from sender to receiver due to distortion.

### **G. Route Maintenance:**

The maintenance of network state information is very difficult due to the frequent changes in the network topology and changing behaviour of the communication medium. During the data transfer process the predefined routing path may be broke so that it is become important to focus on maintenance and reconstruction of routing paths with minimal overhead and delay required. The QoS aware routing would require the reservation of resources at the intermediate nodes[8].

## **EVALUTION PARAMETERS FOR QOS ROUTING PROTOCOLS**

As different applications have different requirements, the services required by them and the associated QoS parameters differ from application to application as per their service requirement. For example, in multimedia applications, bandwidth, delay and delay-jitter are the key QoS parameters, whereas military applications have stringent security requirement. The following is a sample of the metrics commonly used by applications to specify QoS requirement to the routing protocol.

### **A. Throughput –**

In AANET throughput is defined as rate of how much data can be transferred from source to destination within a given timeframe over the wireless infrastructure and it is measured by how many packets arrive at destinations. Throughput generally measured in bits per second or data packets per second/per timeframe.

Throughput = Total packet received/ amount of forwarded packet over certain time interval

### **B. Dropped Packets –**

Dropped packets are the number of packets that sent from the source node and unable to reach the destination node successfully.

Dropped packets = sent packets – received packets

### **C. Mean inter arrival time -**

- Mean inter-arrival time is the summation of inter-arrival times of packet divided by the number of received packets and can be computed by the following equation

$$av = (\sum ai/n)$$

### **D. Average end to end delay-**

End-to-end delay refers to the time taken for a packet to be transmitted across a network from source to destination.

The average end to end delay can be calculated by summing the times taken by all received packets divided by its total numbers.

Average E-2-E =  $\frac{\sum(\text{received time-sent time})}{\sum(\text{number of packets})}$

#### **E. Jitter –**

Jitter in ad hoc networks is the **variation in the latency on a packet flow between two nodes**, when some packets take longer to travel from one node to the other. Network congestion, timing drift and route changes may affect jitter.

The basic standard term is "packet delay variation" (PDV) which is an important quality of service (QoS) factor in evaluation of network performance.

Jitter (J) =  $D_{i+1} - D_i$  where  $D_{i+1}$  is the delay of  $i+1$  packet and  $D_i$  is the delay of  $i$ th packet.

#### **F. Packet delivery fraction (PDF) –**

Packet delivery fraction (PDF) can be measured as the ratio of the delivered packets at destination to the packets sent from the source node.

PDF =  $100 * (\text{Number of received packets} / \text{Number of sent packets})$

#### **ROUTING PROTOCOLS IN AANETS:**

After a lot of relevant survey of Adhoc networks, we observed that some traditional MANETs routing protocols are not effective to meet QoS implementation in AANETs due to its very high mobility of aircraft nodes and large geographical area.

So, there is a need to find out suitable routing protocols for these highly dynamic Ad-hoc networks. Here, we present some of the protocols which may be implemented in these networks.

#### **Open Shortest Path First (OSPF):**

Open Shortest Path First (OSPF) internet routing protocol which is designed based on link-state algorithm. OSPF is used to find the best path between the source and the destination router using its own Shortest Path First. OSPF is developed by Internet Engineering Task Force (IETF) which is one of the Interior Gateway Protocol (IGP), i.e, the protocol which aims at moving the packet within a large autonomous system. It is described as OSPF Version 2 in RFC 2328 (1998) for IPv4. If timer settings are reduced then there will be a decrease in packet loss during link failures. The overhead can also be reduced to meet out the problem of scalability.

#### **Multi-Meshed Tree (MT) Protocol:**

This approach is basically a combination of clustering, reactive and proactive routing schemes[9]. This protocol has been evaluated for strong connectivity amongst distinctly dynamic. This is hybrid approach of proactive Multi-Meshed Tree (MMT) and Reactive Multi-Mesh Tree (RMMT) is employed for inter-cluster routing. This protocol has outperformed other protocols in terms of success rate percentage, End-to-End packet latency, and file transfer delay.

#### **Predictive-OLSR (P-OLSR):**

This protocol makes use of GPS data available on board in aircraft which is able to track changes in highly dynamic network. For highly mobile Aircrafts Networks, geographic routing protocols can prove to be very successful as this GPS data can be obtained from airplanes. Some researchers proven that P-OLSR outperforms OLSR for frequent topology changes by the experimental and simulation results.

#### **Reactive-Greedy-Reactive (RGR) Protocol:**

Reactive-Greedy-Reactive (RGR) is a routing protocol designed for UAANETs. RGR covers both the characteristics of topology-based protocols and position-based protocols. RGR is a combination of AODV and GGF with no recovery strategy. This is a promising routing protocol for high mobility and dense scenarios. The concept of scoped flooding and mobility prediction will be used to improve the original RGR protocol [11].

#### **AeroRP:**

AeroRP is a geographic routing protocol that can be configured to run on one of three modes: ad-hoc mode, GS-location mode, and GS-topology mode. In addition, It has two parallel phases: neighbour discovery and data forwarding. This is another geographical protocol for highly dynamic networks for AANETs geographical information can be helpful for improved routing. AeroRP also is very helpful for improved accuracy, less delay and overhead, etc.

#### **DREAM (Distance Routing Effect Algorithm for Mobility):**

Here, the frequency of sharing of location information among the nodes is decided on the basis of inter-node distance and how fast the individual nodes are moving. More the nodes apart from each other, the less often position updates need to be shared. This way DREAM optimizes the rate of generation of control messages [12].

#### **Location-Aided Routing (LAR):**

It is also based on the concept of wedge zone which is referred to as the request zone as used in the DREAM.

This request zone is used to forward the route request instead of data packets[13, 14]. There are two different methods to decide if a node is in the request zone. In the first method, the sender sends a route request containing the coordinates of a rectangular area which has the request zone. A node receiving this request message will discard it if it is not in the rectangle and forward it if it is. In the second method, the request zone is not defined explicitly but instead, the packet is forwarded based on the distance between the sender and destination nodes.

#### **Optimized Link State Routing (OLSR):**

OLSR is a proactive link-state protocol this routing protocol uses HELLO messages and topology control (TC) messages to discover neighbour node [14]. The HELLO messages are used to find out the neighbour nodes in direct connection (i.e. one hop). While Topology Control messages are used to build a topology information base. This protocol can be used for ad-hoc networks having bandwidth and neighbour mobility. OLSR uses the Multi-point Relay (MPR) technique to reduce control traffic overhead.

#### **Conclusion**

In this paper, we have presented a survey of QoS aware routing protocols for aeronautical mobile adhoc networks. A lot of research has been done in this field. However the different protocols discussed in the paper are very effective and useful for new researchers to identify topics for further research. The QoS routing in an ad hoc network is a challenging task due to inherent characteristics of such a network. Here, following points are covered in this paper: 1) A review of the basic concepts and challenges of QoS routing in AANETs. 2) evaluation metrics for qos routing protocols and 3) The classification of the routing protocols has been done.

The protocols are selected in such a way so as to highlight many different approaches to QoS routing in AANETs, so as to explore the future areas of research. All the QoS routing protocols discussed above can further be explored in many prospective to improve their performance.

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## Manet Simulation Through Opnet

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**Abstract-** The paper presents the results of a detailed packet-level simulation comparing three multi-hop wireless ad hoc network routing protocols under the load of different probability distributions, that cover a range of design choices having different protocol viz. AODV,OLSR and TORA. We have extended the OPNET network simulator to accurately model the MAC and physical-layer behavior of the IEEE 802.11 wireless LAN standard, including a realistic wireless transmission channel model. Simulation of 100 mobile nodes has been carried out and the performance optimization is determined.

**Keywords** – Simulation, Opnet, Wireless, Statistical probability distribution, IEEE802.11, throughput, delay, retransmission attempt, load, protocol, MAC, LAN

### I. INTRODUCTION

Ad-hoc wireless network is that network where no communication is present, in such network; each mobile node operates not only as a host but also as router. Mobile nodes in the network may not be within range of each other, communication of these nodes perform by discovering “multi-hop” paths through the network to other nodes. This type of network is some time called infrastructure less network [1]. Some examples of the possible uses of ad hoc networking are students using laptop computers to participate in an interactive lecture, business associates sharing information during a meeting, soldiers relaying information for situational awareness on the battlefield [2, 3]. Many different protocols have been proposed to solve the multi hop routing problem in ad hoc networks, each based on different assumptions and intuitions.

Mobile Ad hoc Networks (MANETs)[1] are an emerging technology that allows establishing an instant communication network for civilian and military applications, without relying on pre-existing fixed network infrastructure. The nodes in a MANET can dynamically join and leave the network, frequently, often without warning, and possibly without disruption to other nodes' communication. Each node in the network also acts as router, forwarding data packet for other nodes. A central challenge in design of Ad hoc network is the development of dynamic routing protocols that can effectively find the route between two communicating nodes. The routing protocol must be able to keep up with the high degree of node mobility that often changes the topology drastically and unpredictably.

The current Mobile Ad Hoc Network (MANET) [2] paradigm as described by the Internet Engineering Task Force (IETF) MANET work group. Routing algorithms are often difficult to formalize into mathematics; they are instead tested using extensive simulation. A large amount of work has been done in the area of energy efficient routing. This approach attempts to maximize network lifetime by routing through paths, which use the least amount of energy relative to each node. Now a day, more attention has been given to use specific network parameters while specifying routing matrixes. Routing matrixes includes delay of network, link capacity, link stability or identifying low mobility nodes. These schemes are generally based on previous work, which is then enhanced with the new matrix.

The paper is providing a realistic, quantitative analysis comparing the performance of a variety of multi-hop wireless ad hoc network routing protocols. We present results of detailed simulations showing the relative performance of three recently proposed ad hoc routing protocols: AODV [4], OLSR [6] and TORA [7].

Our results in this paper are based on simulations of an ad hoc network of 100 wireless mobile nodes moving about and communicating with each other. We analyze the performance of each protocol and explain the design choices that account for their performance.

The section 2 of the paper describes the different types of protocols used in the simulation. The section 3 has given description of design of simulation model. The performance analysis is describes in section 4 and the section 5 has summaries with conclusion of the paper.

## 2. Description of Protocols

### 2.1 Ad Hoc on demand Vector (AODV) [4]

AODV discovers routes on demand basis. It uses routing table to maintain routing information, one entry per destination. RREP packet is used to replies back to the source and, subsequently, to route data packets to the destination. AODV uses sequence numbers to maintain at each destination to determine routing information and to prevent routing loops [4]. AODV working on timer- based states in each node. A routing table entry is expired if not used recently. If node link is broken, the all predecessor nodes forward the RERR packets, to effectively erasing all routes using broken link. AODV uses expanding ring search technique initially to discover routes to an unknown destination. AODV algorithm has the ability to quickly adapt to dynamic link conditions with low processing and memory overhead. AODV offers low network utilization and uses destination sequence number to ensure loop freedom AODV keeps the following information with each route table entry.

- (i) Destination IP address (IP address for the destination node),
- (ii) Destination sequence number,
- (iii) Valid destination sequence number flag,
- (iv) Network interface,
- (v) Hop count, that is, number of hops required to reach the destination,
- (vi) Next hop (the next valid node that did not re broadcast the RREQ message),
- (vii) List of precursor,
- (viii) Life time, that is, expiration or deletion time of a route.

### 2.2 Optimized Link State Routing (OLSR) [6]

The OLSR model implements the MPR (Multi Point Relay) flooding mechanism to broadcast and flood Topology Control (TC) messages in the network. The algorithm is implemented as suggested in OLSR RFC 3626. This mechanism takes advantage of controlled flooding by allowing only selected nodes (MPR nodes) to flood the TC message. Each node selects an MPR to reach its two-hop neighbors The OLSR model implements the neighbor sensing mechanism through periodic broadcast of Hello messages. These Hello messages are one-hop broadcasts (never forwarded) that carry neighbor type and neighbor quality information. The neighbor sensing mechanism provides information on up to two-hop neighbors. Generation and processing of the Hello messages are implemented as suggested in the OLSR RFC.

Periodic and triggered Topology Control (TC) messages implement the topology discovery/diffusion mechanism in the OLSR model. TC messages are generated by MPR nodes and carry information about MPR selector nodes. These messages are diffused throughout the network using controlled flooding, thus helping to form a topology of reachable nodes, previous hop on each node.

### 2.3 Temporally Ordered Routing Algorithm (TORA) [7]

The Temporally-Ordered Routing Algorithm (TORA) is an adaptive routing protocol for multi hop networks. It possesses the following attributes:

- (i) Distributed execution,
- (ii) Loop-free routing,
- (iii) Multipath routing,
- (iv) Reactive or proactive route establishment and maintenance
- (v) Minimization of communication overhead via localization of algorithmic reaction to topological changes when possible.

Its operation can be biased towards high reactivity (i.e. low time complexity) and bandwidth conservation (i.e. low communication complexity) rather than routing optimality (i.e. continuous shortest-path computation). Its design and flexibility make it potentially well-suited for use of mobile ad hoc networks (MANETs).

A key concept in the protocol's design is an attempt to de-couple (to the greatest extent possible) the generation of far-reaching control message propagation from the dynamics of the network topology. The scope of TORA's control messaging is typically localized to a very small set of nodes near a topological change. TORA includes a secondary

mechanism that is independent of network topology dynamics. It allows far-reaching control message propagation as a means of route optimization or soft-state route verification

### 3. Mobile Ad Hoc Network Model

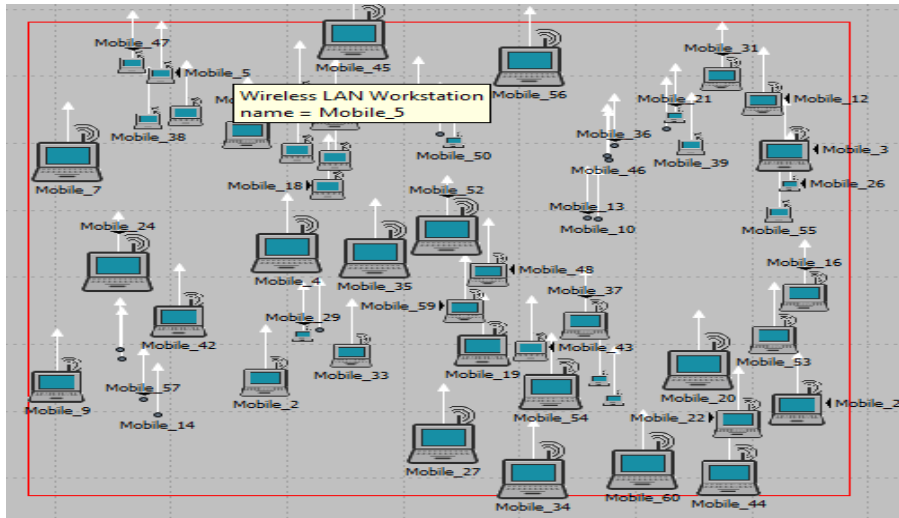


Figure 3.1 Ad hoc Wireless Network

We have design three Mobile Ad-hoc networks scenarios which consist of 100 mobile wireless nodes. Every scenario is following one routing protocol. Scenario one is based on AODV routing protocol, scenario two is following OLSR routing protocol and TORA routing protocol is used in scenario three. In order to enable direct, fair comparisons between Ad-hoc routing protocols, each protocol ran with identical load and environment conditions. Total simulation time was 3600 seconds with 128kbps speed.

As shown in the figure 3.1, wireless network consist of Wireless LAN workstations and supported by random mobility model. Wireless LAN workstation the "wlan\_wkstn" model can be configured to run any MANET routing protocol. It is able to generate application traffic (FTP, E-mail, HTTP, etc.) and route the traffic using the MANET routing protocol configured.

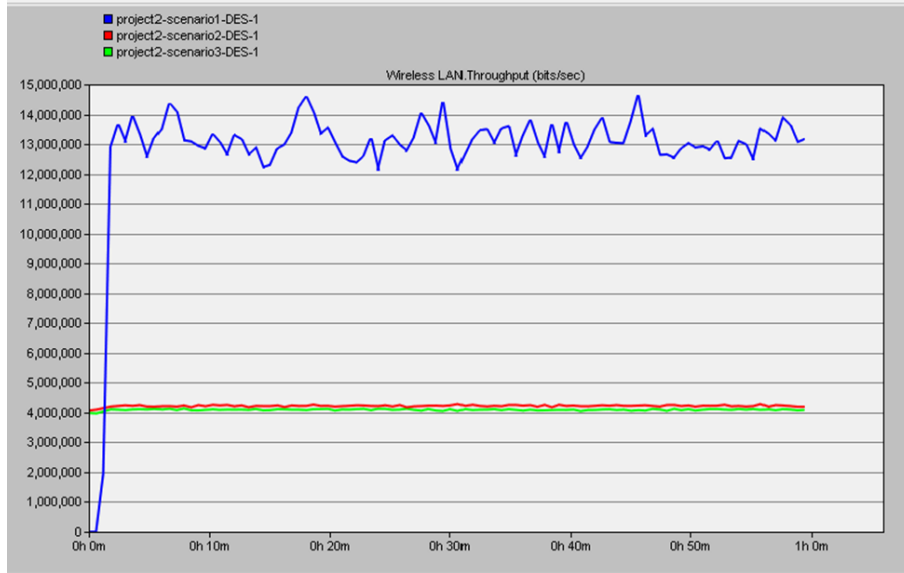
### 4.0 Performance Analysis of Protocol

We have conducted relative performance study of Ad hoc routing protocols through simulation model using Optimize Network Engineering Tool (OPNET 14.5) simulator to carry out simulation. Performance of simulation has analysis based on following matrix.

- a) Wireless LAN Throughput
- b) End to End delay
- c) Wireless LAN Data Dropped

#### 4. (a) Wireless LAN Throughput

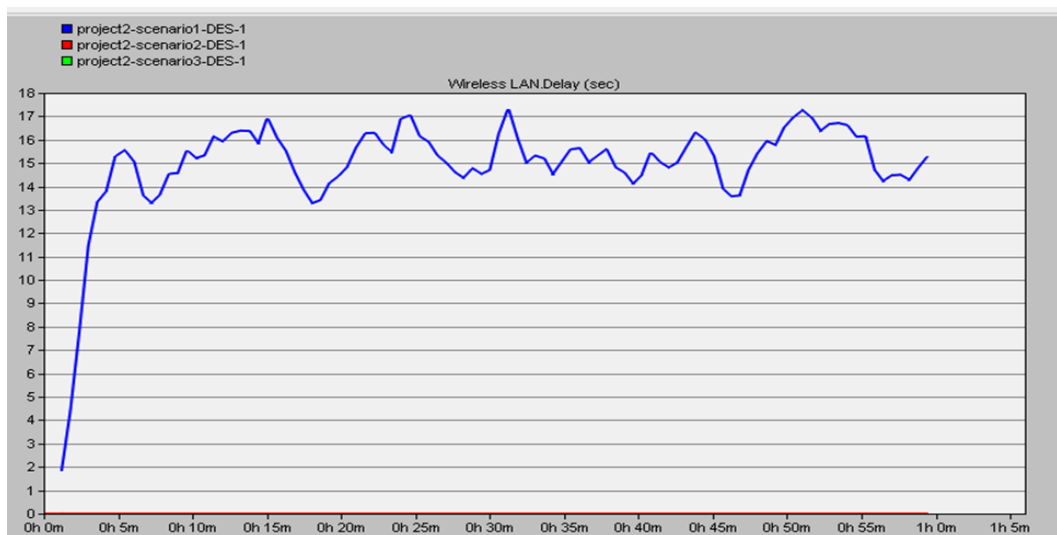




**Figure 4.1 Wireless LAN Throughputs**

As shown in the figure 4.1 throughput of Scenario one is far better than scenario two and three. Scenario one Mobile Ad hoc Network is based on AODV routing protocol and scenario two and three is based on OLSR and TORA routing protocol respectively. AODV is reactive protocol, its shows better throughput as compare to OLSR and TORA. OLSR and TORA are proactive protocols which shows stable throughput throughout the network simulation.

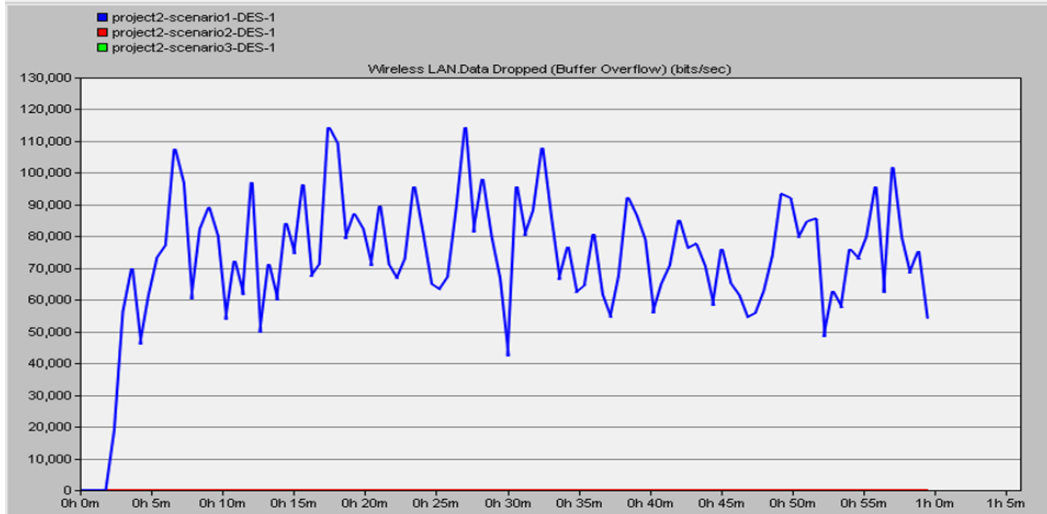
**4.(b) End to End delay**



**Figure 4.2 Wireless LAN Delay (Sec)**

Scenario two and three shows no delay while transmitting the packets from one place to another as shown in the figure 4.2. These two scenarios are based on OLSR and TORA protocol. Scenario one shows fluctuating delay from 13 to 17 sec throughout the simulation time. Scenario one is based on AODV protocol. AODV is dynamic in nature as well as reactive. AODV find the new path on every moment of the wireless mobile node.

**4.(c) Wireless LAN Data Dropped (Buffer Overflow)**



**Figure 4.3 Wireless LAN Data Dropped (Bits/sec)**

As shown in the figure 4.3 scenario one was shown data dropped due to the buffer overflow and scenario two and three shown no data dropped. On an average data dropped 70,000 bits/sec are reported after simulation of the model is completed. It was observed in the scenario one data dropped fluctuating from 45000 bits/sec to 115000 bits/sec throughout the simulation. When bits are reaching to the destination node, memory of the node was full and hence data was dropped by the node.

**5. SUMMARY AND CONCLUSIONS**

A MANET simulation models were developed for different Wireless routing protocols i.e. AODV, OLSR and TORA. The performance of simulation models was observed and discussed in above sections. Based on the performance of routing protocols following are the by and large observations.

1. The AODV performance is best in terms of throughput as compared to the OLSR and TORA.
2. OLSR and TORA have shown zero data dropped and zero delay,
3. It is observed that AODV has shown maximum delay and data dropped as compared to other routing protocols.

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## A Review Paper of Manet and Cloud Computing

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### ***Abstract:***

Ad hoc cloud computing environment providing a way to distributed collaboration. Now days distributed collaboration is become a need in offices and laboratories. However, computer resources and in offices and laboratories are under – utilized, while conventional cloud computing composed of dedicated sever are not suited to flexibly deploying application ad-hoc. In this work we have done the literature reviews of Mobile Ad hoc network protocols (MANET) like Ad-hoc On Demand Distance Vector (AODV), Destination Sequenced Distance Vector Algorithm (DSDV), and Improved Destination Sequenced Distance Vector Algorithm (I-DSDV). This paper also includes literature review of a cloud computing & its performance analysis through simulation models. Simulation results show that I-DSDV compared with DSDV, it reduces the number of dropped data packets with little increased overhead at higher rates of node mobility but still can't compete with AODV in higher node speed and number of node. Similarly, to these studies, our target is measure the performance of ad-hoc cloud networks by using different ad – hoc network protocols using OPNET Simulator 14.5.

***Keywords:*** Mobile Ad hoc-network protocol, ad hoc cloud computing, performance analysis, simulation models, OPNET 14.

### **I. INTRODUCTION**

The cloud computing is a new computing model which comes from grid computing, distributed computing, parallel computing, virtualization technology, utility computing and other computer

technologies and it has more advantage characters such as large scale computation and data storage, virtualization, high expansibility, high reliability and low price service. Cloud computing is the use of hardware or software resources that are delivered as service over network. Ad-hoc network: Definition: “Ad Hoc network is a self-organizing multi-hop wireless network, which relies neither on fixed infrastructure nor on predetermined connectivity”.

The decentralized nature of wireless ad-hoc networks makes them suitable for a variety of applications where central nodes can't be relied on, and may improve the scalability of wireless ad-hoc networks compared to wireless managed networks, though theoretical and practical limits to the overall capacity of such networks have been identified. Ad- hoc cloud computing means allow cloud services to run on existing heterogeneous hardware. In other words, running cloud services on ad-hoc network. Computational and storage resources within organizations are often under-utilized. By using this concept, we can increase the utilization of general purpose computers & other hardware devices.

## II. LITERATURE REVIEW

There has been a branch of research activity in assessing the performance of virtualized resources, in cloud computing environments and in general. In paper [13] work is only specific to EC2 of Amazon web services. In this work performance analysis are categorized in two methods i.e. Cloud specific evaluation and Infrastructure uncertain evaluation. In cloud specific evaluation, the duration of resource acquisition and release over short time and long periods of time.

In Infrastructure uncertain evaluation they have designed two methods of workload i) SJSI (run one or more Single process jobs on single instance). ii) MJSI (Single misprocess jobs on multiple instances). Also they have done the analysis of Resource acquisition and release, Single instances, multiple instances, Performance of SJSI workloads, Compute Performance, I/O Performance Memory Hierarchy Performance, Performance of MJMI workloads, reliability, HPL performance.

In [15] paper author has focused on performance comparison analysis with low cost with different QoS. This paper has considered the three factors i.e. Network bandwidth, Quality of Service and Cost. The main objective of this paper is performance comparison analysis with low cost with different Quality of Service. This framework is implemented by OPNET SIMULATION Model 14.5.

In study [14] author has considered mainly three protocols that are AODV (Ad-hoc on demand distance vector), DSDV (Destination Distance Vector Algorithm) and I-DSDV (Improvement of DSDV). These Protocols are ad-hoc network protocol which is used to designed ad-hoc network. In the above paper, Performance analysis of ad-hoc network protocols (AODV, DSDV, I-DSDV) was done by using NS-2 simulation model and compared in terms of Packet delivery ratio, end to

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end delay , routing overhead in different environment like varying number of nodes, speed and pause time.

QoS is the major factor of service performance, which determines the degree of satisfaction of user. There are two concerns of service a) Technology Oriented b) Service oriented .In this work the degree of satisfaction is expressed by the following qualitative measures.

- a) End-to-end delay
- b) Delay variations
- c) Throughput

The process of providing these QoS requirements is called as Provisioning. Some of the main importance of QoS Provisioning is:

- a) Traffic can be differentiated and provided different levels of service.
- b) The amount of traffic network can be controlled based on the resources.
- c) QoS make it possible to implement the policies across devices and end users.
- d) QoS can enable networks to deliver defined levels of service with existing network infrastructure.

This main objective in this paper was Investigate an alternative real time distribution and delivery method for multimedia applications such as live video streaming, live TV, Video on demand using on demand cloud as a service.

In paper [16], Comparison of two on demand routing protocols for mobile & ad-hoc networks has been done. Protocols used for these comparisons are AODV, DSR and traditional protocol DSDV. A variety of workload has been tested in this paper like mobility, load and size of network in given scenario. This simulation model has been created by using NS-2 simulator. In this paper, simulation results and observations are carried out by following factors.

