

DYNAMIC AUDIT SERVICES FOR ACHIEVING CONSISTENCY AS A SERVICE IN AUDITING CLOUD COMPUTING

Sowmya B¹, Santhosh S², Dr Y.P.Gowramma³

¹M.Tech Scholar, ²Assistant Professor of CS &E, ³Professor & H.O.D of CS &E,

Kalpataru Institute of Technology, Tiptur, Karnataka, (India)

ABSTRACT

Cloud storage services became commercially in style because of their overwhelming blessings. to supply present always-on access, a cloud service supplier (CSP) maintains multiple replicas for every piece of information on geographically distributed servers. A key drawback of victimization the replication technique in clouds is that it's terribly costly to realize robust consistency on a worldwide scale. During this paper, we tend to 1st gift a unique consistency as a service (CaaS) model, that consists of an outsized information cloud and multiple little audit clouds. In the CaaS model, a knowledge cloud is maintained by a CSP, associated a bunch of users that represent an audit cloud will verify whether or not the info cloud provides the secure level of consistency or not. we tend to propose a two-level auditing design, that solely needs a loosely synchronous clock on the audit cloud. Then, we tend to style algorithms to quantify the severity of violations with 2 metrics: the commonality of violations, and therefore the staleness of the worth of a scan. Finally, we tend to devise a heuristic auditing strategy (HAS) to reveal as several violations as potential. in depth experiments were performed employing a combination of simulations and real cloud deployments to validate HAS.

Index Terms: Cloud Storage, Consistency As A Service (CAAS), Two-Level Auditing, Heuristic Auditing Strategy (HAS).

I. INTRODUCTION

CLOUD computing has become commercially in style, because it guarantees to ensure quantifiability, elasticity, and high availability at an occasional price [1], [2]. Target-hunting by the trend of the everything-as-a-service (XaaS) model, information storages, virtualized infrastructure, virtualized platforms, also as code and applications area unit being provided and consumed as services within the cloud. Cloud storage services is considered a typical service in cloud computing, that involves the delivery of information storage as a service, together with database-like services and network connected storage, typically beaked on a utility computing basis, e.g., per G per month..Examples include Amazon SimpleDB1, Microsoft Azure storage2, and soon to meet the promise of ubiquitous 24/7 access, the cloud service provider (CSP) stores data replicas on multiple geographically distributed servers... Updates to a reputation won't be visible right away, however all shoppers are ensured to visualize them eventually. However, ultimate consistency isn't a catholicon for all application. Especially for the interactive applications, stronger consistency assurance is of skyrocketing importance. think about the subsequent state of affairs as shown in Fig. 1.

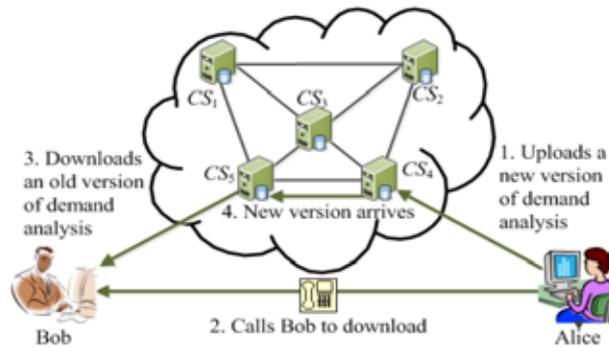


Fig. 1 Associate In Nursing Application That Needs Causative Consistency

II. OVERVIEW

2.1 Distributed Computing: Utilities, Grids & Clouds

The unfold of high-speed broadband networks in developed countries, the continual increase in computing power, and the growth of the net have modified the means within which society manages info and data services. Geographically distributed resources, equivalent to storage devices, information sources, and supercomputers, ar interconnected and might be exploited by users round the world as single, unified resource. To a growing extent, repetitive or resource-intensive IT tasks will be outsourced to service suppliers that execute the task and infrequently offer the results at a lower price. a brand new paradigm is rising within which computing is obtainable as a utility by third parties whereby the user is beaked just for consumption. This service-oriented approach from organizations giving an outsized portfolio of services will be scalable and versatile. This report describes the appearance of recent varieties of distributed computing, notably grid and cloud computing, the applications that they permit, and their potential impact on future standardization. The thought of distributing resources at intervals pc networks isn't new.

2.2 Shared resources

The main goal of a distributed automatic data processing system is to attach users and IT resources in a very clear, open, efficient, reliable and scalable means. The resources which will be shared in grids, clouds and different distributed computing systems embrace.

Physical resources

- procedure power
- Storage devices
- Communication capability

Virtual resources, which might be changed and ar freelance from its physical location; like store

- operational systems
- computer code and licenses
- Tasks and applications
- Services

2.3 Grid computing

Grid computing allows the sharing, selection, and aggregation by users of a good type of geographically distributed resources owned by totally different organizations and is well-suited for finding IT resource-intensive issues in science, engineering and commerce. Grids ar terribly large-scale virtualized, distributed computing systems. They cowl multiple body domains and modify virtual organizations.

2.4 Utility computing

The thought of utility computing is simple: instead of operational servers in-house, organizations subscribe Associate in Nursing external utility computing service supplier and pay just for the hardware and computer code resources.

2.5 Essential Characteristics

2.5.1 On-Demand Self-Service

A client will unilaterally provision computing capabilities, equivalent to server time and network storage, as required mechanically while not requiring human interaction with every service supplier.

2.5.2 Broad Network Access

Capabilities are on the market over the network and accessed through normal mechanisms that promote use by heterogeneous skinny or thick consumer platforms (e.g., mobile phones, tablets, laptops, and workstations).

2.5.3 Resource Pooling

The provider's computing resources are pooled to serve multiple shoppers employing a multi-tenant model, with totally different physical and virtual resources dynamically allotted and reassigned in keeping with client demand.

2.5.4 Rapid Elasticity

Capabilities will be elastically provisioned and free, in some cases mechanically, to scale chop-chop outward and inward commensurable with demand.

III. LITERATURE SURVEY

“Analyzing Consistency Properties for Fun and Profit”[1], Motivated by the increasing quality of eventually consistent key-value stores as an ad service, we have a tendency to address 2 necessary issues involving the consistency properties in a very history of operations on a read/write register (i.e., the beginning time, end time, argument, and response of each operation). First, we have a tendency to contemplate the way to notice a consistency violation as shortly collectively happens. to the current finish, we have a tendency to formulate a specification for on-line verification algorithms, and that we gift such algorithms for many well-known consistency properties. Second, we have a tendency to contemplate the way to quantify the severity of the violations, if a history is found to contain consistency violations. we have a tendency to investigate 2 quantities: one is that the staleness of the reads, and also the different is that the commonality of violations. For staleness, we have a tendency to more contemplate time-based staleness and operation-count-based staleness. we have a tendency to gift economical algorithms that calculate these quantities.

“Auditing Cloud Consistency”[2], Cloud storage services became commercially fashionable because of their overwhelming benefits. to supply omnipresent always-on access, a cloud service supplier (CSP) maintains multiple replicas for every piece of knowledge on geographically distributed servers. A key drawback of mistreatment the replication technique in clouds is that it's terribly big-ticket to realize sturdy consistency on a worldwide scale. during this paper, 1st gift a unique consistency as a service (CaaS) model, that consists of an oversized information cloud and multiple little audit clouds. In the CaaS model, an information cloud is maintained by a CSP, Associate in Nursing gaggle of users that represent an audit cloud will verify whether or not the info cloud provides the secure level of consistency or not. we have a tendency to propose a two-level auditing design, that solely needs a loosely synchronal clock on the audit cloud. Then, we have a tendency to

style algorithms to quantify the severity of violations with 2 metrics: the commonality of violations, and also the staleness of the worth of scan. Finally, we have a tendency to devise a heuristic auditing strategy (HAS) to reveal as several violations as potential. intensive experiments were performed employing a combination of simulations and real cloud deployments to validate HAS.

“A read of Cloud Computing”[3], Cloud computing, the long-held dream of computing as a utility, has the potential to rework an oversized a part of the IT business, creating package even a lot of enticing as a service and shaping the approach IT hardware is intended and purchased. Developers with innovative concepts for brand spanking new net services not need the massive capital outlays in hardware to deploy their service or the human expense to control it. they have not agonize concerning overprovisioning for a servicewhose quality doesn’t meet their predictions, therefore wasting expensive resources, or below provisioning for one that becomes wildly fashionable, therefore missing potentialcustomers and revenue.

“Distributed Computing: Utilities, Grids & Clouds”[5], The unfold of high-speed broadband networks in developed countries, the continual increase in computing power, and also the growth of the web have modified the approach within which society manages info and data services. Geographically distributed resources, like storage devices, information sources, and supercomputers, area unit interconnected and might be exploited by users round the world as single, unified resource. outsourced to service suppliers, that execute the task and sometimes give the results at a lower price.

IV. EXISTING SYSTEM

An existing system the file transfered in cloud that not signed by user in anytime of upload. in order that integrity of shared information isn’t potential in existing system. However, since the cloud isn’t within the same trustworthy domain with every user within the cluster, outsourcing each user’s personal key to the cloud would introduce important.

V. SYSTEM ARCHITECTURE

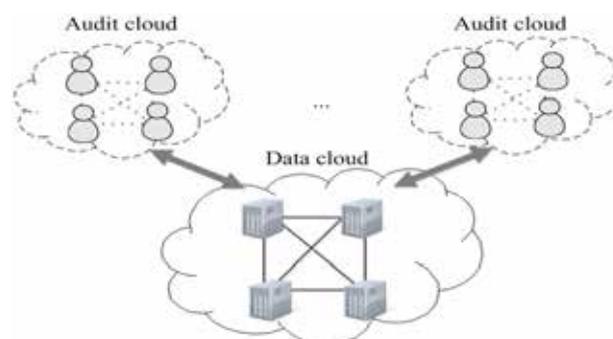


Fig 2: An Audit and Data Cloud Consistency

In this project, illustrate the consistency as a service (CaaS) model. Then, we describe the structure of the user operation table (UOT), with which each user records his operations. Finally, we provide an overview of the two-level auditing structure and related definitions.

5.1 Consistency as a Service (CAAS) Model

As shown in Fig. 2, the CaaS model consists of a data cloud and multiple audit clouds. The data cloud, maintained by the cloud service provider (CSP), is a key-value data storage system, where each piece of data is identified by a unique key. (UOT), which is referred to as a local trace of operations in this paper.

- Ø **Local auditing** can be performed independently by each user with his own UOT; periodically, an auditor is elected from the audit cloud. In this case, all other users will send their UOTs to the auditor.
- Ø **global auditing** with a global trace of operations. We simply let each user become an auditor in turn, and we will provide a more comprehensive solution in Section VIII. The dotted line in the audit cloud means that users are loosely connected.

5.2 User Operation Table (UOT)

Each user maintains a UOT for recording local operations. Each record in the UOT is described by three elements: operation, logical vector, and physical vector. Therefore, we have the following properties:

- (1) A read must have a unique dictating write. A write may have zero or more dictated reads
- (2) From the value of a read, we can know the logical and physical vectors of its dictating write. Each user will maintain a logical vector and a physical vector to track the logical and physical time when an operation happens, respectively.

5.3 Overview of Two-Level Auditing Structure

Consistency models provided by commercial cloud systems. Following their work, we provide a two-level auditing structure for the CaaS model. At the first level, each user independently performs local auditing with his own UOT.

The following consistencies should be verified at this level:

Monotonic-read consistency. If a process reads the value of data K, any successive reads on data K by that process will always return that same value or a more recent value.

Read-your-write consistency. The effect of a write by a process on data K will always be seen by a successive read on data K by the same process. **Causal consistency.** Writes that are causally related must be seen by all processes in the same order. Concurrent writes may be seen in a different order on different machines.

VI. MODULES

1. User Module.
2. Auditor module.
3. Admin Module.

Modules Description

6.1 User Module

In this module, user should register their details and get the secret key for login and user can upload the file regarding the auditing User first has to register in the application and according to his/her system ip server will be allocated via application. A user is able to perform local auditing also. User can upload and download the files also. To make this application consistent we are using hash code technique via MD5 algorithm.

6.2. Auditor Module

In cloud computing there are two audit mechanism

Internal audit scheme inspects the internal behavior and processing service providers and try to avoid violation of SLA of understanding the service providers. When the internal audit starts, auditor and comprehensive understanding of risk in storage service and good measures about dealing with them in industry.

External audit provides end-to-end service quality metrics using SLA. The main purpose is to ensure data integrity in storage services. Through the APIs offered by the service providers, external audit can examine the data stored in the service providers by sampling and ensure their integrity, for example using the APIs provided by Amazon S3 to realize data access.

Phases of third party auditing:

There are two phases of third party auditing namely

1).**Audit planning phase:** First need to make sure the audit content, the audit details and so on and then determine the audit schedule.

2) **Execute audit phase:** It evaluates the superiority and insufficiency of current safety strategy during this phase. Auditors evaluate the matching degree between the methods used to solve the existing security threats and the internal and external security standard.

6.3. Admin Module

In this module admin can view all the user details , user uploads details, And TPA activities....regarding the auditing strategy. Admin is the person who manages this application. Admin is having rights to maintain cloud servers. Admin is able to perform global auditing for make the system consistent.

VII.CONCLUSION

In this paper, we presented a consistency as a service (CaaS) model and a two-level auditing structure to help users verify whether the cloud service provider (CSP) is providing the promised consistency, and to quantify the severity of the violations, if any. With the CaaS model, the users can assess the quality of cloud services and choose a right CSP among various candidates, e.g., the least expensive one that still provides adequate consistency for the users' applications. For our future work, we will conduct a thorough theoretical study of consistency models in cloud computing.

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CBR TECHNIQUES WITH SPARSE CODEWORDS TO RETRIEVE FACE IMAGE

Shruthi K.C¹, Dr.Y.P. Gowramma²

¹Mtech Scholar, Kalpataru Institute of Technology, Tiptur, Karnataka, (India)

²Professor & H.O.D Kalpataru Institute of Technology, Tiptur, Karnataka, (India)

ABSTRACT

Now a days the popularity of social networks like face book, twitter are mostly used by the people. Many of them use human face images for their profile. And also we can maintain large scale database for the image storage. To avoid the large database use two algorithms like attribute enhanced sparse codewords and attribute embedded inverted indexing . In large image database have problem regarding the image retrieval .By using this algorithm we can efficiently retrieve the images from the large image database. It will give the 80% perfect matched images. Photos with people (e.g., family, friends, celebrities, etc.) are the major interest of users. Thus, with the exponentially growing photos, large-scale content-based face image retrieval is an enabling technology for many emerging applications. In this work, we aim to utilize automatically detected human attributes that contain semantic cues of the face photos to improve content-based face retrieval by constructing semantic code-words for efficient large-scale face retrieval. By leveraging human attributes in a scalable and systematic framework, we propose local color histogram to improve the face retrieval.

Keywords: *Attribute Enhanced Sparse Codewords, Attribute Embedded Inverted Indexing, Ranking, Attributes.*

I. INTRODUCTION

Due to the recognition of digital devices and also the rise of social network/photo sharing services (e.g., Facebook, Flipcart), there area unit mostly growing shopper photos on the market in our life. Among all those photos, an enormous proportion of them area unit photos with human faces (estimated quite 60%). The importance and also the sheer quantity of external body part photos build manipulations (e.g., search and mining) of large-scale external body part pictures a extremely necessary analysis downside and alter several world applications.

Nowadays we have a tendency to have several transmission devices such as camera, cellular phone, audio/video player and thus on. pictures play a very important role in our daily communication. Impression is additional proven by associate degree image rather than a thousand words as stipulated by the statement "One image is value quite 10 thousand words". Image retrieval refers to extracting desired pictures from a massive image information. Image retrieval might be text primarily based} or content based. To perform image retrieval by text based mostly, pictures area unit manually annotated by text descriptors. whereas considering the blessings everything is manually done and it is straightforward to gestate and the limitations area unit inconsistency and manual image annotation needs additional quantity of manual labor.By considering the image content such as color, texture and form for image retrieval, the

problem of inconsistency is overcome. This approach is referred to as Content primarily based Image Retrieval. Content primarily based Image Retrieval is used in several areas like art galleries, criminal investigation, medical and geographic databases. For the simple feature extraction, in , the RGB (Red inexperienced, Blue) color pictures square measure reworked into YUV color area and therefore the Y elements representing the grey level pictures square measure reworked into riffle domain. By victimisation Mallat's pyramid algorithmic program, the grey level image is rotten into its riffle coefficients.

To analyze the effectiveness of various human attributes across datasets and notice informative human attributes, the contributions of attribute increased thin codewords include: within the mix mechanically detected high-level human attributes and low-level options to construct linguistics codewords. To the simplest of developer information, this can be the primary proposal of such combination for content-based face image retrieval. To balance international representations in image collections and domestically embedded facial characteristics, within the scalable face image retrieval victimisation attribute increased thin codewords system 2 orthogonal ways to utilize mechanically detected human attributes to boost content-based face image retrieval beneath a scalable framework. It conducts intensive experiments and demonstrates the supported of the planned ways on 2 separate public datasets and still ensures real time response. within the any establish informative and generic human attributes for face image retrieval across totally different datasets. the chosen descriptors square measure promising for different applications from last decade, there's tremendous growth within the use of technology and art galleries, nature, diversion, education, industry, varied areas have resulted in giant amounts of pictures within which the various areas in medicine field, etc in these applications. so as to retrieve the dataset wants immense image particularly image is extremely complicate task to recover; thus

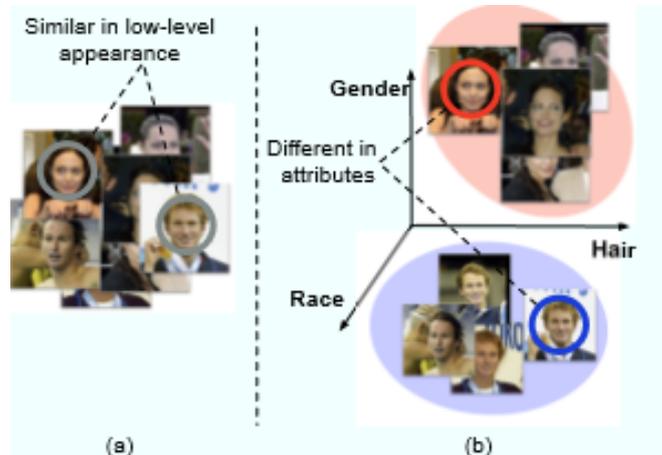


Fig. 1. (a) Because low-level features are lack of semantic meanings, face images of two different people might be close in the traditional low-level feature space. (b) By incorporating high-level human attributes into feature representations, we can provide better discriminability for face image retrieval. there should be an automated system which can input the number of queries image matching to retrieve images. Designing such systems research is quite challenging there is much image retrieval

From large image dataset of images presented yet for automatic recovery systems. There are two types of image retrieval systems such as content based and text based image retrieval. For the text based system, text annotation is done manually for all images and then used by a database management system to perform image retrieval. This manual process may takes more time for doing so. There are two main limitations of this approach such as more resources and costs are required to do the manual annotations and the process of explaining the contents of image highly subjective.

That is, the perspective of textual descriptions given by an annotator could be different from the perspective of a user. In other words, there are textual user queries and image annotation. Incompatibility to correct the problem, Image according to image content retrieval such a strategy carries out so-called content-based image retrieval (CBIR). Physical symptoms of CBIR system [2] to build glossary description of images to facilitate efficient and effective retrieval [1], the primary goal of the CBIR system is basically sewage facilities and queries image color, shape and texture with each dataset.

