INTERNSHIP TRAINING

AT

AL ABEER EDUCITY

ON

"A DESCRIPTIVE AND COMPARITIVE STUDY ON HOSPITAL INFORMATION MANGEMENT SYSTEM"

Name: DIPTI SINGH

Enrolment No. PG/14/076

Under the guidance of

DR. (MAJ.) DINESH G K	**DR. NISHIKANT BELE**
CHIEF OPERATING OFFICER	**ASSOCIATE PROFESSOR**
AL ABEER EDUCITY	**IIHMR-DELHI**

Post Graduate Diploma in Hospital and Health Management

2014-16

International Institute of Health Management Research

New Delhi

INTERNSHIP TRAINING

AT

AL ABEER EDUCITY"

"A DESCRIPTIVE AND COMPARITIVE STUDY ON HOSPITAL INFORMATION MANGEMENT SYSTEM"

Name: DIPTI SINGH

Enrolment No. PG/14/076

Under the guidance of

DR. (MAJ.) DINESH G K

CHIEF OPERATING OFFICER

AL ABEER EDUCITY

DR. NISHIKANT BEL

ASSOCIATE PROFESSOR

IIHMR-DELHI

Post Graduate Diploma in Hospital and Health Management

2014-16

International Institute of Health Management Research

New Delhi

THE CERTIFICATE IS AWARDED TO

NAME: DIPTI SINGH

IN RECOGNITION OF HAVING SUCCESSFULLY COMPLETED HER

INTERNSHIP IN THE DEPARTMENT OF

HEALTH-IT

AND HAS SUCCESSFULLY COMPLETED HER PROJECT ON

A DESCRIPTIVE STUDY ON HOSPITAL MANAGEMENT INFORMATION SYSTEM OF AL ABEER EDUCITY

Date**:** 19th May 2016

Organisation: AL ABEER EDUCITY

She comes across as a committed, sincere & diligent person who has a strong drive & zeal for learning

We wish her all the best for future endeavours

Training & Development **Zonal Head-Human Resources**

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Dipti Kumari Singh student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at AL ABEER EDUCITY, Malappuram, Kerala from 02-March-2016 to 14-May-2016

The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.

The Internship is in fulfilment of the course requirements.

I wish him all success in all his future endeavours.

Dr. A.K. Agarwal
Dean, Academics and Student Affairs
IIHMR, New Delhi

Dr. Nishikant Bele
Associate Professor
IIHMR, New Delhi

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH,

NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "**A DESCRIPTIVE AND COMPARATIVE STUDY OF HOSPITAL MANAGEMENT INFORMATION SYSYTEM"** submitted by Dipti Kumari Singh, Enrolment No. PG/14/076 under the supervision of Dr. (Maj) Dinesh G K for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from 02nd March2016 to 16th May 2016 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Signature

ACKNOWLEDGEMENT

The successful completion of any given task requires a lot of hard work and sincere efforts. Hard work and efforts are only the building blocks of an assignment, but the plinth has to be inspiration, suggestion, support and guidance.

Experience in a hospital environment is an important part of my course and this I have achieved from one of the esteemed health care organization, Al Abeer Educity. These three months of training has added a valuable and knowledgeable exposure in the development of my career and achievement of my objectives, for which I am highly grateful to the organization

Any attempt at any level cannot be a success without the support and direction of learned people. A heartfelt gratitude to Mr. Alungal Mohammed (Chairman and Managing Director) for giving me the golden opportunity to work with the leading health care provider in UAE , now in (Kerala) India. My heartfelt gratitude to Dr. Jemshith Ahmed (Chief Executive Officer) and Dr. (Maj) Dinesh G K (Chief Operating Officer) for showing keen interest in our training, helping us to plan our agenda and guide us despite their busy schedule.

I would like to express my immense gratitude to Mr. Koshy K Ancheril (Head HR) for providing his support and guidance not only for the project in the hospital, but for broadening my horizon and making me learn various other aspects of hospital functioning, which will definitely help me a lot in my career. And yes, and for directing my goals and objectives towards the attitude that derives to achieve and other aspects that one needs to be acquainted with. My learning here in three months is all because of his help.

I would also like to extend my gratefulness to Syed Kadhar Mohaideen (IT Manager) and all the staffs of Al Abeer Educity for helping and guiding me throughout the project and helping me learn various other aspects too.

I am glad to acknowledge Dr. A K Khokhar (Director- IIHMR-Delhi), Dr. A K Aggarwal (Dean Academics and student Affair) and Mr. Nishikant Bele (Mentor) for incorporating right attitude in me towards learning and for supporting me whenever required.

I genuinely thank my parents, family and friends for their blessings and support. Last but not the least I am thankful to God, for getting an opportunity to learn from this organization.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ACRONYMS/ ABBREVIATIONS

- HIS-Hospital Information system
- ERP- Enterprise Resourse Planning
- CSSD- Central Sterile Services Department
- CT- Computerized Topography
- CTVS- Cardio Thoracic Vascular Surgery
- ECG- Electrocardiogram
- ER- Emergency Room
- FMS- Facility Management and safet
- ICU- Intensive Care Unit
- IPD- In-patient Department
- IT- Information Technology
- OPD- Out-patient Department
- OT- Operation Theatre
- LIS- Laboratory Information System
- RIS- Radiological Information system
- PACS-Picture Archiving and Communication System
- DICOM-Digital Imaging and communication in medicines
- RFID- Radio Frequency Identification
- CPOE- Computerized physician order entry

- EMR- Electronic Medical Record
- PHC-Preventive Health Check-up

INTERNSHIP REPORT

Introduction

Internship is an integral part of the Post Graduation Diploma in Hospital Management (PGDHM). Moreover it plays a major role in completion of the PGDHM degree. The main purpose of this is to get an orientation towards the layout, operations and workflow of the hospital, in order to understand the processes and systems in the hospital.

After completing the first academic year of PGDHM, the students are supposed to undergo a two months training in a hospital or any other Healthcare Organization and in the second academic year they supposed to undergo six month of Dissertation Period for the completion of the PGDHM Degree , as a part of the curriculum.

Indeed I have got the golden opportunity to work in one of the leading and renowned Group of Hospital in UAE, Al Abeer Educity. I joined here from 2nd March 2016 for Traning as a Senior Executive Management Trainee (Operations).

AIM:

To have an overall orientation / induction of the hospital setting and system used by the hospital to maintain their workflow digitally.