- a) Packet delivery fraction (PDF).
- b) Average End-to-End delay result.
- c) Routing overhead.
- d) Packet loss as a function of pause time

After result observation author concluded that, AODV and DSR are reactive protocol, while DSDV is proactive protocol. Both reactive protocols performed well in this scenario. DSR generates lower overhead than AODV while DSDV generates almost constant overhead due to

proactive nature. DSR has given poor performance in respect of that, Average delay can be accounted to aggressive use of caching and inability to delete state route. DSDV provided high mobility results in frequent link failures and overhead involved in updating all the nodes with new routing information. DSR consistently generates less routing load than AODV.

In paper [17], Cloud security challenges and solutions have been discussed with the help of literature reviews and simulation model created by OPNET TOOL to produce useful statistics to provide optimal security and compliance. By using simulation results author demonstrated that UTM (Unified threat management) may not be feasible solution for security implementation of cloud. Multi cloud model is created by using OPNET Modeler. Model architecture contains –

- a) Internet domain with high connectivity switch (1500 concurrent user can connect).
- b) UTM cloud model with cloud infrastructure with security.
- c) All clouds are internetworked using high end switches with ATM OC-48 links.
- d) Seven applications configured with some built in parameters like RDBMS service with high load, Antiviruses and Antispyware applications, Web services with high load data service etc.

After successful creating & running simulation model results were carried out and it was observed by author that, cloud computing security issues can be investigated with special emphasis on governance of security and compliance from the perspective of user companies as well as cloud service provider. Some literatures recommended by NIST (National Institute of Standards and Technology) states that cloud security should be hosted as a service oriented framework and the accountability should with separate security as a service. However, in this paper a report by Gartner recommends that visualization security cannot be implemented in centralized manner following the UTM approach. The simulations results in this paper carried out are supporting Gartner recommendations.

In paper [18], BI and OLAP services along with cloud application have been created by using OPNET Simulation TOOL. The network was design in such a way that loads can be evenly distributed to all RDBMS servers. The application has been configured in a way that all RDBMS server can evenly involve in receiving and processing the OLAP query load. The cloud model in OPNET Simulator comprises two large domains that are BI on the cloud domain and Extranet domain consisting six corporates having 500 OLAP users in each corporate.

BI on the cloud domain is expanded with four CISCO 7609 router so that they can evenly distribute the load. After creating the model simulator were run and results are carried out & observed. Hence In this paper, Author concluded that cloud computing can be implemented in three ways a) Software as-a-Service b) Platform as-a-Service c) Infrastructure as-a-Service. These services may provide depending upon the business requirements. However, SaaS provider



needs the settings on Paas and Iaas. In this study, Results have been reflected the ideal scenario for taking BI on cloud. However, Real clouds will not have ideal configuration as made in the OPNET Modeler. Hence real challenges on cloud needs to be identified and addressed to ensure that results can be brought closer to ideal scenario as far as possible.

In study [19], Author has mentioned the way to distribute the load of server in cloud computing providing ad hoc cloud computing environment. In this paper Distributed collaboration term was used for distribution and execution of applications which runs on cloud server to client machine or participating node who can act as a server. This kind of situation mainly occurs ad hoc in offices and laboratories. However, computer resources in offices and laboratories are under-utilized, while conventional cloud computing environments composed of dedicated servers are not suited to flexibly deploying application ad-hoc. This can be easily deployed by using SpACCE (Sophisticated Ad hoc Cloud Computing Environment Built by the Migration of Server to Facilitate Distributed Collaboration). In this study SpACCE is proposed by using CollaboTrays for sharing any kind of Application or Service can be distribute for execution to participating nodes which may run on cloud server. By using CollaboTray server can be dynamically migrated to another PC with sufficient calculation capacity. In this paper Author has done experiments on PCs that will have more than 50 percentage of its calculation capacity remaining.

Result in this paper after experiments shows that the migration of the server improves the facility of distributed collaboration even if user works on the client. Author concluded in this paper is that SpACCE environment could contribute effective utilization of untapped PC resources in daily work and then can be used in persistently in cloud computing environments.

### III. INTRODUCTION OF TOPIC

Similarly, to these studies, our target is measure the performance of ad-hoc cloud networks by using different ad – hoc network protocols. We are having Performance metrics in much broader size and scope. It performs much more in-depth measurements, compares clouds with other off the shelf clusters. The applications used in our study are closer to the mainstream HPC scientific community. The proposed scheme is tested using ordinarily image processing. From the simulation of the experiment results, we can draw to the conclusion that this method is robust to many kinds of watermark images.

Our performance evaluation results extend and match the previous findings and give more insights into the different protocols used for ad-hoc cloud computing (AODV, DSR, ABR, DSDV etc.). On the other hand scientists begin to adapt the cloud infrastructure for their scientific computing. They run their calculations in the cloud [2], extend clusters on demand with IaaS resources [1] and execute big workflows on a resource mix from traditional grids and clouds [6]. This shows the growing importance of IaaS cloud providers for scientific computing

and the need to have performance estimates for the different offered types beyond the marketing information offered by the providers.

#### IV. DESIGN OF PROPOSED MODEL

Our main aim of this project is to design the simulation model of ad-hoc cloud network using different scenarios to evaluate the performance using various performance metrics and ad-hoc protocols; also provide an optimum solution based on the performance analysis results. For this project we are using OPNET Modeler Tool 14.5. We will create three different scenarios of ad-hoc cloud network using different types of protocols in each scenario.

##### Scenario 1:

Cloud services running on ad-hoc network at server side, in other words servers are implemented using ad-hoc cloud network and client machines are in simple network for accessing the cloud services. This ad-hoc cloud network is implemented by following routing protocols separately.

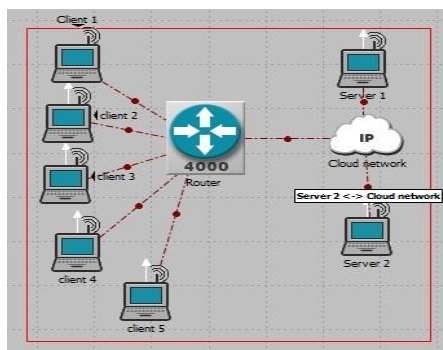
- a) AODV
- b) DSR
- c) ABR
- d) DSDV.

##### Scenario 2:

Cloud services running on ad-hoc network at server side as well as client side. In this scenario both server and client will have same network structure. This ad-hoc cloud network is implemented by following routing protocols separately.

- a) AODV
- b) DSR
- c) ABR
- d) DSDV.

Figure 1 explains the sample architecture of ad hoc cloud network using OPNET tool



**Figure: 1. Sample Architecture of ad hoc cloud networks using OPNET Simulator 14.5**

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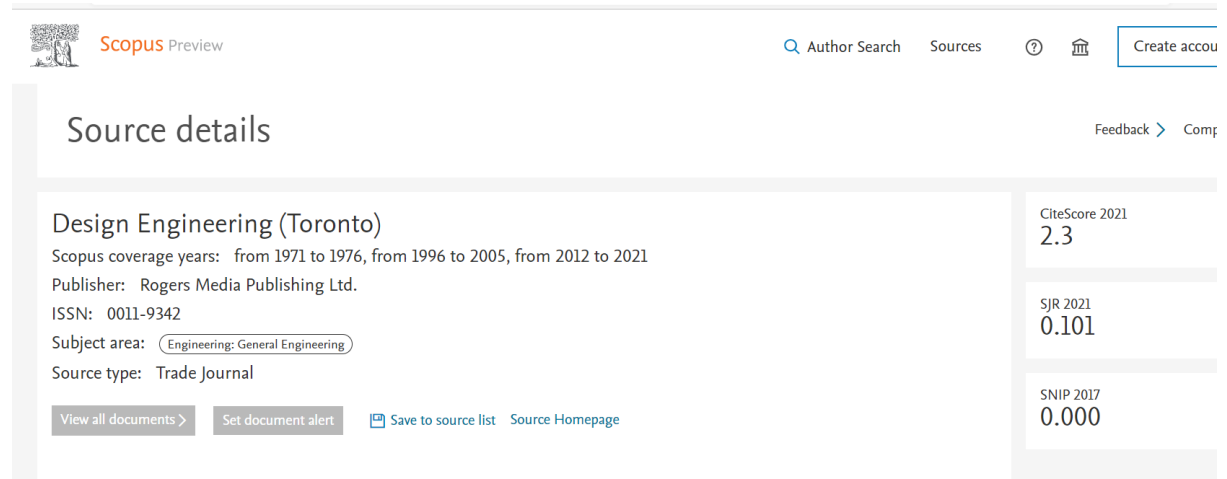
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# A FRAMEWORK TOWARDS ICT APPROPRIATION IN VOLUNTARY ORGANIZATIONS

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## ABSTRACT

*As the roles and functions of voluntary organizations have significantly expanded in recent years, there is a growing concern over the need to transform the operation and structure of these organizations. ICT support in voluntary organizations is an interesting emergent field of research. The purpose of this study is to study the implementation of Information and Communication Technology (ICT) in voluntary organizations. The study was conducted in and around Pune. The objectives of the study were to study the usage and impact of ICT in voluntary organizations, to determine the issues and challenges they are facing. The findings summarized in this paper, are drawn from primary data collected from 107 voluntary organizations which are using ICT. The researcher has proposed suggestions based on findings. Based on the findings, conceptual background and earlier work in this area, the researcher has proposed framework for ICT implementation in voluntary organizations. The researcher has further suggested the direction on research leads and future trends.*

**Key words:** Voluntary Organizations, ICT, NGO.

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## 1. INTRODUCTION

Voluntary organizations have been generally defined as voluntary, autonomous, non-profit organizations or groups of citizens established to address various issues and problems in the society (Singh, 2001)

Voluntary organizations have their own advantages and disadvantages. Some of the advantages of voluntary organizations are:

- Voluntary associations are much closer to the more unfortunate and hindered area of the general public.
- Staff of the voluntary organizations is typically exceptionally motivated and philanthropic in their conduct.
- Voluntary associations can undoubtedly invigorate and prepare network assets and approach volunteers.
- They are increasingly viable in bringing individuals' support.
- Voluntary associations are fewer guidelines bound and are non-bureaucratic, non-formal and adaptable in their structure and activities.
- Voluntary segment has more noteworthy potential for advancements.
- Voluntary associations want to work in multi-sectorial system.
- Voluntary associations are motivation for making social union (Kumar, 1998).

Voluntary organizations are still in early stage of ICT adoption, in their organizational settings. There is a need of information technology services and applications that can be effectively embedded in organizational settings of voluntary organizations to achieve technological appropriation. ICT support in voluntary organizations is an interesting emergent field of research. There is awareness among community organizations to use technology in their activities but the complexity of technologies, lack of technological knowledge, lack of funds and lack of standards are big obstacles.

After having an interaction with the knowledgeable persons and stakeholders in voluntary organizations researcher gathered many issues concerned with ICT adoption in voluntary organizations which needs to be systematically studied, researcher found it necessary to study the various aspects involved in ICT implementation in voluntary organizations. The current research aims to investigate the current situation regarding the implementation of ICT by the voluntary organizations. Based on the investigation, ICT Framework for voluntary organizations is suggested.

### 1.1 Challenges of Voluntary Organizations

#### 1.1.1 Lack of Funds

Most of voluntary organizations discover challenges in getting adequate, and nonstop funding so as to do their work. Accessing proper donors is a noteworthy component of this challenge. Managing some particular donors funding conditions can be a tremendous challenge for voluntary organizations. Donors would prefer to see funding spent on direct unfortunate victims. The voluntary organizations are under consistent stress to hold overhead expenses down.

### ***1.1.2 Absence of Strategic Planning***

Many voluntary organizations suffer from the lack of a consistent, strategic plan that would facilitate success in their activities and mission. This renders them unable to effectively raise and exploit on financial support.

### ***1.1.3 Poor Governance and Networking***

An absence of effective administration is very regular in voluntary organizations. Many have a shortage of understanding concerning why they should have a Board and how to set one up. A founder might be excessively centered on running the voluntary organizations for their very own motivations; be that as it may, governance is foundational to transparency. Poor or disorganized networking is another real challenge, as it can cause duplicated endeavors, time ineffectiveness, conflicting techniques and an incapability to learn from experience. Many voluntary organizations don't strengthen the utilization of current technologies that could encourage better correspondence and networking. More effective use of technology can assist voluntary organizations in staying up-to-date of significant regional, national and global concerns.

### ***1.1.4 Poor Communication***

Voluntary organizations also identify that there is very poor communication within the sector. The majority of voluntary organizations have little or no access to reliable email and internet connections; they receive almost no literature on development problems and are generally unaware of issues of global, regional and national importance.

### ***1.1.5 Limited Capacity***

Limited capacity affects fundraising ability, governance, leadership and technical areas. Existence of quality standards can assist voluntary organizations to develop the required capacities. The speed of technology changes is also a challenge particularly in areas of ICT capacity.

### ***1.1.6 Development Approaches***

Many voluntary organizations support a “hardware” approach to development through building infrastructure and providing services instead of empowering people and institutions locally. In general, their development methodologies are not as flexible, sustainable and pertinent to the community as they could be.

## **1.2 Types of Voluntary Organizations**

Voluntary organization can be registered by many registration processes in India like trust, company, society or any valid formation. The registration process is different but the status of all these organizations is equal as voluntary organization.

### ***1.2.1 Trust- Registration under Public Trust Act***

A Trust can be set up to manage funds and to receive money for a particular purpose for the benefit of a wider community. They establish a formal relationship between the donors, the trustees who become the nominal owners of the trust property and the beneficiaries - the people who will benefit from the trust. Trusts can be set up quickly and cheaply. Trusts are non-democratic organizations because they do not tend to have a membership framework, although trustees may agree to report commonly and consult with a wider group of individuals. Trustees may be personally liable and not protected against private liability for contracts entered into on behalf of the confidence.



### ***1.2.2 Private Sector Companies (Sec 25) – Registration under Companies Act, 1956***

A private company structure is an increasingly popular choice for voluntary and community organisations. If you plan to manage employees, land, contracts and/or substantial amounts of financing, it is very suitable. A private company by guarantee is an incorporated organisation. This implies it has a distinct legal identity from its members. This legal structure limits the insolvency liability encountered by managers, except in instances of negligence or recklessness. This is the most flexible legal agreement, but the primary constraint is that it is not possible to issue stocks.

### ***1.2.3 Society – Registration under Registration Act, 1860***

In India, the Societies Registration Act, 1860 is a regulation that enables the registration of organizations usually engaged in the benefit of society—education, health, jobs, etc. Societies are formed by memorandum of association and registration. Minimum 7 members are required to get registered under this act.

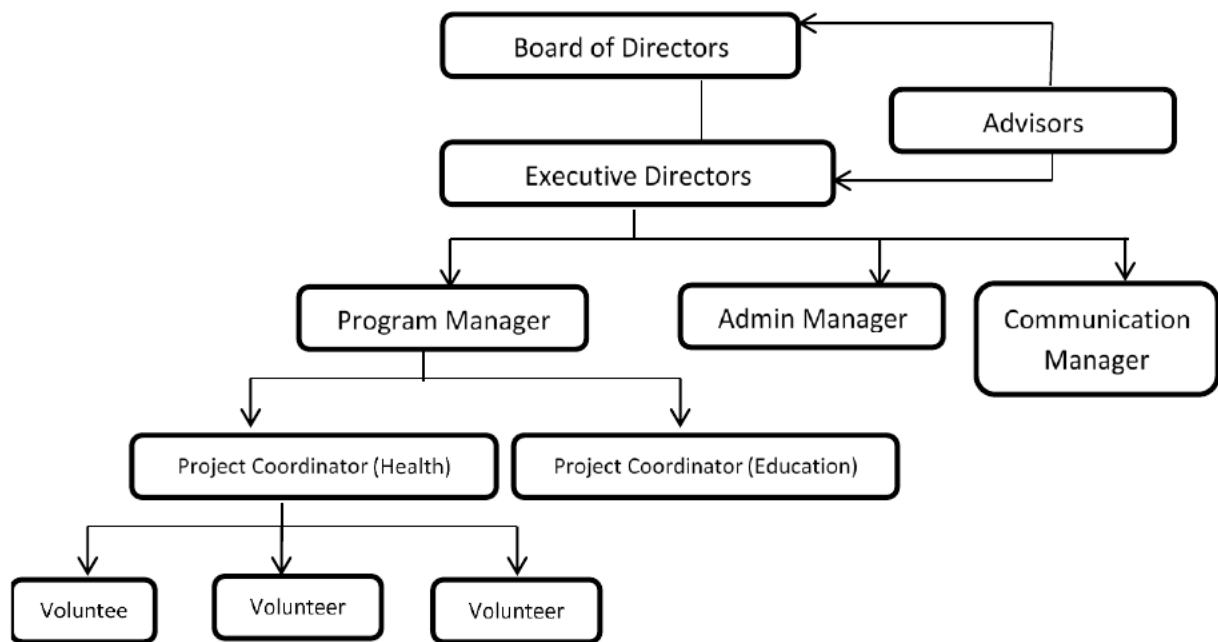
Voluntary Organizations' types can be understood by their level of operation.

#### *Types by level of operation*

- Community-based voluntary organizations (CBOs) are built out of people's own initiatives. They are responsible for helping significant segment of community and working to meet needs of such community. These can include various clubs, women's welfare organizations, and health organizations, religious or educational organizations.
- City-level voluntary organizations include organizations such as Rotary, lion's club, chambers of commerce and industry, coalitions of business, ethnic or educational groups, and associations of community organizations.
- State level voluntary organizations include state-level organizations, associations and groups. Some state organizations also work under the guidance of National and International voluntary organizations.
- National level voluntary organizations include national organizations such as the YMCAs/YWCAs, Bachpan Bachao Andolan, professional associations and similar groups. Some have state and city branches and assist local voluntary organizations.
- International voluntary organizations range from irreligious agencies such as Save the Children, SOS Children's Villages, OXFAM, Ford Foundation, Global march against child labor, and Rockefeller Foundation to religiously motivated groups. They can be responsible for funding local level voluntary organizations, institutions and projects and implementing the projects themselves. (Vaidya Surekha, 2014)

## **1.3 Voluntary Organizations: Organizational Structure**

The most effective organizational structure for a voluntary organization depends on the mission the voluntary organization achieves. Fundraising methods, use of volunteers, roles of the directors and involvement of members all play a role in determining the ideal organizational structure. The structure is divided into three functional areas—governance, programs, communication and administration – and then further subdivided within each area, depending on the purpose and goals of the voluntary organization.



**Figure 1** Organization structure of voluntary organizations

Source: Compiled by Researcher

### 1.4 Stakeholders of the Voluntary Organization

A stakeholder is an individual or group which has an interest that the voluntary organization fulfils its mission. Anyone who is interested or affected by the voluntary organization and its services is a stakeholder. Stakeholders of voluntary organization include the following:

- **Management-** It is a group of people who are responsible for the overall management, decision making, planning the direction and activities of the group and its performance. The management consists of board of directors and executive director assisted by advisors.

Boards are responsible for a number of functions, like hire and supervise the Executive Director, develop and approve budgets, etc. Board members will also be expected to champion the organization’s cause, and represent the organization to the larger community. Many voluntary organizations also expect board members to help raise fund for their projects

Executive Director, or sometimes called as Coordinator, Chief Operating Officer, or CEO, is responsible for the overall direction in which the organization runs, and the responsibility for managing the day-to-day activities of the organization. The Executive Director is also member of the board – known as its Executive Secretary who reports to the Board.

- **Employees-** Employees provide vital services to keep the voluntary organizations running and are important stakeholders for voluntary organizations. Employees are responsible for the day-to-day functioning, and implementing of its programs and projects. Staff members fall into three groups - responsible for activities related to (1) administration, (2) programs/projects and (3) communication.

Administrative activities are led by an administrative manager.

Program and project activities of an organization are led by a program manager.

Communications and dissemination activities are the responsibility of a communication manager.

Volunteers- Volunteers provide vital services to keep the voluntary organizations running and are important stakeholders for voluntary organizations. Volunteers contribute their time to work for organizations or causes. Volunteers donate their time, skills and expertise to provide services to benefit target groups or organization.

- Beneficiaries- The people and parties who actually use the services given by the voluntary organization.
- Donors- Those who help in funding the operations of the voluntary organization are the donors.
- Local Community- The surrounding community as a whole has a stake in how well a voluntary organization completes its mission and objectives.
- Other Voluntary Organizations- Other voluntary organizations with common interest.
- Partners- An association with various partners like corporate partners, media partners for collaborative efforts towards the achievement of mission of an organization.



**Figure 2** Stakeholders of voluntary organizations

Source: Compiled by Researcher

## **2. OBJECTIVES OF THE STUDY**

The current research aims to study use of ICT in Voluntary Organizations, to study issues and challenges of ICT implementation in Voluntary Organizations. It also studies impact of ICT implementation in voluntary organizations. The study suggests the framework for ICT adoption in voluntary organizations.

## **3. RESEARCH DESIGN**

This study was carried out with the help of Quantitative method. In order to attain research goals, the modes chosen to collect data are primary data and secondary data. Before initiating the actual data collection, the pilot study was conducted.

### **3.1 Pilot Study**

A pilot study was conducted for twenty voluntary organizations in which data was collected from managerial positions. The above survey was conducted to finalize the questionnaire. After the pilot study, the questionnaire was refined and primary data collection was done.

### **3.2 Primary Data**

Primary was collected from voluntary organization's employees including Directors, Admin Managers, and Program Managers etc. Informal talks and discussions were also carried out. The following approach/methodology was adopted for primary data collection in the present study.

- Designing of user-friendly and appropriate questionnaire and then distribution of the same amongst management of voluntary organizations.
- Briefing said organizations about the research work personally on telephone as well as by meeting personally with management members of voluntary organizations with prior appointments

### **3.3 Secondary Data**

The various sources of the secondary data collected for this study are various Referred Journals, Research Articles and Journals, Conference proceedings, Published Thesis and dissertations. In the data analysis stage, the Secondary data collected from these sources is used to support primary objectives and hypothesis.

### **3.4 Survey Method**

It is used for this research study. For exploring the data, interviews & discussions were also used as supportive techniques. The research throws light on the extent to which ICT is used by Voluntary Organizations and their satisfaction level. Research examines the issues faced by these organizations while adopting ICT. For undertaking analysis of use and impact of ICT in voluntary organizations, the study is restricted to the selected organizations in and around Pune (Maharashtra State – India)

### **3.5 Sample Design**

The sample selection plan was based on following criteria:

- Voluntary organizations which are using ICT for their day to day activities
- Voluntary organizations which are located in and around Pune city and deal with education of the various target groups.

Total number of voluntary organizations meeting the above mentioned criteria was approximately 250, so 107 voluntary organizations were selected. (Around 43% of the population). 150 organizations were randomly selected for the survey, out of these the data of 107 respondents was found to be consistent and complete. The data from 107 respondents was used for analysis. The organization selection is based on various lists published by authorized government organization Niti Aayog's portal NGO Darpan. (<http://niti.gov.in/content/ngo-darpan>)

### **3.6 Sampling Method**

The sampling technique adopted for the survey of stakeholders is stratified simple random sampling technique. To serve the purpose purposive sampling technique is used.

## **4. SUMMARY OF RESEARCH FINDINGS**

It was observed that, most of the beneficiaries of the voluntary organization are children who are from Slum areas, Adivasi area, Tribal Children, Poor and needy Children. It is observed that most of the voluntary organization does not conduct any ICT related training. It is found that ICT tool is mainly used for program implementation functionality followed by financial management. Lack of ICT training is highlighted issue by most of the respondents, followed by Monitoring, Evaluating, Feedback, Lack of maintenance support and Lack of funds. ICT impact is not as expected as many respondents dissatisfied about various major functions like Campaign Success, Volunteers Productivity, Volunteers Efficiency, Student Performance Cost Saving, Time Saving, and Better Control and Monitoring. Need of ICT tool is highlighted by almost all the respondents. It was noted that many of the respondents were not aware about availability of free ICT tools/software even though they believe that ICT tools enhances organizational functionality or productivity.

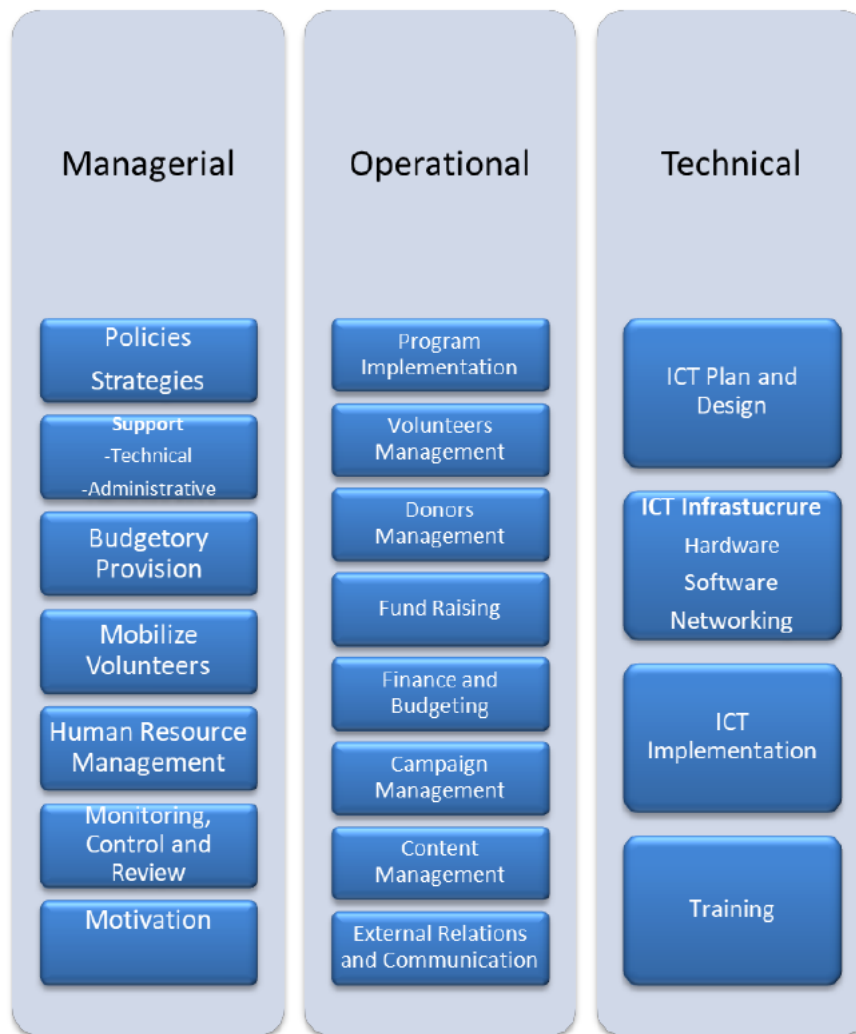
## **5. SUGGESTIONS**

The spread and reach of voluntary organizations is increasing in India. These organizations are still in early stage of ICT adoption in their organizational settings. Hence, the researcher would like to make the following recommendations based on the findings and conclusions.