II. RELATED WORK

B.C.Chen et.al [2] developed a scalable face image retrieval system which can integrate with partial identity information to improve the retrieval result. To achieve this goal, B.C.Chen et.al first apply sparse coding on local features extracted from face images combining with inverted indexing to construct an efficient and scalable face retrieval system. Then propose a novel coding scheme that refines the representation of the original sparse coding by using identity information. Using the proposed coding scheme, face images with large intra-class variances will still be quantized into similar visual words if they share the same identity. Experimental results show that the system can achieve salient retrieval results on LFW dataset (13K faces) and outperform linear search methods using well known face recognition feature descriptors.

Recently shown to give excellent results for category recognition. A. Ramisa et al. [3] discuss their performance in the context of image retrieval; show that retrieving images of particular objects based on attribute vectors gives results comparable to the state of the art. A. Ramisa et al. demonstrate that combining attribute and Fisher vectors improves performance for retrieval of particular objects as well as categories. Implement an efficient coding technique for compressing the combined descriptor to very small codes. Experimental results on the Holidays dataset show that our approach significantly outperforms the state of the art, even for a very compact representation of 16 bytes per image. Retrieving category images is evaluated on the “web-queries” dataset. A. Ramisa et al. show that attribute features combined with Fisher vectors improve the performance and that combined image features can supplement text features. Huang, G. [5] discussed about the labeled faces in the wild. Face recognition has benefitted greatly from the many databases that have been produced to study it. Most of these databases have been created under controlled conditions to facilitate the study of specific parameters on the face recognition problem. These parameters include such variables as position, pose, lighting, expression, background, camera quality, occlusion, age, and gender. While there are many applications for face recognition technology in which one can control the parameters of image acquisition, there are also many applications in which the practitioner has little or no control over such parameters. This database is provided as an aid in studying the latter, unconstrained, face recognition problem.

The database represents an initial attempt to provide a set of labeled face photographs spanning the range of conditions typically encountered by people in their everyday lives. The database exhibits “natural” variability in pose, lighting, focus, resolution, facial expression, age, gender, race, accessories, make-up, occlusions, background, and photographic quality. Despite this variability, the images in the database are presented in a simple and consistent format for maximum ease of use. In addition to describing the details of the database and its acquisition we provide specific experimental paradigms for which the database is suitable. This is done in an effort to make research performed with the database as consistent and comparable as possible. For identity related problems, descriptive attributes can take the form of any information that helps represent an individual, including age data, describable visual attributes, and contextual data. With a rich set of descriptive attributes, it

is possible to enhance the base matching accuracy of a traditional face identification system through intelligent score weighting. Factor any attribute differences between people into our match score calculation, it can deemphasize incorrect results, and ideally lift the correct matching record to a higher rank position. Naturally, the presence of all descriptive attributes during a match instance cannot be expected, especially when considering non- biometric context.

III. EXISTING SYSTEM

Gabor filter is a group of wavelets. Many methods utilize the capability of edge detectors like sobel, prewit and canny; however, the results are unsatisfactory in case of illumination and noise. The algorithm utilizes the odd Gabor filter whose edge detection capability has been proven better when compared to other edge detectors. With different values of filter parameters, Gabor filters yield different filter banks. Many methods utilize the capability of edge detectors like sobel, prewit and canny; however, the results are unsatisfactory in case of illumination and noise

IV. PROPOSED SYSTEM

In this planned system image retrieval method embody a lot of algorithms to expeditiously retrieve the image from giant image data to the image within the info. It split the one image into grides and generates the codewords relying upon the attributes. base. The attribute encodewords to the image within the info. It split the one image into grides and generates the codewords relying upon the attributes. In planned technique, the face feature is extracted with the facilitate native color bar graph. This forms the feature vector. The options square measure extracted for the question image. The on top of method is conjointly applied to the info image. euclidian distance live between feature vector of question image and have vector of every image in the info is computed. The uppermost 'n' similar pictures from the info square measure retrieved

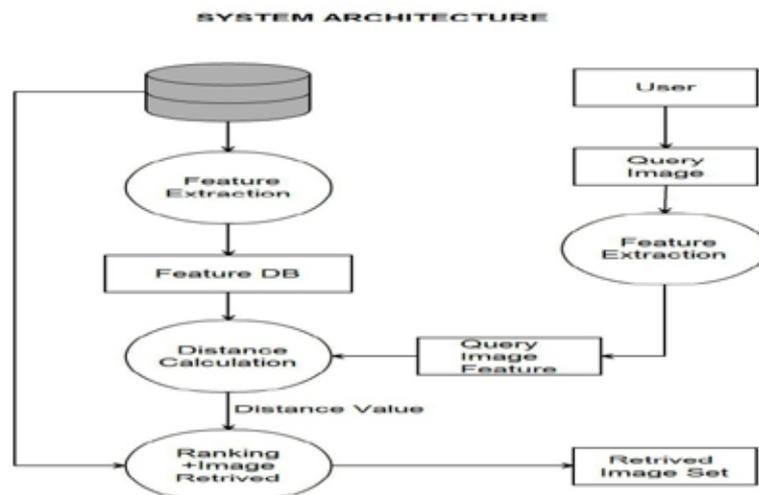


Fig 2. this means the dataflow of image retrieval system. The sample question image is given to the system. it's preprocessed by the system to notice the facial attributes. supported each the content primarily based image retrieval system and therefore the distributed codewords the attribute should be detected. The attribute increased distributed codewords and therefore the attribute embedded inverted categorisation is that the 2 main rule used for the image retrieval method.

In this planned system image retrieval method embody 2 a lot of algorithms to expeditiously retrieve the image from massive image data to the image within the information. It split the one image into grids and generates the codewords relying upon the attributes. base. The attribute encodewords to the image within the information. It split the one image into grids and generates the codewords relying upon the attributes. In planned technique, the face feature is extracted with the facilitate native color bar chart. This forms the feature vector. The options are extracted for the question image. The on top of method is conjointly applied to the information image. euclidian distance live between feature vector of question image and have vector of every image in the information is computed. The uppermost 'n' similar pictures from the information are retrieved.

- Using local color bar chart for retrieving the pictures the retrieval performance was improved alternative than mistreatment Dennis Gabor filters.
- Various ways do not represent the face properly, and thus it is troublesome to do normalisation (matching is somewhat hard). Here, we have a tendency to be ready to determine the faces of Asian, western, African and Indian.

4.1 Observations

4.1.1 Content-Based Image Search

Content-based image retrieval (CBIR) conjointly called question by image content (QBIC) is that the presentation of pc vision techniques to the image retrieval drawback of penetrating for digital pictures in massive databases. Some researchers have attentive on associating the linguistics gap by finding linguistics image representations to extend the CBIR performance. Content-based face image retrieval is associated to face recognition problems however they consider finding applicable feature representations for climbable compartmentalization systems.

4.1.2 Attribute Primarily Based Search

Attribute detection has appropriate quality on numerous of various human attributes. mistreatment these human attributes many researchers have earned promising ends up in totally different applications corresponding to face recognition, face identification, keyword-based face image retrieval, and similar attribute search.

4.1.3 Face Image Retrieval

The recommended work could be a facial image retrieval model for similar facial pictures retrieval within the search area of the facial pictures by combining content-based image retrieval (CBIR) techniques and face recognition techniques with the linguistics rationalization of facial image. the target is to the decrease the linguistics gap among high level question demand and low level of the facial expression of external body part image.

4.2 Experiments on Attribute Enhanced Sparse Committal to Writing (ASC)

4.2.1 Performance of Single Attribute

The MAP of attribute increased thin committal to writing supported single attribute. we've calculated the performance of ASC supported seventy three numerous characteristics on each datasets. supported single attribute, we've attain up to twelve.2% relative development in dataset and sixteen.2% in LFW dataset

mistreatment ASC. sure enough attributes, ASC performs poorer than SC, as a result of ASC is very related to attribute detection accuracy. ASC performs higher in most attributes, as a result of it will cash in of the qualified attribute scores and is therefore most uses the sturdy to attribute detection error. we have a tendency to conjointly notice that mistreatment sure attributes like smiling,harsh lighting can decrease the performance in each datasets. it's maybe as these attributes aren't related to the identity of the person.

4.2.2 Performance of Multiple Attributes

Using qualities hierarchical by ASC across 2 datasets ar capable to categorize informative attributes. Here we will reason high twenty overlapped attributes into 5 totally different classes together with gender connected attributes (G): Male, sporting Earrings, sporting Lipstick, engaging Woman; hair colors (H): Blond Hair, Black Hair, grey Hair; races (R): White, Asian, Indian; ages (A): Youth, Senior; and private options (P): Receding Hairline, Bald, No Beard, No Eyeglasses, Bushy Eyebrows, mentum. Merging these attributes mistreatment ASC we've more attain higher performance.

V. CONCLUSION

This system propose, strategies to utilize mechanically detected human attributes to considerably improve content-based face image retrieval. To the most effective of our data, this can be the primary proposal to automatically detected human attributes for content-based face image retrieval. Attribute-enhanced thin secret writing exploits the world structure and uses many human attributes to construct semantic-aware codeword within the offline stage. Attribute-embedded inverted compartmentalization more considers the native attribute signature of the question image and still ensures economical retrieval within the on-line stage.

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FEASIBILITY STUDY OF A RESIDENTIAL-SCALE STAND-ALONE RENEWABLE ENERGY SYSTEMS (PV /BAT AND PV/FC/BAT) IN SILCHAR, ASSAM

Alok Kumar¹, Dr. Agnimitra Biswas², Subhendu Sekhar Sahoo³

¹Mechanical Engineering Department, NIT, Silchar, Assam, (India)

²Mechanical Engineering Department, NIT, Silchar, Assam, (India)

³Electrical Engineering Department, NIT, Silchar, Assam, (India)

ABSTRACT

In today's world ever increasing demand of energy is mostly fulfilled by non-renewable sources, which is going to be depleted very soon. Also these sources are being more responsible for pollution leading to climate change. Still developing country like India has not been able to transmit power up to its remote and rural areas effectively. As a result, nowadays a lot of research is going on in the field of renewable energy which is clean and sustainable. In this paper a feasibility study on renewable energy system (RES) has been carried out particularly for rural and remote areas like Silchar, Assam.

In this study Photovoltaic (PV) is the primary source of electricity, battery and fuel cell (FC)–electrolyzer combination is used as a backup storage system. The system performance has been carried out by simulation study using a single residential load demand profile and real weather data of Silchar. This simulation is performed with the help of new energy lab (NEL) experimental setup. In the present work, size of PV and various storage systems has been investigated to meet energy demand. This research paper will help the future developers to work on large scale load demands.

Keywords: Fuel-Cell (FC), New Energy Lab (NEL), Renewable Energy, RES, Silchar,

1. INTRODUCTION

In recent years, concerns about environment pollution and global warming from burning fossil fuels have created new demand for clean and sustainable energy sources such as solar, wind, hydro, biomass, etc. However most of people in world still lack access to the grid electricity, mostly those living in island or in remote villages which is isolated from utility [1-2] So, stand-alone renewable energy system is more suitable and safer to meet demand of electricity on those regions. Because of the intermittency and unpredictability nature of solar and wind source, a proper storage system has to be developed to meet uninterrupted load demand. In most cases battery, FC–electrolyzer and pumped hydro storage (PHS) system are used to store renewable energy [3-4].

The site under consideration is Silchar which is located at latitude of 24.833N and a longitude of 92.77E. The annual average solar insolation (ϕ_{avg}) is 4.69kWh/m²/day and annual average wind speed is around 2.32m/s. [11] Due to very low wind speed the present research has been primarily focused only on solar energy. The battery is used as a short-term energy storage unit and FC-electrolyzer for a long-term energy storage unit. Due to undesirable characteristics of charging and discharging rate of battery and also short life cycle, combination

of battery with FC has been used to increase the float life of battery. To guarantee energy security in case of consecutive number of days without any solar energy provided, 5 days of autonomy was ensured in this study [12]. The daily energy consumption, peak load, autonomy day and peak sun hour per day has been shown in Table 1. The block diagram of existing RES on this study consideration in fig.1

Table 1 some basic parameter for Silchar site

Items	unit	Value
Daily energy consumption	Wh	3599.15
Peak load	W	515
Desired day of autonomy	days	5
Peak sun hours per day	hours	4.5

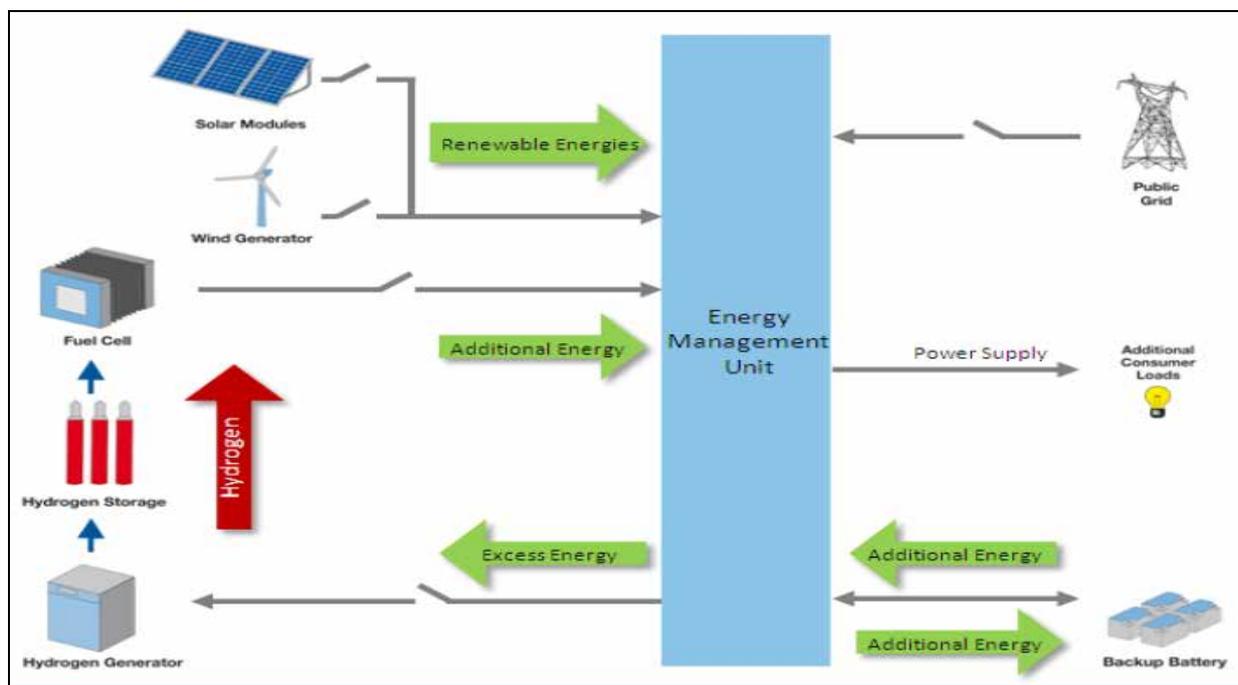


Fig. 1 Block diagram of “HRES”

II. MATHEMATICAL MODELING

2.1 PV Array

The PV panels represent the core of hybrid power generation system. They transfer the sun’s radiation into electricity. The basic element of solar panel is PV cell which can supply a small electric current and voltage. So, the number of cell connected on series and parallel depends on the desire power that should be supplied by plane. The relationship between outputs current I and voltage V of individual PV cell obtained from the Shockley diode equation. [7]

$$I = I_{ph} - I_0 \left(e^{\frac{V+IR_s}{V_t}} - 1 \right) - \frac{V+IR_s}{R_p} \quad (1)$$

Where I_{ph} is the photo current (A); I_0 is the diode saturation current (A); R_s is the series resistance (U); R_p is the shunt/parallel resistance (U); $v_t = \frac{nkT}{4q}$ is the diode thermal voltage (V); n is the diode ideality factor; T is the cell temperature (K); k is Boltzmann’s constant (1.381×10^{-23} J/K); q is the electron charge (1.602×10^{-19} C); Based on the module’s specification and standard test condition (STC) can be computed vale of I_{ph} , I_0 , V_t , R_p and R_s . Power output from PV array is

$$P = I_A V_A \tag{2}$$

The key specifications of the studied PV cell (plane) provided by the manufacturer are presented in Table 2. The dynamic and simple linear power equation for size of PV cell can be calculated from Eq. (3)

$$P_{PV}(t) = \varphi(t) \eta_{PV} A_{PV} \tag{3}$$

Therefore daily energy production by PV cell (4)

$$E_{PV} = \int_0^{24} P_{PV}(t) dt \tag{4}$$

Where φ is irradiation (kW/m^2), A_{PV} is area of PV module, η_{PV} efficiency of module

Table 2 Key specification of the Hecker solar NeMo® 54 P

Characteristic	Value
Type	Polycrystalline
Open circuit voltage (V_{oc})	33.3V
Optimum operating voltage (V_{mp})	27.3V
Short circuit current (I_{sc})	8.67A
Optimum operating current (I_{mp})	7.98A
Maximum power at STC (P_{max})	200Wp
efficiency of module (η_{PV})	14.6%
Area of module (A_{PV})	1.4x.999 m^2

2.2 Battery

The capacities of battery bank in ampere hour (C_{Ah}) need for HRES are determined by Eq.(5) [10]:

$$C_{Ah} = \frac{n_{day} E_{load}}{\eta_B DOD V_B} \tag{5}$$

Where n_{day} is number of autonomous days powered absolutely the battery storage bank E_{load} is the daily energy consumption, V_B is rated battery voltage, DOD is allowable depth of discharge and η_B is overall efficiency of battery with converter. For Silchar region 5 autonomous days is considered [12]

Table 3 Key specification of the Exide NXT 200-12

Characteristic	Value
Type	lead acid
Rate battery voltage	12V
capacity (C20)	200 Ah
capacity (C10)	180 Ah
maximum discharge current	1200 A
internal resistance	5 m-ohm
weight	68.40 kg

2.3 Fuel-cell

The equivalent heating of hydrogen is 3.4kWh/m³ under standard condition and its density is around 0.09kg/m³ therefore, the amount of energy yielded per kg by is 37.8kWh/kg. Therefore electricity produce by FC can be calculated from Eq: (6)

$$E_{FC} = (M_{H_2} \eta_{FC}) 37800 \tag{6}$$

And current density (*i*) in FC in per cell for given mole flow rate (\dot{N}_{H_2}) of hydrogen is [8]

$$i = \frac{2N_{H_2} F}{A} \tag{7}$$

$$I = i.A \tag{8}$$

And power of fuel cell for given FC voltage (V_{FC})

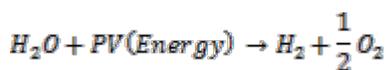
$$P_{FC} = I.V_{FC} \tag{9}$$

Table 4 Key specification of the Nexa©1200-1 FC

Characteristic	Valve
Type	PEM
Rated of current	52A
Rated power	1200W
Output voltage	20....36 V
Hydrogen quality min.	99.99%
Hydrogen consumption	15Sl/min
Operational temperature	5...40°C
Weight	approx.22 kg
Dimension (H×W×D)	400×550×220mm
Monitoring software	Nexa(RCS)

2.4 Electrolyzer

Electrolyzer is modeling for production of hydrogen from excess of PV energy. When DC/AC current is passed through electrodes immersed in de-ionize water hydrogen and oxygen are generated through electrolysis process .the following reaction take place during electrolysis of de-ionize water



Rate of hydrogen production in electrolyzer is directly proportional to electrolyzing current across the circuit. So, weight of hydrogen produces per hour is calculated from Eq. (5) [9]

$$H_2(kg) = \frac{E_{cons.}}{\eta_{el} \times 37800} \tag{10}$$

Where $E_{cons.}$ is energy consumption (kWh) by electrolyzer and η_{el} is overall efficiency of electrolyzer

Table 5 key of specifications for hydrogen generation

Characteristic	Valve
Power supply (AC)	480W _{max}
Hydrogen flow rate	0.60 Sl/h
Fuel purity	>6.0
Delivery pressure	10 bar
Input voltage	230 V
Weight	25 kg

III. LOAD DEMAND PROFILE

A residential scale (single) of load is considered for Silchar region. In this region average daily energy consumption is around 3599.15Wh/day with maximum load (peak) is 515W between 18:00 to 18:30 and minimum load is 70W and the load factor is 0.2912 Load curve has been made taking half an hour load variation for whole day which is shown in fig. 1

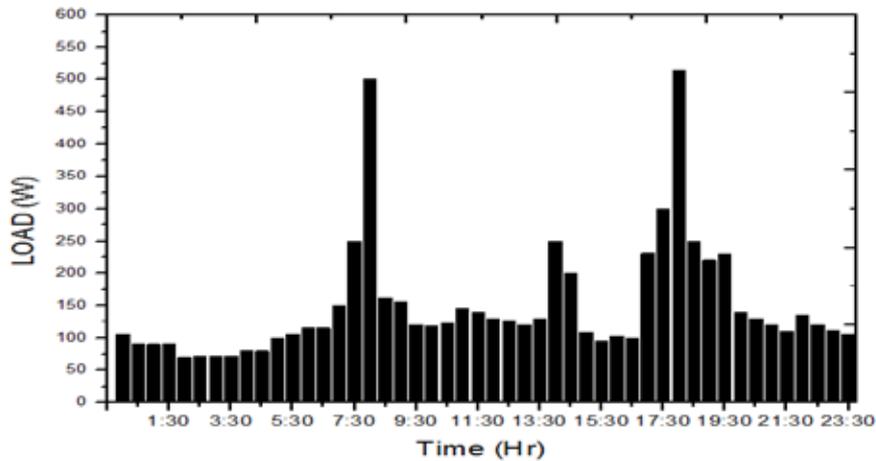


Fig. 2 Daily load demand curve duration

IV. SOLAR ENERGY RESOURCE

The meteorological data for this site was collected by NEL experimental setup in fig .8. The solar radiation distribution profile is presented in fig. 2.