Objectives:

1. To get an overview and develop understanding of the hospital's functioning.
2. To gather knowledge about the process flows of major clinical and non clinical departments in a hospital.
3. To help the management study and address some issues/problems associated with some specific operational area/department.
4. To Study the Hospital management System by various software vendors in India.

5. To select the best in market HIS software vendor by analysing their software efficacy and efficiency.
6. To prepare the Standard Operating Procedure (SOP) of HIS for Al Abeer Educity.

1.0 **Organization History**

Al Abeer Medical Group is an excellent health care service unit in the Saudi Arabia Since 1999, Al Abeer Medical Company has a reputation and legacy of compassionate care that is expressed and lives in their mission and values. Driven by the vision of its Chairman, Mr. Mohammed Alungal, Al Abeer Medical Company has transformed the landscape of healthcare in the Kingdom of Saudi Arabia.

Al-Abeer, the Saudi-based health care services group which has branched out into other countries in the region recently, is planning to set up a Rs5.65 billion education hub in the Southern Indian state of Kerala.

The Educity will house schools offering courses in medicine, engineering, business administration, commerce and humanities with 65 percent seats reserved for children of non-resident Indians. It aims at teaching, training and research in all fields in collaboration with leading Indian and foreign universities.

Started in 1999, Al Abeer now has 13 branches across the kingdom, in Riyadh, Jeddah, Makkah, Madinah and Dammam, and is rapidly expanding into Oman, Qatar and Kuwait. It also runs a 100-bed hospital in Malappuram where the new project is also coming up. The group has also expanded into other areas like information technology and has a set up a software development and training facility at Techno park here. Other firms that he runs include Core International LLC, Jeddah, and Concourse Solutions Pvt Ltd and Al Abeer medical tourism in Al Abeer.

"At Educity, it will provide subsidized education to the children of NRIs whereas other institutions are taxing them indiscriminately. There'll be quota for NRIs and the returnees.

It will introduce a new pattern of quality education right from the kindergarten level to the professional courses under one umbrella at an affordable fee structure. A world class multi-specialty hospital will also be a part of this project. The Educity will offer new generation courses designed by Harvard School of Medicine, Massachusetts Institute of Medical Science and Melbourne University in medical engineering and medicinal sciences and make available online library systems of international universities to enhance competence The campus, set in the midst of a lush green environment, will have residential facility with amenities like hypermarket, playgrounds, meditation area, departmental store and Wi-Fi facility. The campus also contains 50 villas for parents who desire to stay with their children.

The Educity is designed to be built up in an area of 1.346 million square feet in 68 acres of land. The project is planned to gear up in a phased manner and expected to achieve breakeven with full operation in the fifth year.

1.2 Vision

"Strives for Perfection, Excellence & Values in Health Care".

"Achieving global preference in healthcare and education through our distinctive services based on excellence and reliability".

1.3 Mission

To bring affordable healthcare within the reach of every individual. We are committed to the achievement and maintenance of excellence in customer satisfaction, and world class healthcare for the benefit of humanity.

1. To be the leader in all our endeavours founded on reliability, quality, integrity and corporate citizenship.

2. To provide distinctive services to drive excellence and to create a delightful experience.

3. To be an employee centric organization and to ensure stake holder value creation through profitable growth.

4. To shape the thinkers, innovators and leaders for the future, by inspiring young minds and by encouraging research and knowledge creation.

5. To redefine academic landscapes by creating an enjoyable learning experience with emphasis on our values.

6. To be the benchmark of excellence in care, awareness and safety while creating a care-seeker centric wellness-eco system.

1.4 Values

Al Abeer Medical group Believe in: (TEDICS)

TEAM WORK

Strive towards the common goal through collaboration while relying on each other's strength and commitment that is founded on mutual trust and shared values.

EXCELLENCE

Deliver our professional best, provide the highest quality of services again and again, being maximal in reliability and thus being the bench mark in the industry.

DIVERSITY

Understanding and accepting the differences individuals will have geographically, physically, intellectually, emotionally, culturally and in finding value this diverse association brings, in order to be effective, innovative and resourceful.

INTEGRITY

Having the courage to act on convictions, uphold fairness, honesty and trust in whatever we do, be 100% when it comes to respecting processes, people and systems.

COMPASSION

Understanding the point of view of others, recognizing the effect of one's action on others, placing high regard for human dignity and in ensuring affirmative action that support these elements.

SOCIAL COMMITMENT

Focus on the positive impact we can have on the communities, environment and the lives we touch. Our responsibilities extend to having the highest legal and ethical standards that co-exist with business priorities.

1.5 LEARNING FROM THE INTERNSHIP

The following learning happened from the study:

- ERP ecosystem in India
- Key Market Players of HIS Software in India
- Vendor Selection for HIS Software
- Comparative study on the basis of Module availability and functional availability
- Analyzing the modules according to the workflow of hospital
- Mapping of modules, its components and sub components
- Statistical analysis of collected data
- Floor wide and Department wide mapping of IT-asset for Hospital
- Negotiation for the purchase of IT-asset for hospital.
- Mapping of workflow according to software.

DISSERTATION REPORT

ABSTRACT

Planning of IT infrastructure for any organization can be both challenging and rewarding. Proper planning can help to achieve the goal efficiently. Al Abeer Educity is an upcoming 750 bedded multi-speciality cum teaching hospital. Thus, Laboratory services are planned within the hospital to satisfy the need of hospital as well as teaching hospital.

Methodology:

A descriptive and comparative study was carried out. For the selection of ERP-HMIS vendor various IT companies were contacted. Demonstration of their HMIS Software had been carried out. Among different vendors, three were shortlisted for the comparative study on the basis of module availability, functional friendliness and Operational Platform.

Results:

On the basis of Six major parameters, that is overall software requirement, administration and security, reports, web based software, vendor and vendor support and addition data of customer. Calmove Technologies have scored highest (368), Software Associates have scored second highest (367) and Datamate have scored lowest among all (328). After Comparison on various parameters, the Software which satisfy our requirements the best was C-Med of Calmove Technologies

Conclusion:

The hospital is under construction phase. Selection of vendor for the ERP and HMIS has been done. Final implementation of the software will takes place after the soft launch of the hospital. Presently major attention is given to the infrastructure planning and implementation of major infrastructure plan, other will follow.

1. INTRODUCTION:

A **hospital information system** (**HIS**), variously also called **clinical information system** (**CIS**) is a comprehensive, integrated information system designed to manage the administrative, financial and clinical aspects of a hospital. This encompasses paper-based information processing as well as data processing machines.