- The personnel of voluntary organizations should be encouraged to use the ICT tools for various functionalities by means of rewards and recognition.
- ICT training Programs should be conducted for staff and volunteers on latest ICT tools.
- The study recommends that Open Source technologies need to be used by the voluntary organizations as it is cost effective.
- Voluntary organizations should look into 100% need analysis and execution of program using ICT for better performance of students. They should also use ICT tools for volunteer's management for better quality and time & pace flexibility.
- There is a need for collaborative efforts by voluntary organizations working for similar cause towards effective use of ICT in campaigns and fundraising so that all related stakeholders can access the information as and when needed.
- Awareness about use of ICT should be increased within the volunteers' community.
- Active collaboration of the stakeholders during the development and testing phases of the ICT implementation is necessary
- Based on findings researcher has suggested ICT framework for voluntary organizations based on open source technologies. Researcher has identified various parameters involved in designing this framework. They are as under

## A Framework Towards ICT Appropriation in Voluntary Organizations

- Management policies and strategies for successful implementation of ICT
  - Implementation and use of ICT for all functions of voluntary organizations
  - Management support to successfully implement ICT infrastructure, its easy access and maintenance
  - Management motivation for organizing ICT awareness and Training Programs
  - Involvement of target groups to understand their priorities and needs
  - Human resources management
  - It is very important to involve all stakeholders like volunteers, donors, other voluntary organizations in the phase of ICT implementation
  - Budgetary Provision for ICT implementation
  - Monitoring, Review and Control
  - ICT expert volunteers for developing ICT projects
  - Technical Support
- The framework is proposed based on three different components Managerial, Operational and Technical for effective implementation of ICT to ensure attainment of organizational goals.



**Figure 3** ICT Framework for voluntary organizations

Source: Compiled by Researcher

- The researcher has suggested use of open source ICT framework which consists of operational component, technical component, control points, users and stakeholders
  - Voluntary Organization- Operational Component- This component is defined as the mission of the existence of the organization that is accomplished by performing different operations in an organization
  - Voluntary Organization- Technical Component. An intellectual processes used by organization to automate the processes and to transform inputs into services.
  - Control Points- Control points works as tools for effective functioning. Their existence is important not only when you want to monitor the implementation of something new or different, but also when you want to be aware about effectiveness of a process all the time.
  - People/Users- The workforce and consumers of an organization that performs different operations.
  - Stakeholders- Stakeholders are those who have interests in the organization. Multiple stakeholders for an organization include the beneficiaries, donors, volunteers etc.
- ICT Roadmap for voluntary organizations. An ICT roadmap is a flexible planning technique to support strategic and long-range planning, by matching short-term and long-term goals with specific technology solutions.

**Table 1** ICT Roadmap

<b>Milestone</b>	<b>Duration</b>
Define Objectives, Mission and Scope	2 months
Selection of open source software	3 months
Checking Suitability	2 months
Infrastructure Availability	2 months
Training	2 months
Actual Implementation	5 months
Enhancement and Continuation	4 months
Total	20 months

## 6. AREA OF FUTURE STUDY

The researcher feels that further systematic studies need to be done in the following areas:

- The study of cost effectiveness of ICT infrastructure of voluntary organizations using open source software that will substantially enhance the performance because Open Source Software is freely available
- Effectiveness and Security issues relating to use of open source software in voluntary organizations
- A comparative study of leading voluntary organizations in Maharashtra with respect to ICT infrastructure and use of ICT in program implementation
- Evaluation of stakeholders' perception about the adoption of ICT in voluntary organizations

## 7. CONCLUSION

The objectives of the study were to study the usage and impact of ICT in voluntary organizations, to determine the issues and challenges they are facing. The findings summarized in this paper, are drawn from primary data collected from 107 voluntary organizations which are using ICT. The researcher has proposed suggestions based on findings. Based on the findings, conceptual background and earlier work in this area, the researcher has proposed framework for ICT implementation in voluntary organizations. The researcher has further suggested the direction on research leads and future trends.

The purpose of this study is to study the implementation of Information and Communication Technology (ICT) in voluntary organizations. The study was conducted in and around Pune. There is a growing concern over the need to transform the operation and structure of these organizations. ICT support in voluntary organizations is an interesting emergent field of research

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## Mobile Apps and Sustainable Development of Voluntary Organizations

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**Abstract:** ICT support in voluntary organizations is an interesting emergent field of research. The voluntary organizations are aware about the use of technology in their activities but the complexity of technologies, lack of technological knowledge, lack of funds and lack of standards are big obstacles. There is a need to transform the operation and structure of these organizations, as the roles and functions of voluntary organizations have significantly expanded in recent years. The current research objective is to investigate the current scenario of the implementation of ICT by the voluntary organizations. The objectives of the study were to study the usage of ICT, impact of ICT and satisfaction level of ICT in voluntary organizations, also to study the issues and challenges they are facing. The study was conducted in and around Pune. Questionnaires were managed to various voluntary organizations and the results of this are analyzed. Based on the investigation, recommendations are made and mobile application using open source technologies is suggested.

**Keywords:** Information and Communication Technology, Voluntary Organization, Open Source

### Introduction

This study will focus on the functions of voluntary organizations in education sector, the importance and role of Information and Communication Technology in voluntary organizations, the use of Information and communication technology for smooth execution of various activities in voluntary organizations. The findings of this study will be useful in providing an insight into the extent of ICT usage in voluntary organizations, their satisfaction level, the challenges faced by voluntary organizations while adopting ICT and the voluntary organizations' perception about the use of ICT

The study will propose an open source framework for ICT implementation in voluntary organizations and also suggest mobile application.

### Research Design

Research Design is descriptive. Voluntary organizations which are using ICT and are located in and around Pune city and work for education of various target groups are selected. The organizations' selection is based on various lists published by authorized government organization Niti Aayog's portal NGO Darpan ([ngodarpan.gov.in](http://ngodarpan.gov.in)). Simple Random Sampling technique is used. Sample Size is 107 (43% of the population). Data Collection was made on following aspects. Extent to which ICT is used in Program Implementation, Volunteers Management, Fundraising, Financial Management, Campaign Management, Web Content Management, Donors Management, External Communication, The reports generated through use of ICT, The helpfulness of these reports and the satisfaction level, the challenges faced while incorporating ICT and the impact of use of ICT in various functions and perception of voluntary organization towards using freely available ICT tools.

### Data Analysis and Interpretation

#### 1. Use of ICT for Volunteer Management functionality

Considering various extent of use i.e. great extent, moderate extent and some what extent together 59 (55%) respondents are using development of job description functionality followed by 49 (46%) respondents using Orient/train new volunteer and Evaluation of volunteer functionality. It is observed that the least used functionality in volunteer management is Timely communication for retaining volunteer, 70 (65%) respondents and second last least used functionality is Acknowledge/Recognize volunteers' contribution or efforts 67 (63%) respondents. Reporting is also comparatively less used functionality 56 (52%) respondents in volunteer management function.

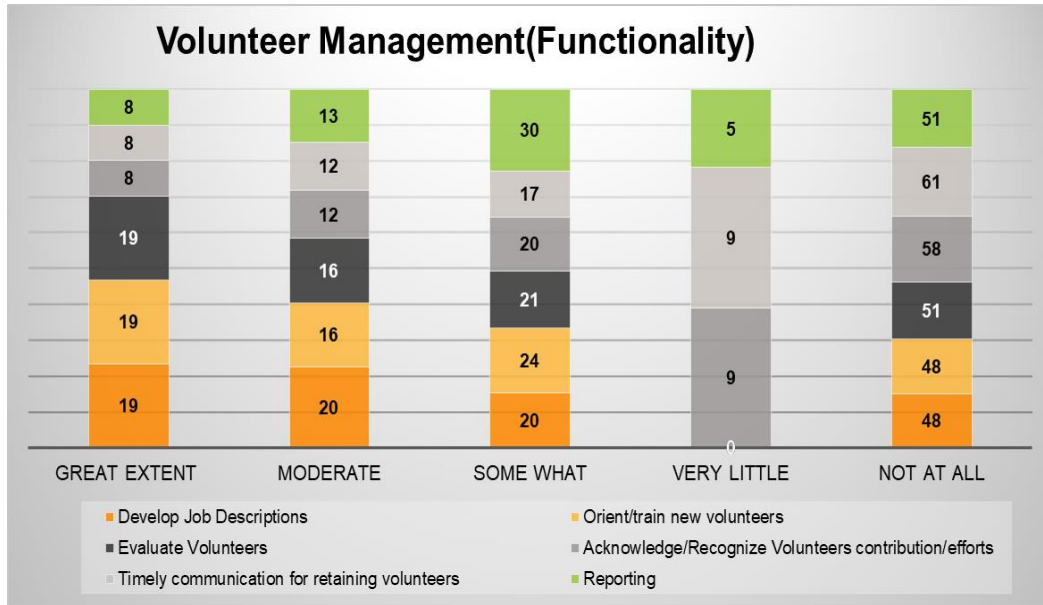


Chart 1 Volunteers Management (ICT use in functions)

**2. Satisfaction Level with the use of ICT for Volunteers Management**

It is clearly indicative from following graph that, only 8 respondents form each category of the responses chosen Very Satisfied option for Helpfulness of report related to volunteer management. Same is the case with Very dissatisfied about the either category of the report. Only 9 respondents voted for the same. As per 27 respondents, the level satisfaction is at satisfied level for Job allotment, as per 28 respondents for volunteers’ training, 9 respondents for volunteers’ activity report and no one chosen for volunteers’ performance. The most selected option from either category of the report is Dissatisfied. According to 37 respondents for volunteers’ activity report, 26 respondents for volunteers’ performance, 20 respondents for Job allotments and 15 respondents for volunteer training voted for dissatisfied option in the case level of satisfaction of the report. 4 respondents given neutral response in the case of Job allotment category report.

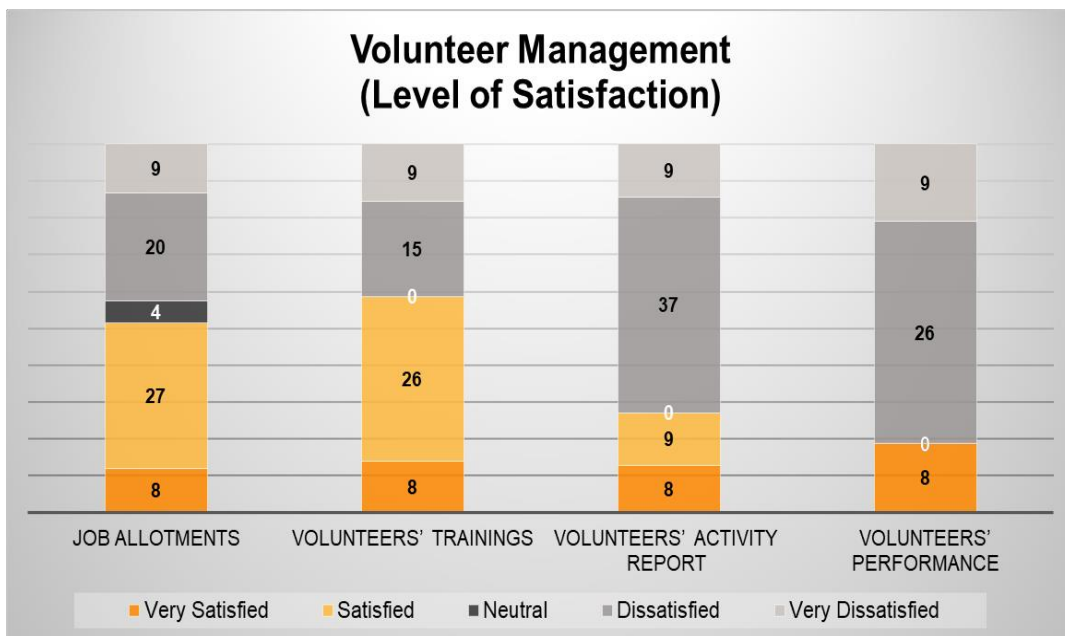


Chart 2 Volunteers Management (ICT use- Satisfaction Level)

**3. ICT Collaboration Challenges**

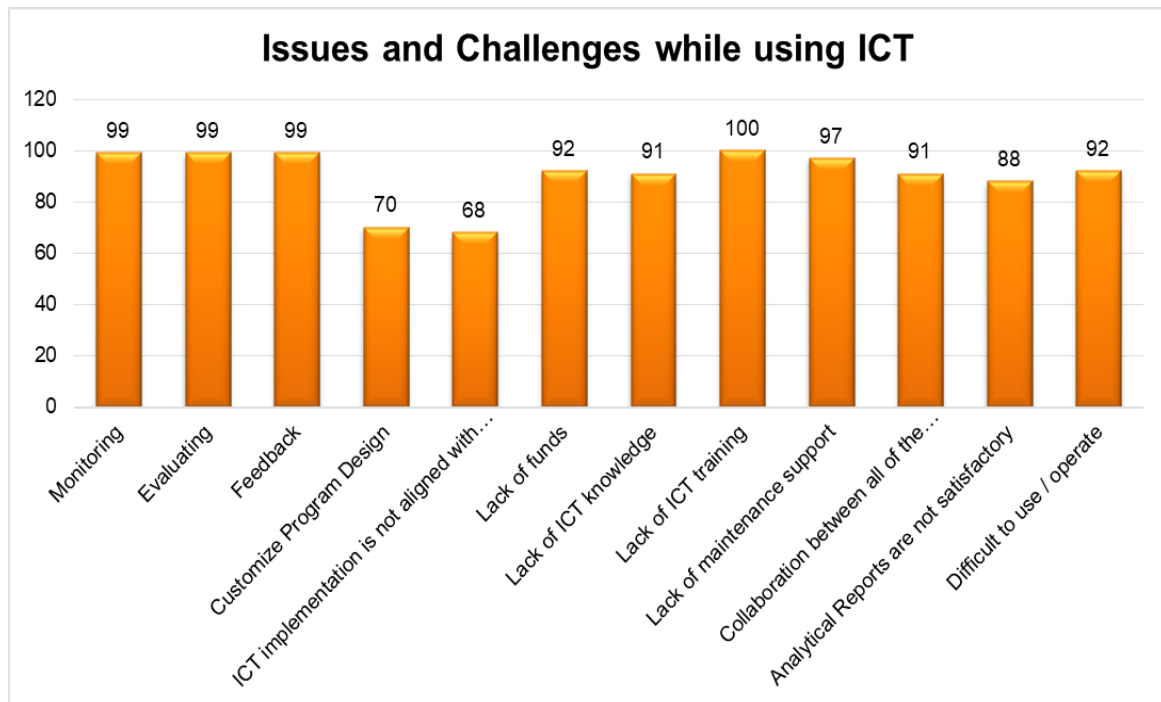


Chart 3 ICT Use- Issues and Challenges

Lack of ICT training is highlighted issue 93% of the respondents, followed by Monitoring, Evaluating and Feedback by 92% respondents. The next specified challenge is Lack of maintenance support for ICT tool (91% of the respondents) followed by Lack of fund (86% of the respondents) for the ICT tool. Further Difficult in use or operation is one of the challenges specified by 86% respondents while Collaboration between all of the stakeholders is also one of the issues as per 85% respondents. Analytical Reports are not satisfactory as per 82% of the respondents. Comparatively less issue observed in the case of Customized Program Design as per 65% respondents and in the case of ICT implementation is not aligned with the process as per 64% of the respondents. This directs towards necessity of training and development of voluntary organization for the use of ICT tool/s

**4. Impact of ICT Implementation**

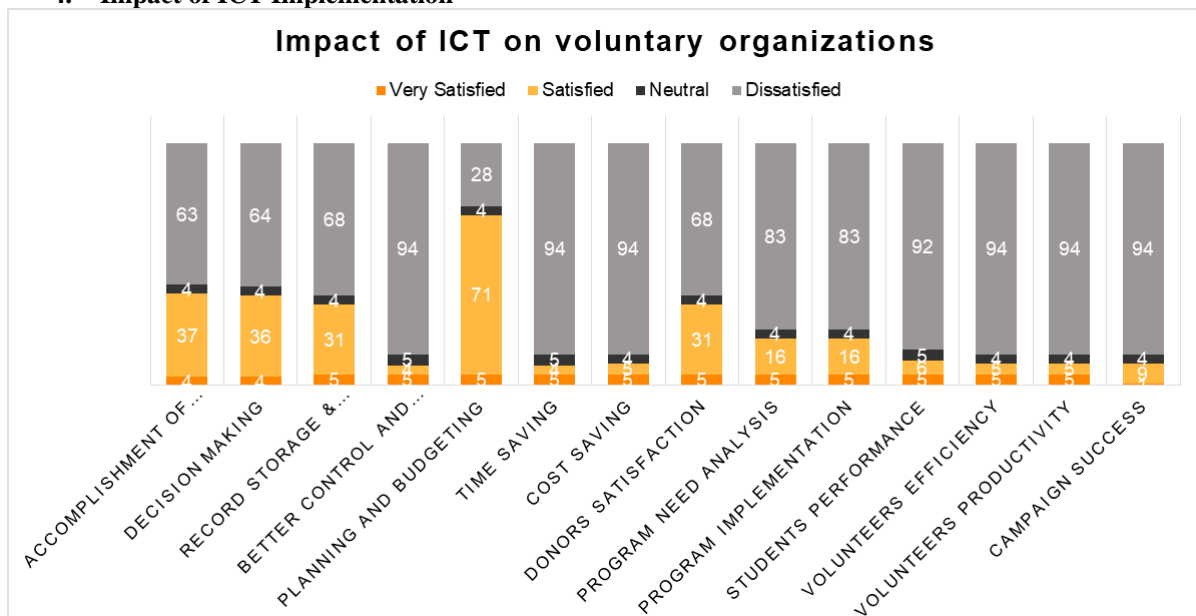


Chart 4 ICT Use- Impact

Impact of ICT implementation is not encouraging, as 84% of the respondents are dissatisfied with most of the organizational functionality. Only Planning and Budgeting taken positively by the respondents.

**5. Paired Sample Test for variables associated with ICT Implementation and its effectiveness**

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PIAVG - ICTIEAVG	-1.20093	.69773	.06745	-1.33466	-1.06720	-17.804	106	.000
Pair 2	VMAVG - ICTIEAVG	-2.06542	1.33371	.12894	-2.32105	-1.80979	-16.019	106	.000
Pair 3	FMAVG - ICTIEAVG	-1.39052	1.22719	.11864	-1.62573	-1.15531	-11.721	106	.000
Pair 4	FRAVG - ICTIEAVG	-2.23976	1.61249	.15589	-2.54882	-1.93071	-14.368	106	.000
Pair 5	CMAVG - ICTIEAVG	-2.32839	1.80792	.17478	-2.67491	-1.98188	-13.322	106	.000
Pair 6	DMAVG - ICTIEAVG	-1.67623	1.37855	.13327	-1.94045	-1.41202	-12.578	106	.000
Pair 7	COAVG - ICTIEAVG	-2.15421	1.81237	.17521	-2.50157	-1.80684	-12.295	106	.000
Pair 8	CTAVG - ICTIEAVG	-1.65643	1.29849	.12553	-1.90531	-1.40756	-13.196	106	.000
Pair 9	PFAVG - ICTIEAVG	-1.83899	1.12493	.10875	-2.05460	-1.62338	-16.910	106	.000

Table1 Paired sample test analysis

The highlighted values are supporting difference between mean of variables stated above. It is also observed that, the important variable mean value of PFAVG which is the variable mean of all the parameters related to performance of voluntary organization having difference of mean with the mean value of variables associated with ICT adoption. (as the p-value is < 0.05). In current scenario, ICT adoption is not positively significantly correlated with performance of voluntary organization.

**Findings**

- ▶ Lack of ICT training is the most emphasized issue in the case of ICT tool in use
- ▶ Through current level of use of ICT, monitoring, collaboration with all stakeholders, lack of maintenance support, lack of ICT knowledge and report generation are the major challenges
- ▶ 86% of the respondents expressing difficulty in finding sufficient funds for ICT
- ▶ Impact of ICT implementation is not encouraging
- ▶ Necessity of ICT tool is highlighted by the respondents
- ▶ Awareness about freely available tool is comparatively less
- ▶ Effectiveness and Enhancement in functionality with help of ICT tool and reports is agreed by the respondents
- ▶

**Suggestions**

**1. Use of Open Source**

There are many practical reasons why voluntary organizations should use open source software. The main reason is cost. There are no license fees, no mandatory upgrades, and no external costs. The organization can customize the code to meet your needs. It is easy to modify the code to best suit the needs of an organization. There is no need to track license agreements. In case of open source, there are fewer legal headaches, as there are very few lawyers involved with Open Source litigation, which is not the case with the "software manufacturing" model. Open source operating system is very stable. Open source tools are becoming user-friendly to use and the more time and effort is put into them, the better they become.

**2. Mobile App can be the an ultimate solution**

Conventionally, non-profit organizations, or NGO's, have had to rely on minimal advertising and physical donations in order to achieve their goals. However, with the invention of smartphones, NGO's now can develop their own mobile applications which immensely expand their capabilities. They can increase the amount of advertising for their respective organizations, as well as accept digital donations, but apps make it easier to regularly engage with volunteers, and manage large events.

**3. Benefits of Mobile Application**

Mobile Technology is the fastest growing operating system of smartphone device and is becoming increasingly popular with each day. It has a very wide range for creating apps for users across the globe. Mobile Application is nowadays necessary for all the business. Many start-ups and big enterprises are now moving to high-quality mobile application which will strengthen your business's competitiveness. Every year, mobile devices become more sophisticated, robust, and ubiquitous in nature. This allows mobile devices such as smartphones and tablet computers to run more complicated programs, send and receive data faster, and operate in more remote areas of

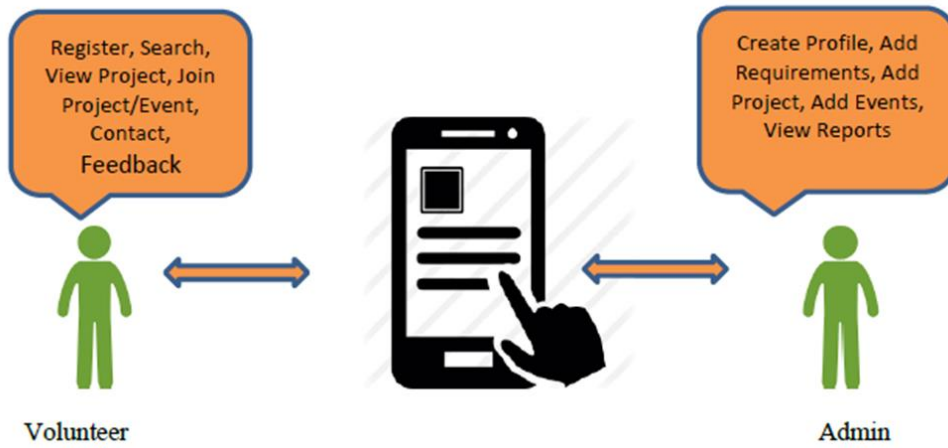
the globe with each passing year. Mobile application platforms are powerful tools for helping organization's track important information. Mobile apps can be a tremendous help from mobile data capture to track beneficiary and donor information, volunteers job scheduling, stock reporting, route planning, and dozens of other significant functions. Reports on the supply inventory of your organization can be produced more readily using electronically recorded data on a mobile device, making it easier to prevent losses in the often messy circumstances surrounding the delivery of assistance to crisis communities. Best of all, mobile application platforms put these tools on devices that your in-field volunteers can easily carry around with them. As the mobile application platform sits at the center of the flow of data and information between the back-office and field based volunteers, it is therefore essential that the mobile application platform can exchange data with the other key systems within the organization.

By integrating the mobile application platform with the voluntary organization's CRM and ERP, systems we can enable significant operational efficiencies.

- **Beneficiary Database** – where a voluntary organization maintains beneficiary records in a central database, by extracting the relevant fields from the central database, we can make this information available on a mobile device to the program volunteers in the field. Updates from the field to the beneficiary database are synchronized back to the central system to ensure that the central database remains updated with the most recent information.
- **Program Implementation** – where the organization maintains a central beneficiary database system, we can enable volunteers and staff in the field to view the records and update about their performance levels, thereby maintaining accuracy of the information.
- **Financial Management**- Integration with the organizations' core financial system can enable enhanced financial control and monitoring of program and staff costs.
- **Staff and Program Expenses** – By enabling field based staff to input time allocated, materials and resources used, and expenses incurred, against specified tasks, activities or programs and by integrating this information with back-office financial systems we can streamline both the approval and sign-off process and also financial accounting and reporting.
- **Communication**- Integration between the mobile enterprise platform and third party SMS Gateways can enable voluntary organizations to enhance the donations and also to maintain communication with stakeholders like donors and other voluntary organizations. You can push notifications to your followers on any device to increase awareness and let people know the activities you organize. People can read your messages anywhere anytime.
- **Donations**- Integration between the mobile enterprise platform and third party Mobile MoneyPlatforms can enable voluntary organizations to enhance the donations. Donors can conveniently donate from their mobile phones.
- **Events and Campaigns**- People can rapidly look up their activities, synchronize them with their calendars, read event information, speakers, sponsors, and even get the contact information straight on their mobile devices.
- **Social Feeds**- Blog updates, FaceBook, Twitter, feeds can now are seen on the mobile devices without going to multiple site locations. People spend more time on FaceBook than any other website, people can share, comment on organization's social media places conveniently and make voluntary organization more popular
- **Reporting**- Comprehensive, enterprise wide management, donor and operations reporting within any large organization will usually require data from multiple sources. This will, in most circumstances, require systems to be capable of sharing data. This becomes particularly important within voluntary organizations that operate across multiple regions and multiple program types where the aggregation of data from these regions / programs is required to enable data based comparisons to be made and the appropriate learning to the extracted.

#### **4. Mobile App for Volunteers' Management**

Volunteers cut costs for voluntary organizations by generously donating their time to the organization and getting work done without depleting budgets. Instead of payment, volunteers are gaining precious life experience, interest-field expertise, and job satisfaction that really makes a difference. Without volunteers, the costs of running a voluntary organization would be significantly greater, and progress significantly slower. Volunteers make voluntary organizations more effective in getting the work done, and everyone gains something in the process. The researcher has made an attempt to develop mobile app for volunteer's management in voluntary organization. In this mobile app voluntary organization can provide information about their organization, including all the events and activities to engage with the people that support them. Through this app volunteer can register and join the events and project.

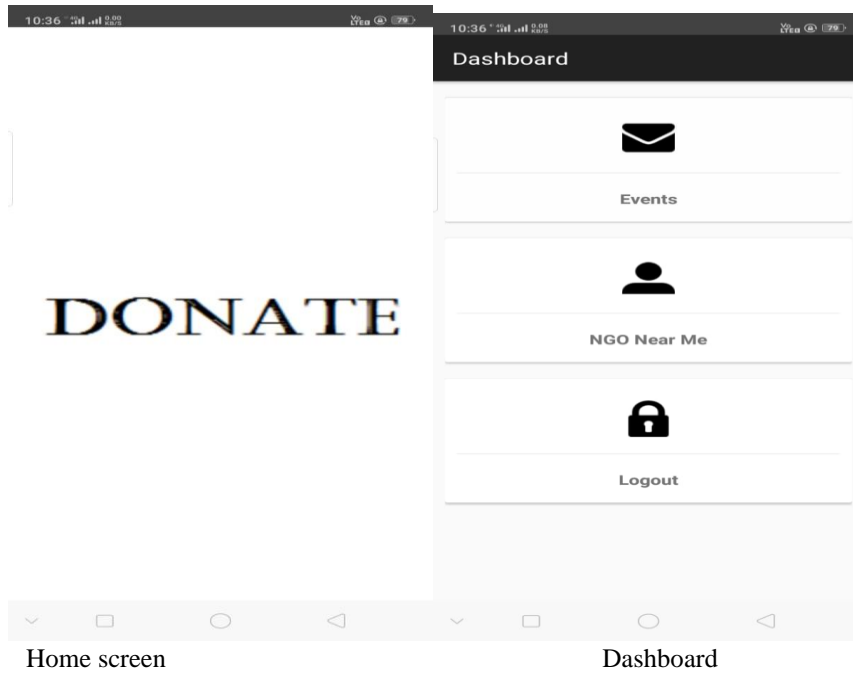


**5. Technology Used**

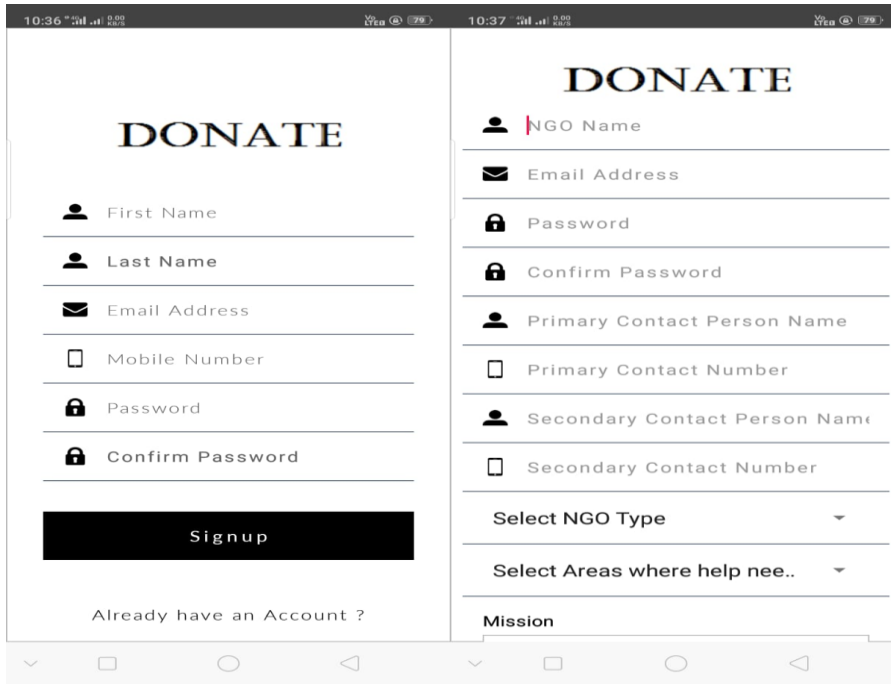
Spring MVC Architecture, Restful Java API, MySQL

**6. Screen design of mobile app**

7.