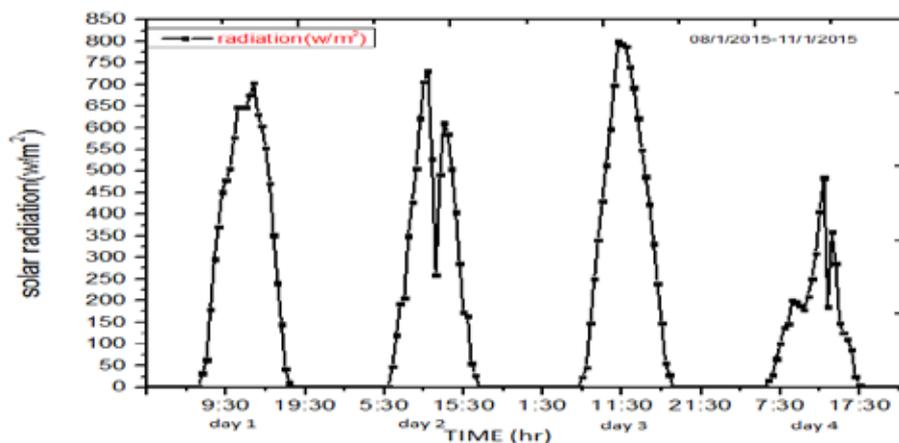


Fig.3. Daily Solar insolation distribution (W/m^2)

V. SIMULATION OF LOAD PROFILE AND RESULTS

The experimental simulation for different combination of storage energy system has been carried out in two ways, first (5.1) with PV and battery only and secondly (5.2) with PV, FC and small bank of battery

5.1 Option -1 (PV/battery)

In this proposed system 1.2 kW size of PV and 2400Ah capacity of battery with 75% of maximum DOD is considered. For this above system the hourly balance of energy is shown in fig. 4. With initial SOC battery of 73.6%, simulation has been carried out for long duration at NIT Silchar in “renewable lab “.

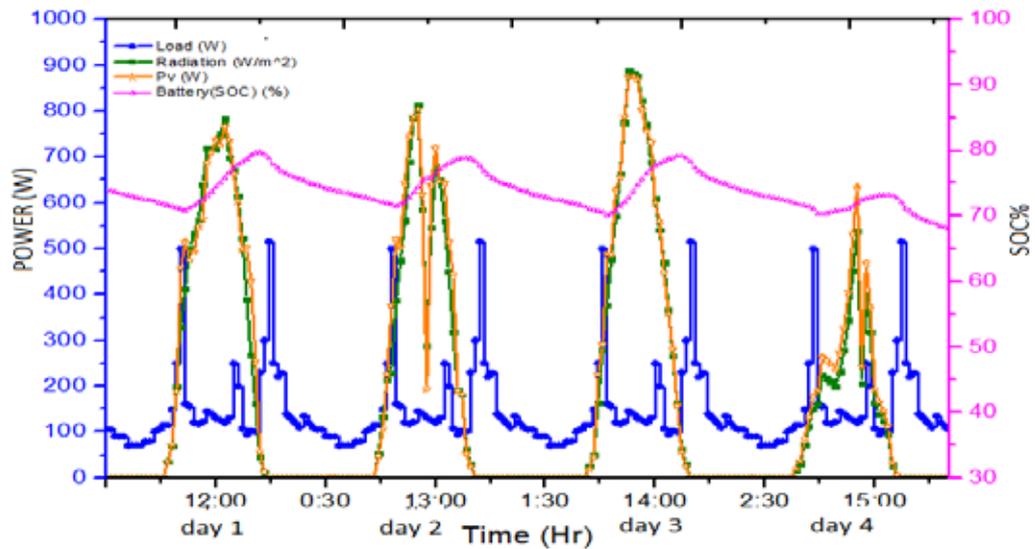


Fig.4. Hourly energy balance curve

5.2 Option -2 (PV/FC/battery)

In this option the combinations of FC and battery storage system have been used for fulfillment of energy demand. To increase the float life of battery, some lower limitation value of DOD is applied such that battery does not discharge further below this limit. To meet the load at this condition the FC needs to be started. Therefore the running status of FC is dependent on DOD of battery so as to have more float life of battery. Production of hydrogen in Electrolyzer is dependent on pressures of hydrogen storage tank. In this case maximum DOD of battery is taken as 60% and initial SOC of battery is 70%. So, fuel cell will provide electricity when battery reaches below 60% as shown in fig.6 and the electrolyzer will start producing hydrogen when pressure of hydrogen tank will fall below 2 bar or State of capacity is below 5%. In this proposed system 1.2kW of PV, a battery of 200Ah capacity and a fuel cell of 1.2kW are considered. The half hour simulation result for this proposed system is shown in fig.6. On the 3rd day of simulation study the FC provided electricity with consumption of hydrogen at the rate of around 85 NL/min and then evening of 4th day fuel cell again started which is shown in fig. 5

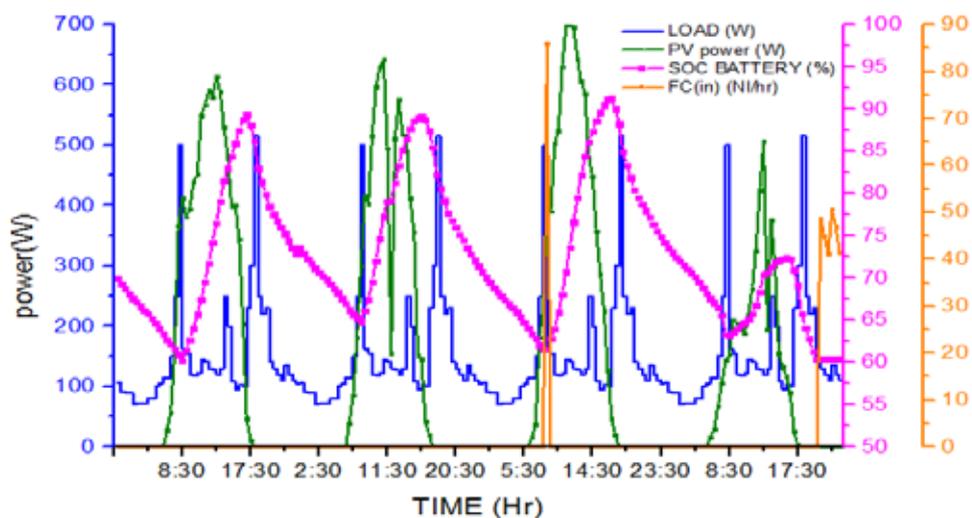


Fig.5. Hourly Energy Balance Curve

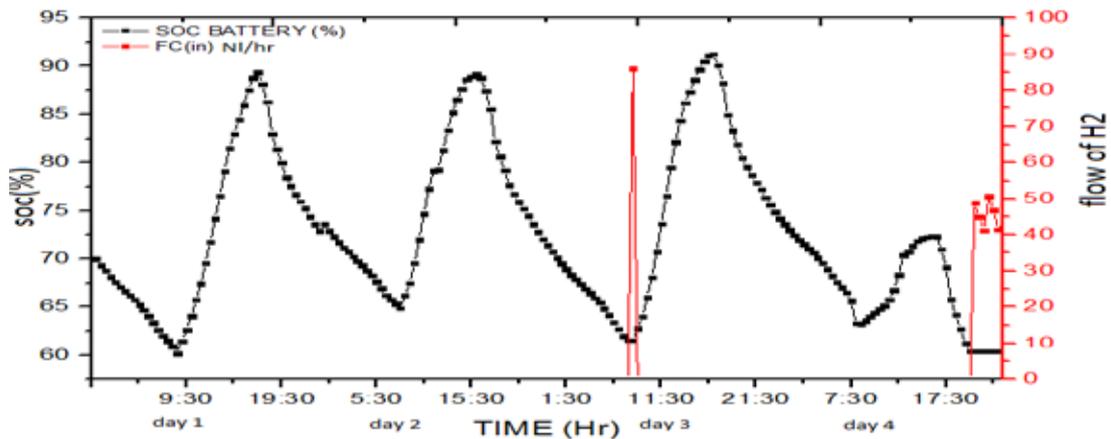


Fig.6 Battery SOC (%) and H₂ flow rate (NI/hr)

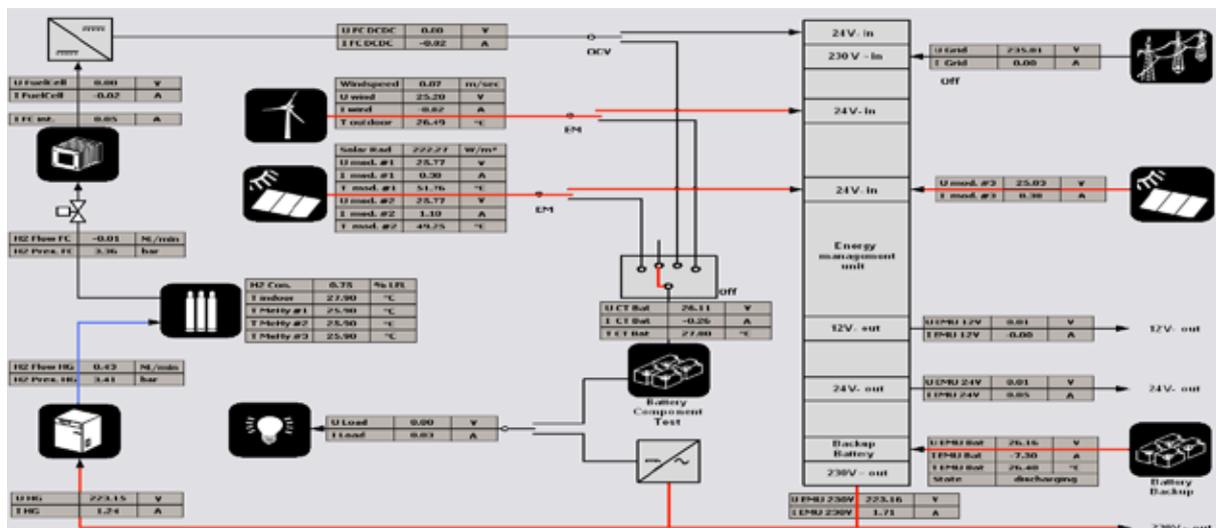


Fig. 7 schematic diagram of existing HRES in renewable energy lab at NIT Silchar, Assam

VI. CONCLUSION

In this investigation, an overall evaluation of the stand-alone RES system has been conducted for a considerable period of time. After analyzing the system performance it was observed that (PV/bat/FC), is the best feasible option in meeting the load demand due to improved battery float life. A comparative study is also performed which prove FC-electrolyzer combination a better energy source under high loads. However in both the case overall power management strategy is effective and load demand is balanced successfully. This research paper will help the future developers to work on large scale load demands.

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FEASIBILITY STUDY FOR MAPPING MULTI-SPECIALTY HOSPITAL PROCESS WITH CMMI

Rakesh K. R.¹, Krishnan Hemamala²

^{1,2} Amrita School of Business, Amrita Vishwa Vidyapeetham, University,
Coimbatore, (India)

ABSTRACT

The organization's processes is an important dimension any organization needs to focus to improve its business. Certification is a proof of high quality service that can win customer trust and confidence. Capability Maturity Model Integration (CMMI) is a process improvement training and appraisal program followed by Software companies' globally to improve their processes. Healthcare is a sunrise service sector. Indian healthcare is one of the best in the world with good quality medical talent and relatively low cost. At present there is no mandatory accreditation process for hospitals. Vendors of healthcare include a wide range of sectors like Insurance companies, Corporates, Government agencies. If they insist on an accreditation in healthcare, then CMMI can be a good option. If the software industry in India was able to become the best in the world by adopting CMMI practices then why can't Indian hospitals do the same? This research focuses on understanding the processes in multi-specialty hospitals and mapping it to the process areas in CMMI for Services for process improvement. A case study approach is followed, where a 300-bed multi-specialty hospital was chosen and qualitative and quantitative data are collected using direct observation, in-depth interviews and archival document analysis.

Keywords: CMMI, Hospital Process, Process Improvement, Process Mapping, Services

I. INTRODUCTION

There are several dimensions that an organization need to focus in order to improve its business. There are three critical dimensions that organizations typically focus on. They are people, procedures and methods, and tools and equipment. The processes used in the organization connects all these three critical dimensions. Processes allows to align the way we do business. Processes allow to leverage the resources and to examine business trends. In short they add value. So one of the main focus of this thesis paper would be on the processes.

Also certification is a proof of high quality service to win customer trust and confidence and earn the organization a better corporate image. Capability Maturity Model Integration (CMMI) is a process improvement training and appraisal program and is widely used by software companies to improve their processes. CMMI is a globally accepted quality standard and is largely adopted by the software companies. Indian software industry is able to meet the international standards by improving on their processes (CMMI Level 5 companies).

CMMI includes the following three areas of focus.

1. CMMI for Development (CMMI-DEV)
2. CMMI for Services (CMMI-SVC), and
3. CMMI for Acquisition (CMMI-ACQ)

Here the main focus is on CMMI for Services (CMMI-SVC). The service industry is an important driver for worldwide economic growth. CMMI-SVC deals with the services and the focus can be on the activities of the service provider.

Indian healthcare is one of the best in the world with good quality medical talent and low cost in comparison with other countries. Indian Healthcare has bright future in international market. It can be seen that over the last few decades, there has been a great improvement in the quality of healthcare services in India. Improvement in healthcare indicators such as life expectancy at birth, infant mortality rates, maternal mortality rate, etc. illustrates this improvement in healthcare sector. In spite of all these improvement measures there exists a considerable gap in the demand and supply of quality healthcare.

At present there is no mandatory accreditation process for hospitals. It is not mandatory for the hospitals to be certified. Accreditation agencies like National Accreditation Board for Hospitals & Healthcare (NABH) are mainly for infrastructure. Vendors of healthcare include a wide range of sectors like Insurance companies, Corporates, Government agencies. If they insist on an accreditation in healthcare, then CMMI can be a good option because it was successfully implemented in software industry. Therefore if the standards of the hospital processes need to be improved, a process improvement program like CMMI would prove to be a fit benchmark. So it is also possible for the Indian hospitals to excel in the area of process improvement by adopting CMMI practices as done by the software industry in India.

This research focuses on understanding the processes in multi-specialty hospitals that deal with all kinds of departments and mapping it to the process levels in CMMI for Services with a view to improving the processes.

The main objectives of this research would be:

- To understand the processes areas in CMMI for services (CMMI-SVC)
- To understand and analyze processes in multi-specialty hospitals
- To mapping the processes in multi-specialty hospitals to the processes areas in CMMI for services (CMMI-SVC)

A case study approach is followed, where a 300- bed multi-specialty hospital was chosen and qualitative and quantitative data are collected using direct observation, in-depth interviews and archival document analysis.

The next session is Literature review which focus on the works done in the areas of CMMI, process improvements and hospital processes. After Literature review, the methodology is explained followed by the mapping of the processes where process areas in CMMI for services were mapped to the processes in the hospital.

II. LITERATURE REVIEW

2.1 Services

Services are important in the life of any person: food services, communication services, healthcare services, entertainment services etc. The welfare of the people and the society is mainly based on the services. The field of management called Service operations management focuses on the service industries. Service industries play a significant role in the growth and development of any country. If we take the case of any nation, we could see that the service industries are the leaders. They enhance the quality of life of every person. Services also play an important role in providing a stable environment for the economic and social growth. Today the development of a country's service sector is an indicator of its economic development. In India service sector is a vital component of its economy. It contributes to about 60% of gross domestic product (GDP). The service practices

they follow is a major contributor to the performance of the organization and customer satisfaction. The growth in service sector can be attributed to the advancements in technology (mainly information technology).

2.2 Processes and Process Improvement

There are several dimensions that an organization need to focus in order to improve its business. There are three critical dimensions that organizations typically focus on. They are people, procedures and methods, and tools and equipment [1]. The processes used in the organization connects all these three critical dimensions. Service organizations are always characterized by the varying processes they follow. Processes allows to align the way we do business. Processes allow to leverage the resources and to examine business trends. Not only service industries but also the manufacturing industries have recognized the importance of the quality in the processes. Process helps and organization to meet its business objectives. It is important for any service to improve upon its processes. Employing any process improvement approach is necessary to achieve customer satisfaction. Therefore it is of critical importance to find the high priority processes and improve on it.

2.3 CMMI

For any service industry, it is very much necessary to develop and maintain quality products and services. In this aspect software industry has been one of the highly developed service industry. From the year 2000 there has been an exponential increase in the software industry as a whole. United States of America has the most advanced information and software technology services industry in the world. There were many process improvement programs adopted by service industries. Capability Maturity Model Integration (CMMI) model is one of the most successful technique and is mostly used by software industry. CMMI was developed by the Software Engineering Institute (SEI). CMMI has outlined several dimensions that any organization needs to focus in order to improve its business [1]. CMMI is a process improvement training and appraisal program and is widely used by software companies to improve their processes. CMMI is a globally accepted quality standard and is largely adopted by the software companies. Currently there are three areas in which CMMI is working on.

- Product and service development — CMMI for Development (CMMI-DEV)
- Service management — CMMI for Services (CMMI-SVC)
- Product and service acquisition — CMMI for Acquisition (CMMI-ACQ)

Since we will be concentrating on services in this paper, the CMMI for services (CMMI-SVC) will only be taken care of here. The CMMI-SVC talks about improving the processes for providing better services.