Computerisation at Al Abeer Educity and Hospital started in a limited way when standalone systems were introduced to take care of routine local area needs the emphasis then was mainly on book-keeping activities. The Medicare areas is planned to computerised soon. An integrated information system will be implemented in the areas of Pathology, Radiology, Medical Research, Medical Stores & Pharmacy, In-patient Admissions & Billing. On-line sharing of information has made extension of the existing system to ICU and wards possible, whereby test results can be made available on-line enabling prompt remedial action by doctor. Hospital Information System (HIS) and Electronic Patient Record (EPR) instantly provide patient history details and latest test results to the desktop of the Al Abeer Educity And Hospital specialist you are consulting, saving valuable time.

Whole Educity building within the Al Abeer Educity network will be connected through a centralized IT system installed by Calmove Technologies which will enable online sharing of patient records and data.

The integrated system will provide all the necessary patient record to the system. The HIS will allow easy and safe access of patient medical records. For the purpose of safety and privacy, strong firewalls and anti-viruses will be uploaded to make the data safe and secure.

As an IT infrastructure becomes larger and more complex, performance begins to decrease while costs increase. In today's economy, neither of these trends is good for a mid-sized hospital. By simplifying our hospital IT infrastructure, we are moving efficiently cope with this growth and complexity by allocating resources more quickly and easily — saving time and money.

Today's infrastructures are complex combinations of servers, storage, network equipment, applications and operating systems. Often characterized by racks of underutilized servers, application and data silos, isolated departmental systems and manual provisioning, they can be difficult, costly and time-consuming to operate. This taxes a hospital's resources, limiting its ability to serve patients and clinicians, comply with regulations, or to respond quickly to changing medical and hospital needs.

A simplified IT infrastructure consolidates and integrates systems and resources with the goal of saving time and money. With an open, standards-based, scalable infrastructure, you can deploy IT assets more efficiently, matching these resources to hospital priorities. Rigid, complex infrastructures slow your response to the workload demands of your hospital. A flexible, responsive IT infrastructure is crucial to reducing complexity. By consolidating your infrastructure, the number of servers is reduced, as each can now share resources and manage workloads. By simplifying your IT infrastructure, you can more efficiently cope with growth and complexity, and allocate resources more quickly and easily, saving time and money.

Al Abeer Educity and Hospital is still an under construction building, it has an in –house software development team name Calmove. The in-house team of software development is in developing phase of the ERP and HIS. The cost allocation for IT- Infrastructure is Rs. 75,250,000 (including hardware, networking cable, networking LAN, Servers, Wi-Fi, Database license, antivirus license, Microsoft license.) as a consolidate amount for the development and deployment of the software.

2. Problem Statement:

There is a need to address the challenges faced by the health care industry, integrate the clinical and non-clinical functionalities, deliver real-time information, optimizing the workflow, decision-making and overall patient care and at the same time ensure information security.

The changing scenario of the Indian healthcare industry has drastically changed the IT requirements of hospitals also. Indeed, between the health care that we now have, and the health care we could have, lies not just a gap, but a chasm. There is a need for the Indian IT industry and healthcare organizations together make an important distinction by showing that the best strategy to develop ICT Enabled projects in the area of healthcare. There are challenges within the current healthcare system that must be overcome. The current challenges are:

i) Low reach or inaccessibility or insufficiency of quality care to the most economically backward areas.

ii) Presence of specialist doctors is restricted to the metro and class-A cities.

iii) The risk of under-utilization of resources like beds, Doctors, Nurses etc.

iv) Isolated bits of patient and medical know-how across entities in the system.

v) Lack of a complete patient record.

vi) High cost and low productivity due to bottom-up re-creation of diagnosis or investigations for every instance.

vii) A majority of the hospitals in the country are still rooted in manual processes and unable to cope with the huge volume of data generated.

viii) In many of the hospitals they have either disparate systems running or some small systems developed in-house, which neither provide the desired results nor integrate with newer systems.

ix) In the bigger hospitals, patient records literally occupy lot of space and still remain difficult to access.

3. Scope of the Project:

3.1 Purpose

Al Abeer Educity and Hospital requires such an ERP guidelines which integrates all the workflows of different departments. These guidelines should intend to support Hospital Management Information System (HMIS) and provide guidance on the operational use of such systems. These guidelines address applications which interface directly to the other Information System used in the hospital. The interoperability with the HMIS is referenced where appropriate. It is envisaged this document will be used by hospital IT departments, transfusion laboratories and, where applicable, suppliers of IT systems which support Hospital medicine.

Also, Necessary controls must be implemented to meet such requirements. It is of particular importance that external systems are not able to update patient demographic data held on the HMIS, and that patient record merging/linking on external systems is verified by the Hospital.

a. For the administrative staff the system maintains and integrates information of hospital, hospital staff and patients.

b. Information systems should help in educating patients about the latest developments in medical science through the internet and also the facilities available in various hospitals and clinics across the country.

c. The medical researchers will have greater access to presenting problems, diagnosis, treatment and results.

d. The patients and doctors will receive a higher standard of information immediately on line.

e. The system allows the physician and medical students improve their efficiency by providing them with information that will help in research and analysis.

3.2 Comparison of services and features of different HIS software.

Features of software	Company 1	Company 2	Company 3
	CALMOVE TECHNOLOGIES	DATAMATE	SOFTWARE ASSOCIATES
Operating system (window7,8,10)	YES	YES	YES
Database format (SQL, Oracle, etc.)	YES	YES	YES
Supports cloud computing	YES	NO	NO
Data import or export requirements	YES	YES	YES
Filtering and searching friendliness (response time)	YES	YES	NO
Interface system (laboratory)	YES	YES	YES
Supports number of	YES	NO	YES

concurrent users= 1000			
Regulatory compliance support	YES	YES	YES
Ease of implementation and customization	YES	YES	NO
Access to data from various areas/ mobile devices	YES	NO	NO
Ease of access reports from various department	YES	NO	YES
Budget	75,250,000	85,350,00	83.560,00
Online registration/kiosk/mobile registration facility	YES	YES	NO

Table 3.2.1 Showing Comparison of services and features on the basis of different parameters of three different HIS Software.