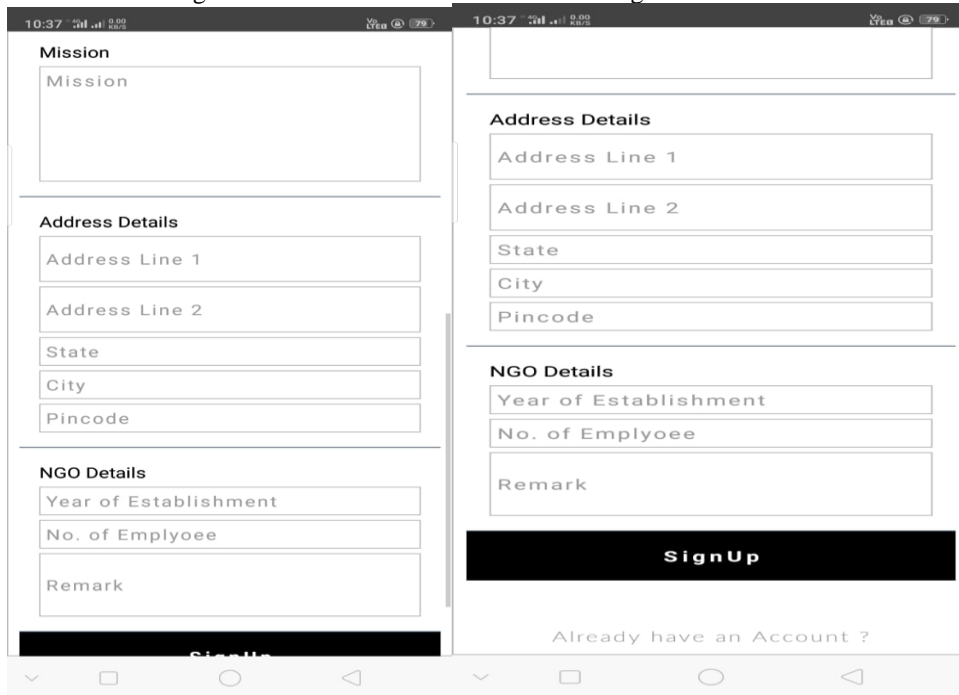






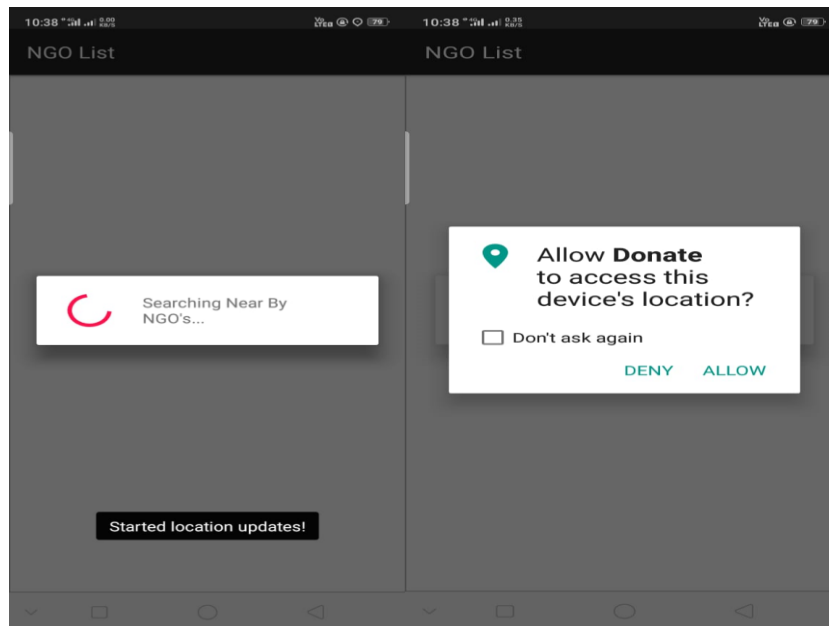
Volunteer Registration

NGO Registration



NGO Registration

NGO Registration



Search nearby NGOs

Access Device Location

The features of this app are

1. Include the history, mission and vision of your organization
2. Add rich information about the projects they are working on: description, images, videos
3. Add information of their specific requirements as well as the events of an organization and members can get involved
4. Send push notifications, "Whatsapp" like messages with information about the activities and events they can participate.
5. Include your social networks twitter, facebook, youtube, instagram
6. Volunteers can register and search nearby location's voluntary organizations
7. Volunteers can view the events and project going; they can join for an event or project by filing some mandatory information.
8. Volunteers can contact an organization through phone, email or a form. Just one touch on the screen, and they can contact.
9. Volunteers can spread message by sharing feedback and first hand experiences to attract more volunteers to help with their cause.
10. Donor can search voluntary organization to fulfil specific requirements of voluntary organizations

### Conclusions

The study investigated the influence of ICT on the performance of voluntary organizations. Using apps could be an effective and efficient way to reach, engage with, scheduling of tasks for and track volunteers. Unlike using laptops or tablets, people often carry their smartphones all day long. Efficiency and effectiveness of the tasks, appointments and planning for events will be made easy by mobile technology hence influencing performance voluntary organizations. The uses of mobile technology lead to cost saving practices on labour, stationery and data. The study recommends further research to be carried on impact of mobile technology on performance of voluntary organizations; effect of mobile technology on employment in voluntary organizations.

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## Individual Investors Perception Towards Diversified Portfolio

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**Abstract**—One of the most important factors of an individual investors investment portfolio is the lack of diversification. A wide range of possible alternatives is available for an investor to invest in the financial market. All these investment avenues vary from each other and are not equally decisive. The pattern of investment differs from investor to investor based on the reason behind the investment, withdrawal time, and risk-bearing capacity. The design and execution of a portfolio risk management program need not wait for all the bits of the puzzle to fall into place. Centralization of the portfolio management function may not be considered an optimal solution. A successful implementation necessitates a careful, well-articulated strategy to evaluate and address the key issues across the entire spectrum of investment risk management. Data requirements, dictated by the analytical model selected, can be significant but establishing implementation priorities will avoid inertia on this front. The individual's decision of investment is prejudiced by the kind of services rendered and the benefits offered in the financial market. Financial knowledge and experience have an impact on the financial investment decision-making process. Investment Portfolio Diversification refers to selecting diverse classes of assets with the objective of risk minimization and returns/profit maximization. 94% of investors are preferring investments in Shares and 88% investors are investing in Bonds. 96% investors are holding mutual funds in their current portfolio. From recorded data it can be observed that, nowadays investors are inclined towards diversified investment portfolio.

**Index Terms**—Individual Investor, Investment Management, Shares, Mutual Funds, Bonds, Portfolio Diversification

### I. INTRODUCTION

One of the most important factors of an individual investors investment portfolio is the lack of diversification. These individuals can be referred to as 'eager amateurs in the field of investment. Economic globalization and liberalization brought a passionate environment for small and medium investors. There are a large number of investors who are proficient in the field of investment. An investment in a diversified financial sector is a captivating task that entices people during their life journey. The basic intention behind any investments is the rise in capital for earning income. The investment is a conscious way to park excess funds with an artistic strategy for capital appreciation and/or earning extra income.

A wide range of possible alternatives is available for an investor to invest in the financial market. All these investment avenues vary from each other and are not equally decisive. The pattern of investment differs from investor to investor based on the reason behind the investment, withdrawal time, and risk-bearing capacity. Two significant attributes of any investment are time and risk. In the end, the benefit is expected and leans towards uncertainty. For some investments such as bonds, time is a crucial factor and for some investments such as investments in the stock market, the risk is a crucial factor. And for some investments such as investments in equity shares, time and risk both are crucial. As investors are lacking in knowledge, they find it difficult to invest in the financial market.

Virtually every one of us owns an investment portfolio. The portfolio comprises financial assets like bonds, shares, deposits, etc., and real assets like real estate, machinery, commodities, agricultural land, precious metals, etc. Several factors attract and motivate investors to invest in the financial market. Decisions of individual investors were believed to be based on the Modern Portfolio Theory proposed by Markowitz in 1952. There are three basic criteria of modern portfolio theory i.e., Standard deviation, Expected return, and correlation. However, it was proved that individual investor possesses very few stocks and are unable to diversify their portfolio [1]. An individual's risk-bearing capacity also plays an important role in the financial decision-making process to achieve desired financial goals. To understand the individual investors behavior, factors like the objective of the investment,

composition of the portfolio, risk-bearing capacity, market knowledge, demographic characteristics, and attitude need to be considered.

For many investors, the most important asset in their portfolio is a residential home. In addition to this investors are also interested in buying agricultural land, a second home, a resort home, commercial property, etc.

### II. INVESTMENT MANAGEMENT

Investment management also known as asset management or portfolio management is a systematic approach to achieve benefits or profits through various investment avenues by an individual investor or asset management/investment management company. Individual investors having sufficient knowledge can directly invest in primary or secondary market. Investors not having sufficient knowledge can invest through asset management companies that are managed by fund managers.



**Non-marketable Financial Assets :** A proper balance of financial assets is represented by non-marketable financial assets. It includes bank deposits, provident fund deposits, company deposits, post office deposits etc.

**Real Estate :** For many investors, the most important asset in their portfolio is residential home. In addition to this, investors are also interested in buying agricultural land, a second home, a resort home, commercial property etc.

**Bonds :** Debentures or bonds are long term debt funds instruments. The issuer of the fund promises to pay a specified stream of cash flow. Bonds can be classified as savings bonds, debentures of private companies, government securities, PSU bonds.

**Equity shares :** Equity shares represent ownership of some capital. As an equity shareholder, investor has an ownership stake in the organization/company. Owning equity shares indicates investor's interest in additional income. Equity share is a popular investment avenue among investors. It can be classified as income shares, growth shares, blue chip shares, speculative shares and cyclical shares.

**Life Insurance Policy :** In general, life insurance may be considered as an investment. The assured sum can be viewed as benefit from the policy. Insurance policies are broadly classified as Money back policies, Term assurance policies, endowment assurance policies and whole life policies.

**Mutual Funds :** Instead of directly investing in equity shares or investing in fixed income schemes, investors can participate in various mutual fund schemes, which again invest in equity share market but assure fixed income. The major types of mutual funds are balanced schemes, equity schemes and debt schemes.

**Precious Metals :** Precious metals or objects are the items, which have higher monetary value. This may include art objects, gold, silver, platinum and precious stones.

Investment avenues are evaluated on the basis of following criteria -

- 1) **Marketability :** An investment is highly marketable if it can be transacted easily having low transaction cost

and if the price difference between two consecutive transactions is low.

- 2) **Rate of return** : A rate of return is referred as the gain or loss on an investment for the specific period of time. Formula to calculate rate of return is -
- 3) **Risk** : The risk refers to the difference in the rate of return on an investment. It is the simple measure of dispersion between the highest and lowest value. In finance, other measures such as standard deviation, variance and bets are used to measure risk.
- 4) **Tax shelter** : Some investments like investment in provident fund are considered as tax saver investments. Tax benefits are categorized as initial tax benefit, continuing tax benefit and terminal tax benefit.

5) **Convenience** : Convenience can be considered as ease with which investments are made and maintained. The investor has to consider various aspects while making an investment decision, they are as below: the reason behind the investment, tax benefits, associated risks with the investment, corporate earnings, liquidity, and marketability of the instruments, stock affordability, firm related qualities, investor-related services, withdrawal plan, firm's reputation, socially responsible investing, Current economic indicators, Opinion from friend/family/colleagues, or by the broker, recommendation from the fund manager, and other professional advice. In this article, the author has studied Individual Investors' perception towards diversified portfolios.

### III. RELATED WORK

Nowadays various researchers are exploring behavioral patterns that influence individual investor's decisions regarding investing in the financial market. It is observed that there is a dynamic relationship between the behavior of individual investors, stock price movements, the volume of trading, and returns gained. It is also observed that up to a certain extent there could be a region-wise cultural difference in investment patterns. A review of the literature clearly states that individual investor's behavioral pattern is the most important characteristics in stock price movements and the probable returns.

As a part of the literature survey, we studied many research papers from different countries focusing on the behavior of individual investors, factors influencing the investment decision-making process. Some of them are -

A financial advisor has to analyze the risk tolerance level of their clients. It is quite an important parameter while taking the decision related to investment management. Nguyen et al. (2016), in the research article **The influence of financial risk tolerance on investment decision-making in a financial advice context** [2], the researcher examined the impact of belief in financial advice service, literacy related to finance, and relation length along with service. For the study, data of 538 Australian investors were taken into consideration. The researcher observed that there is a positive association between

investment decision-making and investors' risk tolerance level. The researcher also observed that there is no positive relation between literacy related to finance and individual investor's risk tolerance level.

Hoffmann et al (2015) in the research paper **How investor perceptions drive actual trading and risk-taking behavior** [3], worked on understanding the investor's perceptions and risk-taking behavior. They used the data of investors from the Netherlands. They combined monthly survey data with matching brokerage records to show the change in individual investor's perception drive the trading process and decision of risk. They concluded that investors with higher levels and upward revisions are actively involved in trading and getting higher benefits. Also, the risk tolerance level is observed as high.

Forecasting the direction of the stock price is a vital task in the financial domain. Even minor improvements in the prediction make a great effect on the profit earned from investments. Michel Ballings et. al. (2015) in the article entitled **Evaluating multiple classifiers for stock price direction prediction** [4] studied random forest, kernel factory, support vector machine, neural networks, k-nearest neighbor, and logistic regression for prediction of the direction of stock price. Researchers collected data from 5767 companies listed publicly from Europe and used AUC as a measure of performance. They observed that random forest is the better performer for stock prediction as compared to all others.

S. Lodhi (2014) in the paper entitled **Factors influencing individual investor behavior: An empirical study of city Karachi** [5], investigated individual investor behavior of Karachi, Pakistan. She observed that there were five independent variables - financial literacy, high experience, use of accounting information, the importance of analyzing financial statements, and age are the factors that affect the investor's decision-making process. She also observed that accounting information and risk aversion are directly related to each other. Hood et al. (2014) in the paper **Conservation, discrimination, and salvation: Investor's social concerns in the stock market** [6], studied

the factors which affect the decisions of socially responsible investors. Logistic regression, descriptive statistics, clustered standard error, and correlation are the techniques used. The study showed that personal and social characteristics and values have a major impact on individual investor's stock composition.

Ambrose et. al. (2014) in the research paper **A survey of the factors influencing investment decisions: the case of individual investors at the NSE** [7], studied the behavior of an individual investor and factors affecting investment decision. According to the researcher, investment decisions are frequently supported by decision tools. With the help of a structured questionnaire, the author has collected the data from individual investors. The researcher applied methods such as frequencies, standard deviation, mean squares, percentages, and correlation. The researcher observed that the most significant factors are the firm's reputation in the market, expected return, profit, the historical performance of the firm's stock, price of the stock. The researcher concluded that there is some degree of correlation between factors of behavioral finance and earlier previously identified empirical factors.

Tomola et al (2013) in the research paper **Factors influencing investment decisions in capital market: A study of individual investors in Nigeria** [8], studied the factors affecting decisions of individual investments and also studied the relation of the socio-economic characteristics of the Nigerian capital market. Data of 297 investors were used for the study. Statistical techniques like independent t-test, post hoc test, and ANOVA were used for the data analysis. They found the factors like the performance of the fund sponsoring company, expected split of the stock, probable corporate earnings, dividend policies of the company are more important for the decision making. They also found that socio-economic factors like age, education, gender, marital status significantly affect the decision-making about the investments from Nigeria.

Kartasova et al (2013) in the article **Factors forming irrational Lithuanian individual investors' behavior** [9], studied the investment patterns of an investor's from the Lithuania stock market. Through questionnaire data is collected from the investors. He observed that women are overconfident than men. Investors with the required knowledge are found good or even very good investors. The level of confidence depends on experience and knowledge. Kartasova also observed that investors from age groups 30 - 45 and beginners are opting for most risky investments. Also married take less risk as compared to single and concluded that individual investor's decision-making depends on some personal characteristics like age, gender, profession, and experience.

According to Ebrahim (2012), in the paper entitled **An empirical analysis of financial risk tolerance and demographic features of individual investors** [10], Financial risk tolerance is the level of risk that one is ready to take. Risk tolerance should be measured for investment decision-making. The author studied the effect of demographic features on portfolio construction, investment decision-making, and risk tolerance level. Demographic features like age, gender, occupation, marital status, time horizon, income, size of the portfolio are taken into consideration. As per the study, there is a variation in financial risk tolerance level in accordance with demographic characteristics. The Association of these attributes is used to predict the risk tolerance level of the individual.

Hoffmann et al (2012) in research article **Individual investor perceptions and behavior during the financial crisis** [11], examined change in an individual investor's perception and risk-bearing capacity during the financial crisis. They observed that individual investors' perceptions vacillate majorly during the financial crisis. Throughout the worst months of the financial crisis, expectations on return on investment and risk tolerance level get decreased, whereas risk perception gets increased. They concluded that even in the situation of financial crises, individual investors actively participate in the trading process and can also be ready to take the little risk during the financial crisis.

As per Manhot et al (2012) in research article **Impact of demographic factors on investment decision of investors in Rajasthan** [12], markets are moving from static to dynamic thereby changing the level of risk. As risk is increased, the additional amount is at stake. They explored the relationship between risk level and demographic characteristics from Rajasthan state. They observed that based on the capacity to handle risk, investment avenues get changed like mutual funds, bonds, shares, gold, real estate, etc. They concluded that there is a negative correlation between Gender, Marital status, Age, Occupation, and Education and there is a positive correlation between Income level, Cities, and Knowledge.

Anna et al (2011) in the article **Economic factors and individual investor behavior: The case of the Greek stock exchange** [13], studied the economic factors that are affecting an individual investor's behavior from the Greek Stock Exchange. The analysis is done on the data collected from Athens Stock Exchange (ASE) and observed that the knowledgeable and experienced investors are more adaptive to financial situations. Also observed that there is some correlation between the factors of behavioral finance theory and individual investor's behavioral patterns.

Walia and Ravikant (2009) in the research paper **An analysis of investors risk perception towards mutual funds**



services [14], inspected the expectations of individual investor towards mutual funds. Chi-square test, rank and rating methodology, average performance scores (APS), and ANOVA are the techniques applied for the study. They detected that the investment patterns vary and added quality dimensions of existing services need to be enhanced.

Hui et al. (2008) in paper **Data mining method for listed companies financial distress prediction** [15], presented a data mining method by combining decision tree, information gain, and attribute oriented induction. It is used for preprocessing financial data and a decision tree model is constructed for the prediction of financial distress. Depending on the one class attributes and financial ratio attributes, a data mining model for financial distress prediction is designed.

Manish Kumar et. al. (2006) in the research article entitled **Forecasting Stock Index Movement: A Comparison of Support Vector Machines and Random Forest** [16], compared random forest and support vector machine to forecast the movement of stock index. According to him a lot of the study is present on precise forecasting of the stock index and found a research gap in the prediction of stock index movement. Support vector machine and random forest are the types of machine learning algorithms that can be used to predict time series data of finance. In this study, the researcher attempted to forecast the direction of the NIFT index of the National Stock Exchange. The researcher observed that SVM performs better to forecast the direction of movement of the stock market, as compared to other classification models like the random forest, linear discriminant analysis, artificial neural network.

#### RESEARCH METHODOLOGY

Research can be referred to as the generation of new knowledge. Research can also be considered as a systematic and scientific search for admissible information on a specific topic. Research artistically applies methods for scientific investigations. According to Oxford's dictionary, research is defined as "a careful study of a subject, especially to discover new facts or information about it" [17]. One can also consider research as an innovative or unique contribution to the existing body of knowledge. An objective behind the research is to explore answers to the question raised/identified. Research helps to find the hidden patterns, which are not yet discovered. To attain the research objectives, the descriptive analytical approach has been used. Descriptive statistics depends on the statistics of research analysis. The analytical approach focuses on the process of generating a final result. This research aims at the determination and analysis of various factors that affect the investment decision-making process of individual investors and risk assessment of their investment portfolio.

Investment Analysis Questionnaire comprises of two sections as -

**Section-I** deals with Personal Details and

**Section-II** includes the questions about portfolio composition and risk-bearing capacity of individual investor's portfolio. Section -II is divided into six axes viz. Investment objective, Time horizon, Level of Satisfaction, Factors influencing Investments, Knowledge, and Risk Tolerance levels. Data analysis is mainly based on the primary data collected by the researcher. Data of 618 respondents are analyzed for the present study. Primary data is collected from the individual investors. Questionnaire method is used for data collection. Demographic information and some core investment related questions are included in the questionnaire. Data is analysed using chi-squared test and data mining techniques such as association rule mining, classification, clustering and predictive analysis.

#### IV. DATA ANALYSIS

The Indian financial system has experienced huge change in the investment perception from last year. Investments strategies are to be revised in order to assist investors in invest in financial market. Government changed the perception of the investors regarding investment decisions in this pandemic. People are acquainting about the latest investment plans and expected returns on these plans. Foreign investment avenues also changed the whole scenario and now attracting schemes are now launching. Through this study, attempt has been made to comprehend behavior of individual investor in this Corona virus outbreak. Demographic data analysis is as below -

From the data, it can be observed that major investors are in the age group 30 to 50. 88% investors are preferring investments in shares, mutual funds and bonds as shown in Fig.2. Investors below age group 30 do not prefer the investments in financial market as they have fewer responsibilities. Also people above 50 feel it risky to invest in shares and mutual funds.

undergraduate, graduate, post-graduate and professional degree. It is observed that undergraduates are not doing much of the investments. Frequency distribution of Education is as shown in Fig.4. Higher education level helps investor to select the stocks, mutual funds and bonds effectively so as to achieve the investment objectives [20].

Age	Frequency	Expected	Percentage
Below 30	37	123.6	6.0
Between 30-40	247	123.6	40.0
Between 41-50	300	123.6	48.5
Between 51-60	29	123.6	4.7
Above 60	5	123.6	0.8
Total	618		

TABLE I

**FREQUENCY TABLE - AGE**

Education	Frequency	Expected	Percentage
Undergraduate	11	154.5	1.8
Graduate	110	154.5	17.8
Post-Graduate	322	154.5	52.1
Professional Degree	175	154.5	28.3
Total	618		

TABLE III

**FREQUENCY TABLE - EDUCATION**

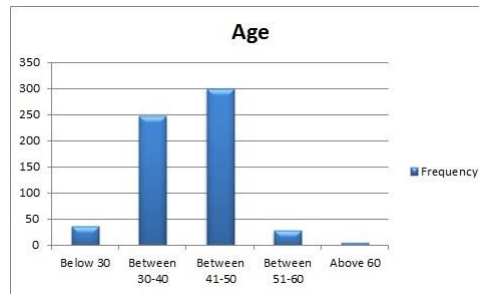


Fig. 2. Age

Gender parameter affects mostly on investment process [18] [19]. From the data obtained, it is observed that males are more inclined towards the investments in financial market as compared with women investors. Frequency distribution of gender is as shown in Fig.3.

Gender	Frequency	Expected	Percentage
Male	465	309.0	75.2
Female	153	309.0	24.8
Total	618		

TABLE II

**FREQUENCY TABLE - GENDER**

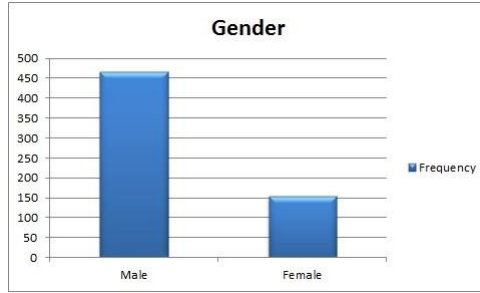


Fig. 3. Gender

Basic education creates awareness among the investors. Education aspect is divided into four sections as

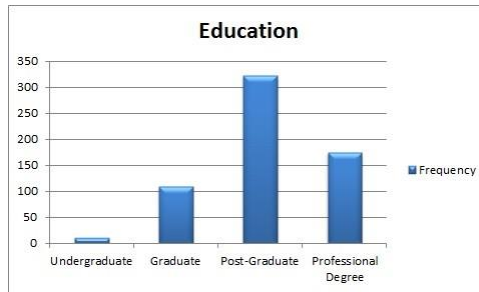


Fig. 4. Education

As per the occupation, investment decision changes. Salaried and businessman are ready to investment in financial market. There is an relative risk with these investments. Retired people are not ready to bear risk. Frequency distribution of occupation is as shown in Fig.5.

Occupation	Frequency	Expected	Percentage
Self-employed	237	123.6	38.3
Retired	7	123.6	1.1
Unemployed	4	123.6	0.6
Student	7	123.6	1.1
Salaried	363	123.6	58.7
Total	618		

TABLE IV  
FREQUENCY TABLE - OCCUPATION

Individual investor’s investment decision is greatly affected by annual income. Annual income is a key factor. As per annual income, an individual can analyse his/her investment capacity. Accordingly, investment avenues are selected, which will help to achieve the investment objectives. Annual income is categorized in six parts. Frequency distribution is as shown in Fig. ?? It is observed that individuals with income range between 10 to 15 lakh are major investors. Graphical

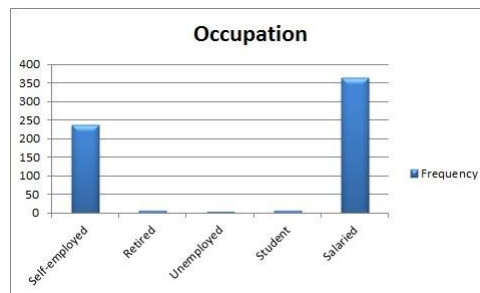


Fig. 5. Occupation

representation is as shown in Fig.6. It is said that investment is sacrifice to the current earning. So, by sacrificing current needs, one has to save for securing the future.