2.4 CMMI for Services

This research considers certain process improvement approaches which are available in the CMMI-SVC. The components are called Process Area Components. CMMI-SVC contains 24 process areas. If we take any organizational processes, there will be several aspects of service development. These process areas describe those aspects. There are 16 core process areas out of 24 process areas. 7 of them are service-specific and one is a shared process area [1].

Application of CMMI for services in software industry is the scope defined for this study. Software industry is one of the key industry in the development of any nation. There are many processes in any software industry where we can apply CMMI. Some of areas are Software Process Improvement in Software Outsourcing, Software debugging and testing, Software Maintenance and Process Improvement, Scrum methodology implementation, etc. All these studies highlights the fact that CMMI enable companies to enhance their performance and rates the maturity of process [2]. There has been several researches conducted in the area of CMMI for services and the implementation. In most of these researches the process specific goals and practices

are initially identified and then analyzed. After which these specific process areas in the problem will be mapped to the key process areas in CMMI. This will help in the improvement of those critical processes by mapping it and comparing it with the actual CMMI processes. In many of the papers there is also the use of Case studies to identify the problems related to process improvement. These case studies also shows various difficulties concerning potential improvements [2]. The processes in the case studies were then mapped to the CMMI processes for the purpose of process improvement and avoiding the difficulties. After the mapping of the processes are done, in the final part there will be an appraisal of the project. Usually this would be done by taking real case studies. This was done in order to find real evidence of a working combination of CMMI and the software processes studied in the research. CMMI-SVC can support software maintenance in the process improvement [3]. The above methods of mapping were used in this also. It was also seen from another research that in a professional software organization most of the missing gaps in the processes were filled through company policies and project practices [4]. The improvements would be then done.

2.5 Health Care Industry

The health care industry is one of the world's largest and fastest-growing industries [5]. If we take the case of most of the developed nations, healthcare industry forms over 10 percent of gross domestic product (GDP). Health care forms an enormous part of a country's economy. Over the past two decades, the health care delivery system has undergone incredible changes which was a result of modern technologies. It is expected that the size of healthcare industry would increase because of the ever increasing population and the spending in this sector by various country governments.

According to the World Health Organization estimates “there are 9.2 million physicians, 19.4 million nurses and midwives, 1.9 million dentists and other dentistry personnel, 2.6 million pharmacists and other pharmaceutical personnel, and over 1.3 million community health workers worldwide”. This make health care industry one of the largest segments of the workforce.

2.6 Indian Health Care Industry

If we look from Indian perspective, in terms of revenue and employment healthcare has become one of our largest sectors. The healthcare industry includes hospitals, medical clinical, medical equipments, medical tourism, life and health insurance, telemedicine etc. Public and private are the two categories of healthcare delivery system in India. Indian healthcare is one of the best in the world with good quality medical talent and low cost in comparison with other countries. A large pool of well-trained medical professionals are the assets of Indian healthcare sector and this provides a competitive advantage compared to hospitals in other countries. Over the last few decades, there has been significant increase in the quality of healthcare services in India. Also, another important feature of Indian healthcare sector is the low cost compared to peers in Asia and Western countries. For example it would cost only one-tenth of the cost for a surgery in India compared to that of the US or Western Europe. Indian Healthcare has bright future in international market.

In-spite of all these improvement measures there exists a considerable gap in the demand and supply of quality healthcare. There were many efforts to foster quality improvement in healthcare. But it has been seen from many of the researches that there has been that substantial shortcomings in the delivery of effective and reliable health care [6].

2.7 Hospital Processes

Patient safety and the quality improvement in larger hospitals can be done better by the development of general and outcome specific climates. Also in the case of small hospitals instead of investing in cultural

transformations, they can focus on scarce resources on using specific practices for specific patient needs. Thus we will be able to apply the operations management in the processes in hospitals [6]. There are a wide range of areas in a healthcare industry where we can work on the improvement of the processes and service quality.

As an example of a process in a hospital we can consider the discharge and the billing process in a hospital and the customer satisfaction associated with these processes. Discharge of a patient from a hospital is one of the most important process in a hospital. Discharge and the billing process are the final processes that a patient has to experience in any hospital. If there is any problem in these processes, even though all the other processes went well, the customer satisfaction will get affected. This calls for an efficient process. The delay in discharge and the billing processes leads to dissatisfaction of customers (patients) and can badly affect the goodwill of the hospital [7]. In many of the studies it was seen that there is a delay in all the steps in hospitals discharge process in many Indian hospital [8].

Some process improvement methodologies like six sigma can be applied to the processes in the hospitals. Six Sigma is a set of techniques and tools for process improvement. Certain studies were conducted in Indian multi-specialty hospitals using the approach of six sigma. For instance in a study on reduction of waiting time at the outpatient services of the Cardiology department of a large university teaching hospital, there were significant reduction in waiting time by using the six sigma approach [9]. A significant reduction in waiting time for getting the lab results was also achieved. As a result of the study several modifications were done in the OPD such as modification of forms, appointment of new staffs to handle telephones, appointment of biochemistry analyst etc. [9].

It is seen from all these studies that improvement in the processes is critical in the smooth functioning of any organization and therefore in the case of multi-specialty hospitals also the situation is not different. Hence in order to improve the processes in a systematic way we can use CMMI for services.

From studying the papers it was found that none of them talks about the implementation of CMMI in hospitals. If we want to improve on the standards of the hospital processes they would need a process improvement program like CMMI. This research is about analyzing this feasibility of implementing CMMI in hospitals in India.

III. METHODOLOGY

The research question is to analyze the feasibility of mapping the processes in the multi-specialty hospitals to the process areas in the CMMI for Services so as to optimize the processes in the hospitals.

- a) The unit of analysis in this research is a multi-specialty hospital
- b) Qualitative data (like hospital process) and quantitative data (like number of departments, number of beds) were collected.
- c) The data collection methods used were direct observation, in-depth interviews and archival document analysis.
- d) For the analysis qualitative data was used. The quantitative data were used as supporting data.

IV. PROCESS MAPPING

The methodology of process improvement follows certain steps. They are:

- Identify the process
- Identify the ownership

- Resource allocation (In accordance to strategic importance)
- Measure the performance
- Process Improvement

There are 24 process areas in CMMI SVC. The process areas were mapped with the multi-specialty hospital processes. The mapping is given below in the table. The Table 1 gives all the 24 CMMI process areas and the processes in hospitals which are mapped to these processes. For the processes which were not mapped, suggested Hospital processes are given. It is done so as to improve upon in this area.

Table 1: Process mapping

SL. No.	CMMI Process Area	Hospital Process Mapped	Suggested Hospital Process
1	Capacity and Availability Management (CAM)	Pharmacy process	---
2	Causal Analysis and Resolution (CAR)	Consultation of doctor by patient	---
3	Configuration Management (CM)	Hospital Information system	---
4	Decision Analysis and Resolution (DAR)	---	Benchmarking doctor performance
5	Incident Resolution and Prevention (IRP)	Emergency care process	---
6	Integrated Work Management (IWM)	Overall hospital organizational structure	---
7	Measurement and Analysis (MA)	Hospital Information system	---
8	Organizational Process Definition (OPD)	Standard process like consultation with doctor, lab tests, emergency care	---
9	Organizational Process Focus (OPF)	---	Strategic decision making by top management
10	Organizational Performance Management (OPM)	Analysis of standard processes like consultation	---
11	Organizational Process Performance (OPP)	---	Clinical quality of care
12	Organizational Training (OT)	Doctor and nurses training	---
13	Process and Product Quality Assurance (PPQA)	Overall hospital service	---
14	Quantitative Work Management (QWM)	---	Healthcare waste management
15	Requirements Management (REQM)	Availability of doctors	---
16	Risk Management (RSKM)	---	Patient Safety Training
17	Supplier Agreement Management (SAM)	Supply to pharmacy	---
18	Service Continuity (SCON)	Service after a disaster	---
19	Service Delivery (SD)	Medical departments	---
20	Service System Development (SSD)	Pharmacy, shelves, delivery of drugs	---
21	Service System Transition (SST)	Implementation of new law for nurses	---
22	Strategic Service Management	New services like modern	---

	(STSM)	equipments, new departments	
23	Work Monitoring and Control (WMC)	---	Infection prevention and control
24	Work Planning (WP)	Doctors to different departments	---

The description of the processes is as follows. In all the process area mapping written below, the format followed is that first paragraph describes the purpose of that particular process area and the paragraph following that explains the process mapping.

4.1. Capacity and Availability Management (CAM)

This is a Project and Work Management Process Area at Maturity Level 3. This area ensure effective service system performance and ensure that resources are provided and used effectively to support service requirements. In the multi-specialty hospitals, the capacity could be mapped to the pharmacy i.e. to ensure that sufficient resources (medicines, pharmacists, oxygen etc.) are available on a regular basis at an appropriate cost. Capacity here refers to the ability of the pharmacy to provide medicines to the patients without any failure. The availability management can be mapped with the availability of the doctors at various departments. The process of scheduling the allocation of doctors to different departments on particular days strengthens this process area.

4.2. Causal Analysis and Resolution (CAR)

This is a Support Process Area at Maturity Level 5. Causal Analysis and Resolution (CAR) is the process area which identify causes of selected outcomes and take action to improve the performance of process.

In the multi-specialty hospitals, the Causal Analysis and Resolution (CAR) can be applied in the process of a patient meeting the doctor. At present time is wasted when the Medical records department takes the file of the patient to the doctor before the patient meets the doctor. This can involve some extra labor also. So the cause of this extra time taken can be analyzed with the help of analytical tools and resolution can be provided. A suggestion in this case is to provide the patients with a card which has data embedded in it and when a patient is meeting the doctor, when the patient swipes in the card the doctor will get all the information about the patient and also doctor will be able to access his medical history.

4.3. Configuration Management (CM)

This is a Support Process Area at Maturity Level 2. Configuration Management (CM) establish and maintain the reliability of services or products. It uses identification, control, and audits of the configuration.

In multi-specialty hospitals the hospital data and the patient data is managed by an information system called Hospital Information System (HIS). It focuses not only on the hospital administration needs but also on the patient database management. The Medical records department records the data of patients in this digital format. The HIS is also used by the laboratories (as shown in the Fig. 1) which upload the lab test results to the system, as soon as the results of the lab tests are available, for easy access to the doctors. It is also necessary to maintain the different methods to ensure the completeness and consistency of data.

4.4. Incident Resolution and Prevention (IRP)

This is a Service Establishment and Delivery Process Area at Maturity Level 3. Incident Resolution and Prevention (IRP) is the process area of CMMI SVC which resolves the service incidents effectively and appropriately.

Incidents mentioned here are those events if not addressed would disrupt the service commitments of the service provider. So timely and effective addressing of incidents is necessary. In multi-specialty hospitals an incident

like this scenario could be emergency cases of admitting the patients to the Intensive Care Units. To handle the situation effectively the emergency cases are directly moved to the corresponding specialty departments and admitted to the ICU. Here the normal process of patient meeting the trainee doctors is bypassed considering the criticality of the incident. Also the proper communication the status of incidents to relevant stakeholders is an important activity in Incident Resolution and Prevention. This is taken care by proper communication between the departments and also with the people along with patient.

4.5. Integrated Work Management (IWM)

This is a Project and Work Management Process Area at Maturity Level 3. Integrated Work Management (IWM) helps in the development of an integrated and defined process adhering to the set of standard processes followed by the organization.

In the case of multi-specialty hospitals, this process area is associated with the overall organizational structure of the hospital. It deals with the involvement of relevant stakeholders like owners, doctors, nurses, other staffs, patients, etc. in the hospitals set of standard processes. The hospital organizational structure is mentioned as block diagram (Fig. 2). The management of the cost, staffing, scheduling, etc. in hospitals are associated with the work management. In hospitals the coordination of different activities is needed for ensuring the quality of work. The involvement of all the stakeholders is necessary in the work structure coordination.

4.6. Measurement and Analysis (MA)

This is a Support Process Area at Maturity Level 2. Measurement and Analysis (MA) is that process area which support the information needs of the management by developing and sustaining a measurement capability.

Taking the case of multi-specialty hospitals, the Hospital Information system can be mapped with Measurement and Analysis. The process area include specifying measures, data collection methods, data storage, reporting etc. which we can map to the process by which the Medical records department collects data from patient, stores the data, retrieve data, sharing of data (with other departments) etc. A proper procedure and process for the maintenance of data is essential. The data in the information system can be made available to multiple levels to minimize re-work on data.

4.7. Organizational Process Definition (OPD)

This is a Process Management Process Area at Maturity Level 3. The processes in the organization, different standards in work environments, rules and regulations etc. are established and maintained by the process area Organizational Process Definition (OPD).

Multi-specialty follows certain pre-determined set of processes and procedures which are well defined. There are specific set of standard processes for different areas, for example: consulting a doctor, conducting laboratory tests, emergency cases, etc. The execution of these processes provide long-term benefits to the organization (hospital). These processes also have sub-processes. There are work environment standards and rules and guidelines that has to be followed in the processes. The proper documentation of these set of standard processes will help in the checking any gaps in the process and would help in process improvement.

4.8. Organizational Performance Management (OPM)

This is a Process Management Process Area at Maturity Level 5. The performance of every organization should be such that it should meet its business objectives. This is managed by Organizational Performance Management (OPM).

Earlier when discussing the process area- Organizational Process Definition, the mapping of processes in multi-specialty hospital was done. In this process area we can map the analysis of that processes in multi-specialty

hospitals to identify the gaps in performance. This is done to check whether the business objectives are being met. The analysis of the processes can be helpful in deciding the potential areas of improvements to close the gaps. The service quality of the hospitals can be improved. This will increase the productivity and efficiency of the hospital and would result in better customer (patient) satisfaction.

4.9. Organizational Training (OT)

This is a Process Management Process Area at Maturity Level 3. The role of Organizational Training (OT) is to develop knowledge and skills of people in the organization, so that they will be able to perform their roles effectively and efficiently. Organizational Training is also essential for supporting the strategic business objectives of the organization. In a multi-specialty hospital there is proper training for the people associated with the hospitals. There are medical colleges associated with these hospitals (with well-equipped labs and libraries) where the proper training is given to the doctors and the nurses on performing their jobs effectively and efficiently. The people other than doctors and nurses are also given proper training for their work. As a part of the training the trainee doctors are the people who are consulted by the patients when they arrive at the hospital. It is the trainee doctors who redirect the patients to different departments depending on the medical conditions.

4.10. Process and Product Quality Assurance (PPQA)

This is a Support Process Area at Maturity Level 2. Process and Product Quality Assurance (PPQA) is for assuring the quality of the products and services by evaluating them against standard procedures.

In a multi-specialty hospital quality assurance plays an important role in the service delivery. This can be mapped with the overall service provided by the hospital and can be further broken down into the levels of processes followed. The quality assurance of the products like medicine in the pharmacy, laboratory equipments results in the delivery of high class products and services. Another process which can be mapped with this process area is the assurance of quality in the information system.

4.11. Requirements Management (REQM)

This is a Project and Work Management Process Area at Maturity Level 2. Requirements Management (REQM) is the process area to manage requirements in the processes for its smooth working. In the multi-specialty hospital we can map the requirements of the doctors by specific departments, for the hospital service delivery to function accurately. For example a particular doctor will be required at surgery on one day, outpatient department on another day, medical college on other day, etc. Therefore the requirements must be aligned with the work process. A similar mapping can also be done with the management of pharmaceutical medicines, laboratory equipments etc.

4.12. Supplier Agreement Management (SAM)

This is a Project and Work Management Process Area at Maturity Level 2. Supplier Agreement Management (SAM) deals with the management of acquisition of products and services from suppliers. Mapping of this process area can be done against the process by which various suppliers are managed by a hospital. Some of the important suppliers to a multi-specialty hospital are pharmaceutical companies, medical equipment manufacturers etc. The mapping to this process area also addresses the acquisition of these products which are included in the service system.

4.13. Service Continuity (SCON)

This is a Project and Work Management Process Area at Maturity Level 3. The goal of Service Continuity (SCON) is to establish and maintain plans that would ensure continuity of services in case of disruption of

normal operations. In a multi-specialty hospital this process area can be mapped to the activities that the hospital staffs plan and rehearse to restore the service/ system after any natural disaster or terrorist attack.

4.14. Service Delivery (SD)

This is a Service Establishment and Delivery Process Area at Maturity Level 2. The aim of this process area is to deliver services in accordance with service agreements.

In a multi-specialty hospital the mapping would be to processes in the different medical departments. For example if we take Cardiology department, the service delivery includes scheduling of the doctors for cardiology, consultation with patients, delivering drugs etc. It also includes processes like monitoring the supply of medicines, tracking customer satisfaction etc. Here management of requests can be prescription from other departments like neurology or respiratory medicine.

4.15. Service System Development (SSD)

This is a Service Establishment and Delivery Process Area at Maturity Level 3. Design and development, analysis and integration of the service systems. This is done in order to satisfy the service agreements.

In a multispecialty hospital the different service system includes facilities such as the pharmacy, shelves and equipment for measurement, delivery of drugs etc., doctors, nurses, pharmacists, therapists, and technical specialists. It also includes various processes like diagnosing, prescribing, drug delivery, scheduling, planning, budgeting, and operating.

4.16. Service System Transition (SST)

This is a Service Establishment and Delivery Process Area at Maturity Level 3. In the cases where the service system components are significantly changed, then the deployment function along with the management of ongoing service delivery, is taken care by the Service System Transition (SST).

In a multi-specialty hospital, if a new law comes that nurses are no longer able to direct certain medicines, except in the presence of a pharmacist, then we can apply Service System Transition to the scenario. There would be changes in the processes and the system. Service System Transition can be applied to make the changes to people and processes.

4.17. Strategic Service Management (STSM)

This is a Service Establishment and Delivery Process Area at Maturity Level 3. The establishment and maintenance of standard services is done by Strategic Service Management (STSM). This will be in line with the strategic needs and plans.

In multi-specialty hospitals, the management implements new services (use of state-of-the-art equipments for diagnosis, starting new departments etc.) to meet the needs of its customers. They analyze market data strategically to review these services to meet those needs. Service-level agreement is a standard service. From the analysis they can know about other requirements also.

4.18. Work Planning (WP)

This is a Project and Work Management Process Area at Maturity Level 2. The establishment and maintenance of plans that define work activities is done by Work Planning (WP).

In the case of multi-specialty hospital the work week planning of the different doctors to various departments can be mapped to the process area of Work Planning.

4.19. Other Process areas

Out of the total 24 process areas in CMMI-SVC, 18 were mapped as given above. The remaining 6 are: Decision Analysis and Resolution (DAR), Organizational Process Focus (OPF), Organizational Process

Performance (OPP), Quantitative Work Management (QWM), Risk Management (RSKM) and Work Monitoring and Control (WMC). These areas were not mapped because the corresponding process areas were not identified. The table 1 shows the suggested hospital process areas which can be mapped with these 6 process areas so that the process ownership can be properly assigned and do proper resource allocation which will result in process improvement.