4. Review of Literature:

1. Wockhardt Limited is a global pharmaceutical and biotechnology company based in India, with a strong and growing presence in the world's leading markets. The company, a leading player in the Healthcare Industry, manufactures and markets formulations, biopharmaceuticals, nutrition products, vaccines and active pharmaceutical ingredients (APIs). Wockhardt has manufacturing plants in India, United States of America, UK, Ireland, and France. More than 65 percent of the company's revenue comes from the United States of America and Europe.

   Wockhardt had already deployed ERP systems from Avalon, but was plagued with a number of challenges but as it went more global, looked for integration across all business functions, faster information availability, and better control of operations. The company was unable to draw a future roadmap and upgrade its technology. Consolidation of data across locations was difficult. To add to that, duplication of work and reconciliation would happen at every stage. Further, the lack of a structured information system led to delayed decision making, and consequently was having a negative impact on the business. Transparency in processes was essential to make informed decisions. The company looked for integration across all business functions, faster information availability, and better control of operations. This prompted Wockhardt to look for an alternative enterprise applications solution for its business.

Wockhardt goes global hmoreover; Wockhardt's strategies are aligned towards being a significant player in the emerging global biopharmaceuticals market. It has a strong track record in acquisition management, with five successful acquisitions in the European market. The company decided to replace its existing IT landscape with a future-oriented solution that would be capable of supporting growth and continuous innovation on a global scale. Processes were a major reason for introducing SAP solutions. Looking ahead, Wockhardt determined that the SAP software could scale and adapt to support its continuously expanding global business. [1]

2. In recent years, Singapore's public hospitals have experienced occupancy levels of up to 95 percent, a figure that may compromise patients requiring immediate admission. This has seen Singapore's Ministry of Health implement step-down care models to reduce hospital waiting times by providing cost-effective chronic disease monitoring services at primary care centres, and reserving the tertiary hospitals for more specialised care. In early 2014, one major public hospital implemented a remote cardio monitoring solution, which consisted of elements certified for standardisation. These included a software platform that received biometric information; blood pressure, glucose and weighing scale devices; a receiving hub placed at the patient's home to receive data from the devices used by the patients; and chronic disease 'kits' including a hub and corresponding medical devices. The overall solution was designed to be as simple as possible, even for the elderly. Patients received the kits to be used at home to record vital signs, which were then sent wirelessly to the hospital caregiver. From a technology perspective, the monitoring services proved effective in assisting hospitals in the efficient monitoring of patients, as well as doing away with the need for patients to make periodic visits to the hospital.[2]

3. The availability of certified, interoperable health monitoring devices greatly helped Japan during the earthquake that struck Miyagi Prefecture in March 2011. During and after the crisis, interoperable technologies and solutions were utilised to mitigate the risk of cardiovascular disease (CVD) among elderly patients and other survivors. Earthquake exposure as well as the impact of living in an evacuation camp within the devastated area was factors associated with elevated cardiac risk, making CVD management an important element in the recovery of hundreds of survivors. Given the urgency of delivering healthcare support, Dr. Kazuomi Kario, Chairman of Cardiovascular Medicine at Jichi Medical University in Tochigi, worked with Continua Health Alliance—an organisation of healthcare and technology companies that certifies interoperable personal connected healthcare solutions—to deploy a remote monitoring solution. The technological components were sourced from various companies—automatic blood pressure monitors from A&D, Inc.; gateway firmware from Alive, Inc.; data server from Ryoto Electro Corp.; clinical PC from Panasonic; patient ID cards from Toppan Forms; and web application development from Qute—with project coordination carried out by Intel. The integrated solution was in operation within two weeks. At a set up cost of US$26,000, it compared most favourably to the non-integrated solutions that would have required up to 12 weeks and about six times the cost (around US$165,000) to set up. Clinicians monitored the data and alerted on-site physicians by phone of any significant developments. Highrisk patients were then moved from the evacuation camp into temporary housing provided by the government, and given individual blood pressure monitors capable of storing one month's readings. Nearly a year and a half after the earthquake, every one of the 400 high-risk evacuees was still alive and the programme remained in operation. The disaster CVD solution has been credited with saving lives and illustrates the Software/ clinical, time and cost advantages of interoperability, especially in a crisis, when time is of the essence.[3]

4. The University of the Philippines College of Medicine uses telemedicine to reach out to 'barrios' or villages and poor communities in remote areas. The University's clinical specialists work at the Philippine General Hospital, Baguio General Hospital and East Visayas Regional Medical Center to provide support for a wide range of clinical specialties. It also conducts specific research in telederma ophthalmology surgery, medicine/diabetes care, tuberculosis, screening of newborns, screening of the hearing impaired, amputee treatment, rabies, leprosy, malaria and parasitological. The Center works with an interdisciplinary pool of individuals and stakeholders to ensure that the technologies being developed and introduced on the ground are culturally acceptable and within the reach of users.[4]

5. The Telemedicine Reference Center Ltd (TRCL) opened in 1999 and is one of Bangladesh's longest-serving companies in the telemedicine sector. In 2003, the Center introduced a mobile health programme, which was an extension of its telemedicine health platform. By 2007, TRCL's first m-Health project had received a global award from Group Special Mobile Association (GSMA), an industry group formed in 1995 and comprising mobile operators and related companies devoted to the standardisation, deployment and promotion of the Global System for Mobile communication (GSM). In 2009, TRCL launched its AMCARE chronic disease management programme. In 2010, AMCARE signed an exclusive collaboration agreement with the Diabetes Association of Bangladesh to provide diabetes care services nationwide. The agreement was designed to bring 100 percent of diabetes patients under treatment and monitoring using TRCL's patient management platform and medical call centre system, which was a much-needed initiative given the alarming increase in the incidence of diabetes in Bangladesh from 4 percent in 1997 to 11 percent in 2011.[5]

6. In the same way that mobile technologies and technological innovation brought access to financial systems and services to the largely unbanked poorer communities in Africa, Dokter Gratis uses mobile platforms to provide a telemedicine service and medical consultations to almost two million users in Indonesia. Established in Indonesia two years ago, Dokter Gratis is operated by Singapore based Health2i Pte Ltd., and up to 1,000 Indonesians receive free medical advice on a daily basis from a team of online doctors.[6]

5. Methodology:

Study Type: Descriptive and Comparative study

Sample Size: 15

Sample area: Al Abeer Educity, Corporate Office

Tools and Technique: Feedback Form, MS- Office

Data Analysis: Statistical analysis like PERT Chart, Gantt Chart.