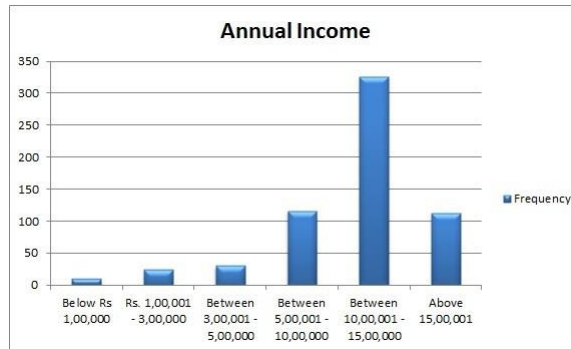


Fig. 6. Annual Income

Systematic withdrawal plan is important for any investor. Systematic withdrawal plan allows an investor to withdraw a fixed amount or variable amount from his/her investments on a fixed interval of time i.e. monthly, quarterly or yearly. With this, investor can customize their cash flow as per their requirements. Responses are collected for the withdrawal time of the investments. Motivating factor for majority of the investments is the reason behind the investment. Some investors depend on their investments to supplement cash flow, some want to supplement future income, some want to protect the value of the capital, some want to save the money for their rainy days and some expect capital appreciation. Ultimate goal is to grow capital which will fulfil future requirements. On the basis of reason for investment, time horizon of the investment is decided. Frequency distribution of withdrawal plan is as shown in Fig.7.

Graphical representation is as shown in Fig.7. From the graph, it can be seen that most of the investors are having plans to save upto 4-5 years. From the obtained data, 19.6% investors are willing to hold the investments for 1-2 years. 17.8% investors have 3 year investment plan. 54.2% investors are investing for 4-5 years. The latest trend in the market says

Withdrawal Plan	Frequency	Expected	Percentage
Less than 1 years	26	123.6	4.2
1 - 2 Years	121	123.6	19.6
3 Years	110	123.6	17.8
4 - 5 years	335	123.6	54.2
6 - 7 Years	26	123.6	4.2
Total	618		

TABLE VI  
FREQUENCY TABLE - WITHDRAWAL PLAN

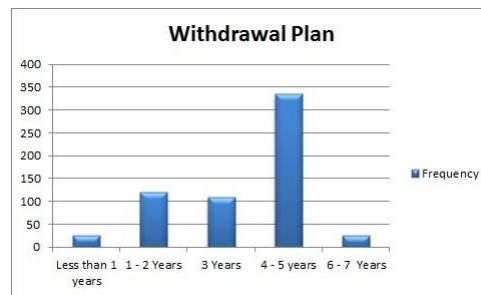


Fig. 7. Withdrawal Plan

that investors are not preferring long term investment plans.

Corona virus outbreak forced investors to think about their priorities. Researcher studied various factors that affect on the investors behaviour in the pandemic. From the data obtained from the investors, it is clear that 55% of the investors are investing just to supplement the cash flow.

Reason - A	Frequency	Expected	Percentage
Strongly Disagree	5	123.6	0.8
Disagree	28	123.6	4.5
Neutral	47	123.6	7.6
Agree	340	123.6	55.0
Strogly Agree	198	123.6	32.0
Total	618		

**TABLE VII  
FREQUENCY TABLE - REASON A - I DEPEND ON INVESTMENTS TO SUPPLEMENT MY CASH FLOW.**

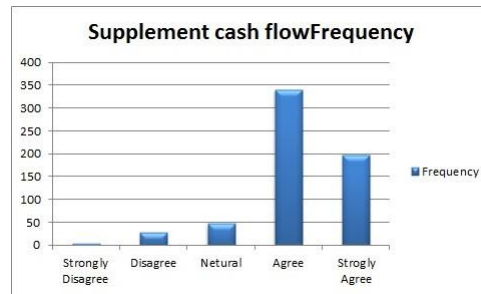


Fig. 8. Supplement Cash Flown

Second reason identified by the researcher in that investors are investing in financial market is to "depend on my investment to supplement my future income". People are owning lots of responsibilities. The investments done by investors today will surely supplement them in future. As per the data from Fig.9

Reason - B	Frequency	Expected	Percentage
Strongly Disagree	1	123.6	0.2
Disagree	10	123.6	1.6
Neutral	32	123.6	5.2
Agree	357	123.6	57.8
Strogly Agree	218	123.6	35.3
Total	618		

**TABLE VIII  
FREQUENCY TABLE -REASON-B- I DEPEND ON MY INVESTMENT TO SUPPLEMENT MY FUTURE INCOME..**

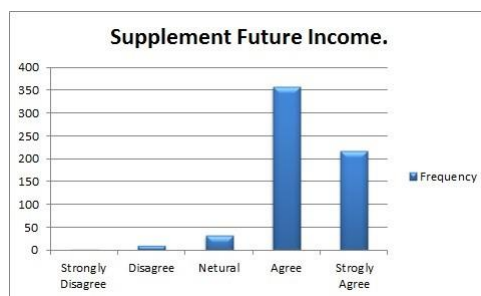


Fig. 9. Supplement Cash Flown

Savings are usually put into safe places that allow investors access their money at any time. These investment avenues include savings account, bonds, recurring deposits and some in mutual funds. Most clever investors put adequate money in savings to cover an emergency, like a abrupt unemployment. Data from Fig. 10 shows that around 93% investors want to invest to save for rainy days.

Reason - C	Frequency	Expected	Percentage
Strongly Disagree	1	123.6	0.2
Disagree	10	123.6	1.6
Netural	27	123.6	4.4
Agree	314	123.6	50.8
Strogly Agree	266	123.6	43.0
Total	618		

TABLE IX  
FREQUENCY TABLE -REASON-C- I WANT TO SAVE FOR MY RAINY-DAYS.

Comprehensive financial planning enables the effective fund management to grow the capital. Wealth creation and wealth preservation are two broad aspects of efficient financial planning. Wealth creation is the balanced accumulation of income and assets over a period of time. Around 93% investors are investing for wealth prevention.

Fig. 10. Save for Rainy Days



Reason - D	Frequency	Expected	Percentage
Strongly Disagree	4	123.6	0.6
Disagree	7	123.6	1.1
Netural	30	123.6	4.9
Agree	248	123.6	40.1
Strogly Agree	329	123.6	53.2
Total	618		

**TABLE X**  
**FREQUENCY TABLE -REASON-D- - I WANT TO PROTECT THE VALUE OF MY CAPITAL (WEALTH PREVENTION).**



Fig. 11. Wealth Prevention

account value can be considered growth. There are several ways to make a portfolio grow in value. Some take more time to invest or some have more risk than others. Diversification is the most appropriate way to grow capital. 94% investors are investing with the objective of capital appreciation Fig.12.

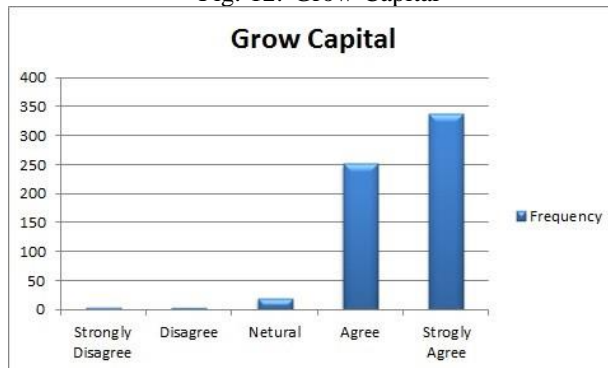
Reason - D	Frequency	Expected	Percentage
Strongly Disagree	5	123.6	0.8
Disagree	4	123.6	0.6
Netural	20	123.6	3.2
Agree	252	123.6	40.8
Strogly Agree	373	123.6	54.5
Total	618		

**TABLE XI**  
**FREQUENCY TABLE -REASON-E- - I WANT TO GROW MY CAPITAL).**

Investment Portfolio Diversification refers to selecting di-verse classes of assets with the objective of risk minimiza-

Growth can be defined in several ways when it comes to investing. In the most general sense, any appreciation in value and returns/profit maximization. Each investor has his individual risk profile, but there is a probability that investor

Fig. 12. Grow Capital



does not have appropriate investment securities that matches with his risk bearing capacity. This is possible when investors select a bunch of assets to balance risk and return. Portfolio diversification is required to satisfy future requirements. From the Fig. 13 it can be seen that 94% of investors are preferring investments in Shares and 88% investors are investing in Bonds. Even if the financial market is unpredictable, investors are investing in Mutual funds. From data 96% investors are holding mutual funds in their current portfolio. People are not considering Real estate as an investment option. Currently, Only 37% investors are choosing Real estate as an investment option. 43% investors are having Life insurance policies in the investment portfolio. From recorded data it can be observed that, nowadays investors are inclined towards diversified investment portfolio.

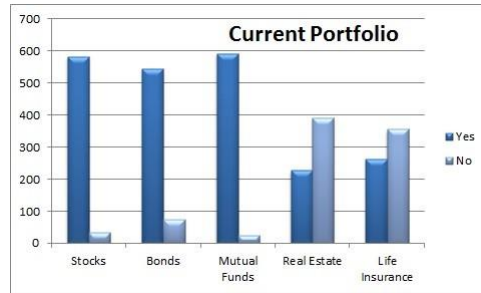


Fig. 13. Current portfolio

#### V. CONCLUSION

The design and execution of a portfolio risk management program need not wait for all the bits of the puzzle to fall into place. Centralization of the portfolio management function may not be considered an optimal solution. A successful implementation necessitates a careful, well-articulated strategy to evaluate and address the key issues across the entire spectrum of investment risk management. Data requirements, dictated by the analytical model selected, can be significant but establishing implementation priorities will avoid inertia on this front. Defining clear roles and responsibilities and selecting the appropriate risk-adjusted performance measures are necessary elements for success. On studying the peculiarities of portfolio management and analyzing the responses given by the investors on their insight and expectation from a financial advisor, the following points are recommended which a general financial advisor should consider at the time of approaching the people. Unbiased Advisory Diversified Investment Perfect Financial Planning to Encourage Investors In the growing economic globalization and advancement of information technology, financial data is generated and accumulated rapidly. Hence need some tools and techniques to manage and analyze the data effectively. This will facilitate individual investors and companies for planning their strategies and for decision making. Data mining finds patterns and correlations which can be used to predict future trends in finance. The advantages of using data mining in finance are low cost, revenue generation, awareness, and responsiveness. The diversified financial service sector has given a wide range of opportunities to individual investors. It can be seen that 94% of investors are preferring investments in Shares and 88% investors are investing in Bonds. Even if the financial market is unpredictable, investors are investing in Mutual funds. From data 96% investors are holding mutual funds in their current portfolio. People are not considering Real estate as an investment option. Currently, Only 37% investors are choosing Real estate as an investment option. 43% investors are having Life insurance policies in the investment portfolio. From recorded data it can be observed that, nowadays investors are inclined towards diversified investment portfolio. The individual's decision of investment is prejudiced by the kind of services rendered and the benefits offered in the financial market. Investment decisions are highly dependent on demographic, personal, psychosomatic characteristics, ethics, risk tolerance, economic factors, etc. The reason behind the investments, expected returns, time duration, and the type of investors are some of the factors that help individual investors or their fund managers to manage funds effectively.

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## Performance of MyNET Model on Handwriting Biometrics

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### ABSTRACT:

This paper is in the continuation of Writer Identification using Neural Network[1]. Offline signature identification is the challenging task till date. Unlike to verification problem of one-to-onemapping, identification maps single with rest them to identify the signer. For this process we model a model using convolution neural network. This paper explains the performance of MyNET model on MyNET offline signature dataset which consists of 434 writers 20 signatures each.

**Keywords:**Signature Identification, CNN, Handwriting Biometrics, MyNET, neural network

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### Introduction:

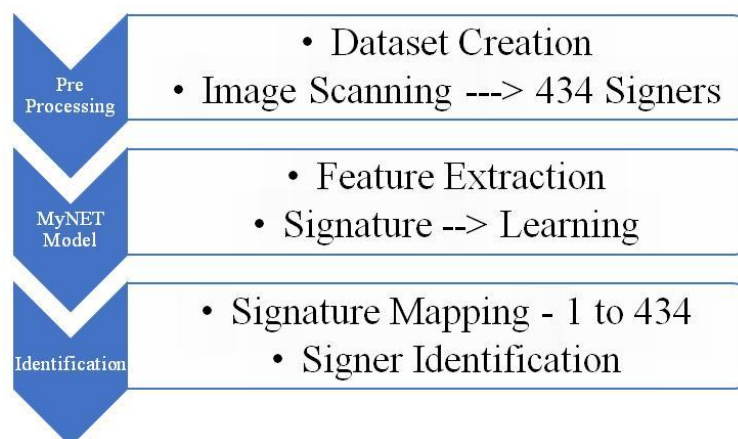
Biometric systems play major role in different applications. The two main important biometrics widely used are fingerprint scanner and iris scanner with many applications in different areas such attendance monitoring to security access controls. Handwriting biometrics usually referred as signature is mainly used largely in banking and legal application thought the globe. But due to their performance issues they are less used.[2][3]

There are two major problems associated with handwriting biometrics. They are namely, i) Writer Identification ii) Signature Verification. The writer identification is based on the identifying the signer from previous set of signatures available. For the process of identification current signatures is mapped with every signer's signature and based on matching pattens the writer is identified. Instead in signature verification process claims are made based on the signer

and only the process maps current signature with the only claimed signer's signature available. If the matching patterns is more that desired the verification confirms the signer to be valid.[4][5]

There are mainly two major techniques used in handwriting biometrics mainly, i) Offline and ii) Online. In offline, signatures are generally made on the piece of the paper and then they are computerized using scanners and then process with image processing techniques. On the other hand, in online signatures are captured using devices such as digitizers and then are process based on the parameters recorded during the acquisition process. Due to the advantage of acquiring the parameters using digitizers online techniques provided more accurate results compared to offline.[6][7]

## Proposed Architecture:



*Figure 1 Identification Process*

In order to study the performance which will identify the signer the following architecture has been implemented and performance was recorded.

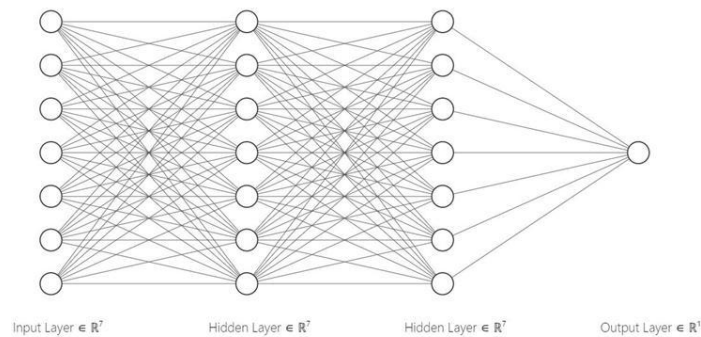
There are three major processes as shown in figure 1.

### 1. Dataset Creation

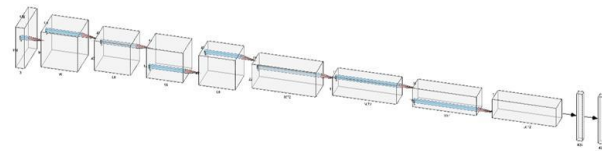
There are several existing datasets available for offline signature verification. Major of the datasets were on mixed mode i.e., offline and online. In the previous research work we have found the offline signatures datasets have signatures varies from 300 to 3000[1]. Hence, we proceeded to create a larger dataset with at least 8000 genuine signatures.

20 signatures of each signer were collected using page and paper method. Then using HP scanner with 1200 dpi each signature scanned and store separately with coding separate numeral for each signer. In this process we collected signatures from 500 signers. After implementing selection process for each signature 8680 signatures of 434 signer's 20 each were shortlisted for further process. With these signature MyNET signature dataset created.

## 2. MyNET Model



*Figure 2 MyNET Neural Network Architecture*



*Figure 3 MyNET Framework Architecture*

- Image Preprocessing – Each signer’s signature images were of different sizes. All images were resized for common input size [224 224]. The colour images were converted to grey scaled images.
- Convolution Neural Network[8] – Each signature image was processed for convolution with 5 by5 filter matrix and such 96 different random filters were used to create 96 filter maps. Followed by ReLu Activation functions to remove negative values. We have done down sampling of these images further using max-pooling layer. Since the filter numbers are large, we have use mini-batch normalization to speed CNN training further.
- Multiple Convolutions – 32 Grouped convolutions were implemented with ReLu and Average pooling for performance and speed improvement. Further cross-normalization was implemented channel wise. Additionally, drop-out layer added at the end to randomize the values to improve the performance of the network.

### **Experimentation:**

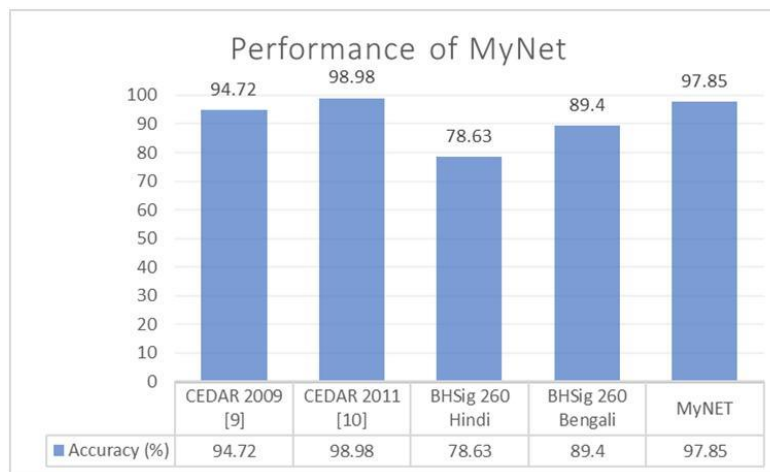
## 3. Identification

To study the performance of our MyNET model for the process of signer identification we have used our own dataset MyNet with 434 signers. Our objective was to identify the signer from the set of signatures available. Hence, we have implemented writer dependent signer identification. From the dataset randomly signatures were split into two different set for the process of training and validation. 21 different sets of 352 signatures each were created and MyNET model

implemented with cross validation. Since all of the signatures where genuine accuracy of signer identification was measured for each set.

## Results:

Considering new era of computation with enhancement into computation technologies, a larger dataset always important for research advancement. MyNET dataset with 9000+ genuine signatures without any synthetic signature creation could be larger dataset in this category. The performance of MyNET Model with larger dataset gives promising results for further research work. Below Table shows performance of MyNET model on different datasets with accuracy.



*Figure 4 Performance of MyNET on different datasets*

Based on the performance of MyNET Model on different dataset given in the above table we state of results as follows:

1. The performance of MyNET is promising on CEDAR datasets.
2. The performance of MyNET on BHSig 260 varies a lot with different Indic Scripts. In Hindi, performance has reduced below 80. This indicates to research further to improve the performance.
3. Compared to the performance with other Bengali shows less performance but considering other literature its still promising.
4. The accuracy of MyNET model on MyNET dataset and other as mentioned above proves the stability of the model with some variation to Hindi.

## Conclusion:

Handwriting biometric framework based on convolution neural network showed high accuracy performance on different datasets. The parameters could be further tunes to improve the

performance to other scripts as well. This model can be further implemented in real life application for signer identification.

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# Automated Test Script Generation Framework

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## ABSTRACT

In software testing test cases can be designed either manually or automatically. In this paper, we are introducing a framework for automatic test data generation. We put a large emphasis on automating the software testing process to generate the test cases that produce more complex code with less effort using some intelligent techniques like natural language processing.

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## KEYWORDS

Software testing, Natural language Processing (NLP), automated test case. Generating test script

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## 1. INTRODUCTION

Software testing is an activity to ensure quality in software systems. It is an important but expensive activity in the software development lifecycle. It is used to strengthen the quality of the product before delivering it to the client.

However, software testing is costly. Statistics say that 50% of the total cost of software development is devoted to software testing even if it is more in the case of critical software [1]. Automation Software Testing involves different activities like selection of test tools, defining the scope of automation, planning, design, development, execution, and maintenance, etc. Good

quality software can be made by using an efficient test method. The problem is how to reduce the software testing work while ensuring good quality software. Some solutions involve software execution automation tools, outsourcing the testing tasks at lower labor rates. Such solutions still depend upon individual skills in the generation of the test cases. [2]

In automation software testing tools test execution involves running tests on a computer system manually. Such solutions still depend on the programming skills of the tester to write the test script. In this paper, we focused on the automatic generation of test scripts rather than writing it manually.

## 2. MOTIVATION

Software engineering research puts a large emphasis on automating the software development process that produces large and complex quantities of code with less effort [1]. For software testing, we need to find advanced intelligent support procedures to automate the testing process [3]. In spite of continuous effort till today automated testing has limited impact in the industry, where the test generation activity remains largely done manually. Automation testing requires expertise in multiple languages and technologies, also it requires manual intervention to create test script, to execute, monitor and maintain automated tests. What we need is 100% automated testing to reduce the overall cost of software development with high quality [1]. Most of the times, design and maintenance takes the majority of the time allocated for automation of test scenarios and there is an extra cost for maintenance of the test automation team and training on specific tools being implemented.

One of the phases in automation testing is test-case design in which the human tester uses written (formal) requirements, written often in natural language (NL), to derive a set of test cases. There are many approaches proposed in the different literatures to reduce these manual efforts for conversion of natural-language requirements into automated test cases using NLP, using UML or code.

NLP is Natural language processing (NLP) is an area of computer science and artificial intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to process and analyse natural language data. The high-level design idea of using NLP is to generate automated test cases from a test scenario. A number of test data generation techniques such as random test data generator, path oriented test data generator, goal-oriented test data generator, and intelligent test data generator have been automated [1].

## 3. AUTOMATED TEST SCRIPT GENERATION FRAMEWORK

Our framework is basically designed for keyword-driven testing. In this Framework manually written test cases will be processed by using intelligent techniques called NLP, in which we identify low- level as well as high-level keywords, implement the keywords as executable, create the test cases, create the driver scripts and execute the automation test scripts. This driver script which we generally create manually will be implemented automatically through this framework.

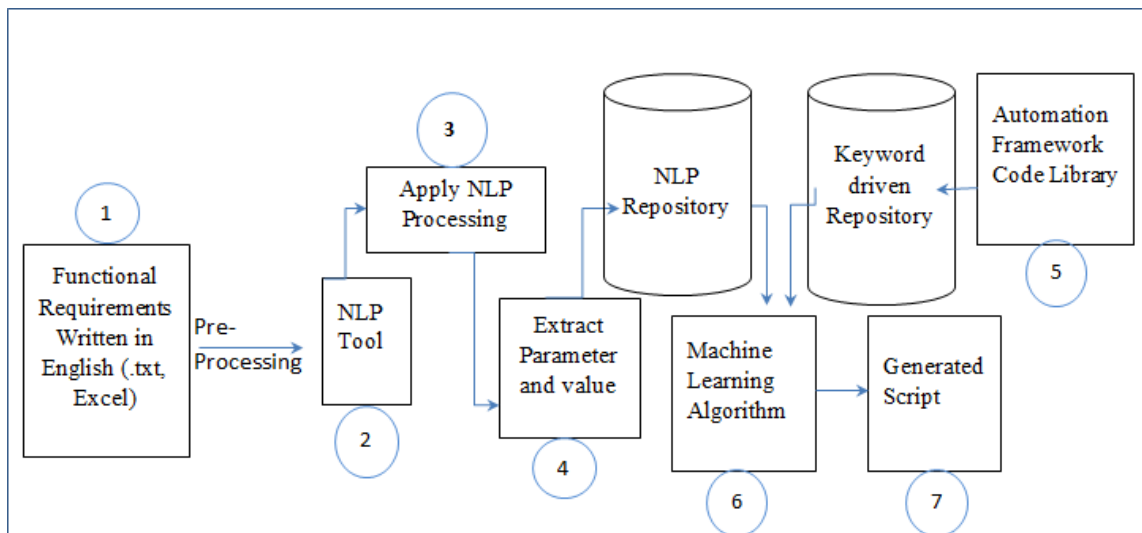


Fig. 1- Automated Test Script Generation Framework

This Automated Test Script Generation Framework follows some set of steps which are as below.

1. In the first step Natural Language parser will parse the functional requirement document, which content a test scenario with attributes expressed in natural language. This document is the input to the system.
2. In step two NLP tool will process the document. The Parser will parse the user test cases/test scenario written in natural language (English).
- 3 The NLP tool will parse the morphologic, syntactic and semantic approaches requirement of the document [4].

Through this parsing, we will extract the object, its value, and the handler. This information is used to match with available test building blocks of testing, and store them into an NLP repository.

4. In this framework, we are having another repository called Keyword Driven Framework Repository that will get data from the automation testing keyword driven framework. This will store the keywords and other parameters into the repository according to our selected keyword driven automation tool. The idea behind the Keyword Driven approach in automation testing is to separate the coding from the test case & test step. This method helps a non-technical person to understand the automation very well [6]. In the keyword driven test framework, all the operations and instructions are written in some external file like .CSV file. Example of .csv file is

Keyword	Locator	Locator Value	Parameter
Navigate			https://www.flipkart.com/

---

SendKeys	xpath	xpath [contains(text(), 'Enter your email')]	YOUR USER NAME
Click	xpath	[contains(text(),'Next' )]	
SendKeys	id	Password	YOUR PASS WORD
Click	xpath		Sign in

Table 1. Example of .CSV file

This type of data will be maintained into keyword driven framework repository.

5. Our framework will get the data from both repositories, first Repository is the repository in which we collected the parse data i.e. NLP Repository and another is the Keyword Driven Framework Repository, in which collected the data from Keyword Driven Testing Framework. This framework will map the data from both the repositories and it will apply Machine learning techniques.

6. After performing Machine Learning algorithms this framework will generate an automated test script. This will be the output of our framework. And this generated file can be an input for automation testing tools.

#### 4.

### CONCLUSION

This framework is developed for automatic generation of test scripts for automation software testing in keyword driven approach. This will reduce the task of manually writing the test script for automation testing framework. This will reduce test-generation efforts and will save the cost and time. This will also save the time of the tester for learning new programming skills which are required to generate test scripts.

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## Understanding the Impact of Work from Home Arrangement on Psychological Empowerment

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**Abstract:** Psychological empowerment can be understood as a sense of self control with respect to one's work and active involvement with one's work related role. It is manifested when employees feel that the work they do is personally meaningful to them, they have required competence to get the work done, they also have a degree of self-determination in taking work related decisions and their work has some impact on others and on the organizational as a whole. Psychological empowerment results in positive organizational and managerial outcomes. Today's era is marked by tremendous changes in ways of work including the work from home arrangements. Because of the COVID-19 Pandemic situation, working from home arrangement is preeminent. The current study focuses on the working from home arrangements, personal life characteristics of individuals which might have an impact on psychological empowerment of employees. Gender differences, marital status, working hours, childcare responsibilities are expected to have impact on psychological empowerment of employees. T Test and Analysis of Variance (ANOVA) were used to test the hypothesis. The results of this study show that gender differences, marital status, childcare responsibility and working hours affect psychological empowerment of employees. The results also focus on need to reduce insecurity in the minds of remote working employees. The implications for the organizations and limitations of the study are also discussed.

**Key Words:** Psychological Empowerment, Working from Home, Gender Differences, Marital Status, Childcare Responsibility, Working Hours

### Introduction

#### Understanding the Concept of Psychological Empowerment

Psychological empowerment is a concept originating from industrial-organizational psychology. Empowerment is defined as the opportunity an individual has for autonomy, choice, responsibility, and participation in decision making in organizations. Psychological empowerment refers to an "intrinsic task motivation reflecting a sense of self-control in relation to one's work and an active engagement with one's work role."

Since the 1980s, an increased interest in empowerment had been seen in diverse subject areas within psychology and management, including motivation, task performance, leadership, group processes, decision-making, and organizational design, because empowerment can enhance employee performance, well-being, and positive attitudes of individuals, teams, and organizations.

It is the process of enhancing feelings of self-efficacy among organizational members through the identification of conditions that foster powerlessness and through their removal by both formal organizational practices and informal techniques of providing efficacy information. Many studies on enterprise organizations have found that psychological empowerment can effectively stimulate individuals' enthusiasm for work and promote the improvement of job performance.