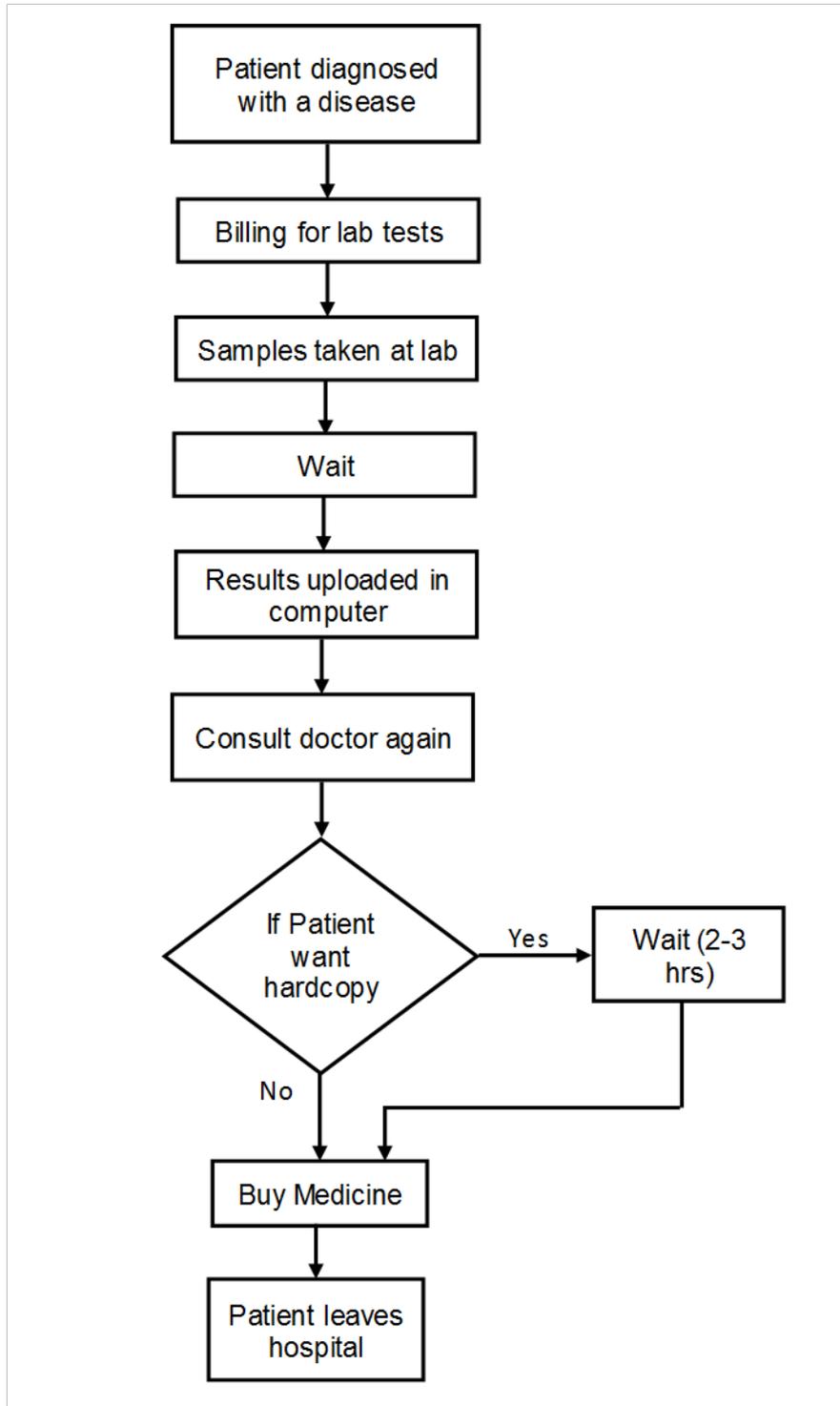


Fig. 1: Laboratory Process

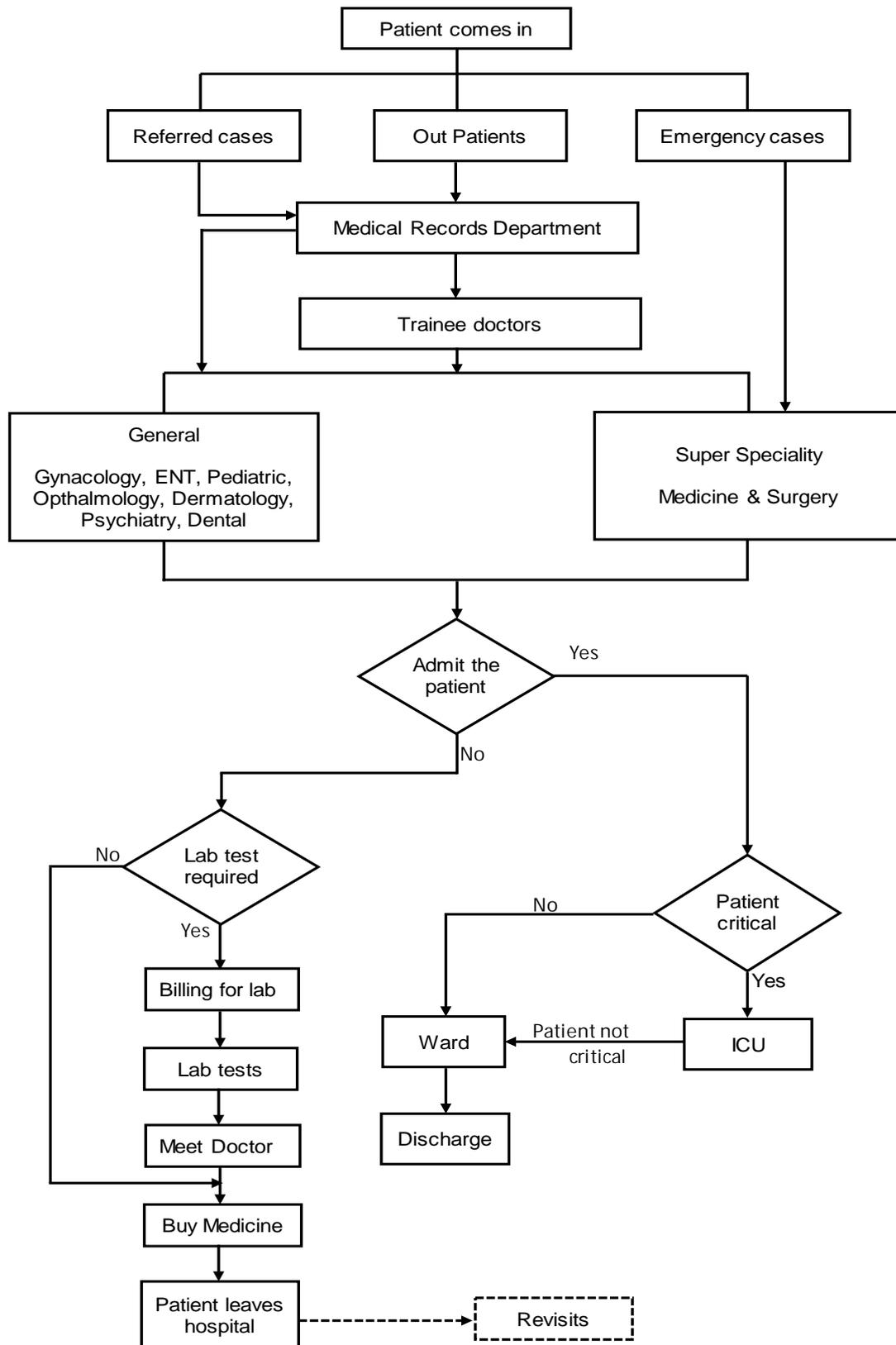


Fig. 2: Hospital Process flow diagram

V. CONCLUSION

In any industry, process improvement plays a major role in the success of the business. It is necessary for improving the customer satisfaction, reliability, efficiency and effectiveness of process, accountability etc. As discussed in the literature review, CMMI is an effective method for improving the processes by the implementation of various process areas. And implementing CMMI for services on hospitals process would improve the hospital services. In this paper, an attempt was made to map the processes in a multi-specialty hospital with that of the process areas of CMMI for services. 17 out of the 24 core process areas were mapped with the hospital processes. It can be concluded that it we will be able to implement CMMI for services in a multi-specialty hospital. So the Indian hospitals should adopt the system of CMMI certification for its service and improving their service. By the implementation of CMMI the hospitals can improve their standards and with this Indian hospital industry can match up with the hospitals in the West in the processes.

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AN ENHANCED SELECTION SORT ALGORITHM

**Ramesh M. Patelia¹, Shilpan D. Vyas², Parina S. Vyas³,
Nayan S. Patel⁴**

¹Department of M.Sc. (IT) & HOD of BCA, AMCOST, Anand, Gujarat, (India)

²Department of M.Sc. (IT) & BCA, AMCOST, Anand, Gujarat, (India)

³Department of E&C, Shree P.M. Patel College of E&C, Anand, Gujarat, (India)

⁴Department of M.Sc. (IT), B.N. Institute of Paramedical and Science, Anand, Gujarat, (India)

ABSTRACT

Sorting is a commonly used operation in field of computer science. Sorting is the process to arrange the data in either ascending or descending order. Sorting technique is a technique that does the sorting. The names of sorting techniques are Selection sort, Insertion sort, Bubble sort, Shell sort, Merge sort, Quick sort and many more. There is no one sorting method that is best for every situation. In this paper, an enhanced version of the selection sort algorithm is presented. It is analyzed and tested before presenting here. Enhanced selection sort reduced the iteration by half times.

Keywords –Enhanced Selection Sort, Permutation, Selection Sort, Sorting, Time Complexity.

I. INTRODUCTION

A sorting algorithm is an algorithm that puts elements of a list in a certain order. The output must satisfy two conditions:

1. The output is in a particular order either ascending or descending.
2. The output is a permutation (reordering) of the input.

Two main factors on which the performance of a program depends are the amount of computer memory consumed and time required to execute it successfully. Time complexity of a program is the amount of time required to execute successfully.

II. SELECTION SORT

2.1 Concept

It is the simplest sorting technique. A selection sort selects the element with the lowest value and exchanges it with the first element. Then, from the remaining n-1 elements with the smallest key is found and exchanged with the second element, and so forth. The exchange continues to the last two elements.

2.2 Algorithm

The following algorithm is to arrange the data in ascending order of an array A which is consisting of N elements. The variable PASS and MIN_INDEX are pass index and position of smallest element in an array, respectively. The variable I is used to index of an array. All variables are integer.

1. Repeat step 2 to 4 for PASS = 1 to N-1
2. Set MIN_INDEX = PASS
3. Repeat for I = PASS+1 to N
 If (A[I] < A[MIN_INDEX])
 Then
 MIN_INDEX = I
4. If (PASS != MIN_INDEX)
 Then
 Interchange A[PASS] and A[MIN_INDEX]
5. EXIT

2.3 Tracing of a Data

For example, if the Selection sort were used on array, 90, 80, 100, 20, 30, 10, 40, 50, 70, 60, each pass would be like as shown in Table-1.

Table-1 Tracing Of Data for Selection Sort

Unsorted	Initial	90	80	100	20	30	10	40	50	70	60
Pass Number(I)	Pass1	<u>10</u>	80	100	20	30	90	40	50	70	60
	Pass2	<u>10</u>	<u>20</u>	100	80	30	90	40	50	70	60
	Pass3	<u>10</u>	<u>20</u>	<u>30</u>	80	100	90	40	50	70	60
	Pass4	<u>10</u>	<u>20</u>	<u>30</u>	<u>40</u>	100	90	80	50	70	60
	Pass5	<u>10</u>	<u>20</u>	<u>30</u>	<u>40</u>	<u>50</u>	90	80	100	70	60
	Pass6	<u>10</u>	<u>20</u>	<u>30</u>	<u>40</u>	<u>50</u>	<u>60</u>	80	100	70	90
	Pass7	<u>10</u>	<u>20</u>	<u>30</u>	<u>40</u>	<u>50</u>	<u>60</u>	<u>70</u>	100	80	90
	Pass8	<u>10</u>	<u>20</u>	<u>30</u>	<u>40</u>	<u>50</u>	<u>60</u>	<u>70</u>	<u>80</u>	100	90
Sorted	Pass9	<u>10</u>	<u>20</u>	<u>30</u>	<u>40</u>	<u>50</u>	<u>60</u>	<u>70</u>	<u>80</u>	<u>90</u>	<u>100</u>

In above table, the underline elements are indicates that only those elements are arranged in their proper order in corresponding iteration. The array is sorted at the end of the 9th iteration of an outer pass loop.

2.4 Analysis

The time required to sort the data does not depend upon the order of the elements. There is no difference in the number of iteration for a list which is sorted already or which has its elements in reverse order. The only difference will be with the number of comparison and with the assignment statements. Their execution frequency will be varying. Total number of comparison is $n(n-1)/2$. The best case, average case and worst case are same and they are

$$\begin{aligned}
 F(n) &= (n-1) + (n-2) + (n-3) + (n-4) \dots \dots \dots + 1 \\
 &= n(n-1)/2 \\
 &= O(n^2)
 \end{aligned}$$

III. ENHANCED SELECTION SORT

3.1 Concept

The main idea behind the enhanced selection sort is that successive elements are selected on both the side of an array or file and placed in their proper position. In this technique, we sort the data in a single pass by two ways as shown below:

1. To find the minimum element from the array and replaced with first element.
2. To find the maximum element from the array and replaced with last element.

This will place smallest element at the top and largest element at the bottom of an array after completion of first cycle. The repetition of above work successively gets the desired result.

3.2 Algorithm

The following algorithm is to arrange the data in ascending order of an array A which is consisting of N elements. The variable MIN_INDEX and MAX_INDEX are position of smallest & largest element in an array, respectively. The variables FIRST and LAST are position of starting & ending element in an unsorted array, respectively. The variable I is used to index of an array. All variables are integer.

1. Set FIRST = 1 and LAST = n
2. Repeat step 3 to 10 for PASS = 1 to N/2
3. Set MIN_INDEX = FIRST
4. Repeat for I = FIRST+1 to LAST
If (A[I] < A[MIN_INDEX])
Then
 MIN_INDEX = I
5. If (PASS != MIN_INDEX)
Then
 Interchange A[FIRST] and A[MIN_INDEX]
6. Increment FIRST = FIRST + 1
7. Set MAX_INDEX = FIRST
8. Repeat for I = FIRST+1 to LAST
If (A[I] > A[MAX_INDEX])
Then
 MAX_INDEX = I
9. If (PASS != MAX_INDEX)
Then
 Interchange A[LAST] and A[MAX_INDEX]
10. Decrement LAST = LAST - 1
11. EXIT

3.3 Tracing of a Data

For example, if the Enhanced Selection sort were used on array, 90, 80, 100, 20, 30, 10, 40, 50, 70, 60, each pass would be like as shown in Table-2.

Table-2 Tracing Of Data for Enhanced Selection Sort

Unsorted	Initial	90	80	100	20	30	10	40	50	70	60
Pass Number(1)	Pass1	<u>10</u>	80	60	20	30	90	40	50	70	<u>100</u>
	Pass2	<u>10</u>	<u>20</u>	60	80	30	70	40	50	<u>90</u>	<u>100</u>
	Pass3	<u>10</u>	<u>20</u>	<u>30</u>	50	60	70	40	<u>80</u>	<u>90</u>	<u>100</u>
	Pass4	<u>10</u>	<u>20</u>	<u>30</u>	<u>40</u>	60	50	<u>70</u>	<u>80</u>	<u>90</u>	<u>100</u>
Sorted	Pass5	<u>10</u>	<u>20</u>	<u>30</u>	<u>40</u>	<u>50</u>	<u>60</u>	<u>70</u>	<u>80</u>	<u>90</u>	<u>100</u>

In above table, the underline elements are indicates that only those elements are arranged in their proper order in corresponding iteration. The array is sorted at the end of the 5th iteration of an outer pass loop.

3.4 Analysis

The enhancement of the proposed algorithm is by reducing number of pass iteration, which does not necessary reduce any comparisons. Hence, the time complexity of the enhanced selection sort is exactly same as the original version, which are $O(n^2)$, $O(n^2)$ and $O(n^2)$ for the best, average and worst case respectively.

IV. CONCLUSION

The number of pass iteration in enhanced selection sort is half of the number of pass iteration in original selection sort algorithm. The proposed enhancement algorithm has a significant improvement on reducing the number of pass iteration. The other popular sorting techniques such as Bubble sort, Insertion sort, Quick sort, Heap sort can be enhanced by using the proposed approach. This method and mention algorithm deserves future research.

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Biographical Notes

Mr. Ramesh M. Patelia has cleared National Eligibility Test (NET) in Computer Applications and is working as an Assistant Professor in B.C.A. (HOD) and M.Sc. (IT), Anand Mercantile College of Science, Management and Computer Technology, Anand, Gujarat, India.

Dr. Shilpan D. Vyas has been awarded Doctorate Degree (Ph.D.) in Computer Science and Engineering from Sai Nath University and is working as a Lecturer in B.C.A. and M.Sc. (IT), Anand Mercantile College of Science, Management and Computer Technology, Anand, Gujarat, India.

Ms. Parina S. Vyas is working as an Assistant Professor in Electronics and Communication Department, Shri P. M. Patel College of Electronics and Communication, Anand, Gujarat, India.

Mr. Nayan Patel is working as an Assistant Professor in M.Sc. (IT) Department, B. N. Patel Institute of Paramedical and Science, Anand, Gujarat, India.

DETECTION OF CAR FORENSICS USING ANDROID

Ashwini S Tadkal¹, Vishwanath C Patil², Sandip A Jadhav³

¹Dept. of Electronics and Communication Engineering, VTU Regional Centre Gulbarga, (India)

²Assistant Professor, Dept. of Mechanical Engineering, SITCOE Ichalkaranji, (India)

³Assistant Professor, Dept. of Mechanical Engineering, SITCOE Ichalkaranji, (India)

ABSTRACT

Car black box is a device that stores images that could be critical clues for investigating car related accidents or crimes, those images can be collected to the smart phones. car black box and smart phone can communicate with each other in order to transmit data by using wireless communication e.g., Bluetooth.

Critical images in the black box are hashed to provide data integrity before being transmitted to the smart phones.

Keywords- Car Black Box, Smartphone, Vehicular Ad Hoc Network.

I. INTRODUCTION

An event data recorder or EDR is a device installed in some automobiles to record information related to vehicle crashes or accidents. In modern diesel trucks, EDRs are triggered by electronically sensed problems in the engine (often called faults), or a sudden change in wheel speed. One or more of these conditions may occur because of an accident. Information from these devices can be collected after a crash and analyzed to help determine what the vehicles were doing before, during and after the crash or event. The term generally refers to a simple, tamper-proof, read-write memory device, similar to the "black box" found on airplanes (as opposed to the tape recorders and video cameras common in police vehicles and many commercial trucks).

Here in EDR we only have the information stored in the device but not sent immediately to any sever or smart phones. If we use smart phones we can avoid car forensics such as car related crimes or accidents.

Car black box is a device to record driving history which can be used for car forensics in case of car accident or related crimes. Car black box stores images that could be critical clues for investigating car-related accidents or crimes. Those images can be collected to smart phones. Every car is equipped with smart phone, car black box and global positioning system (GPS). car black box and smart phone can communicate with each other in order to transmit data by using wireless communication e.g., Bluetooth. Each smart phone is installed with special software which we developed.