6. Data Analysis

The various component of General software requirements are being analysed on the basis of feedback collected from the End-User. Some of the components are being evaluated on the basis of 0-5 rating scale (RATING SCALE- 5-Excellent, 4- Very Good, 3-Good,2-Average & 1 - Poor) and some of the others components are being evaluated on the basis of functional availability (REMARKS: YES or NO).

On the basis of Six major parameters, that is overall software requirement, administration and security, reports, web based software, vendor and vendor support and addition data of

customer. Following are the tabular and graphical representation of comparative data collected from the End-User by using Feedback form (Annexes 1) as a tool.

- **OVERALL SOFTWARE REQUIREMENT**

Meeting our general or overall software requirements	**Symbols**	**Calmove Technologies**	**Data-Mate**	**Software Associates**
The look and feel of the application	A	57	48	53
Filtering and searching friendliness	B	52	48	57
Look ups	C	48	53	45
Interface system (laboratory)	D	60	55	58
User configurability of tags and labels	E	53	56	54
Handling of links to ancillary information	F	62	50	52
Archiving requirements	G	54	47	60
Speed	H	62	58	50
Customisable screen	I	54	47	58
Resourcing	J	58	51	47
overall ease of use	K	63	58	58

Table 5.1.1 Showing ratings of the General software requirements. The column 'symbol' signifies the symbolic representation of the components under general software requirement.

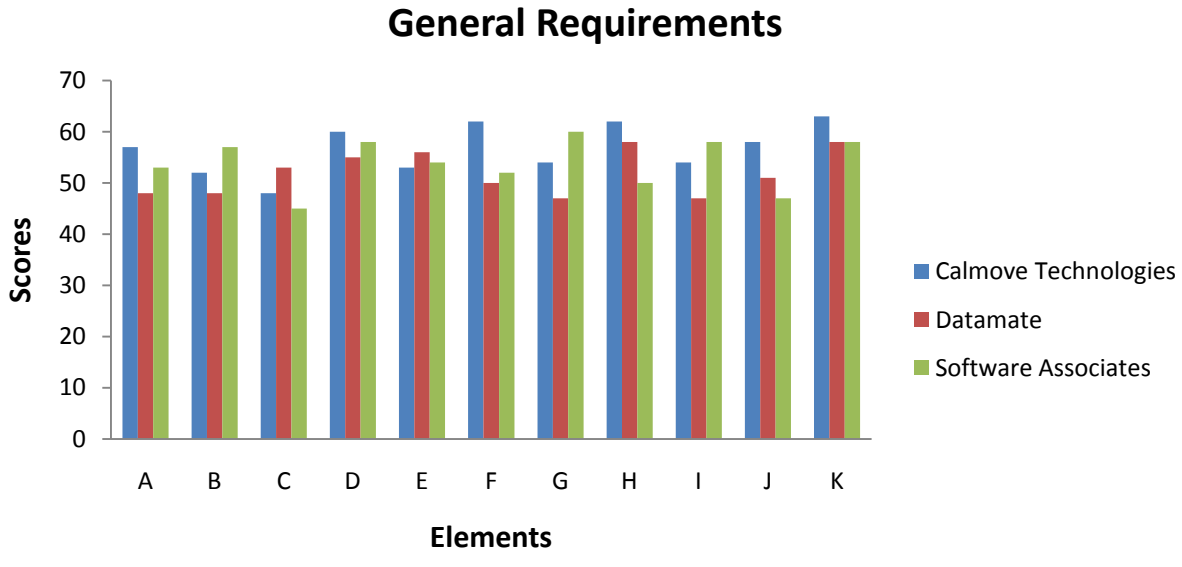


Figure 4.1.1 Showing Comparative Graphical representations of General software requirements

Interpretation: Blue, Red and Green coloured bar showing the scores for Calmove Technologies, Datamate and Software Associate Respectively**.** The Calmove Technologies Scored high for "Component A, D, F, H, j and D". Software Associates scored high for 'Component B, G and I". Datamate scored high for Component E.

- **GENERAL REQUIREMENTS**

Meeting our general or overall software requirements	**Symbols**	**Calmove Technologies**		**Datamate**		**Software Associates**	
Operating system	**A**	YES	NO	YES	NO	YES	NO

(window7,8,10)							
Data import or export requirements	**C**	13	2	5	10	7	8
Barcoding, PDs and remote devices	**D**	10	5	11	4	3	12
Single or multiple site functionality	**E**	8	7	6	9	6	9
graphical, hierarchial data structure	**F**	8	7	5	10	10	5
Regulatory compliance support	**G**	3	12	3	12	11	4
Ease of implementation	**H**	8	7	7	8	12	3
Additional database software required	**I**	9	4	9	6	7	8
Paperless systems	**J**	3	12	12	3	9	6
Access to data from various areas/ mobile devices	**K**	6	9	10	5	8	7
Equipment history	**L**	11	4	7	8	4	11
Simple login process	**M**	14	1	5	10	10	5
alternative languages	**N**	12	3	11	4	4	11
speech to text	**O**	10	5	12	3	9	6
Average Score		8.85	6	7.64	7.36	8	7

Table 5.1.2 Showing ratings of the General software requirements. The column ‘symbol’ signifies the symbolic representation of the components under general software requirement.

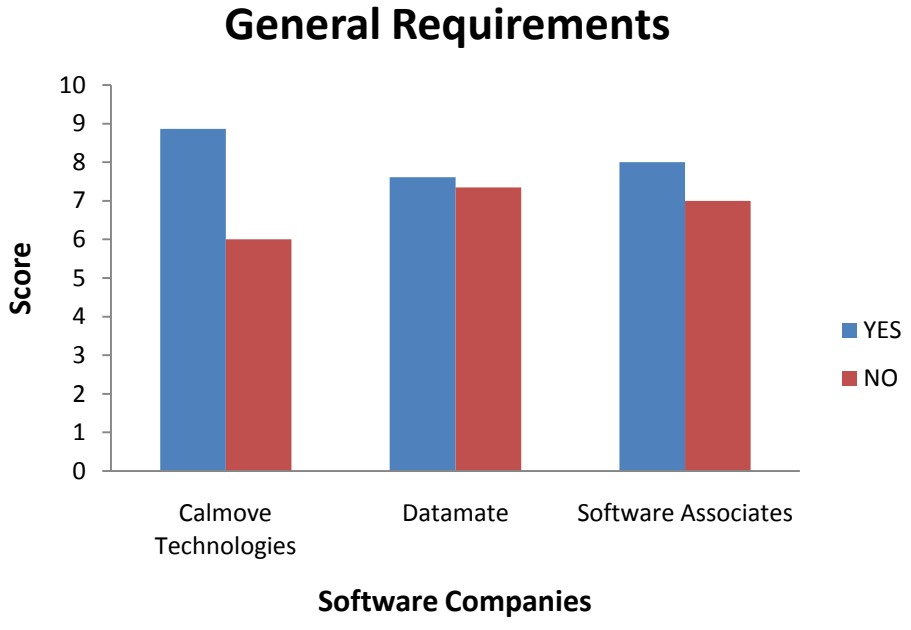


Figure 5.1.2 Showing Comparative Graphical representations of General software requirements on the basis of Functional Availability.