Psychological empowerment is composed of four cognitions according to Spreitzer namely Meaning, Self-determination, Competence and Impact. Meaning refers to a sense of purpose or personal connection to work. Empowered people feel that their work is important to them and they care about what they are doing. Competence reflects individuals' beliefs that they have the necessary skills and abilities to perform their work well. Self-determination refers to a sense of freedom about how individuals do their work. Impact describes a belief that individuals can influence the system in which they are embedded. The four dimensions are independent and distinct yet related and mutually reinforcing, qualities that capture a dynamic state or active orientation towards work.



The prime objective of empowerment is allocation of power between management and employees in such a way that employees' commitment can be enhanced. Managers in contemporary organization advocate performance improvement through employee empowerment and decentralization. Individuals feel empowered when they perceive and possess power to adequately cope with events, situations, or people they confront.

An employee feels empowered due to a meaningful job, gaining confidence to perform the task, degree of autonomy in decision-making, and perceives that the job and individual performance have a positive and vital impact on the organization. Employee empowerment is reflected in job satisfaction, enhanced morale and improved performance which is ultimately in long-run interest of the organizations. The firms' objectives can be achieved easily.

Meaning results in high commitment and concentration of energy. Competence results in effort and persistence in challenging situations, coping and high goal expectations, and high performance. Self-determination results in learning interest in activity and resilience in the face of adversity. Impact is associated with absence of withdrawal from difficult situations and high- performance.

Psychological empowerment is beneficial in reducing the cost as employees save the time and efforts of top management, reducing the need for middle level managers to a considerably lower level. It helps to increase the productivity, quality of product which helps to gain a competitive edge over the organization's competitors. Psychological empowerment may vary with organizational structure, individual and team characteristics, work design, leadership, and organizational support.

Researches show that employees with higher degrees of psychological empowerment will be motivated to work harder and their performance will be correspondingly higher. Psychological empowerment brings congenial atmosphere in the organization to achieve organizational goals, and develops a culture of openness and trust.

In changing scenario like global COVID-19 pandemic, workers need acceptance of changes in operation, methods, techniques, changing workplace dynamics like working from home and changing workplace demographic as well as employee expectations. Employees with higher degree of psychological empowerment tend to adopt such changes within the organization easily compared to other employees, with increasing employee satisfaction and reducing attrition rate.

#### Understanding Today's Working From Home Scenario

The concept of working from home/ remote working emerged in the last decade due to explosion in technology and globalization (Caramela, 2017). In the 1980s, companies began officially experimenting with flexible work. For example, IBM installed "remote terminals" in several employees' homes during that time, and the program flourished to the point that "by 2009, 40% of IBM's 386,000 global employees already worked at home (the company noted that it had reduced its office space by 78 million square feet and saved about \$100 million in the US annually as a result)," cites a report in Quartz. Today the concept has working from home has come to the forefront due to sudden outbreak of COVID-19 pandemic.

Although initially it was challenging for organizations to operate as per this new normal, by now, after being locked down organizations and employees are getting used to this new normal and coming up with various ideas and methods to cope up with this challenging situation. Video conferencing tools and collaborative technology has made it easy for coworkers to communicate and stay in touch, no matter their geographical location. As long as one is connected to the internet and has required devices, technology has now made it easier to work from anywhere in the world (Hendricks, 2014).

This lockdown had major impact on employees working environment and work methodology. Different professionals are now working from home ranging from professor, scientist to artists. Due to this 'new normal' working environment is changing drastically. Though many working individuals have accepted this remote working and are working from home now, claims that they are not able to conduct their various roles and responsibilities like before. With the changes happening in all walks of life, schools, colleges and day cares are also closed down. Many working individuals today are responsible for looking after their children. While others have to support elders, dependents and other family members through this trying times of illness and uncertainty.

It simply means that on the one hand through working from home individuals have brought their 'professional roles'

at home, while on the other hand due to pandemic situations their personal life roles have already multiplied. In a nutshell, the COVID-19 crisis is disrupting the way individual works.

This paper focuses on understanding the impact of working from home and personal life characteristics of working individual like gender, marital status, child care responsibilities and working hours on psychological empowerment of employee.

### Literature Review & Hypothesis

Tripathi, N., & Bharadwaja, M. (2019), research shows that PE (psychological empowerment) has a significant negative relationship with perceived stress, which helps to validate the effectiveness of PE (psychological empowerment) in Indian work settings. They established emotional stability and agreeableness as significant moderators which enhance the negative links between PE and perceived stress.

Saltiel, F. (2020), his paper examined the feasibility of working from home in developing countries. The feasibility of working from home is positively correlated with high paying occupations. Educational attainment, formal employment status, an household wealth are positively associated with the possibility of working from home, reflecting the vulnerability of various groups of workers. These relationships remained significant within narrowly defined occupations, yet exhibited heterogeneity across countries. He remarked the importance of rapidly identifying the vulnerability of workers to design adequate policies to combat the negative employment impacts of COVID-19.

Results from the analyses of Hayes, S., Priestley, J. L., Ishmakhmetov, N., & Ray, H. E. (2020), paper suggested that perceived stress did increase during the COVID-19 restrictions, especially for people that had limited experience working from home and were female. Individuals who worked from home before COVID-19 had higher levels of work-related burnout but did not differ based on gender or part-time work status. The results suggested that working from home

may create more stress and result in more burnout, which challenges the current moves by some employers to make working from home a permanent arrangement.

From the above discussion it is hypothesized that

H1 – People working from home will experience the feeling of stress, fear, anxiety, insecurity and uncertainty.

H2 - Women working from home will experience higher stress, fear, anxiety, insecurity and uncertainty than men.

H3 – Married employees will experience higher stress, fear, anxiety, insecurity and uncertainty than unmarried employees.

H4– Employees with childcare responsibility while working from home will experience higher stress, fear, anxiety, insecurity and uncertainty than employees without childcare responsibilities.

H 5 – Employees working more hours than normal due to work from home arrangement will experience higher stress, fear, anxiety, insecurity and uncertainty.

H 6 – Employees working from home will experience less psychological empowerment than those not working from home or occasionally working from home.

### Methods

To secure information from respondents, a self- administered survey /questionnaire was used in current study. Due to Covid-19 pandemic, physical distribution was not possible. So, questionnaires were sent to respondents through social media platforms and using websites like survey swap, and survey circle. Electronic distribution techniques were also used (Google form).

Total 160 questionnaires were distributed electronically, out of which 82 filled questionnaires were returned giving a total response rate of 51.25%. A non-probability convenient sampling method was used to reach the respondents in this study.

Sample size was 82 respondents out of which 43.9% are male and 56.1% are female respondents with an average age of 30 years. Approximately 45.7% respondents were graduates, while 49.4% had post graduate degrees. Approximately 62.2% were single and 35.4% were married. 20.7% were from a joint family and 79.3% from the nuclear family. Approximately 26.8% respondents had children and 48.8% had dependent care responsibilities. About 30.3% of respondents earn annual income ranging from Rs. 2, 00,000 to 4, 00,000.

On average respondents worked 5 days a week with average 8 working hours per day and average work experience was 7 years. On an average experience working with the current organization of the respondents was 4 years.

**Measures**

Work from Home - A scale for working from home was taken from Snapsurvey blog by Joshua Nicholas (2020). Sample items include, ‘Have you worked from home before the COVID-19 lockdown?’, ‘ Do you have required equipment to work from home?’ etc.

Psychological Empowerment – A scale was used in this study to measure Psychological Empowerment is developed by Spreitzer (1995). Spreitzer developed the sub scale by adapting items from previous studies. Meaning items were taken directly from Tymon (1988), competence items from Jones’s (1986) self-efficacy scale, impact from Ashforth’s (1989) helplessness scale and self-determination items from Hackman and Oldham’s (1980) autonomy scale.

The Psychological Empowerment Questionnaire contains three items for each of the four sub- dimensions of psychological empowerment for example, Meaning: ‘The work I do is meaningful to me’; Competence: ‘I have mastered the skills necessary for my job’; Self- determination: ‘I have significant autonomy in determining how to do my job’; and Impact: ‘I have a great deal of control over what happens in my department’. Respondents were asked to indicate their responses on a five-point Likert scale where 1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = agree, 5 = strongly agree. Highest score indicate more employee engaged while lower score indicate lower employee engagement.

Buckle (2003) reported a Cronbach’s alpha coefficient of 0.88 for total psychological empowerment and Malan (2002) reported alpha coefficients for all the four sub dimensions of psychological empowerment to vary from 0.68 to 0.83. For the current study the alpha reliability was .89.

Demographic Profile - Demographic data was collected on the parameters like Gender, Age, Educational qualification, Department, Work Experience, Marital status, Number of dependents, Number of children, etc.

**Data Analysis & Results**

- Correlation between working from home and feeling of Stress, Fear, Anxiety, Insecurity & Uncertainty

Table 1- Mean, Std. Deviation and Zero Order Correlations among variables

Variables	M	SD	WFH	Stress	Fear	Uncert.	Anx.	Insec.	
WFH	3.44	.787	1						
Stress	1.94	.802	-.323**	1					
Fear	1.38	.696	-.336**	.428**	1				
Uncertainty	1.68	.788		-.317**	.432**	.672**	1		
Anxiety	1.70	.822		-.267**	.602**	.499**	.609**	1	
Insecurity	1.52	.728		-.240**	.423**	.610**	.478**	.445**	1

\*\*  $p < .01$

Results in Table 1 show significant negative correlation of work from home with stress (-.323\*\*), fear (-.336\*\*), uncertainty (-.317\*\*), anxiety (-.267\*\*) and insecurity (-.240\*\*). Thus hypothesis 1 which states that people working from home will experience the feeling of stress, fear, anxiety, insecurity and uncertainty is supported by the data.

- Gender Differences

Independent samples T test was conducted to understand the differences of perception of male and female employees’ regarding factors like stress, fear, anxiety, insecurity and uncertainty. Significant results are shown in Table 2

Table 2: Results of T test for Gender Differences

Particulars	Gender	Mean	Std. Deviation	F	sig.
Fear	Male	1.19	.525	11.695	.001
	Female	1.46	.751		
Insecurity about Job	Male	1.22	.485	26.914	.000
	Female	1.72	.834		

\*\*  $p < .01$

The results of T test shows that there are significant differences in the feeling of fear of male 1.19 (SD= .525) and for female 1.46 (SD= .751) employees due working from home,  $F= 11.695, p =.001$ . Additionally, significant differences were found between male 1.22 (SD= .485) and female 1.22 (SD= .485) employees in their experience of feeling of insecurity about the job,  $F= 26.914, p =.000$  Therefore, hypothesis 2 stating that women working from home will experience higher stress, fear, anxiety, insecurity and uncertainty than men is partially supported by the data.

- Marital Status

Table 3: Results of T test of marital status of employees on stress and uncertainty due to working from home

Particulars	Marital status	Mean	Std. Deviation	F	sig.
Stress	Single	1.87	.856	6.059	.016
	Married	2.07	.704		
Uncertainty	Single	1.62	.837	2.783	.099
	Married	1.69	.712		

\*\*  $p < .01$

The results of T test shows that there are significant differences in the feeling of stress of unmarried 1.87(SD= .856) and married 2.07 (SD= .704) employees due working from home,  $F= 6.059, p =.016$ . Additionally, significant differences were found between unmarried 1.62 (SD= .837) and married 1.69 (SD= .712) employees in their experience of feeling of uncertainty,  $F=2.783, p =.099$ .

Hence, hypothesis 3 which claims that married employees will experience higher stress, fear, anxiety, insecurity and uncertainty than unmarried employees.

- Childcare Responsibility

Table 4: Results of T test for Childcare responsibility

Particulars	Childcare Responsibility	Mean	Std. Deviation	F	sig.
Stress	No	1.87	.853	7.895	.006
	Yes	2.14	.640		
Fear	No	1.27	.607	6.526	.013
	Yes	1.55	.800		

\*\*  $p < .01$

Results of T test shows that there are significant differences in the perception of stress among employees with childcare

responsibility 2.14(SD= .640) and employees without childcare responsibility 1.87(SD= .853),  $F=7.895$ ,  $p =.006$ . Additionally, there are also significant differences in the experience of fear of employees with childcare responsibility 1.55 (SD= .800) and employees without childcare responsibility 1.27(SD= .607),  $F= 6.526$ ,  $p =.013$ . Hence, the data partially supports hypothesis 4 which states that employees will childcare responsibility while working from home will experience higher stress, fear, anxiety, insecurity and uncertainty than employees without childcare responsibilities.

Working Hours

Table 5: Results of one way ANOVA for Working Hours

Particulars	Working Hours	Mean	Std. Deviation	F	Sig.
Stress	Working less than before	1.44	.698	9.158	.000
	Working more than before	2.16	.721		
	Feels to work for 24×7	2.25	.866		
Anxiety	Working less than before	1.33	.620	3.344	.040
	Working more than before	1.79	.833		
	Feels to work for 24×7	1.83	.835		
Insecurity about job	Working less than before	1.26	.594	2.451	.093
	Working more than before	1.58	.763		
	Feels to work for 24×7	1.75	.866		
Uncertainty	Working less than before	1.41	.636	2.452	.093
	Working more than before	1.65	.720		
	Feels to work for 24×7	1.92	.669		

\*\*  $p < .01$

Analysis of variance in Table 5 shows that employees who feels like they are working 24\*7, experience higher level of stress 2.25 (SD = .866\*\*), Anxiety 1.83 (SD =.835), insecurity about the job 1.75 (SD = .866\*) and uncertainty 1.92 (SD = .699) than employees who are working more than before or working less than before.

This partially supports hypothesis 5 stating that Employees working more hours than normal due to work from home arrangement will experience higher stress, fear, anxiety, insecurity and uncertainty.

Work from Home & Psychological Empowerment

Table 6: Results of one way ANOVA for Work Form Home & Psychological Empowerment

Particulars	Work from Home	Mean	Std. Deviation	F	Sig.
Psychological	No	4.30	.483	3.289	.042
	Occasionally	3.70	.483		

empowerment	Yes	4.08	.552		
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The results of ANOVA shows that employees who work from home 4.08 (SD = .552) experience lower level of psychological empowerment compared to employees who do not work from home 4.30 (SD = .483). Thus, hypothesis 6 which states that employees working from home will experience less psychological empowerment than those not working from home or occasionally working from home is supported by the data.

### Discussion

This study claims that people working from home experience the feeling of stress, fear, anxiety, insecurity and uncertainty. This was supported by the data. The reason for this can be attributed to the change or shift in working arrangements, no separation between work life and personal life, extended working hours, increase of competition, and lack of one to one interaction.

Further it was found that women working from home experience higher fear, insecurity than men. This may be because in this study, 26.8% of employees have children and 56.1% are women employees in this research. Because of the working from home arrangement, female employees have to carry out both the responsibilities of work as well as of the home simultaneously. Male employees feel less responsible to carry out the household duties. The burden or the pressure of duties and responsibilities on women employees has increased since the country is under lockdown every member of the family is at home including children. The schooling of the child is also from home, parent employees especially female employees have to take care of the child's health as well as education.

It was also found that married employees experience higher stress and uncertainty than unmarried employee. This finding can be justified as married employees have more responsibilities and duties regarding their family they feel more uncertain and stressful about their job. Married employees have more responsibilities so they tend to avoid risks, changes. So, adopting the sudden shift in working arrangements due to pandemic becomes difficult.

The study also claims that employees with childcare responsibility while working from home will experience higher stress and fear than employees without childcare responsibilities. This is due to COVID-19 pandemic, children are also at home. Parent employees have to manage both the roles as parents and also as employees simultaneously. The switching between these two roles becomes difficult to manage because employees are working from home.

It was further found that employees working more hours than normal due to work from home arrangement experience higher stress, fear, anxiety, insecurity and uncertainty. This can be justified by some obvious reasons like workload, long working hours, changes within the organization, boring work, managers or higher authority providing no feedback, tight deadlines, etc.

At the end it was found that employees working from home experience less psychological empowerment than those not working from home or occasionally working from home. This is because employees working from home experience stress, fear, anxiety, workload, and insecurity about the job, and as studies show that stress, fear, anxiety, workload, and insecurity about the job is negatively correlated to psychological empowerment.

### Limitations

Like any other research this research also have certain limitations. This study is based on self- reported responses of the individuals. For this study we have used the convenient sampling method to approach participants and hence the issue arises regarding whether the findings of this study will generalize to the entire population. The study is based on the self- reported responses of respondents. In this study all sectors are not considered. Further, considering the sample profile of this study, the representation of male participants in the current study sample is less as compared to female participants.

### Conclusion

The purpose of this study was to understand the impact of work from home arrangements on psychological empowerment of employee. In this study, it was found that demographic factors like gender, marital status, and childcare responsibility have an impact on psychological empowerment of employees. Negative correlation between stress, anxiety, fear, uncertainty, insecurity about the job and psychological empowerment was found.

This study claims that people working from home experience the feeling of stress, fear, anxiety, insecurity and uncertainty, which was supported by data. The study shows that women working from home experience higher fear, insecurity than men. The study also claims that employees with marital status, childcare responsibility while working from home will experience higher stress, uncertainty and fear than other employees. It was further found that employees working more hours than normal due to work from home arrangement experience higher stress, fear, anxiety, insecurity and uncertainty. At the end it was found that employees working from home experience less psychological empowerment than those not working from home or occasionally working from home.

It is recommended to perform psychological empowerment practices in the organization by decentralizing, giving access to information, building an open culture, involving employee in decision making etc. These practices can help the employer to improve employee's psychological empowerment. Employee's productivity gets influenced by the changing or uncertain external factors which can be minimized by empowering employees.

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## **Understanding the Relationship between Remote Working, Personal Life Characteristics and Employee Engagement**

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**Abstract:** The concept of employee engagement was coined by Kahn in 1990, as part of his research into identify theory. This concept of employee engagement is multi-dimensional. It can be understood as the emotional attachment employees feel towards their job roles, place of work, and position in the company, colleagues and culture. Employee engagement has positive impact on well-being and productivity of individual employee and organization as a whole. Today's era is marked by tremendous changes in ways of work including the remote working / work from home arrangements. The Pandemic of Covid 19 had made it imperative. The current study focuses on the impact this remote working arrangements, personal life characteristics of individuals might have on employee engagement. Marital status and child care responsibilities are expected to have impact on employee engagement. T Test and Analysis of Variance (ANOVA) were used to test the hypothesis. The results of this study show that marital status and childcare responsibility affects employee engagement. The results also focus on need to reduce insecurity in the minds of remote working employees. The implications for the organizations and limitations of the study are also discussed.

**Key Words:** Employee Engagement, Remote Working, Marital Status, Children

### **Introduction**

The term employee engagement can be understood as an extent to which people are ready to put additional efforts for their job and feel passionate and committed for their jobs. It is noteworthy that committed employees work hard; they are excited about their jobs and tend to stay for long time with their organizations.

Employee engagement has become topic of interest for researchers and employers alike because it is now established that it is an important predictor of individual and organizational outcomes. Employee engagement also has implications for employee well-being and performance.

Employee engagement is the emotional commitment employees feel towards their organisation. When employees are engaged they take actions to ensure the organization's success. It is also evident that engaged employees demonstrate accountability, enthusiasm, care and dedication.

'Engaged employees' are 'caring employees'. They use discretionary effort for organizational well-being. As they feel committed and responsible, they stay behind to get a job done. At time sit is observed that because they care for their workplace, they easily engage themselves with activities like picking up the cups left behind on the table in the meeting room. Engaged employees feel proud about their organization and as a result tend to stand up for it. They are solution finders and usually come up with ways to get the job done. Overall engaged employees care and they are emotionally engaged with their organisation.

Talking about employee engagement it is also interesting to note that there exists another category of employees that is called as actively disengaged employee. These employees are unhappy at work; they show their negative behavior and unhappiness. Unlike engaged employees actively disengaged employees come up with illogical or fake excuses, and keep irresponsible attitude. They do not take initiative for finding solutions. They do not feel proud to be part of their organization. They tend to erode their teams and their business.

Engaged employees are real assets for their organizations. They work with passion, are loyal, innovative and help the organization grow and prosper. Hence organizations need to ensure that their employees are engaged. Employee engagement gets affected due to several factors like how an organisation and their superiors treat employees.

Employee engagement has become crucial like never before due to changing work scenarios owing to global Covid-19 pandemic, changing workplace dynamics like remote working/ work from home and changing workplace demographic as well as employee expectations. A recent Employee Engagement & Benefits report by Raconteur

claims that older generations in the workplace like baby boomers begin to retire, and ambitious millennial are entering the workforce. This new generation is demanding in terms of employee engagement and benefits more than any previous generation.

Considering all these changes it is imperative for employers today to pay attention towards employee engagement as it is found that 60% of workers would be more productive if they felt happy and engaged at work.

#### Understanding the Remote Working Scenario Today

The concept of remote working emerged in the last decade due to the explosion in technology and globalization (Caramela, 2017). Today the concept of remote working has come to the forefront due to the sudden outbreak of Covid 19 pandemic.

Although initially it was challenging for organizations to operate as per this new normal, by now, after being locked down organizations and employees are getting used to this new normal and coming up with various ideas and methods to cope up with this challenging situation. As long as one is connected to the internet and has required devices, technology has now made it easier to work from anywhere in the world (Hendricks, 2014).

This lockdown had a major impact on employees' working environment and work methodology. Different professionals are now working from home ranging from professor, scientist to artists. Due to this 'new normal' working environment is changing drastically. Though many working individuals have accepted this remote working and are working from home now, claims that they are not able to conduct their various roles and responsibilities like before. With the changes happening in all walks of life, schools, colleges and day cares are also closed down. Many working individuals today are responsible for looking after their children. While others have to support elders, dependents and other family members through this trying times of illness and uncertainty.

It simply means that on the one hand remote working individuals have brought their 'professional roles' at home, while on the other hand due to pandemic situations their personal life roles have already multiplied. In a nutshell, the COVID-19 crisis is disrupting the way individual works.

This paper focuses on understanding the impact of remote working and personal life characteristics of working individual like marital status and child care responsibilities on employee engagement.

#### **Literature Review & Hypothesis**

Due to Covid 19 pandemic and lockdown situation, many organizations today have adopted work from home arrangements. Due to the critical pandemic conditions the expectations of more work from home arrangements are increasing. This may potentially impact overall job satisfaction, level of work-family conflicts, job performance and turnover intention rates of employees.

There has always been a disagreement around performance of remote working employees. Some argue that working from home allows employees to be more productive as there are fewer office distractions, while others proclaim that working from home is not allows for more home distractions (Fonner & Roloff, 2010).

The second argument seems more applicable in current times, as employees working from home also have to perform many other roles like parents, spouses and care givers at home. This may impact them negatively.

It is also observed that those who work from home with children around has lower performance and engagement than others. However, according to Gallup report on the State American Workplace individuals who work remotely are more committed, enthusiastic and engaged (Gallup, 2017)

From the above discussion it is hypothesized that,

H 1 – Remote working will have an impact on the perceived engagement of employees.

H 2 – There will be a difference in perception of engagement among employees based on their marital status.

H 3 - There will be difference in perception of engagement among employees based on whether they have children or not.

# Understanding the Relationship between Remote Working, Personal Life Characteristics and Employee Engagement

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H 4 – Employees working from home will experience more fear, anxiety and uncertainty than employees who are occasionally working from home or not working from home.

## Methods

To secure information from respondents, a self-administered questionnaire was used in current study. Due to COVID 19 pandemic the physical distribution was not possible hence it was convenient to send the questionnaire via electronic medium. The questionnaire was distributed using Google forms.

Total 125 questionnaires were distributed electronically, out of which 80 filled questionnaires were returned giving a total response rate of 64%. Out of these 80 responses eligible and validate responses were 73 in number which were coded and used for further analysis. These respondents belong Information Technology (I.T) industry.

The population for this study was employees working from home in Pune city. As it was not possible to reach all the members of population to get data hence, non-probability sampling was the only feasible alternative.

Convenience sampling is non-probability sampling and involves the selection of sample members based on easy availability or accessibility. Hence, non-probability convenient sampling method was used to reach the respondents in this study.

Sample Profile - Sample constitutes of 54.8 % male and 45.2 % female respondents. 65% of total respondents were married. Approximately 40.5 % respondents had children and 69.86 % had dependent's care responsibilities. Average age of respondents was 28.63 yrs, with average working experience of 6.41 yrs. They have been working with the current organization for average 3.79 yrs.

## Measures

The following scales were used to collect data in the current research.

Employee engagement - Employee engagement was measured using two scales. One of which was of 9 question and other of 5 which were combined to form a total of 14 question. The first scale was published in: "New Measurements Scale for Employee Engagement Scale Development, Pilot Test and Replication" by Christopher H. Thomas (2007). Second scale was given by Mark A. Murphy, (2009) best-selling author and noted expert on organizational leadership and employee engagement.

Respondents were asked to indicate their responses on a five-point Likert scale where 1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = agree, 5 = strongly agree. Highest score indicate more employee engaged while lower score indicate lower employee engagement. Samples items include, 'My boss recognizes high and low performers', 'My boss removes roadblocks to my successes, I am willing to go the extra mile to perform my job duties better', 'I am enthusiastic about providing the high-quality product or service'. Final survey questionnaire for employee engagement had 14 questions.

Remote Working – To understand remote working conditions of employees some questions were include in the questionnaire like, 'How long have you been working from home?', 'Do you have all the equipment needed?', 'Is remote working creating any uncertainty in your mind about the job?', 'Is working from home better than working from office?' etc.

Demographic Profile - Demographic data was collected on the parameters like Gender, Age, Educational qualification, Department, Work Experience, Marital status, Number of dependents, Number of children.

## Analysis and Results

**Cronbach's Alpha** – The validity and reliability of the survey instruments used was tested with Cronbach's Alpha. Past studies recommend using Cronbach's Alpha to validate the survey instruments (Prosad, Kapoor and Sengupta, 2015; Wood and Zaichkowsky, 2004). Cronbach's Alpha was tested for the variables, employee engagement. The alpha reliability of employee engagement is 0.85. The scale has acceptable reliability.

## H1- Employee Engagement & Remote Working

Table 1- Results of Correlation

Variables	M	SD	EE	RW
Employee Engagement	3.54	.50	1	.008
Remote Working	.76	1.132		1

Mean, standard deviations and correlations among employee engagement and remote working is reported in Table 1. There is no significant correlation found among these two variables. Hence, we could not run regression test for these two variables. Thus, hypothesis one which states that remote working will have an impact on the perceived engagement of employees is not supported by the data.

H2 - Employee Engagement & Marital Status

Table 2 - Results of T test

		Mean	SD	F	Sig.
Employee engagement	Married	3.92	.674	9.941	.002
	Unmarried	3.93	.450		

T test was conducted to compare if there is any significant difference in employee engagement based on marital status of the respondent. Table 2 shows result of t test.

This table shows average employee engagement of married respondents was 3.92 (SD = .674) and that of unmarried respondents it was 3.93 (SD =.450). Effect of marital status of respondent on the engagement was found to be significant F= 9.941,  $p = .002$ .

Thus, hypothesis 2 which claims that there will be difference in perception of engagement among employees based on their marital status is supported by the data.

H3 - Employee Engagement & Children

Table 3 - Results of T Test

		Mean	SD	F	Sig.
Employee engagement	With Children	3.89	.715	12.948	.001
	Without Children	3.94	.460		

Independent samples T test was conducted to compare if there is any significant difference in employee engagement based on having children to be taken care of. Table 3 shows result of T test.

This table shows average employee engagement of respondents having children was 3.89 (SD = .715) and that of respondents without any children was 3.94 (SD=.460). Effect of having children on the engagement of respondents was found to be significant F=12.948,  $p = .001$

Therefore, hypothesis 3stating that there will be difference in perception of engagement among employees based on whether they have children or not is supported by the data.