II. PROPOSED WORK

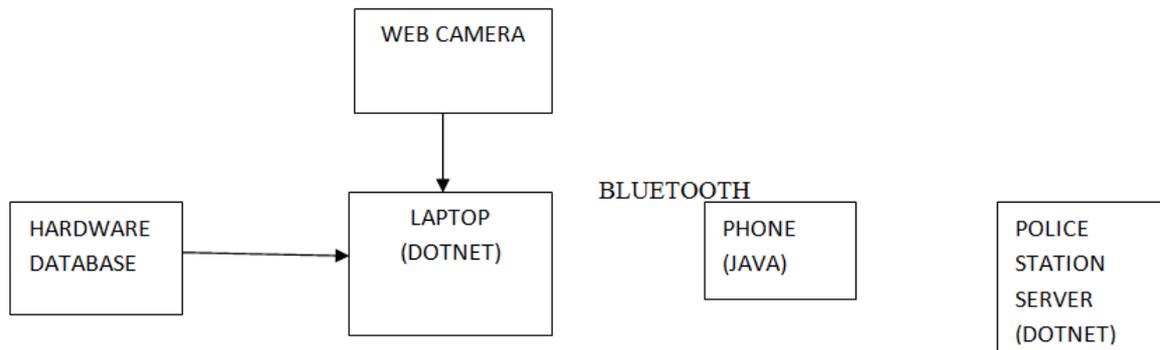


Fig 1: Block Diagram

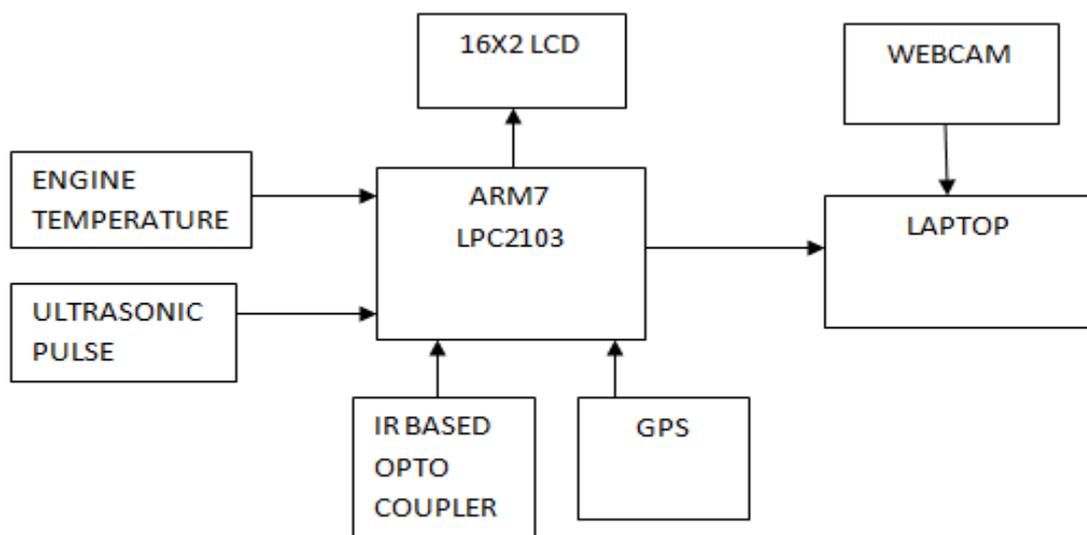


Fig 2: Hardware module

Every car is equipped with black box. Car black box and smart phone can communicate with each other in order to transmit data by using wireless communication e.g. Bluetooth. Each smart phone is installed with special software which we developed. Controller collects the information from the temperature sensor, ultrasonic sensor; IR based Optocoupler, GPS and switch and displays the collected information on the LCD. Temperature sensor senses temperature of the engine, if it crosses the threshold value it displays on the LCD as high.

Ultrasonic sensor detects obstacle near the car. If there is obstacle then obstacle=1 otherwise obstacle=0. IR based Optocoupler detects whether door is open or not. If the door is open then it displays door=1 on LCD otherwise door=0. GPS detects the location co-ordinates of the car and displays on the LCD. At the same time all this information is send to the laptop using serial communication (UART) and this information along with the images are displayed on the smart phone through Bluetooth.

III. HARDWARE AND SOFTWARE REQUIREMENTS

The hardware design consists of mainly the following components

- Regulated power supply
- ARM7 microcontroller
- MAX 232

V. CONCLUSION

The paper “Detection of Car Forensics using Android” can be successfully designed and tested. Integrating features of all the hardware components used have developed it. In our demonstration, the evidence collecting system which uses smart phone, not only to transmit images, but also to manage information obtained from car black box, was proposed. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

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REVIEW OF PROACTIVE ROUTING PROTOCOLS IN AD HOC WIRELESS NETWORKS

Sohit Choudhary¹, Sanjay Singh²

^{1,2} *Computer Science and Engineering Department, IET, Alwar, (India)*

ABSTRACT

The key challenges in mobile Ad Hoc networks are efficient and dynamic routing. An ad hoc routing protocol is a standard that controls the way computing devices route packets in a mobile ad hoc network. The aim of ad hoc routing protocol is to establish correct and efficient route between pair of nodes that requires minimum overhead and bandwidth consumption. A number of ad hoc routing protocols have been proposed so far. In this article we examine four proactive ad hoc routing protocols-Destination-Sequenced and Distance-Vector (DSDV), Wireless Routing Protocol (WRP), Optimized Link State Routing (OLSR) and Topology Broadcast based on Reverse-Path Forwarding (TBRPF) protocol based on set of performance parameters.

Index Terms: *DSDV, WRP, OLSR, TBRPF*

I. INTRODUCTION

Wireless network has become very popular in computing industry. Wireless network are adapted to ensure mobility. Mobile Ad Hoc networks [5] are wireless networks which do not require any infrastructure support for transferring packet between two nodes. Communication is directly between nodes or through intermediate nodes acting as routers. Wireless networks are used to augment rather than replace wired networks and are most commonly used to provide last few stages of connectivity between a mobile user and wired network.

Wireless networks provide connection flexibility between users in different places. Moreover, the network can be extended to any place or building without the need for a wired connection. Wireless networks are classified into two categories: Infrastructure networks and Ad Hoc networks.

Infrastructure Networks: This is infra-structured network (i.e. a network with fixed and wired gateways). An Access Point (AP) represents a central coordinator for all nodes. Any node can be joining the network through AP. In addition, AP organizes the connection between the Basic Set Services (BSSs) so that the route is ready when it is needed. However, one drawback of using an infrastructure network is the large overhead of maintaining the routing tables.

Ad Hoc Networks: Infrastructure less networks have no fixed routers; all nodes are capable of movement and can be connected dynamically in an arbitrary manner. Nodes of these networks function as routers which discover and maintain routes to other nodes in the network. Such a network may operate in standalone fashion, or may be connected to the larger internet.

II. AD HOC NETWORK CHARACTERISTICS

Mobility: nodes can be rapidly repositioned and/or move in ad hoc networks. We can have individual random mobility, group mobility, motion along pre planned routes, etc. The mobility model can have major impact on the selection of a routing scheme and can thus influence performance.

Multihopping: a multihop network is a network where the path from source to destination traverses several other nodes. Ad hoc nets often exhibit multiple hops for obstacle negotiation, spectrum reuse, and energy conservation. Battlefield covert operations also favor a sequence of short hops to reduce detection by the enemy.

Self-organization: the ad hoc network must autonomously determine its own configuration parameters including: addressing, routing, clustering, position identification, power control, etc. In some cases, special nodes (e.g., mobile backbone nodes) can coordinate their motion and dynamically distribute in the geographic area to provide coverage of disconnected islands

Energy conservation: most ad hoc nodes (e.g., laptops, PDAs, sensors, etc.) have limited power supply and no capability to generate their own power (e.g., solar panels). Energy efficient protocol design (e.g., MAC, routing, resource discovery, etc) is critical for longevity of the mission.

Scalability: in some For wireless “infrastructure” networks scalability is simply handled by a hierarchical construction. The limited mobility of infrastructure networks can also be easily handled using Mobile IP or local handoff techniques. In contrast, because of the more extensive mobility and the lack of fixed references, pure ad hoc networks do not tolerate mobile IP or a fixed hierarchy structure. Thus, mobility, jointly with large scale is one of the most critical challenges in ad hoc design.

Security: the challenges of wireless security are well known - ability of the intruders to eavesdrop and jam/spoof the channel. A lot of the work done in general wireless infrastructure networks extends to the ad hoc domain. The ad hoc networks, however, are even more vulnerable to attacks than the infrastructure counterparts. Both active and passive attacks are possible. An active attacker tends to disrupt operations (say, an impostor posing as a legitimate node intercepts control and data packets; reintroduces bogus control packets; damages the routing tables beyond repair; unleashes denial of service attacks, etc.). Due to the complexity of the ad hoc network protocols these active attacks are by far more difficult to detect in ad hoc than infrastructure nets. Passive attacks are unique of ad hoc nets, and can be even more insidious than the active ones. The active attacker is eventually discovered and physically disabled/eliminated. The passive attacker is never discovered by the network. Defense from passive attacks require powerful novel encryption techniques coupled with careful network protocol designs.

III. CLASSIFICATION OF ROUTING PROTOCOLS

There are number of routing protocols currently available in ad hoc networks [6]. There is a need for a general technique to classify protocols available. Traditionally classification was done by dividing protocols to table driven and to source initiated. Table Driven routing protocols attempts to maintain consistent up to date routing information for each and every node in the network. These protocols require maintaining a consistent view. The areas in which they differ are the number of necessary routing related tables and the methods by which changes in network structure are broadcast.

A very different approach from table driven routing scheme is source initiated routing. This type of routing creates routes only when needed by the source node. When a node needs a route to a destination, it initiates a route discovery process with in the network. This process is completed once route is found or all possible route permutations has been established, it is maintained by a route maintenance procedure until either the destination becomes inaccessible along every path from the source or until the route is no longer required. This classification is based on to divide protocols according to following criteria, reflecting fundamental design and implementation choices.

- **Communication model.** What is the wireless communication model? Multi or single channel?
- **Structure.** Are all nodes treated uniformly? How are distinguished nodes selected? Is the addressing hierarchical or flat?
- **State Information.** Is network-scale topology information obtained at each node?
- **Scheduling.** Is route information continually maintained for each destination?

This model does not care for if a protocol is unicast, multicast or geocast. Also it does not deal with how links are measured. In order to overcome this, Finnish Defense force naval academy modified the model by introducing **Type cast** routing and **Cost function** routing.

There are no measures taken to classify the protocols according to power consumption and awareness in routing protocols. In order to overcome this, we add **power aware** routing to this model.

Communication Model: The routing protocols presently available can be categorized according to communication model to protocols that are designed for multi-channel or single channel. The example of multichannel protocol is clustered Gateway switched routing (CGSR). Single channel presumes one shared media to be used.

Structure: Routing protocols can be categorized according to structure as:

Uniform routing: In uniform routing, all nodes act in the same manner as that of other nodes. Sending and receiving messages are controlled in the same way by each and every node. No hierarchy is present in the network.

Non-Uniform routing: In this type, there is an effort for the limiting of routing complexity by reducing the number of nodes participating in routing computation.

State of Information: Protocols can be divided according to state of information obtained at each node as under:

Topology Based routing: This maintains a large scale topology information for each node participating in topology based protocols. The topology based protocols follow the basic principle of link state protocols.

Destination Based routing: This does not maintain large scale topology information but maintains topology information needed to know the nearest neighbors. i.e., Each node exchanges its distance estimates for all network nodes with each of its immediate neighbors.

IV. PROACTIVE ROUTING

Proactive protocols maintain unicast routes between all pairs of nodes regardless of whether all routes are actually used. Therefore, when the need arises (i.e., when a traffic source begins a session with a remote destination), the traffic source has a route readily available and does not have to incur any delay for route discovery. These protocols also can find optimal routes (shortest paths) given a model of link costs.

Routing protocols on the Internet (i.e., distance vector-based RIP and link state-based OSPF) fall under this category. However, these protocols are not directly suitable for resource-poor and mobile ad hoc networks because of their high overheads and/or somewhat poor convergence behavior. Therefore, several optimized variations of these protocols have been proposed for use in ad hoc networks. These protocols are broadly classified into the two traditional categories: distance vector and link state. In distance vector protocols, a node

exchanges with its neighbors a vector containing the current distance information to all known destinations; the distance information propagates across the network transitively and routes are computed in a distributed manner at each node. On the other hand, in link state protocols, each node disseminates the status of each of its outgoing links throughout the network (typically via flooding) in the form of link state updates. Each node locally computes routes in a decentralized manner using the complete topology information. In the rest of this section, we describe two protocols from each of these categories that have received wide attention.

V. DISTANCE VECTOR PROTOCOLS

Destination-Sequenced Distance-Vector (DSDV) [1] was one of the earliest protocols developed for ad hoc networks. Primary design goal of DSDV was to develop a protocol that preserves the simplicity of RIP, while guaranteeing loop freedom. It is well known that Distributed Bellman-Ford (DBF), the basic distance vector protocol, suffers from both short-term and long-term routing loops (the *counting-to-infinity* problem) and thus exhibits poor convergence in the presence of link failures. Note that RIP is DBF with the addition of two ad hoc techniques (split-horizon and poisoned-reverse) to prevent two hop loops.

The main idea in DSDV is the use of destination sequence numbers to achieve loop freedom without any inter-nodal coordination. Every node maintains a monotonically increasing sequence number for itself. It also maintains the highest known sequence number for each destination in the routing table (called “destination sequence numbers”). The distance/metric information for every destination, typically exchanged via routing updates among neighbors in distance-vector protocols, is tagged with the corresponding destination sequence number. These sequence numbers are used to determine the relative freshness of distance information generated by two nodes for the same destination (the node with a higher destination sequence number has the more recent information). Routing loops are prevented by maintaining an invariant that destination sequence numbers along any valid route monotonically increase toward the destination.

DSDV also uses triggered incremental routing updates between periodic full updates to quickly propagate information about route changes. In DSDV, like in DBF, a node may receive a route with a longer hop count earlier than the one with the smallest hop count. Therefore, always propagating distance information immediately upon change can trigger many updates that will ripple through the network, resulting in a huge overhead. So, DSDV estimates route settling time (time it takes to get the route with the shortest distance after getting the route with a higher distance) based on past history and uses it to avoid propagating every improvement in distance information.

Wireless Routing Protocol (WRP) [2] is another distance vector protocol optimized for ad hoc networks. WRP belongs to a class of distance vector protocols called path finding algorithms. The algorithms of this class use the next hop and second-to-last hop information to overcome the counting-to-infinity problem; this information is sufficient to locally determine the shortest path spanning tree at each node. In these algorithms, every node is updated with the shortest path spanning tree of each of its neighbors. Each node uses the cost of its adjacent links along with shortest path trees reported by neighbors to update its own shortest path tree; the node reports changes to its own shortest path tree to all the neighbors in the form of updates containing distance and second-to-last hop information to each destination.

Path finding algorithms originally proposed for the Internet suffer from temporary routing loops even though they prevent the counting-to-infinity problem. This happens because these algorithms fail to recognize that updates received from different neighbors may not agree on the second-to-last hop to a destination. WRP

improves on the earlier algorithms by verifying the consistency of second-to-last hop reported by all neighbors. With this mechanism, WRP reduces the possibility of temporary routing loops, which in turn results in faster convergence time. One major drawback of WRP is its requirement for reliable and ordered delivery of routing messages.

VI. LINK STATE PROTOCOLS

Optimized Link State Routing (OLSR) [3] is an optimized version of traditional link state protocol such as OSPF. It uses the concept of Multipoint Relays (MPRs), discussed in the previous section, to efficiently disseminate link state updates across the network. Only the nodes selected as MPRs by some node are allowed to generate link state updates. Moreover, link state updates contain only the links between MPR nodes and their MPR-Selectors in order to keep the update size small. Thus, only partial topology information is made available at each node. However, this information is sufficient for each to locally compute shortest hop path to every other node because at least one such path consists of only MPR nodes.

OLSR uses only periodic updates for link state dissemination. Since the total overhead is then determined by the product of number of nodes generating the updates, number of nodes forwarding each update and the size of each update, OLSR reduces the overhead compared to a base link state protocol when the network is dense. For a sparse network, OLSR degenerates to traditional link state protocol. Finally, using only periodic updates makes the choice of update interval critical in reacting to topology changes.

Topology Broadcast based on Reverse-Path Forwarding (TBRPF) [4] is a partial topology link state protocol where each node has only partial view of the whole network topology, but sufficient to compute a shortest path source spanning tree rooted at the node. When a node obtains source trees maintained at neighboring nodes, it can update its own shortest path tree. This idea is somewhat similar to that in path finding algorithms such as WRP discussed above. TBRPF exploits an additional fact that shortest path trees reported by neighbors can have a large overlap. A node can still compute its shortest path tree even if it receives partial trees from each of its neighbors as long as they minimally overlap. Thus, every node reports only a part of its source tree (called Reported Tree (RT)) to all neighbors in an attempt to reduce the size of topology updates. A node uses periodic topology updates to inform its complete RT to all neighbors at longer intervals, while it uses differential updates to inform them about the changes to its RT more frequently.

In order to compute RT, a node X first determines a Reported Node (RN) set. RN contains itself (node X) and each neighbor Y for which X is on the shortest path to Y from another neighbor. RN so computed contains X and a subset (possibly empty) of its neighbors. For each neighbor Y included in RN, X acts as a forwarding node for data destined to Y . Finally, X also includes in RN all nodes which can be reached by a shortest path via one of its neighbors already in RN. Once X completes computing RN as stated above, the set of all links (u,v) such that $u \in$ RN constitute the RT of X . Note that RT only specifies the minimum amount of topology that a node must report to its neighbors. To obtain some redundancy in the topology maintained at each node (e.g., a sub graph more connected than a tree), nodes can report more topology than RT.

TBRPF also employs an efficient neighbor discovery mechanism using differential hellos for nodes to determine their bidirectional neighbors. This mechanism reduces the size of hello messages by avoiding the need to include every neighbor in each hello message.

VII. CONCLUSION

Among the proactive protocols we have discussed, DSDV seems to suffer from poor responsiveness to topology changes and slow convergence to optimal paths. This is mainly because of the transitive nature of topology updates in distance vector protocols. Simulation results [5] [26] also confirm this behavior. Although reducing the update intervals appears to improve its responsiveness, it might also proportionately increase the overhead leading to congestion. WRP, the other distance vector protocol we have discussed, assumes reliable and in order delivery of routing control packets which is an unreasonable requirement in error-prone wireless networks. The performance of the protocol when this assumption does not hold is unclear. As far as the two link state protocols — OLSR and TBRPF — are concerned, both of them share some features such as being partial topology protocols. However, the details of the protocols are quite different. Whereas OLSR is more like a traditional link state protocol with optimizations to reduce overhead in ad hoc networks, TBRPF is a link state variant based on tree sharing concept. TBRPF also has one desirable feature of using frequent incremental updates in addition to periodic, less frequent full updates. This feature will likely improve responsiveness to topology changes. OLSR, on the other hand, relies solely on periodic full updates. Although in our knowledge there is no comprehensive study focusing on relative performance of OLSR and TBRPF, they expected to show comparable performance (and likely better than their distance vector counterparts).

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INFLUENCE OF JINONG (ORGANIC LIQUID FERTILIZER) ON SEEDLING GERMINATION AND GROWTH AND ITS COMPARISON WITH BIO-FERTILIZER ON YIELD OF BREAD WHEAT (TRITICUM AESTIVUM L.)

Kowsar Jan¹, M.V.Boswal²

^{1,2} Department of Botany Christ Church College, C.S.J.M. University, Kanpur (INDIA)

ABSTRACT

In the experiment performed during Nov. 2009 to April 2011 at Christ Church College, Kanpur on influence of Jinong [Organic liquid fertilizer whose main constituent is humic acid] on seedling germination and growth and its comparison with Bio-fertilizer (Azotobacter sps.) and farmyard manure alone or in combination on yield of Bread Wheat [triticum aestivum L].variety [(K-9107 (Deva)]: The treatments of Jinong except 0.5% promoted germination percentage in Triticum aestivum L. The effect in increasing germination was observed with 0.2% Jinong. All treatments except 0.5% Jinong increase shoot length ,root length,lateral root number and dry weight of seedling the increase was maximum with 0.2% Jinong as compared to control. Based on experiments on seedling growth 0.2% Jinong and 0.3% Jinong gave better result these were used for combined treatments with Bio-fertilizer / farmyard manure. the new humic acid containing organic fertilizer Jinong was far more effective than Bio-fertilizer and Farmyard manure applied alone or in combination in enhancement of grain number on main shoot, grain number / plant, grain weight of 100 seeds, grain weight / plant, straw weight / plant and harvest index. Among all applications 0.2% Jinong + Farmyard induced the best effects. When combination of Bio-fertilizer, Jinong and Farmyard manure were applied together there was a tremendous fall in the values of yield

Keywords: Biofertilizer (Azotobacter Sps.), Farmyard Manure, Jinong, Organic Liquid Fertilizer Triticum Aestivum L.