Interpretation: Blue and Red Bar showing the scores according to functional availability (YES/NO)**.** The Calmove Technologies Scored high for General requirements and functional availability.

- **ADMINISTRATION AND SECURITY**

Components	**Ease of use**	**Password**	**Individuals and groups settings**	**Customization**
Symbols	**A**	B	C	D
Calmove	**68**	69	47	53
Datamate	**63**	50	55	67

Software Associate	**53**	59	52	62

Table 5.2.1 Showing ratings of the Administration and Security. The row 'symbol' signifies the symbolic representation of the components under Administration and Security.

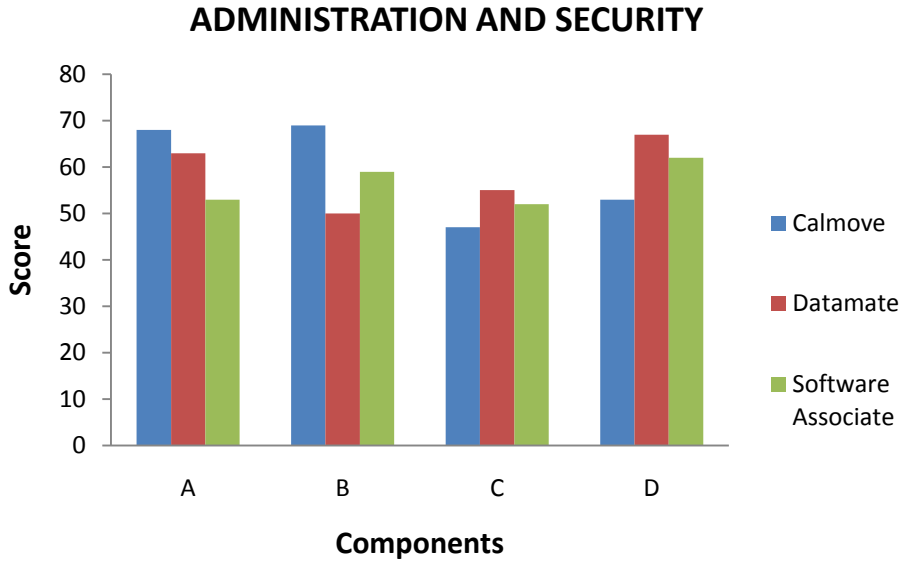


Figure 5.2.1 Showing Comparative Analysis of Administration and Security requirements**.**

Interpretation: Blue, Red and Green coloured bar showing the scores for Calmove Technologies, Datamate and Software Associate Respectively**.**

The Calmove Technologies Scored high for "Component A and B". Datamate scored high for "Component C and D". Software Associates scored less with comparison to other Software for all the components.

Administration and Security Requirements	Calmove		Datamate		Software Associate	
	YES	NO	YES	NO	YES	NO
Tabular selection	12	3	11	4	10	5
Audit trails	8	7	6	9	12	3
Average Score	10	5	8.5	6.5	11	4

Table5.2.2 Showing Comparative Analysis of Administration and Security Requirements on the basis of functional Availability.

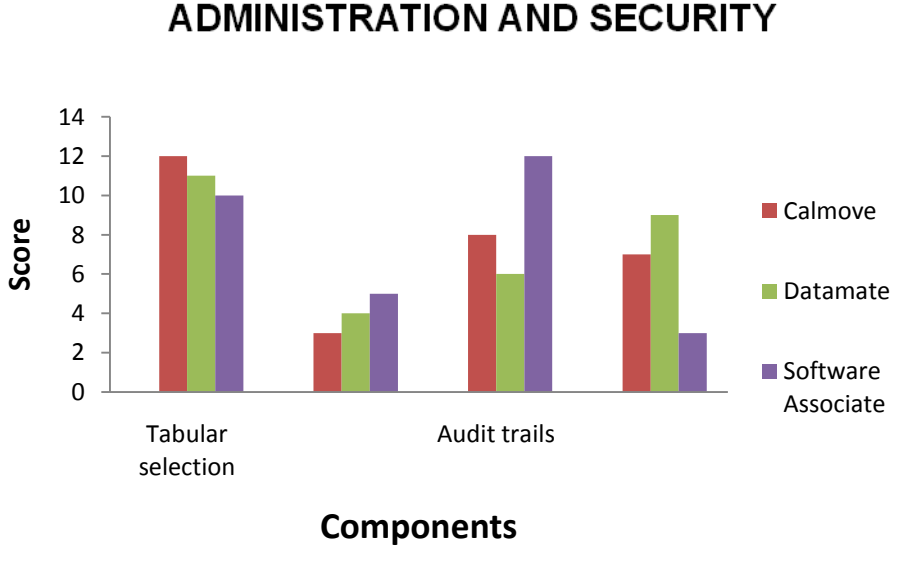


Figure 5.2.2 Showing Comparative Graphical representations of Administration and Security Requirements on the basis of Functional Availability.

Interpretation: Blue, Red and Green coloured bar showing the scores for Calmove Technologies, Datamate and Software Associate Respectively**.**

The Calmove Technologies Scored high for the component named "Tabular Selection". Software Associates Scored high for the component named "Audit Trails" Among all the three software companies.

- **REPORTS AND STATISTICAL OUTPUT REQUIREMENTS**

Reports and statistical output	**Symbols**	**Calmove Technologies**	**Datamate**	**Software Associates**
Ease of access reports	**A**	68	57	62
data export capability	**B**	60	54	57
Formats of reports (graphical)	**C**	55	57	63
Formats of reports (text)	**D**	63	62	67
Performance of reports	**E**	59	52	55

T

able 5.3.1 Showing Comparative Analysis of Administration and Security Requirements on the basis of Rating Scale (0-5).