H4 – Remote Working & Uncertainty

Table 4 – Results of ANOVA

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		Mean	SD	F	Sig.
Uncertainty	Working from home	1.77	1.033	2.976	.058
	Occasionally working from home	1.69	1.025		
	Not working from home	1.07	1.235		

ANOVA was conducted to compare if there is any significant difference in employee engagement who are working from home, occasionally working from home and not working from home in their experience of the feeling of uncertainty. Table 4 shows result of ANOVA. This table shows perceived uncertainty of respondents working from home was 1.77 (SD = 1.033), for respondents who occasionally work from home it was 1.69 (SD= 1.025) and for respondents not working from home it was 1.07 (SD = 1.235). Effect of remote working on the perceived feeling of uncertainty of respondents was found to be significant  $F= 2.976, p = .058$ .

However, no significant differences were found between respondents working from home, occasionally working from home and not working from home in their experience of feeling of fear and anxiety.

Thus, hypothesis 4 which states that employees working from home will experience more fear, anxiety and uncertainty than employees who are occasionally working from home or not working from home was partially supported by the data.

### Discussion & Results

The present study claims that remote working will have an impact on the perceived engagement of employees. Contrary to our expectations, this hypothesis is not supported by the data.

This may be because of the proven fact that engagement and performance can be influenced by social union, feeling upheld by one's manager or supervisor, information sharing, shared objectives and vision, communication, and trust. Mostly, their work is important and their thoughts are heard by their manager or supervisor. (Julyan Adhitama, Setyo Riyanto, 2020). On the other hand, studies have also found out that engagement was raised in lockdown period. This could be because remote working allows hiring geographically diverse workforce or because they are facing lower interruption.

Significant differences were found between married and unmarried employees in their perception of engagement. Unmarried employees seem to be more engaged ( $M = 3.93^*$ ) than married employees ( $M = 3.92^*$ ). A few studies from 2014 have found that married employees are more satisfied with their job than that of unmarried employees but in pandemic they had to face more responsibility. More distractions were introduced to them which can be the reason behind lowered engagement.

Having child care responsibilities was also found to have significant impact of the perception of engagement. Respondents without any childcare responsibility reported significantly higher level of engagement ( $M = 3.94$ ) than respondents with childcare responsibility ( $M = 3.89^*$ ). This may be attributed to the fact that WFH was accompanied by increased childcare demands due to the fact that, at least during a portion of time, schools and childcare facilities were also closed. Both of these might have diminished the flexibility usually associated with WFH and, consequently, limit its potential for better Work Life Balance and hence employee engagement as well. (Lapierre *et. al.*, 2015)

It was found that employees working from home experience more uncertainty ( $M = 1.77^*$ ) than employees who are occasionally working from home ( $M = 1.69^*$ ) or not working from home ( $M$

= 1.07\*). An uncertain work environment has a negative significant influence on work engagement. Uncertain work environment moderates the interaction effect of job demands and job resources with work engagement negatively (Kenyi et al. 2020). Uncertainty in the workplace leads to bad feelings, hamper organizational loyalty and experience of unhappiness in addition to development of aggressiveness which is attributed negatively to employee character. Thus, to cope up with the uncertain working environment, employees' behavior changed to negative and irresponsible as they searching for the means of living (K. Kim & Byon, 2018).

### **Limitations**

As with every research, this study also has certain limitations. Limitations are mentioned below. Current study is based on self-reported responses of individuals as all responses were collected online via Google form; respondents have given answers as per their perception and their own understanding. Also for the purpose of study all sectors are not considered. This research relies on the convenient sampling method to approach participants; this may lead to the question whether or not this will generalize the entire population. Due to convenient sampling method the male female ratio is not equal.

### **Conclusion**

The study intended to understand the effect of relationship between remote working, personal life characteristics and employee engagement. In this study we found impact of demographic characters on the engagement of employees while they are working from home. We hypothesized that remote working will have an impact on the perceived engagement of employees; this hypothesis was not supported by the data of this study. Differences in engagement in married and unmarried employees were found where engagement of married employees was lesser than that of unmarried employees. Another significance factor was childcare. We also studied uncertainty due to remote working and its impact on engagement in this study. It is recommended to maintain regulated, standardize, good salaries and bonuses, a strong relationship between administration and relation with subordinates.

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# FACTORS AFFECTING EMPLOYABILITY – A STUDENT’S PERSPECTIVE

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## ABSTRACT

*The basic objective of the Master of Computer Application (MCA) program is to provide a steady stream of necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into rapidly expanding world of Information Technology. Current MCA Curriculum is built on the implementation of the Choice Based Credit System (CBCS) and Grading System. Curriculum also gives emphasis on identifying industrial expectations and institutional reparation for meeting industrial needs. These interventions would be successful only when the perceptions of its major stakeholder i.e. students are taken into consideration. Doing so will help in taking maximum advantage of India’s favorable demographic dividend.*

**Key words:** Master of Computer Application (MCA), Choice Based Credit System (CBCS), stakeholder.

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## 1. INTRODUCTION

India has witnessed a massive transformation in its educational system in the 21st century and is flourishing with well-designed form of it. Management education in India is not very old. After the establishment of the IITs, there was awful need for similar establishments in the field of management education. Thus, Indian Institute of Management Ahmadabad came into existence. After that many institutions started which are offering various professional courses including management programs like Master in Computer Application (MCA).



Management education gives emphasis on developing a broad range of managerial knowledge and abilities amongst the students. The basic objective of the Master of Computer Application (MCA) program is to provide a steady stream of necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into rapidly expanding world of Information Technology. Current MCA Curriculum is built on the implementation of the Choice Based Credit System (CBCS) and Grading System. Curriculum also gives emphasis on identifying industrial expectations and institutional reparation for meeting industrial needs.

Students' employability is a key concern for the institutions offering higher education. Focused and timely efforts of institution and students towards employability will give positive results. Many factors are associated with employability. Most of the international companies need MCAs who are flexible, trainable with an innovative attitude and who will serve as change agents in the business.

Employability skills focus more on performance of the candidates on the job and this requires a set of skills that match the job. To become employable, in addition to subject-specific job skills, student need to have problem solving, planning and organizing, innovation, learnability, technology skills, self-management skills, interpersonal skills, leadership skills, team building and communication skills. This paper sheds light on the study of employability skills of MCA students from their own perspective.

## 2. LITERATURE REVIEW

Employability is explained by Lee Harvey as an attempt to get a job in stipulated time, more specifically after defined period after graduation, or an ability to fit our self as per company needs (Mishra *et.al.* 2016).

Another approach given by Hillage and Pollard to look at employability is the capability to get primary employment, sustaining and upgrading oneself with new employment if needed. The primary factors that are needed are in-depth knowledge, abilities and right attitude. They have proposed three types of skills i. Baseline Skills These are simple skills and personal qualities like trustworthiness and integrity ii. Intermediate Skills - It consists of professional skills, like communication skills, problem solving skills etc. iii. High level Skills –these are specific skills related to performance in the industry such as self-management, team work, commercial alertness etc. Thus, employability skills are person dependent and environment dependent (Mohapatra *et.al.* 2019).

Talking about the employability of male and female students from post graduate management programs, India Skills Report 2019-20 claims that female employability showed an upward trend, climbing from 38 per cent in 2017; 46 per cent in 2018 and registering 47 per cent in the year 2020. Of these, the most employable candidates are MBA students with 54 per cent as against 40 per cent of Engineering and MCA in the last two years i.e., 2018 and 2019.[10]

Information and communication technology (ICT) is very important in today's era. The most important skills with which a student can get ready to face or solve the critical issues in the industries is technological skills. ICT skills are vital and should form a major part of institutional strategy in providing better quality students. This skill is an important factor in inhibiting the learning of the students from developing communities. If technology literacy is not recognized or dealt with, the lack of technology skills may discourage the efforts to use e-learning in bridging the digital divide (Mohapatra *et.al.* 2019).

In the study of role of employability skills in management education, MCA students are the integral part management education. Human resources are considered to be the biggest asset for any nation. Fortunately, India has this demographic dividend. To take the advantage of this

demographic dividend, skills of the students must be upgraded through innovative initiatives. (Asirvatham *et.al.* 2017)

The objective of this study is to explore and understand student’s perception regarding importance of various skills that are required for being employable.

### 3. METHODS

#### 3.1 Sample

Survey method was adopted to explore student’s perspective on factors affecting their employability. Data was collected through a survey of 187 respondents studying in first, second and final year of their Master Degree (MCA). For collecting the data Google form was made and sent to students. Out of 300 forms sent online, 187 responses were received by data collection deadline.

Out of 187 respondents, 101 were male. The average age of respondents is 23 years.

#### 3.2 Measure

For understating the factors that affects employability of students, various items/statements were prepared based on the review of previous literature and students were asked to rate each item on the scale of 5 (0 = not at all important to 4 = Extremely Important). Total 48 items/statements were given. Sample items include “*I can speak and write clearly so that others understand*”, “*I recognize the many dimensions of a problem and can determine a root cause*”, “*I am good at managing time and priorities – setting timelines*”, “*I usually come up with creative and innovative ideas during group work*”, “*I am able to adapt to act in new situations*”, “*I am successful in resolving conflicts with others*”, “*Initiates change to enhance productivity*”.

### 4. ANALYSIS & RESULTS

#### 4.1 Exploratory Factor Analysis

Factor analysis is an interdependence technique, whose primary purpose is to define the underlying structure among the variables in the analysis (Hair, Anderson, Tatham, Black, 1995). It is a multivariate statistical procedure that has many uses. Factor analysis reduces a large number of variables into a smaller set of variables (also referred to as factors). It also provides construct validity evidence of self - reporting scales (Gorsuch, 1983; Hair, Anderson, Tatham, Black, 1995; Tabachnick & Fidell, 2007; Thompson, 2004)

In Exploratory Factor Analysis, the investigator has no expectations of the number or nature of the variables and as the title suggests, is exploratory in nature. That is, it allows the researcher to explore the main dimensions to generate a theory or model from a relatively large set of latent constructs often represented by a set of items (Pett, Lackey, Sullivan, 2003; Henson & Roberts, 2006; Thompson, 2004).

In this study we tried to explore the factors that affects employability from student’s perspective, exploratory factor analysis (EFA) was used to examine and understand the structure and relationship between variables.

**Table 1** Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett’s Test of Sphericity

<b>KMO and Bartlett's Test</b>		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.899
Bartlett's Test of Sphericity	Approx. Chi-Square	5054.170
	df	171
	Sig.	.000

The KMO measure indicates adequacy level of 0.899 and Bartlett’s Test of Sphericity was significant ( $p = .000$ ), validating the data for analysis.

The factor structure of the 48 item scale was examined. The Rotated Component Matrix shows the factor loadings for each variable (Table 1.2). Factor loadings  $> .5$  are shown in the table.

Based on these factor loadings, 6 items loaded strongly on Factor 1, which represents “Team Player Skills”. Items 30 to 36, all loaded strongly on Factor 2, which represents “Time Management Skills”. Item 37 to item 39 and items 43 to 46 and item 48 loaded strongly on factor 3, which represents “Adaptability and Interpersonal Skills”. Item 1, 2, 4,5,21 & 47 loaded highly on factor 4 which represents “Communication Skills”. Items 3, 6 and 8 loaded highly on Factor 5 which represents “Problem Solving Skills”. Items 15 to item 20 loaded highly on Factor 6 which represents “Planning & Creativity Skills”. Items 7, 41 and 42 loaded highly on Factor 7 which represents “Assertiveness Skills”. Items 22 to 24 loaded highly on Factor 8 which represents “Ability to learn”. While, items 26 to items 29 loaded highly on Factor 9 which represents “Technology Skills”.

**Table 2** Factor structure of Employability scale

**Rotated Component Matrix**

	Components								
	1	2	3	4	5	6	7	8	9
Item 1				.589					
Item 2				.587					
Item 3					.625				
Item 4				.560					
Item 5				.550					
Item 6					.717				
Item 7							.517		
Item 8					.599				
Item 9	.619								
Item 10	.812								
Item 11	.583								
Item 12	.803								
Item 13	.714								
Item 14	.660								
Item 15						.574			
Item 16						.403			
Item 17						.448			
Item 18						.620			
Item 19						.649			

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Item 20						.560			
Item 21				.558					
Item 22								.604	
Item 23								.604	
Item 24								.696	
Item 25									.633
Item 26									.610
Item 27									.641
Item 28									.720
Item 29									
Item 30		.505							
Item 31		.535							
Item 32		.564							
Item 33		.731							
Item 34		.693							
Item 35		.612							
Item 36		.568							
Item 37			.652						
Item 38			.608						
Item 39			.598						
Item 40									
Item 41							.587		
Item 42							.545		
Item 43			.702						
Item 44			.580						
Item 45			.509						
Item 46			.534						
Item 47				.599					
Item 48			.536						
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.									

The factor structure that was extracted from the above given EFA is represented in following diagram.

## 4.2 Derived Research Model

The derived research model is presented in Figure

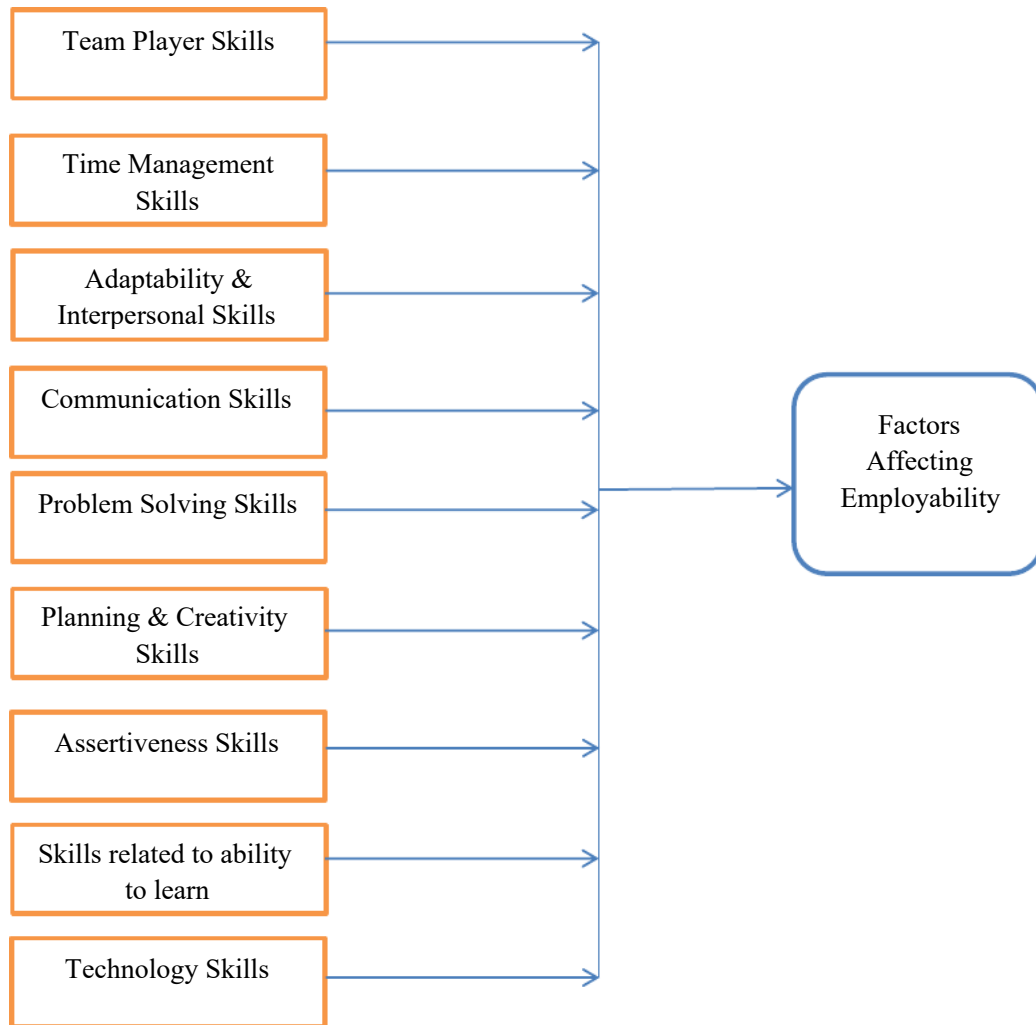


Figure 1 Research Model

## 5. DISCUSSION & IMPLICATIONS

The study to find out factors that are important for employability from students' perspective has derived nine factors/ skills. These skills can be further divided into three categories i.e. Baseline Skills, Intermediate Skills and High level Skills (Mohapatra *et.al.* 2019).

Out of all the skills derived in this study assertiveness Skills, ability to learn, Time Management skills and adaptability and interpersonal skills fall in the category of baseline skills. Communication skills and problem solving skills are from intermediate skills category. While, high level skills category includes skills like, technology skills, team player skills and planning & creativity skills.

Baseline skills like time management and interpersonal skills are highly in demand by employers irrespective of industry. It is claimed that even in technical area like IT and engineering talent requirement of baseline skills is ever increasing [11]. Additionally, it is found that Intermediate Skills like Communication Skills and Problem Solving Skills are few of the highly sought after skills from employers in IT candidates [12]. Whereas, High level Skills like Technology Skills are considered to be the foundation for employability in IT industry.

The categorized skills received from the students through above research must be evaluated with the Industrial Requirements. The fitment of these skills with precise Industry requirements is of vital importance. If needed from Industry viewpoint, addition of supplementary skills and imparting its training to students can be thought of. To enhance the placements, these skills can be fine-tuned with the MCA curriculum. Curriculum amendments can be done if possible. Along with amendments in curriculum, Institutes can undertake Employability Enhancement Programs (EEP) for students partnering with Industries. One to one student mentoring can also be done which can be supplemented with SWOT analysis. All these efforts would take the students to achieve their placement goals in general and successful career paths in particular.

## 6. SCOPE FOR FUTURE RESEARCH

Further research studies can be conducted in the direction of suggesting implementation methodologies for skill enhancement of management students. Student’s family background and geographical area from which they belong has influence on skills possessed by them. Hence these factors can be taken into consideration for in-depth study. Industry specific skills study can also be conducted.

## 7. CONCLUSION

In today’s global context where challenges of business sustainability are increasing, management education has a crucial role to play. In ever changing business environment, most of the organizations today are looking for young talent from management and technology specializations that possess not only good domain knowledge but also exhibit skills like adaptability, flexibility and effective interpersonal skills. The gap between demand and supply in employment market is increasing. Though the number of graduates entering the job market is ever rising, the quality of these young graduates is questionable. To bridge the gap of skill shortage in industry, active interventions are needed from the supply side i.e. educational institutes. These interventions would be successful only when the perceptions of its major stakeholder i.e. students are taken into consideration. Doing so will help in taking maximum advantage of India’s favorable demographic dividend.

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## ABSTRACT

*The basic objective of the Master of Computer Application (MCA) program is to provide a steady stream of necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into rapidly expanding world of Information Technology. Current MCA Curriculum is built on the implementation of the Choice Based Credit System (CBCS) and Grading System. Curriculum also gives emphasis on identifying industrial expectations and institutional reparation for meeting industrial needs. These interventions would be successful only when the perceptions of its major stakeholder i.e. students are taken into consideration. Doing so will help in taking maximum advantage of India’s favorable demographic dividend.*

**Key words:** Master of Computer Application (MCA), Choice Based Credit System (CBCS), stakeholder.

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## 1. INTRODUCTION

India has witnessed a massive transformation in its educational system in the 21st century and is flourishing with well-designed form of it. Management education in India is not very old. After the establishment of the IITs, there was awful need for similar establishments in the field of management education. Thus, Indian Institute of Management Ahmadabad came into existence. After that many institutions started which are offering various professional courses including management programs like Master in Computer Application (MCA).

Management education gives emphasis on developing a broad range of managerial knowledge and abilities amongst the students. The basic objective of the Master of Computer Application (MCA) program is to provide a steady stream of necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into rapidly expanding world of Information Technology. Current MCA Curriculum is built on the implementation of the Choice Based Credit System (CBCS) and Grading System. Curriculum also gives emphasis on identifying industrial expectations and institutional reparation for meeting industrial needs.

Students' employability is a key concern for the institutions offering higher education. Focused and timely efforts of institution and students towards employability will give positive results. Many factors are associated with employability. Most of the international companies need MCAs who are flexible, trainable with an innovative attitude and who will serve as change agents in the business.

Employability skills focus more on performance of the candidates on the job and this requires a set of skills that match the job. To become employable, in addition to subject-specific job skills, student need to have problem solving, planning and organizing, innovation, learnability, technology skills, self-management skills, interpersonal skills, leadership skills, team building and communication skills. This paper sheds light on the study of employability skills of MCA students from their own perspective.

## 2. LITERATURE REVIEW

Employability is explained by Lee Harvey as an attempt to get a job in stipulated time, more specifically after defined period after graduation, or an ability to fit our self as per company needs (Mishra *et.al.* 2016).

Another approach given by Hillage and Pollard to look at employability is the capability to get primary employment, sustaining and upgrading oneself with new employment if needed. The primary factors that are needed are in-depth knowledge, abilities and right attitude. They have proposed three types of skills i. Baseline Skills These are simple skills and personal qualities like trustworthiness and integrity ii. Intermediate Skills - It consists of professional skills, like communication skills, problem solving skills etc. iii. High level Skills –these are specific skills related to performance in the industry such as self-management, team work, commercial alertness etc. Thus, employability skills are person dependent and environment dependent (Mohapatra *et.al.* 2019).

Talking about the employability of male and female students from post graduate management programs, India Skills Report 2019-20 claims that female employability showed an upward trend, climbing from 38 per cent in 2017; 46 per cent in 2018 and registering 47 per cent in the year 2020. Of these, the most employable candidates are MBA students with 54 per cent as against 40 per cent of Engineering and MCA in the last two years i.e., 2018 and 2019.[10]

Information and communication technology (ICT) is very important in today's era. The most important skills with which a student can get ready to face or solve the critical issues in the industries is technological skills. ICT skills are vital and should form a major part of institutional strategy in providing better quality students. This skill is an important factor in inhibiting the learning of the students from developing communities. If technology literacy is not recognized or dealt with, the lack of technology skills may discourage the efforts to use e-learning in bridging the digital divide (Mohapatra *et.al.* 2019).

In the study of role of employability skills in management education, MCA students are the integral part management education. Human resources are considered to be the biggest asset for any nation. Fortunately, India has this demographic dividend. To take the advantage of this

demographic dividend, skills of the students must be upgraded through innovative initiatives. (Asirvatham *et.al.* 2017)

The objective of this study is to explore and understand student’s perception regarding importance of various skills that are required for being employable.

### 3. METHODS

#### 3.1 Sample

Survey method was adopted to explore student’s perspective on factors affecting their employability. Data was collected through a survey of 187 respondents studying in first, second and final year of their Master Degree (MCA). For collecting the data Google form was made and sent to students. Out of 300 forms sent online, 187 responses were received by data collection deadline.

Out of 187 respondents, 101 were male. The average age of respondents is 23 years.

#### 3.2 Measure

For understating the factors that affects employability of students, various items/statements were prepared based on the review of previous literature and students were asked to rate each item on the scale of 5 (0 = not at all important to 4 = Extremely Important). Total 48 items/statements were given. Sample items include “*I can speak and write clearly so that others understand*”, “*I recognize the many dimensions of a problem and can determine a root cause*”, “*I am good at managing time and priorities – setting timelines*”, “*I usually come up with creative and innovative ideas during group work*”, “*I am able to adapt to act in new situations*”, “*I am successful in resolving conflicts with others*”, “*Initiates change to enhance productivity*”.

### 4. ANALYSIS & RESULTS

#### 4.1 Exploratory Factor Analysis

Factor analysis is an interdependence technique, whose primary purpose is to define the underlying structure among the variables in the analysis (Hair, Anderson, Tatham, Black, 1995). It is a multivariate statistical procedure that has many uses. Factor analysis reduces a large number of variables into a smaller set of variables (also referred to as factors). It also provides construct validity evidence of self - reporting scales (Gorsuch, 1983; Hair, Anderson, Tatham, Black, 1995; Tabachnick & Fidell, 2007; Thompson, 2004)

In Exploratory Factor Analysis, the investigator has no expectations of the number or nature of the variables and as the title suggests, is exploratory in nature. That is, it allows the researcher to explore the main dimensions to generate a theory or model from a relatively large set of latent constructs often represented by a set of items (Pett, Lackey, Sullivan, 2003; Henson & Roberts, 2006; Thompson, 2004).

In this study we tried to explore the factors that affects employability from student’s perspective, exploratory factor analysis (EFA) was used to examine and understand the structure and relationship between variables.

**Table 1** Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett’s Test of Sphericity

<b>KMO and Bartlett's Test</b>		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.899
Bartlett's Test of Sphericity	Approx. Chi-Square	5054.170
	df	171
	Sig.	.000

The KMO measure indicates adequacy level of 0.899 and Bartlett’s Test of Sphericity was significant ( $p = .000$ ), validating the data for analysis.

The factor structure of the 48 item scale was examined. The Rotated Component Matrix shows the factor loadings for each variable (Table 1.2). Factor loadings  $> .5$  are shown in the table.

Based on these factor loadings, 6 items loaded strongly on Factor 1, which represents “Team Player Skills”. Items 30 to 36, all loaded strongly on Factor 2, which represents “Time Management Skills”. Item 37 to item 39 and items 43 to 46 and item 48 loaded strongly on factor 3, which represents “Adaptability and Interpersonal Skills”. Item 1, 2, 4,5,21 & 47 loaded highly on factor 4 which represents “Communication Skills”. Items 3, 6 and 8 loaded highly on Factor 5 which represents “Problem Solving Skills”. Items 15 to item 20 loaded highly on Factor 6 which represents “Planning & Creativity Skills”. Items 7, 41 and 42 loaded highly on Factor 7 which represents “Assertiveness Skills”. Items 22 to 24 loaded highly on Factor 8 which represents “Ability to learn”. While, items 26 to items 29 loaded highly on Factor 9 which represents “Technology Skills”.

**Table 2** Factor structure of Employability scale

**Rotated Component Matrix**

	Components								
	1	2	3	4	5	6	7	8	9
Item 1				.589					
Item 2				.587					
Item 3					.625				
Item 4				.560					
Item 5				.550					
Item 6					.717				
Item 7							.517		
Item 8					.599				
Item 9	.619								
Item 10	.812								
Item 11	.583								
Item 12	.803								
Item 13	.714								
Item 14	.660								
Item 15						.574			
Item 16						.403			
Item 17						.448			
Item 18						.620			
Item 19						.649			

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Item 20						.560			
Item 21				.558					
Item 22								.604	
Item 23								.604	
Item 24								.696	
Item 25									.633
Item 26									.610
Item 27									.641
Item 28									.720
Item 29									
Item 30		.505							
Item 31		.535							
Item 32		.564							
Item 33		.731							
Item 34		.693							
Item 35		.612							
Item 36		.568							
Item 37			.652						
Item 38			.608						
Item 39			.598						
Item 40									
Item 41							.587		
Item 42							.545		
Item 43			.702						
Item 44			.580						
Item 45			.509						
Item 46			.534						
Item 47				.599					
Item 48			.536						
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.									

The factor structure that was extracted from the above given EFA is represented in following diagram.