I. INTRODUCTION

Wheat cereal grass of the genus *Triticum*, family Poaceae is one of the oldest and most important of cereal crops. Globally wheat is the leading source of vegetable protein in human food, having a higher protein content than either maize or rice. Wheat grain is a staple food used to make flour for bread, biscuits, cookies, cakes, pasta, noodles and for fermentation to make beer other alcoholic beverages (Neill, 2002) [1] or biofuel (Department of Agriculture Appropriations, 1957). Wheat is planted for use as forage for livestock. Its straw can be used as construction material for roofing thatch (Bridgwater and Aldrich, 1966).[2] The embryo is rich in carbohydrate, Ca, Fe, K, P, Zn. An increasing realization in human population all over the world, the need of consumption of wheat after rice has importance. To meet out the requirement effort is being made of how to increase crop productivity per unit area, per unit time so that demand of its supply be increased. Increasing

wheat production is an essential global and national target to fill the gap between production and consumption.

In a bid to increase food crop excessive farming is done. Fertility of soils has been declining due to extensive use of land and chemical fertilizers in quest of producing more food for ever increasing population. The organic content of most soils is below the critical level. Extensive use of chemical fertilizers has been inflicting adverse effect on the environment causing pollution and damaging beneficial soil flora and fauna, causing erosion and lower crop quality (Kumar *et al.*, 2001) [3]. Experiencing the adverse effects of synthetic input dependent agriculture the concept of organic agriculture is gaining momentum. Almost 31 million hectares of land are currently managed organically and constitute 0.7% of agricultural land. Of the total cultivable area in India 70% of the land which is mainly rainfed, a very negligible amount of chemical fertilizer is being used. Farmers in these areas often use organic manures.

India has tremendous potential to grow crops organically (Maity *et al.*, 2004) [4]. Application of organic manures or biofertilizers is the only option to improve soil organic carbon for sustenance of soil quality and future agricultural productivity (Ramesh, 2008) [5].

Jinong, recommended by China Green Food Development Center, Under the Agricultural Ministry, Govt. of China (www.cfcl_india.com/jinong-haolf.html) is an organic liquid fertilizer, whose main constituent is humic acid {65.54 g/l} Humic acid fertilizer is the essence of farm manure, its effect on increasing crop yield is more significant than chemical fertilizer and manure. It has been further observed that the NPK(20.58 g/l of N; 23.69 g/l of P; 21.67 g/l of K) and trace elements(2.03 g/l of Cu + Fe + Zn + Mo + Mn + B) present along with humic acid in Jinong are ideal for any plant growth. The humic substance have multiple effects (Sangeetha *et al.*, 2006) [6]. It may have direct and indirect effects on plant growth (Chen and Aviad, 1990) [7]. Indirect effects involve improvement of soil properties such as aggregation, aeration, permeability, water holding capacity, micronutrient transport and availability. Direct effects are those which require uptake of humic substance into the plant tissue resulting in various biochemical effects (Chen and Aviad, 1990) [7]. Consequently the use of humic substance has often been proposed as a method to improve crop food (Adani *et al.* 1998) [8]. Singer *et al.* (1998) [9] found that application of Delta mix (a fertilizer containing humic acid substance with micronutrients B, Zn, S, Mn, Fe and Cu) enhanced the growth with food quality of common bean.. The micronutrients thus, made available to plants play an important role in increasing crop yield and straw yield in wheat (Asad and Rafique 2000 [10]; Hussain *et al.*, 2002) [11].

Sharif *et al.* (2002) [12] found the addition of 0.5 – 1.0 kg/ha humic acid resulted in increased wheat grain yield by 25-69% over control. It was observed that pretreatment of seeds + foliar sprays of humic acid increased yield and yield components in *Phaseolus vulgaris* L. as also observed with humic acid containing Jinong in the present study. Delfine *et al.*, 2005[13] has concluded that humic acid as foliar sprays enhanced yield and growth in plants. For yield parameters grain number on main shoot, grain number / plant, dry weight of 100 seeds, dry grain weight / plant, straw weight and harvest index can be studied.

the objectives of this Study Was To determine the the variability effects of organic liquid fertilizer on wheat plant variety and to compare the effect of Biofertilizer used (*Azotobacter* *sps.*) with organic fertilizers including the newly marketed humic acid containing liquid organic fertilizer – Jinong on wheat yield.The goal was to minimizes the use of chemical fertilizers . Therefore in order to make agriculture sustainable, it is necessary to implement a balanced and responsible use of organic agriculture

II. MATERIALS AND METHODS

The seeds of *Triticum aestivum* L. var. K-9107 (Deva) were obtained from Chandra Shekhar Azad University of Agriculture and Technology, Kanpur.

2.1 Preparation of Biofertilizer

The Biofertilizer (*Azotobacter sp*) in packets of 200 g each were bought from the Microbiology Dept. of C.S.A. University, Kanpur.

2.2 Preparation of Farmyard Manure

Farmyard manure was bought from the local market.

2.3 Preparation of Solutions of Jinong

Jinong also called Zinong is an organic liquid fertilizer, manufactured by Yangling Techteam Jinong Humic Acid Products Co., Ltd. China was obtained from dealers of Elegant Fashion Fiber Chemicals Ltd.

For preparation of the experimental chemicals 0.5, 1.0, 2.0, 3.0, 4.0 and 5.0 c.c. Jinong was taken and made to 100 c.c. with distilled water in clean measuring flask and continued to 1000 ml for 0.5%, 0.1%, 0.2%, 0.3%, 0.4% and 0.5% solutions.

In order to find the most suitable concentration of Jinong i.e 0.05%, 0.1%, 0.2%, 0.3%, 0.4%, and 0.5% preliminary experiments were conducted under controlled laboratory conditions in the Department of Botany, Christ Church College. The experiments on seed germination and seedling growth were conducted by Garrad's Technique (1954) [14] in test tube. For Garrad's technique seeds were placed in test tubes between blotting paper and wall of the tubes. The level of water and experimental solutions of 0.05%, 0.1%, 0.2%, 0.3%, 0.4%, 0.5% Jinong were made upto the marked level every alternate day

2.4 Treatment of Biofertilizer

The Biofertilizer *Azotobacter* was applied as soil treatment. For this soil was mixed with *Azotobacter* powder as 50 mg for 10 kg soil as recommended. In preliminary experiments soils treatment and seed treatment were compared. For seed treatment two kg wheat grains were treated in a mixture of 40 g *Azotobacter* + 10 g Jaggery. However, soil treatment being more effective this was chosen as mode of application in the present study

2.5 Treatment of Farmyard manure

Two handful of manure was added per pot wherever it was considered as application.

2.6 Treatment of Jinong

Based on preliminary experiments and experiments on seedling growth 0.2% Jinong and 0.3% Jinong were applied alone or in combinations at soaking seed stage and three sprays at intervals of 14 days, the first spray being 20 DAS (days after sowing). (since 0.2% Jinong gave better result it was used for combined treatments with Biofertilizer / farmyard manure

2.7 Spraying of Experimental Jinong Solutions

Solutions were prepared as mentioned earlier. A few drops of teepol were added as wetting agent in each solution, followed by vigorous shaking. The solutions thus prepared were thoroughly sprayed on the plants with the help of a 600 ml hand sprayer. The spraying machine was thoroughly cleaned, rinsed several times with the solution intended to be sprayed next to avoid any admixture of the experimental solution.

The first treatment was done by seed soaking in the respective solutions. This was followed by the first spray 20 DAS. Two more sprays of the respective solutions were made at intervals of 14 days. Control plants were sprayed with distilled water having few drops of teepol. Plants in each pot (5 sample) were drenched with approx. 100 c.c. of solution, remaining falling to the soil.

2.8 Ten treatments were applied as follows:

1.	Control	6.	FYM
2.	Biofertilizer	7.	Biofertilizer + FYM
3.	0.2% Jinong	8.	0.2% Jinong + FYM
4.	0.3% Jinong	9.	0.3% Jinong + FYM
5.	Biofertilizer + 0.2% Jinong	10.	Biofertilizer + 0.2% J + FYM

2.9 Experimental Layout

For all experiments, earthenware pots (9") were arranged in randomized block design, having three blocks of two rows each. Two pots were randomly selected in each block for each treatment. Each pot had 5 plants growing in them. Two plants in each pot were tagged for regular observations.

III. RESULTS AND DISCUSSION

3.1 Germination Percentage

The treatments of Jinong (Table A) except 0.5% promoted germination percentage in *Triticum aestivum* L. The effect in increasing germination was observed with 0.2%. Jinong where the value was 98.33 percentage. However, 0.5% Jinong decreased germination percentage to 42.33.

3.2 Shoot Length

All treatments except 0.5% Jinong increase shoot length (Table A). The increase was maximum (16.33 cm) with 0.2% Jinong as compared to 11.16 cm in the control. With increase in concentration there was a decrease in shoot length and it was 10.16 cm (lesser than control) with 0.5% Jinong.

3.3 Root Length

Treatments of Jinong increased root length except with 0.5% concentration as compared to 10.67 cm in the control (Table B) the increase in length did not show any particular trend. It was 11.12 cm with 0.05%, 14.54 cm with 0.1%, 13.60 cm with 0.2%, 14.40 cm with 0.3%, 11.97 cm with 0.4% Jinong. However, with 0.5% concentration the root length decreased to 8.75 cm.

3.4 Lateral Root Number

Lateral root number increased with all treatments (Table B) except 0.5% Jinong as compared to 3.67 in the control. The root number was best (4.33) with 0.2% and 0.3% Jinong. Treatment of 0.1% and 0.4% induced less increase in lateral root number and it was 4.00.

3.5 Dry Weight of Seedlings

The dry weight of seedlings also increased with all treatments of Jinong except 0.05%, 0.4% and 0.5% concentrations (Table B). The increase was maximum 0.07 mg with 0.2% Jinong. With increase in dose to 0.3%, 0.4% promotion in seedling weight was lesser and was 0.06 and 0.04 mg. However, with 0.5% there was a decrease in dry weight to 0.2 mg as compared to 0.04 mg in the control Enhancement of grain number (Chart D) on main shoot, grain number / plant, grain weight of 100 seeds, grain weight / plant, straw weight / plant and

harvest index was also increased with the use of biofertilizer. The increase over control was 7.48%, 49.55%, 11.30%, 25.79%, 19.57% and 3.97%, respectively. Addition of Jinong to Biofertilizer improved the values and were 11.90%, 78.34%, 12.65%, 42.02%, 23.62% and 11.12%, respectively. Addition of Farmyard manure to Biofertilizer was less effective combination than Bf + 0.2% J and the readings were 9.50%, 54.66%, 13.92%, 35.36%, 12.93% and 14.66%, respectively.

When combination of Biofertilizer, Jinong and Farmyard manure were applied together there was a tremendous fall in the values and was 6.14%, 24.39%, 7.59%, 9.27%, 14.91% and -3.79%, respectively.

Astonishingly 0.2% Jinong, the newly available liquid organic fertilizer mainly containing humic acid applied alone was more effective than Biofertilizer. The percentage increase here was 14.70%, 87.40%, 18.99%, 54.78%, 25.86% and 16.84%, respectively.

Addition of Farmyard manure to this organic fertilizer further enhanced the values to maximum of 18.97%, 150.06%, 22.78%, 101.15%, 35.69% and 33.51%, respectively.

The benefits of humic substances are reflected in improved seed germination, root growth, uptake of minerals in plants and other physiological effects on plant growth and thus improve crop production (Adani *et al.*, 1998).

Literature supports increased growth parameters, yield and yield parameters in crops with Biofertilizers and organic fertilizers and even humic acid. However, there is a report on increased growth and yield in corn with the new humic acid containing product Jinong (Zeng and Luo, 2011) [15]. Sharif *et al.*, 2002 [12] found that addition of 0.5 to 1.0 kg / ha humic acid resulted in increased wheat grain yield by 25-69% over control. It was observed that pretreatment of seeds + foliar sprays of humic acid increased yield and yield components in *Phaseolus vulgaris* L. as also observed with humic acid containing Jinong in the present study. Delfine *et al.*, 2005[13] has concluded that humic acid as foliar sprays enhanced yield and growth in plants. The increase in growth with Jinong can be attributed to be due to presence humic acid which is the major component in addition to small proportions of macro and micronutrients especially Zn and Fe. Moreover wheat is rich in phytic acid and phenolic compounds that reduce biological availability of Zn and Fe in the human digestive tract (Welch and Graham, 2004) [16]. So sufficient amount of Fe and Zn should be available in the crops to overcome this problem. Therefore, the Fe and Zn content in grains of wheat due to treatments of Biofertilizer and especially Jinong can be considered a beneficial effect.

Humic acid are reported to enhance growth, drought tolerance, seed germination and overall performance (Chen and Aviad, 1990 [7]; Zhang *et al.*, 2003[17] as also observed in the present study.

IV. TABLE A EFFECT OF JINONG ON GERMINATION AND SHOOT LENGTH OF SEEDLINGS OF *TRITICUM AESTIVUM* L.

S.No.	Treatment	% of Germination		Shoot length (cm)	
	Control	83.33		11.16	
1	0.05% J	84.66	(1.60)	12.20	(9.32)
2	0.1% J	91.66	(9.99)	13.90	(24.55)
3	0.2% J	98.33	(18.00)	16.33	(46.32)
4	0.3% J	96.66	(15.99)	15.40	(37.99)
5	0.4% J	86.66	(3.99)	15.16	(35.84)
6	0.5% J	42.33	(-49.20)	10.16	(-8.96)

Data in parenthesis is % increase over control.

Table B Effect of Jinong on Root Length, Lateral Root Number, Seedling Dry Weight of Triticum Aestivum L

S.No.	Treatment	Root length (cm)	Lateral root number	Dry weight of seedling (mg)
	Control	10.67	3.67	0.04
1	0.05% J	11.12 (4.22)	3.78 (3.00)	0.04 (0.00)
2	0.1% J	14.54 (36.26)	4.00 (8.99)	0.05 (25.00)
3	0.2% J	13.60 (27.46)	4.33 (17.98)	0.07 (75.00)
4	0.3% J	14.40 (34.95)	4.33 (17.98)	0.06 (50.00)
5	0.4% J	11.97 (12.18)	4.00 (8.99)	0.04 (0.00)
6	0.5% J	8.75 (-17.99)	2.33 (-36.51)	0.02 (-50.00)

Data in parenthesis is % increase over control.

D: Comparative Effect Of Organic Fertilizers With Biofertilizer On Yield Parameters As Compared To Control.

Parameters	Control	Treatments								
		BF	0.2% J	0.3%J	BF + 0.2% J	FYM	BF + F	0.2% J + F	0.3% J + F	BF + J + F
Grain no. on main shoot	27.67	7.48	14.70	10.22	11.90	7.48	9.50	18.97	12.03	6.14
Grain no. / plant	78.30	49.55	87.40	68.25	78.34	24.06	54.66	150.06	103.57	24.39
Grain weight of 100 seeds (g)	1.58	11.30	18.99	12.66	12.65	8.86	13.92	22.78	15.19	7.59
Grain weight / plant (g)	3.45	25.79	54.78	41.15	42.02	38.26	35.36	101.15	46.67	9.27
Straw weight (g)	11.60	19.57	25.86	31.38	23.62	27.07	12.93	35.69	42.24	14.91
Harvest index	22.92	3.97	16.84	5.67	11.12	6.63	14.66	33.51	2.40	-3.79

Data shows % increase over control

V. CONCLUSION

The present study performed during Nov. 2009 to April 2011 at Christ Church College, Kanpur, was spread over investigation concerned with the influence of organic fertilizer and to compare it with biofertilizer fertilizers on yield of wheat *Triticum aestivum* L. [(K-9107 (Deva)] to minimize the use of chemical fertilizers, in order to make agriculture sustainable, Humic acid containing Jinong which is new to the market should be promoted and further research on this be encouraged. The present investigation will be of applied significance to growers of commercial crop of *Triticum aestivum* L.

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ADVANCED MANUFACTURING TECHNOLOGY IMPLEMENTATION IN SMALL SCALE MANUFACTURING INDUSTRIES

Ashish Mathew¹, Dr. Ashish Dutt Sharma²

¹Department of Mechanical Engineering, Ph.D. Scholar, Shri. JJT University, Vidyanagari,
Jhunjhunu, Rajasthan, (India)

²BE, M.Tech Scholar, Ph.D. (MNIT), Director G.I.E.T., Kota, Rajasthan, (India)

ABSTRACT

This research paper explains an in depth body of literature to inquire in to the factors effective on performance of firms implementing Advanced manufacturing technology (AMT).The aim of this analysis is to supply a comprehensive viewpoint of problems associated with roaring implementation of AMT and supply some directions to managers and investigators to create a corporation well-prepared to just accept new technological advancements. The factors are classified in to three classes technological, structural, internal or outside factors. A spread of pressures either domestically or globally encourage makers to become additional agile, responsive and versatile within the event that they wanted to survive .The literature showed that so as to own a fruitful result from AMT investment, the structure, culture, operational strategy and human resource got to be organized and integrated fittingly with one another to stay faraway from probable barriers or problems. Corporations that operate in developing AMT, fresh industrialized countries face lots of uncertainties once venturing in to the fashionable world markets [4]. Planned framework will be used as a suggestion for managers and investors in lifting up their AMT implementation system therefore, it absolutely was important for manufactures to own the flexibility to contend owing to the globalization altogether aspects of product producing like product variations, labor, market experience etc [9]. These enclosed massively enlarged competition and globalization of production process they served to position stress on a good set of value factors like style, product innovation frequency, and customization and delivery responsiveness [7].

The rise in each handiness and vary of AMT alternative disclose major opportunities not just for up substitution innovation however conjointly for radical alternatives. These opportunities have not been done before and do in ways in which weren't attainable past [15]. Changes in communication and interaction associated with AMT implementation are shown to end in larger satisfaction with the technology and AMT adoptions seem to be a key condition for long run aggressiveness. However, several AMT comes fail to fulfill the expectations of their adopters [11] and increasing signs of issue began to emerge that steered that the interpretation of potential advantages into real competitive advantage wasn't continually as straightforward as language a check for a brand new piece of equipment. In several cases not solely AMT investments are criticized for not yielding the specified results, however conjointly some researchers found a negative contribution of AMTs to the firm performance [2]. The researchers finished that the link between AMTs and firm performance contains a advanced relationship [28] and therefore the link is influenced by alternative factors, some governable and a few not governable.

These conditions give nice challenges to companies, which may have an effect on company strategic directions and alter business and producing ways. In an endeavor to survive underneath such conditions, firms area unit giving a strategic role to producing, from merely supporting promoting ways to taking part in a serious role in strengthening a company's market position [8]. The effective implementation of advanced producing technology is taken into account to beat this turbulent and hostile atmosphere. This feature is a very important resolution particularly for little and medium size firms [19] within which lack body and inadequate level of mean staff and engineers and don't seem to be attentive to the ways that within which AMT may be useful for them.