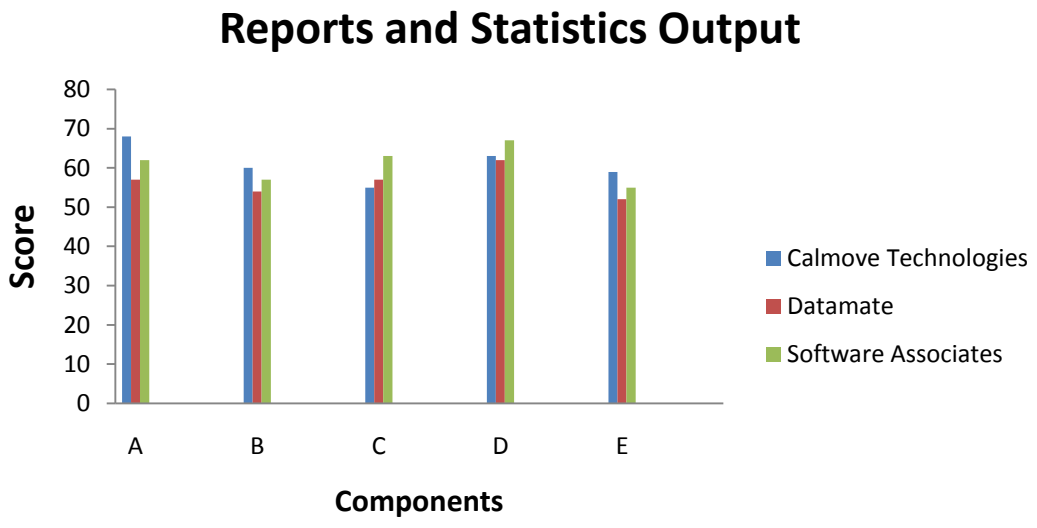


Figure 5.3.1 Showing Comparative Analysis of Reports and statistical output Requirements on the basis of rating scale (0-5).

Interpretation: Blue, Red and Green coloured bar showing the scores for Calmove Technologies, Datamate and Software Associate Respectively**.**

The Calmove Technologies Scored high for "Component A, B and E". Software Associates scored high for "Component C and D". Datamate scored less with comparison to other Software for all the components.

➢ **WEB BASED SOFTWARE REQUIREMENT**

Components	Symbols	Calmove Technologies	Datamate	Software Associates
Functionality	A	68	58	60
Response Speed	B	58	45	57
company stability	C	45	35	59
Internet access	D	42	47	45
customization potential	E	52	55	59

Table 5.4.1 Showing Comparative Analysis of Web based software Requirements on the basis of rating scale (0-5).

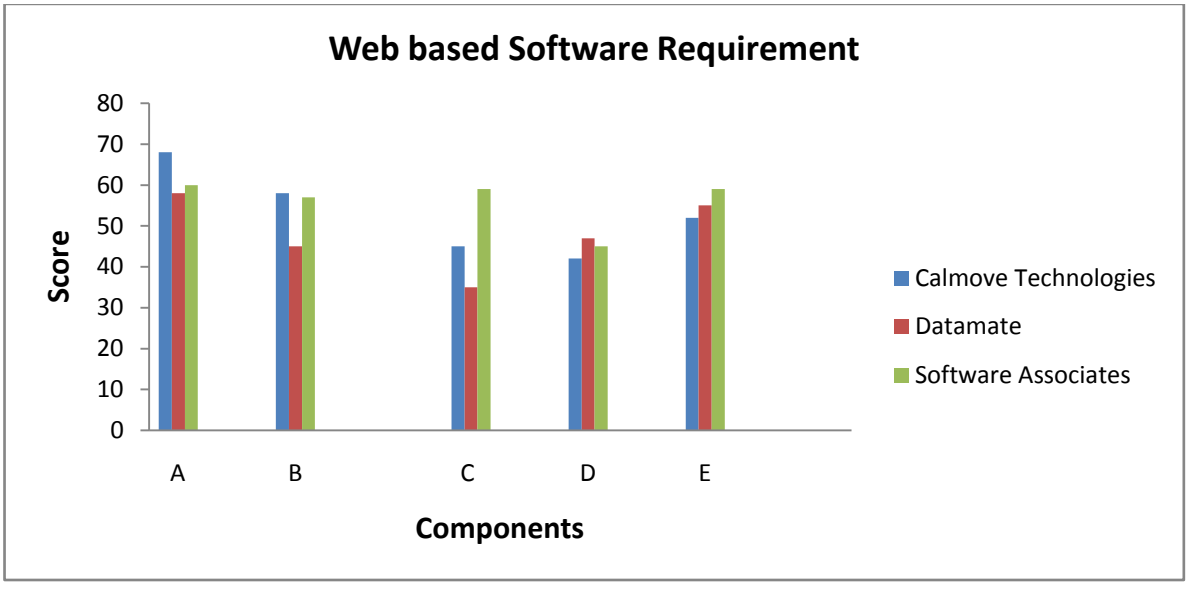


Figure 5.4.1 Showing Comparative Analysis of Reports and statistical output Requirements on the basis of rating scale (0-5).

Interpretation: Blue, Red and Green coloured bar showing the scores for Calmove Technologies, Datamate and Software Associate Respectively**.**

The Calmove Technologies Scored high for "Component A and B". Datamate scored high for "Component C and D". Software Associates scored less with comparison to other Software for all the components.

- **VENDOR ASSESSMENT AND SUPPORT PROVISION**

Components	**Symbols**	**Calmove**	**Datamate**	**Software Associates**
Stability	**A**	60	45	62
Professionalism	**B**	47	34	58
Service level agreement	**C**	52	48	59
Provision of customisation	**D**	55	43	62
Upgrade Path	**E**	59	54	56
Customer base	**F**	57	45	58
Support for add-ons	**G**	60	56	55
Our data	**H**	54	46	60

Table 5.5.1 Showing Comparative Analysis of Vendor assessment and support provision Requirements on the basis of rating scale (0-5).