## 4.2 Derived Research Model

The derived research model is presented in Figure

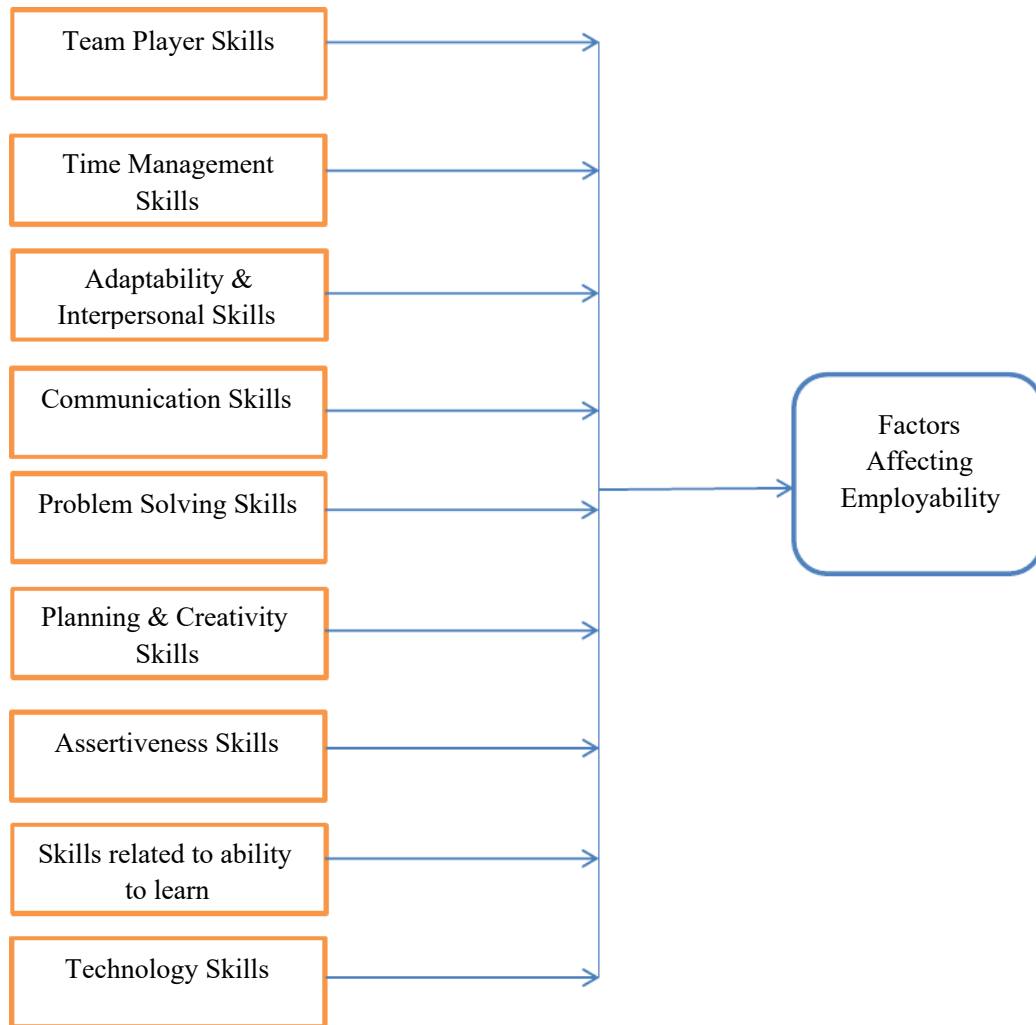


Figure 1 Research Model

## 5. DISCUSSION & IMPLICATIONS

The study to find out factors that are important for employability from students' perspective has derived nine factors/ skills. These skills can be further divided into three categories i.e. Baseline Skills, Intermediate Skills and High level Skills (Mohapatra *et.al.* 2019).

Out of all the skills derived in this study assertiveness Skills, ability to learn, Time Management skills and adaptability and interpersonal skills fall in the category of baseline skills. Communication skills and problem solving skills are from intermediate skills category. While, high level skills category includes skills like, technology skills, team player skills and planning & creativity skills.

Baseline skills like time management and interpersonal skills are highly in demand by employers irrespective of industry. It is claimed that even in technical area like IT and engineering talent requirement of baseline skills is ever increasing [11]. Additionally, it is found that Intermediate Skills like Communication Skills and Problem Solving Skills are few of the highly sought after skills from employers in IT candidates [12]. Whereas, High level Skills like Technology Skills are considered to be the foundation for employability in IT industry.

The categorized skills received from the students through above research must be evaluated with the Industrial Requirements. The fitment of these skills with precise Industry requirements is of vital importance. If needed from Industry viewpoint, addition of supplementary skills and imparting its training to students can be thought of. To enhance the placements, these skills can be fine-tuned with the MCA curriculum. Curriculum amendments can be done if possible. Along with amendments in curriculum, Institutes can undertake Employability Enhancement Programs (EEP) for students partnering with Industries. One to one student mentoring can also be done which can be supplemented with SWOT analysis. All these efforts would take the students to achieve their placement goals in general and successful career paths in particular.

## 6. SCOPE FOR FUTURE RESEARCH

Further research studies can be conducted in the direction of suggesting implementation methodologies for skill enhancement of management students. Student’s family background and geographical area from which they belong has influence on skills possessed by them. Hence these factors can be taken into consideration for in-depth study. Industry specific skills study can also be conducted.

## 7. CONCLUSION

In today’s global context where challenges of business sustainability are increasing, management education has a crucial role to play. In ever changing business environment, most of the organizations today are looking for young talent from management and technology specializations that possess not only good domain knowledge but also exhibit skills like adaptability, flexibility and effective interpersonal skills. The gap between demand and supply in employment market is increasing. Though the number of graduates entering the job market is ever rising, the quality of these young graduates is questionable. To bridge the gap of skill shortage in industry, active interventions are needed from the supply side i.e. educational institutes. These interventions would be successful only when the perceptions of its major stakeholder i.e. students are taken into consideration. Doing so will help in taking maximum advantage of India’s favorable demographic dividend.

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## “Role of Organizational Culture in the Adoption of Employee Engagement Practices in Selected Industries in Pune”

Dr. Poonam Abhijit Rawat

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**Abstract:** Organizations have realized that engaged employees are invaluable assets to an organization. Surveys have been revealing that engagement promotes talent retention and improves organizational performance. Culture of an organization impacts the way interaction happens between people and groups and the way they work with each other. This research intended to throw light on the possible influence organization culture for the adoption of employee engagement practices.

**Key Words:** Organizational Culture, Employee Engagement, Culture dimensions

### Introduction

For past few years, every organization is talking about “Employee Engagement” and its significance. According to Harter, Schmidt & Hayes (2002) - “Engagement refers to a person’s involvement and satisfaction with also an enthusiasm for work”.

Understanding employee engagement is most valuable when understood within the context of the strengths and weaknesses of the organization. Looking at employee engagement alone, without considering the culture that employees work in, potentially leaves blind to the strategic strengths and weaknesses in the organization that impact employee performance and ultimately organizational performance.

Organization culture is embedded in the everyday working lives of all cultural members. Manifestations of cultures in organizations include formal practices, informal practices, physical arrangements and rituals. Hence the role of culture in influencing employee behaviour appears to be increasingly important in today’s workplace. As organizations have widened spans of control, flattened structures, introduced teams, reduced formalization and empowered employees, culture ensures that everyone is motivated in the same direction

Corporate culture helps an organization to connect with people, gives employees the opportunities to share ideas and experience, develops employees for leadership roles and helps them grow with the organization. Organizational culture strongly influences the way groups and people interact with each other, with their clients and with their stakeholders.

### OCTAPACE

The OCTAPACE framework was developed by T.V.Rao and Uday Pareek It is a 40-item instrument that accounts for organization's values and ethos. It is an acronym for o-openness, c-confrontation, t-trust, a-authenticity, p-proaction, a-autonomy, c-collaboration and e-experimentation. The instrument is divided into two parts. In part I, three statements for eight values are stated and the respondent rates on five point scale about how much each statement is valued in their organization. Part II contains two statements each for eight values making it total sixteen statements on beliefs. Respondent rates each statement on how widely each belief is shared in the organization.

Each aspect is discussed with its meaning, its outcome for the organization and its indicators- showing whether and how much, it exists in the organization.

**Openness:** Meaning: It is the spontaneous expression of thoughts and feelings, and sharing of the same without defensiveness. Openness in organizations has to be two-way, receiving and giving. Both of these relate to giving ideas (including suggestions), taking feedback (also criticism), and feelings. Openness means encouraging more suggestions and feedback from customers, peers and others. Similarly, it also means to give ideas, information, feedback etc without hesitation.

Internal e-mailing and internal portals providing information access to everyone plus retrieval of it at any time, spaces without walls, floor space being shared by other colleagues at different levels in the organization are some examples of open culture.

Outcome: Free interaction and more clarity of objectives, impartial performance feedback etc.

Indicators: Better implementation of systems, productive meetings and increased innovations.

**Confrontation:** It is defined as facing problems instead of shying away, taking up challenges, supports in-depth analysis of interpersonal.

Outcome: Improved problem solving; inclination to resolve problems and deal with customers as well as ‘difficult’ employees, open team discussions to resolve sensitive matters.

Indicators: Quick discussions on difficult issues, strong actions and discussions with clients on continuous basis.

**Trust:** It's more about preserving information confidentiality with no misuse especially the ones shared employees. It is the guarantee that help will be received when needed and will respect commitments and mutual obligations.

Outcome: Timely support, empathy, reduced stress, simplification of procedures

Indicator: Reduced documentation, increased productivity, effective delegation.

**Authenticity:** Authenticity is closed to openness. It is the similarity in what one says, does and feels. It is reflected in owning up of one's mistakes, and in uninhibited sharing of feelings.

Outcome: Smooth and straight communication.

Indicator: Interaction and correspondence between employees

**Proaction:** It means to take initiative, plan in advance and take preventive actions, preparing alternative course before taking action. The term 'Proaction' is the opposite of reaction. Reaction is an action in response to some source; while proaction is the action taken free of the source. Proaction is generally functional at three levels -feeling, rational thinking, and action.

Outcome: more initiative in anticipation problems / issues, planning, strategy development, faster response

Indicator: early problem detection, detailed planning, improved time management, willingness to enter new areas of work, better capital management.

**Autonomy:** It denotes giving and utilizing freedom to plan an act. It is about role autonomy through which dependency on superior's approval is reduced and encourages individual responsibility, individual initiatives.

Outcome: Increased willingness to take responsibility, new ways of doing things, sense of owning work.

Indicator: Effective delegation and reduction in references made to senior people for approval of planned actions.

**Collaboration:** It is giving help to, and asking for help from, others. It means working together (individuals and groups) to solve problems with team spirit.

Outcome: Timely help, teamwork, sharing of learning and experiences; improved resource sharing, smooth communication.

Indicator: Productivity reports, qualitative meetings, involvement, inclusive decisions and better resource utilization.

**Experimenting:** It involves looking for fresh ways and encouraging creativity. People are encouraged to use innovative approaches for problem solving coupled with using feedback for improvements. Other terms such as creativity, innovations, experiments, new approaches etc also convey the same meaning.

Outcome: Development of new product(s), method(s), and procedure(s).

Indicator: Innovation, new methods, ignoring constraints and increased lateral thinking.

### **Objectives of the study:**

The objectives of this study are:

1. To identify important aspects of organization culture from existing literature.
2. To study the role of Organization culture in adoption of employee engagement activities in select industries in Pune.

**Research Methodology:** Survey research method falling under descriptive research and convenience sampling method was adopted for this study. The questionnaire targeted middle level managers working in manufacturing and service industries in Pune. Accordingly, 400 respondents were approached and out of 391 responses received 384 were included for the analysis. The analysis of data has been carried out by using One-way between subject ANOVA, Friedman test and Multi-Regression analysis.

### **Data Analysis:**

The OCTAPACE instrument contains two parts. In part I, values are stated in items 1 to 24 (three statements of each of the eight values), and the respondent is required to check (on a 5-point scale) how much each item is valued in his/her organization. Part II contains sixteen statements on beliefs, two each for eight values, and the respondent checks (on a 5-point scale) how widely each of them is shared in the organization

For Employee Engagement, respondents were asked to choose the approaches that reflect the attitude of the organization towards adoption of employee engagement. Responses were taken on a five point Likert scale.

**Hypothesis Testing:** To study the role of Organization culture in adoption of Employee Engagement practices, the following hypothesis was tested using statistical tools explained below.

H<sub>0</sub>: There is no significant effect of determinants of organization culture on adoption of Employee Engagement practices

H<sub>1</sub>: There is significant effect of determinants of organization culture on adoption of Employee Engagement practices.

Statistical test: Multiple Regression Analysis

Variables and Measurement:

Independent Variable: Openness, Confrontation, Trust, Authenticity, Pro-Action, Autonomy, Collaboration and Experimentation (OCTAPACE)

## “Role of Organizational Culture in the Adoption of Employee Engagement Practices in Selected Industries in Pune”

Dependent Variable: Adoption of Employee Engagement practices

The question measuring attitude of organization towards adoption of Employee Engagement practices had five response options (Likert scale). And the for the culture aspect too, importance were assigned to five responses ranging from Not at all important to Very Important respectively.

Level of Significance:  $\alpha = 0.05$

<b>Table 1. Model Summary</b>				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.763 <sup>a</sup>	.582	.518	.1775

R square is 0.582 i.e coefficient of multiple determination is 0.582.

The above table indicates that Organization culture components can explain 58.2% of the variance of the dependent variable -Adoption of Employee Engagement practices.

<b>Table 2. ANOVA</b>						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.285	8	.286	9.063	.000 <sup>a</sup>
	Residual	1.639	52	.032		
	Total	3.924	60			

Null Hypothesis was rejected as P value is 0.000, hence the F test is significant ( $P < 0.05$ ). Thus it can be concluded that the regression model used for confirming predictive relationship between Organizational culture dimensions and adoption of employee engagement practice is significant and has predictive ability.

<b>Table 3. Organizational culture (OCTAPACE) Coefficients</b>							
Model		Unstandardized Coefficients		Standardized Coefficients	t		Sig.
		B	Std. Error	Beta			
1	(Constant)	-7.536	2.115		-3.563		.001
	Openness	.821	.376	.309	2.186	*	.033
	Confrontation	.656	.370	.236	1.771	ps	.082
	Trust	-.090	.296	-.046	-.304	ns	.762
	Authenticity	-.159	.324	-.075	-.490	ns	.626
	Pro-action	.620	.271	.285	2.290	*	.026
	Autonomy	.008	.258	.003	.029	ns	.977
	Collaboration	.548	.274	.249	1.999	*	.051
	Experimentation	.200	.225	.114	.890	ns	.378

\*= significant at 5% level of significance

ps = partial significant : significant at 10% level of sig

ns = not significant

The Coefficient table shows that Openness is a significant predictor of adoption of employee engagement practices (B = 0.107, P=0.016), Confrontation is also a significant predictor of adoption of employee engagement practices (B

= 0.095, P=0.37), Autonomy is a significant predictor of adoption of employee engagement practices (B = 0.192, P=0.01), Collaboration is also a significant predictor of adoption of employee engagement practices (B = 0.104, P=0.023) and Experimentation is also a significant predictor of adoption of employee engagement practices (B = 0.090, P=0.052).

Thus, it can be stated that organization culture with strong components like Openness, Confrontation, Pro-action and Collaboration are more likely to adopt employee engagement practices and alternate hypothesis is accepted.

These components reveal that employees express their ideas freely and organizations are willing to accept new ways of doing things. When employees happen to confront any problems, they all work together to resolve them. Issues are faced openly without the fear of hurting each other. Employees are action oriented and are willing to take initiatives to respond to the needs of future. Employees believe in using one another's strength for planning and implementing strategies for organizations growth.

### **Conclusion:**

During the study, it has been found that almost all companies that were approached for this study were committed towards engaging their employees. The survey responses also show that their organization believes that employee engagement impacts firms' performance and brings competitive advantage to their organization. Organization culture with strong components like Openness, Confrontation, Autonomy, Experimentation and Collaboration are more likely to adopt employee engagement practices.

Thus it can be concluded that Organizations should foster a culture of engagement and regularly conduct employee engagement activities. Sense of purpose can be instilled through communicating the value of employee engagement. The eight dimensions of OCTAPACE culture will help organizations to build a healthy and performing environment.

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## Review of e-Commerce Security Challenges

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**Abstract:** e-Commerce means nothing but the exchange of goods and services over the Internet.

This paper gives a way for e-commerce security so as to improve confidence in customer. Web security has become most important issue now a day. Online payment system now a day most of time people uses online payment system for payment, so all the manual payment is replaced by online payment system. The main objective of this paper is to know the views of consumers towards the security aspects of e-commerce technology. This paper gives the idea about the perception and awareness of security from the consumers' views. The paper also examines the measures that can be taken so that the views of users can be changed to adopt this new on-line system. This new security challenges are the results of the use of the new technology and communication medium, and the flow of information from organization to organization, from organization to consumers, and also within the organization.

**Index Terms**—e-Commerce, Security, Threats and Vulnerabilities, SSL, Firewall, viruses. E-commerce security, e-business security challenges.

### I. INTRODUCTION

E-commerce Security is a part of the Information Security framework and is specifically applied to the components that affect e-commerce that include Computer Security, Data security and other wider Information Security framework. E-commerce security has its own shades and is one of the highest security components that affect the end user through their daily payment interaction with business. e-Commerce environments composed of front-end web pages, back-end databases, web servers, and internal network infrastructure. The vulnerable areas of an e-commerce system must be identified and resolved to reduce the risk to security.

### II. SECURITY OVERVIEW

In an e-Commerce system security hardware, software, and environment are the main important and vulnerable points. Hardware security includes devices used in running the e-Commerce website like web servers, database servers and client's computer.

The Properly configured firewall system can be helpful to protect the network. Any software used in running the e-Commerce system such as the operating system, web server software, database software and web browser are part of securing software .to protect the network from various threats, operating system should be configured properly. Software and routinely released patches should be regularly updated to fix security holes. The website development should provide protection against attacks like hidden-field manipulation, tampering, buffer overflow, and cross-site scripting. Cryptography algorithm can be used to protect confidential data which can be entered by end user.

### III. Security Threats

#### 3.1 Online Credit Card Fraud

Credit card fraud main cause is the usage of credit card over the Internet. Credit card to a certain extent portrays the following threats:

MasterCard misrepresentation fundamental driver is the utilization of Visa over the Internet. Charge card to a limited degree depicts the accompanying dangers:

presently a day's Visa misrepresentation is most normal approach to take cash. programmer can hack charge card number and can utilize it for individual use. The lone safety effort on charge card buys is the mark on the receipt however that can without much of a stretch be produced. The greater part of time individuals neglect to gather their duplicate of cards subsequent to taking care of bills of cafés. These receipts are containing individuals' MasterCard number and people signature for anybody to see and utilize. Just by this data somebody can buy online things. Also, the approved individual will not notification this until the individual gets month to month proclamation so Make sure

the site is trusted and secure when doing shopping on the web. With the assistance of phishing procedures, a few programmers may take a few to get back some composure of your Visa number.

### **3.2 Confidentiality**

Secrecy is one of the significant measure which can be broken from numerous points of view. Assaultants don't require refined comprehension of the PCs and Internet to break an organization's PC. passwords and charge card numbers and extortion guidance guides are accessible in Internet visit rooms. Other than this, many web worker have PCs that runs different workers other than the web worker. Model is the FTP worker.

### **3.3 Authentication**

Space Name System (DNS) satirizing is additionally conceivable with inappropriately set authorizations. In DNS parodying, If the two pages seem to be indistinguishable, even judicious clients can be effortlessly cheated and the company's notoriety harmed.

### **3.4 Vulnerabilities**

Security penetrates happens time after time when safety efforts are by passed. Classified subtleties can be shared like sharing passwords or OTP via telephone or tossing security manuals without destroying can make issues on the off chance that it falls in some unacceptable hand.

By having tight access control one can have control on framework security. That is by giving the Workers access just to their work capacities and not more than that.

### **3.5 Security System Design**

Great security configuration incorporates great general control, appropriate isolation of obligations, plainly outlined lines of power, inward review, great documentation, legitimate approval, interior review and endorsement for the two exchanges and program changes. With every one of these actions set up, we ought to deliberately concentrate on the anticipation, discovery and amendment of safety penetrates.

## **IV Main Security Solutions**

Online business requires another kind of safety. conventional security frameworks are intended to keep individuals out and limit admittance to significant data and registering assets. nonetheless, web based business requires security frameworks that give approved untouchables admittance to restricted organization assets and applications, regardless of whether they're online installment frameworks, stock information, or the capacity to do exchanges with the assistance of Internet. As the innovation arises, the accompanying procedures have been created to straighten out security. Once more, the issue here is the means by which far the purchasers know about these innovations. A couple of innovation techniques to conquer the Internet security dangers are recorded underneath.

### **4.1 Encryption**

Touchy data, for example, charge card subtleties can be secured by encryption, that should be possible with the utilization of mystery codes. The objective of encryption is to make lucid content into non decipherable arrangement so it makes inconceivable for a programmer who acquires the code text (ambiguous type of the message in the wake of being encoded) as it goes through the organization, to recuperate the first message. Encryption is the change of significant data in any structure into a structure that must be delivered clear with the assistance of decoding key. There are two fundamental sorts of encryption in like manner use today – symmetric, or private key frameworks and deviated or public key frameworks. In a symmetric key framework, a similar key is utilized to encode and decode the plaintext. The key is known as a private key and should be shared by the sender and recipient of the content. Public-key encryption utilizes two firmly related keys. One key is utilized to scramble the message, and the other key is utilized to unscramble the message. The public key can be spread the word about for different gatherings or we can say to recipient, and can be circulated uninhibitedly. The private key should be kept secret, and should be known distinctly to its approved proprietor. The two keys, in any case, should be secured against the smallest change, or the component won't work. Model is RSA calculation

### **4.2 Digital Signature**

A computerized mark is a numerical method used to approve the realness and honesty of a message, programming or advanced record. It's what might be compared to a transcribed mark or stepped seal, yet it offers undeniably more intrinsic security. A computerized mark is expected to tackle the issue of altering and pantomime in advanced correspondences.



Advanced marks can give proof of starting point, personality and status of electronic archives, exchanges or computerized messages. Endorsers can likewise utilize them to recognize educated assent. In numerous nations, including the United States, advanced marks are viewed as legitimately restricting similarly as conventional written by hand record marks.

### 4.3 Digital Certificate

Validation is additionally fortified by the utilization of computerized authentications. Advanced declarations confirm that the holder of a public and private key is who they guarantee to be. Outsiders called endorsement specialists (CA) issue advanced authentications. Most declarations follow the Internet Engineering Task Force's (IETF) X.509 testament standard. Under rendition 3.0 of this norm, an endorsement contains things, for example, the subject's name (proprietor of the private key), legitimacy period, subject's public key data and a marked hash of the testament information (for example hashed substance of the endorsement endorsed with the CA's private key). Endorsements are utilized to validate Web locales (website authentications), people (individual testaments) and programming organizations (programming distributor declarations) VeriSign issues three classes of authentications. Class 1 checks that an email really comes from the user's address. Class 2 checks the user's character against a business credit information base. Class 3 necessities authenticated records. Organizations like Microsoft offer frameworks that permit organizations to give their own private, in-house authentications. These can be utilized to recognize clients on their own organizations

### 4.4 Cross-site script (XSS)

Cross-webpage scripting (referred to likewise as XSS) is a sort of assault focused on web application clients. Assailant infuses customer side code (regularly a JavaScript) into weak web application so that the content is run on client's programs visiting weak page. Envision that you've assemble a web application permitting your clients to send private messages to one another. One of the clients discovers that you don't encode messages, so it is feasible to send unadulterated HTML or JavaScript code to other individual. The client chooses to send this message to his pal:

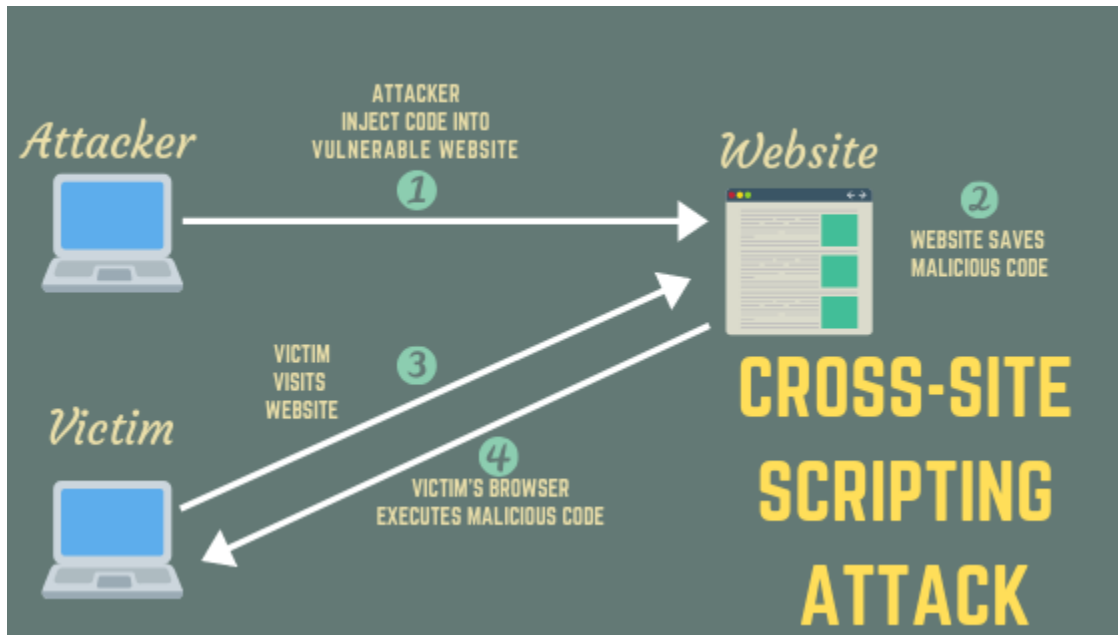


Figure 4.4 Cross site scripting

### 4.5. Personal Firewalls

While interfacing our PC to an organization, it gets helpless against assault. An individual firewall ensures our PC from external assailant by restricting the sorts of traffic started by and coordinated to our PC. The aggressor can check the hard drive to recognize any put away private subtleties or information. Numerous PCs are tainted by spyware or some likeness thereof. Most are 'innocuous', however an expanding number pass into infections that will take and send secret data,

#### **4.6. Secure Socket Layer (SSL)**

Secure Socket Layer is a convention that scrambles information between the customer's PC and the site's worker. At the point when a Secure attachment Layer-ensured page is mentioned, the program distinguishes that the worker as a confided in substance and starts a handshake to pass encryption key data to and fro. Presently, on ensuing solicitations to the worker, the data streaming to and fro is scrambled so a programmer sniffing the organization can't peruse the substance. SSL permits moving information in a scrambled structure. All data that a client should keep hidden ought to be communicated through SSL. Such data should incorporate Mastercard number and related data, and may, contingent upon the sort of business, incorporate client's name, address, and the rundown of items that the client is purchasing. It ought to likewise incorporate the client's secret word and request ID.

#### **4.7. Web Server Firewall**

A web worker or web application firewall, either an equipment machine or programming arrangement, is set in the middle of the customer end point and the web application. Web application firewalls secure cardholder information since all web layer traffic is investigated searching for traffic A firewall resembles the channel encompassing a palace. The external firewall has ports open that permit ingoing and active HTTP demands. This permits the customer program to speak with the worker.

#### **4.8. Password policies**

We may decide to have various strategies for customers versus our inside clients. For instance, we may pick to lockout a director after 3 fizzled login endeavors rather than 6. These secret phrase arrangements ensure against assaults that endeavor to figure the client's secret key. They guarantee that passwords are adequately sufficient so they can't be effectively speculated.

#### **4.9. Installing Recent Patches**

Programming bugs and weaknesses can be recognized each day. Despite the fact that a significant number of them are found by security specialists, instead of programmers, they may in any case be abused by programmers once they turned into a public information. This is the motivation behind why it is critical to introduce all product fixes when they become accessible.

#### **5.0. Intrusion Detection and Audits of Security Logs**

Security logs are very important to follow the client record. For model, if an individual compose secret phrase wrong, and every one of the 6 time if the individual is composing incorrect password then ,that people account gets locked. This occasion ought to likewise be signed in the system, this should be possible by sending email to the administrator. We can likewise have logged or record the unapproved admittance to the framework.

### **V. CONCLUSIONS**

Current technology allows to design secure site. It is important to always keep in mind that whatever are the security measures are described and explained do afford a good sense of protection, we should always use and follows above security ensures in order to have safe online shopping or online payment.

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