Thus, applying and adopting new technologies indicated that their area unit broader problems that ought to be thought-about. Management of companies that area unit considering the adoption of AMT got to acknowledge, perceive and address these problems so as to beat or circumvent the issues of previous installations. They need knowing what the structure and strategic factors area unit that create a firm additional competitive and adaptation victimization AMT in rising its performance and whether or not AMT's impact on company performance additional pronounced if related to a compatible structure style and human force and management practices. Attributable to high price and moderate-to high risk concerned in AMT investment, it's therefore vital for any organization to understand additional regarding these factors. Generally, the investigated factors may be classified as technological, structure and internal/external. This classification is illustrated in Fig. 1.

This study may be a step in paving the thanks to give an summary and steering in AMT adoption and also the correct mix of strategic and vital components that results in effective use of AMT in enhancing company performance.

Keywords: *Advanced Manufacturing Technology (AMT), Computer Integrated Manufacturing (CIM), Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Aided Engineering (CAE), Computer Aided Process Planning (CAPP), Computerized Numerical Controls (CNCS).*

I. INTRODUCTION

In finding out AMT implications, the selection of AMT varieties and also their classification may be a call of crucial importance that ought to be created on the idea of existing theory and the nature of the analysis study to be conducted. Advanced manufacturing technology has totally different meanings in several things, however it is generally outlined as an automatic production system of individuals, machines and tools for the design and management of the assembly method, together with the acquisition of raw materials, parts, and also the cargo and repair of finished products [15]. Additional specifically, AMT is represented as a gaggle of computer-based technologies, together with Computer-Aided Design (CAD), robotics, Flexible Manufacturing Systems (FMS), Automated Materials Handling Systems (AMHS), Computer Numerically Controlled (CNC) machine or other automated identification techniques [25].

It is outlined advanced producing technology as a group of integrated hardware and software package based mostly technologies[27], that if properly enforced, controlled and evaluated, can improve the potency and effectiveness of the firm[2], used the term advanced manufacturing technology in their analysis to explain a range of technologies like CAD and Electronic Data Interchange (EDI) that primarily utilize computers to

regulate, track, or monitor producing activities, either directly or indirectly. Additionally, many technologies or programs like bar codes or cluster technology that don't directly involve computers are thought of to be AMTs since they're closely related to alternative AMT technologies. AMT has been classified in several ways that supported the automation and integration of producing activities



Fig. 1: Contextual Factors Effective On Company Performance

1.1 Levels of Manufacturing Activities

First level includes numerically controlled machine and robots referred to as complete machine tools or equipments that area unit controlled by self-contained computers. In level a pair of or producing cells a clustering of machines like group technology and versatile producing system perform a spread of tasks to supply a family of elements. In level three cells in level a pair of area unit connected to create connected islands through network of processed data like computer-aided design/computer-aided producing, automatic storage and retrieval systems. In level four all the producing activities as well as promoting of product area unit integrated through data network and shaped computer-integrated producing [12].

It is classified advanced technologies in the study by correlation analysis in two levels: initial level is Basic technology as well as software [28], Computer-aided manufacturing (CAM) and Direct numerical management. Next level is computer science or complicated technologies comprising vision systems, knowledge-based systems and decision-support systems [27]. Additionally classified AMTs as style technologies, like CAD and CAE that support product style and engineering; producing technologies, like CNC, CAM and AMHS that create production easier and faster; coming up with and management activities area unit expedited by the event of MRP, MRP II, electronic knowledge interchange and bar secret writing and Integration technologies like international intelligence agency, local area network (LAN) and enterprise-wide resource coming up with that permit a flow of knowledge and coordinated decision-making between functions among and between the corporations. Small and Chen [25] and Zhao [29] classified AMT into 3 levels supported quality, automation and integration of producing activities.

1.2 Classification of AMT Levels

Stand-alone systems include machine tools or equipment controlled by independent computers such as (computer-aided design and computer-aided process planning (CAPP) Intermediate systems contain a group of

machines to produce a family of parts such as (automated guided vehicles (AGVS) and automated storage and retrieval systems (AS/RS) and Integrated systems which are connected to form linked islands through computerized information network[1], for example (flexible manufacturing systems and MRP). In summary, Table 1 presents the classifications found in the literature.

It is affordable to state that almost all technological advancements that have modified the character of producing performance have taken place since 1950[4]. AMTs modify each economies of scale and economies of scope to be achieved while not dynamic the hardware and permit corporations to mix small-batch and custom-order operations with the inexpensive potency of standardized production [6]. The most important strategic advantages that these technologies supply area unit the hyperbolic flexibility and responsiveness, enabling a company to boost considerably its aggressiveness within the marketplace [2]. AMT has been viewed as a strategic weapon to realize competitive advantage, to boost productivity and performance, to boost quality of production [7] and reduce lead-time [3]. In result AMT changes the external risk propensity of the firm from risk-averse to risk-prone. That is, corporations victimization AMT in observes produce a series of decision choices to enter new markets and industries within the future [9]. It additionally was mentioned that even the advantages of advanced techniques like Just-In-Time are often complete with applying solely a couple of part of JIT and as a result corporations will bit by bit invest in these technologies to urge the foremost have the benefit of it [5].

Table 1: Advanced Manufacturing Technology Classification

Resource(s)	Dimensions
Boyer <i>et al.</i> (1996), Jonsson (2000), D'jaz <i>et al.</i> (2003) (Swamidass and Kotha, 1998)	Design, Manufacturing, and administrative Information exchange and planning technology, Production design technology, High-volume automation technology, and low-volume flexible automation technology
Small and Chen (1997) Small and Yasin (1997a, b) Sanchez (1996), Beaumont <i>et al.</i> (2002) Meredith (1987) Ghani and Jayabalan (2000), Ghani <i>et al.</i> (2002) Majchrzak and Paris (1995) Kotha (1991), Kotha and Swamidass (2000)	Stand-alone, Intermediate, and integrated systems Direct, indirect, and administrative Engineering techniques, manufacturing techniques, business techniques Stand-alone, manufacturing cells, linked islands, integrated manufacturing Integrated AMT , Non-integrated AMT Product design technologies, process technologies, logistics/planning technologies, information exchange technologies
Beaumont and Schroder (1997) Zhang <i>et al.</i> (2006) Waldeck (2007) Small (2006) Burgess and Gules (1998)	Direct, indirect, communication Design technologies, manufacturing technologies, planning and control, integration technologies Basic technology, artificial intelligence Stand-alone, moderate, and high complexity Hard technologies, soft technologies

Certainly, it takes some time for plants to realize the potential benefits of an AMT investment. It can be because of the learning curve associated with these technologies that may delay performance gains. As a fairly complicated technology, employees need extensive training and experience to master for new technologies. Therefore, time may act as a confounding variable in obtaining AMT benefits [10].

II. OVERVIEW

Successful implementation of AMT involves the mutual adaptation of each the new technology to the organization and also the organization to the technology [21]. In truth the adjustment of technology to the organization and the other way around will ease the accomplishment of latest technologies and avoid

management issues related to AMTs [27]. This importance embraces structure, culture and strategy of any organization.

2.1 Organizational Structure

It has been argued that producing corporations that adopt AMTs while not initial redesigning structure structures and processes, encountering high difficulties. Beside AMTs emergence, industrial organizations have deeply modified their producing processes through the acquisition of processed technologies. This evolvement is often viewed because the basis for a brand new industrial revolution-the arrival of the mill of the future- and new type of structure [20]. Generally, structure of a company is that the formal system of operating relationships that share and harmonize the tasks of multiple folks and teams to serve a typical purpose. Centralization, systematization and complexness are the 3 dimensions typically use in analysis and observe to explain structure. Centralization within the organization refers to the delegation of power among the roles. The less power delegated in a company the larger the centralization within the organization and contrariwise. Systematization refers to the extent to that expectations relating to the aims and objectives of labor are given and written. Extremely formalized organization structures suggest what every individual ought to act supported rules and procedures that are gettable. Last dimension, Complexity, refers to variety the amount, the quantity of clearly totally different job titles or activity groupings and also the number of positively dissimilar units/departments, in an exceedingly organization [19].

The structure of the organization has been thought of because the key issue to with success implementing AMT in varied literatures [21]. It's theorized that the right structure is in this situation, an organization are going to be additional thriving in implementing advanced producing technologies [17]. Boyer [2] expressed that the multiple levels of authority involved graded organizations typically represent AN obstacle to the effective implementation of AMTs and streamlining the organization with fewer level of authority brings a larger ability to integrate AMT. They all over that rigid, official structure that has been related to extremely machine-controlled, however non-computerized producing systems like assembly lines, isn't acceptable for additional versatile technologies. It conjointly indicated that solely decentralization with fewer rules and additional worker involvement were completely related to technology whereas systematization and mechanistic structure interacted negatively with AMT. The results of this study emphasized that no matter the technology sort, a firm has to be as least mechanistic as doable to be effective. In examining the link between structure and AMT Ghani [8] found that, at high proactive level, the mechanistic structure of AMT plants has been found to vary into a body. If truth be told organizations with many alternative forms of jobs and departments generate additional difficult social control and structure issues than those with fewer jobs and units. Flatter, less complicated structures with most body decentralization, are additional doubtless toward making a possible for improved attitudes, simpler management, larger individual responsibility and company performance.

2.2 Organizational Culture

Successful implementation of AMT typically needs dissimilar forms of organization and or management practices than area unit found in additional ancient environments [14]. This is often as a result of new technologies directly challenge established norms and strategic choices. Structure culture named a holistic construct that describes the complicated set of information structures that organization members use to perform

tasks and generate social behavior. This construct is full of and impacts several aspects of organization like structure, role expectations and description. Culture defines the way to act on the duty, that makes call in numerous things and the way to assume and behave toward coworkers, supervisors, trade norms and practices. This read of culture includes the organization's internal system of power together with formal authority structures, management systems, task structures and organization rules [1]. In different word, culture is to the organization what temperament is to the individual, a hidden, however unifying topic that has that means, direction and mobilization [13].

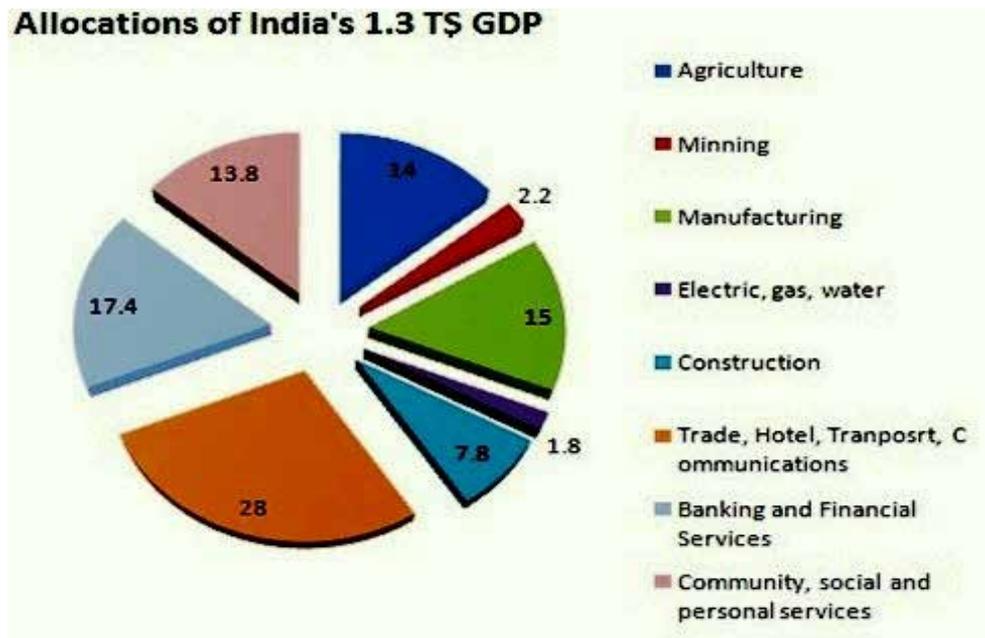


Fig 2 Overview of Manufacturing in India

Generally the culture was image into two main dimensions as flexibility and management [8]. Flexibility-oriented culture is predicated on norms and values associated with the affiliation. It focuses on the event of human resources and values member involvement in deciding. During this culture, people area unit inspired by the many or ideological attractiveness of the task being undertaken. On the opposite hand, control-oriented culture is penetrated by assumptions of accomplishment like coming up with, productivity and potency. a lot of specifically, assumptions of stability area unit the muse of this culture and people relevance the structure mandates as a result of roles area unit formally declared and implemented through rules and laws.

Regarding to the result of culture on company performance, swamidass [31] hypothesized that the control-oriented approach may perhaps cause exaggerated productivity, however will hinder AMTs implementation, as a result of centralization of responsibilities diminishes opportunities for structure learning, which, in turn, will build a lot of difficulties to urge AMT up and running dependably. They complete that flexibility-oriented values can gain AMTs' productivity and adaptability advantages. McDermott and Stock [15] examined however structure culture is said to outcomes related to advance producing technology implementation, such as, operational advantages, structure or social control advantages, competitive advantages and satisfaction. They found that implementation effects that will take longer to happen, like overall satisfaction or competitive performance, did depend upon the cultural flexibility. Chan [5] tried to seek out the connection between structure culture and sure-fire implementation of AMTs in Taiwan. Analysis showed that the control-oriented culture did end in reduced AMT implementation success whereas smart internal method, rational goals and

horizontal coordination have positive result. Results incontestable that firms with a history of sure-fire AMT implementation most well-liked a flexibility-oriented culture during a lot of contributing surroundings to ease the AMT implementation Yusuff [30].

2.3 Operational / Manufacturing Strategy

Basically, the importance of producing strategy to the success of the corporation has received goodly attention as Skinner printed his landmark article in 1969, manufacturing-missing link in company strategy [7]. in keeping with the new approach to producing strategy, managers ought to deem investments a lot of in their capability to make new capabilities that give enduring sources of competitive advantage and are sometimes engineered over time through a series of investments in facilities, human capital and information. the first approach to producing strategy led high managers to focus their firms operations around specific competitive priorities that cared-for create them at risk of strategic shifts. a decent producing strategy was one that defended a company's position through a narrowly centered set of capabilities [11]. In different words, strategy was denoted as actions or patterns of actions meant for the accomplishment of goals. The term strategy covers quite simply meant or planned strategy in associate structure setting; it additionally contains the sequence of call that exhibit a post consistencies in decisional behavior [31].

There is general agreement that a firm's operations/manufacturing strategy is comprised of 4 key competitive priorities: value, quality, flexibility and delivery [3]. Value strategy relies on the assembly and distribution of product at lower value. It's a live of the producing function's potency and historically it's been related to high volume/mass production. Quality strategy is related to a firm's ability to supply superior product or services, usually at higher costs. Delivery strategy is outlined with on-time delivery schedules and quickly response to client orders. Flexibility could be alive of a firm's ability to react to promote demands by shift from one product to a different through matched policies and actions and react to changes in production and merchandise combine, modifications in style, fluctuations in materials and changes in sequence. The effectiveness of a company's operations strategy is that the operation of degree of linkage or consistency between the competitive priorities that are stressed on the corresponding choices relating to the structure and infrastructure of operations [15]. The stress placed on these priorities varies by corporations, looking on an outsized range of things as well as accessibility of resources, business strategy, existing capability, social control behavior, nature and intensity of competition and status [20].

One of company's most vital variables for addressing environmental uncertainty is flexibility that's notably relevant to the speedily ever-changing conditions poignant producing organizations .This is obscurity a lot of actually than for AMT that provides the most important supply of flexibility in any producing organization [2]. It's been noted that though AMT creates a world of opportunities, they'll not be regenerate to advantage unless the adopting firm uses a strategic coming up with approach. Swamidass [31] conducted associate empirical study to search out the link between operational strategy and performance. They found that environmental uncertainty like producing flexibility and also the role of producing of producing managers in strategic deciding influenced manufacturing strategy and among completely different dimension of producing strategy, flexibility features a sturdy relationship with business performance. Zhang [29] declared that AMT implementation is a lot of associated with quality and delivery strategy. Results from Boyer [2] showed that among the two teams in their sample (high performers and low performers) in applying AMTs throughout the last three years, high

performers typically were a lot of doubtless to worry on flexibility, quality and delivery strategy than value strategy and specifically the foremost dramatic distinction appeared with relevance quality strategy between the two teams. different researchers believed that every one four producing strategy dimensions are necessary in implementing new technologies and gaining connected advantages [12] and specializing in one dimension doesn't relate on to AMT performance. The concurrent accomplishment of value, quality, delivery and adaptability by several Japanese firms has highlighted this new risk that may be complete by adopting advanced method technologies and management techniques [30].

2.4 Human Resource and Management Practices

Along with technology development, the human resource is Associate in resource quality for any organization, while not that the employment and development of technology won't happen and has vital impact on strategic success. Human resources qualities, attitudes and behavior will give the firm with a supply of competitive advantage with reference to its rivals [25]. Researchers emphasize the importance of providing applicable manpower development activities like socialization ability Chan [5] and manager's involvement in R and D comes to boost skills and relative needs ensuing from modifications in technology and new production processes in enhancing company performance. Inherently, all AMTs can increase employee needs as staff area unit given additional autonomy over problems together with designing and drawback finding [16]. Proof from the literature recommended that designing Associate in implementation activities aimed toward making ready staff for AMT adoption play a crucial role in guaranteeing an exploitation of the system edges. Thus, a serious challenge for future winning implementations lies in addressing the wants obligatory by AMT on the human components.

In order to show staff into key components for building a competitive edge, folks need to be managed in a very distinctive means and being additional capable in terms of information, skills, attitudes and responsibility [23]. As a result, providing staff with opportunities to boost their inherent motivation and job satisfaction by suggests that of employee-involvement practices may well be deemed a suitable policy to ally the goals of workers with the company's victimization AMTs [14]. Education and coaching are crucial to the winning implementation of AMT. expertise has shown that between twenty five to four-hundredth of the whole price of an intensive winning automation project ought to be spent on education and coaching [29]. Companies with winning AMT implementations conjointly enlist champions. These people support a continuous drive throughout the initiative. The consequences of those 3 practices beside the opposite seven factors were tested on ERP systems in some Malaysian firms and therefore the results showed their importance in real things. Widening of the marketplace, increasing importance of technology and imperative of innovation and specializing in cross-functional teams, area unit applicable ways in which to develop viable business solutions [7]. Thanks to the importance of the management personal characteristics, expertise and background on their selections, any amendment has got to begin with the managers on the highest and within the middle, then the organization of staff on the work. Besides, to facilitate the psychological, physical and cultural amendment ensuing from AMT implementation, management should build trust and co-operation [12]. These practices will receive the accomplishment of technology investment comes.

III. CONCLUSION

A comprehensive analysis on AMT consistently builds upon past researchers so as to guide investigation into the triple-crown AMT implementation and to work out those most crucial structure and strategic parts that will create a firm ready to use AMT in enhancing performance. To analyze Technological capabilities that will be strategically accustomed, accomplish property with competitive advantage and also the implementation of those technology is associate structure transformation method, during which labor price, structure, culture, competition strategy and arrangement of individuals all can amendment to compatible with one another. The key to triple-crown AMT implementation seems to be the collaboration of acceptable factors and their integration which will supply most advantages from AMT implementation. To gain fundamental insight into the framework which will present the intra/inter-relationship among the variables influencing company performance in parallel with technology utilization that may be analyzed and offers testable propositions? This research suggests that utilization of AMT won't additionally necessary issue that guarantee performance however any need acceptable changes within the firm's structure and infrastructure can and continue with performance appraisal to enhance company capability. To implement intra/inter relationship framework for manufacturing process.

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