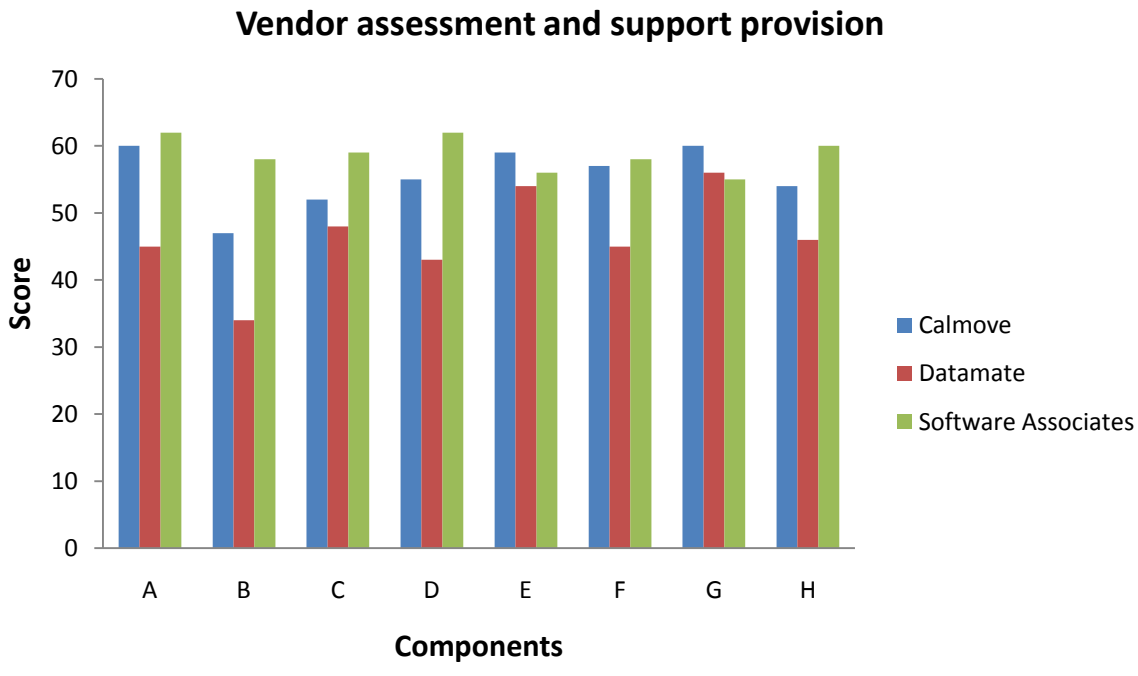


Figure 4.5.1 Showing Comparative Analysis of Vendor assessment and support provision Requirements on the basis of rating scale (0-5).

Interpretation: Blue, Red and Green coloured bar showing the scores for Calmove Technologies, Datamate and Software Associate Respectively**.**

The Calmove Technologies Scored high for "Component E and G". Software Associates scored high for "Component A, B, C, D, F and H. Datamate scored less with comparison to other Software for all the components.

- **ADDITION DATA OF CUSTOMER**

Addition Data Of Customer	Symbols	Calmove	Datamate	Software Associates
Module availability	**A**	62	45	60
Linen and house-keeping with service calls	**B**	54	34	47
HL7 interface for PACS	**C**	57	48	52
Queue management system with display	**D**	45	43	55
Pharmacy (stock, ledger, recorder level integration)	**E**	54	54	59
store (stock)	**F**	62	45	57

Table 4.6.1 Showing Comparative Analysis of Vendor assessment and support provision Requirements on the basis of rating scale (0-5).

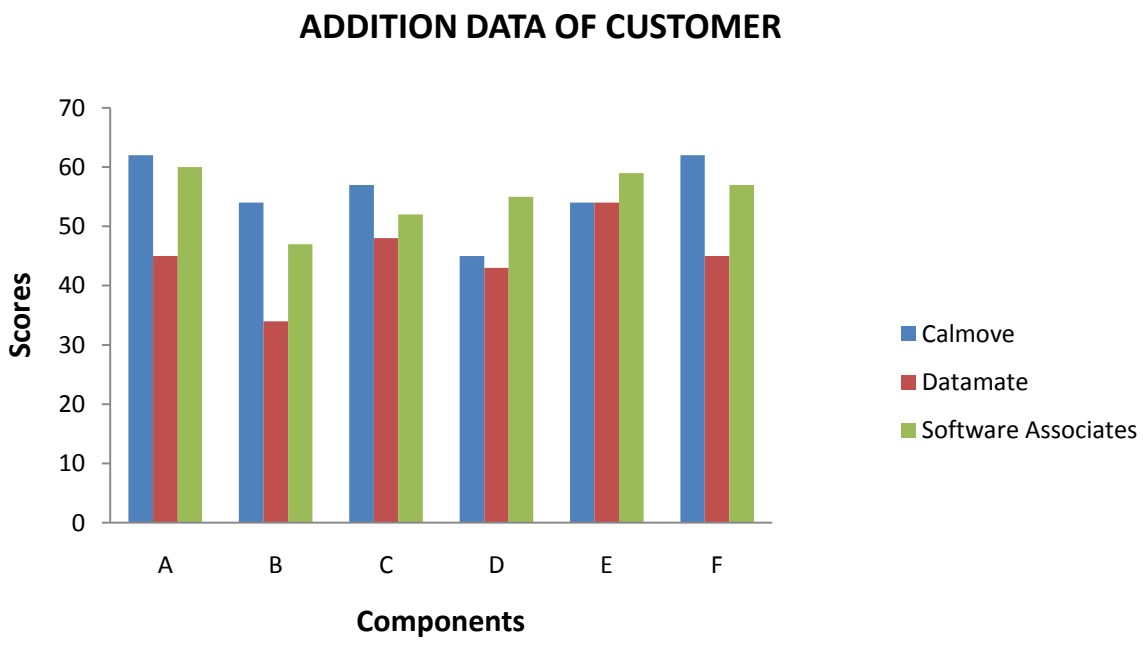


Figure 4.6.1 Showing Comparative Analysis of Additional Data of customer Requirements on the basis of rating scale (0-5).

Interpretation: Blue, Red and Green coloured bar showing the scores for Calmove Technologies, Datamate and Software Associate Respectively**.**

The Calmove Technologies Scored highest for "Component A, C and F". Software Associates scored high for "Component D and E". Datamate scored less with comparison to other Software for all the components.

- **OVERALL SOFTWARE REQUIREMENTS (PARAMETERS)**

Overall Software Requirements (Parameters)	**Symbols**	**Calmove Technologies**	**Datamate**	**Software Associate**
Overall Software Requirement	**A**	623	571	592
Administration And Security	**B**	237	235	226
Reports	**C**	305	282	304
Web Based Software	**D**	265	240	280
Vendor And Vendor Support	**E**	444	371	470
Addition Data Of Our Own	**F**	334	269	330

Table 4.6.1 Showing Comparative Analysis of Overall Requirements on the basis of rating scale (0-5).

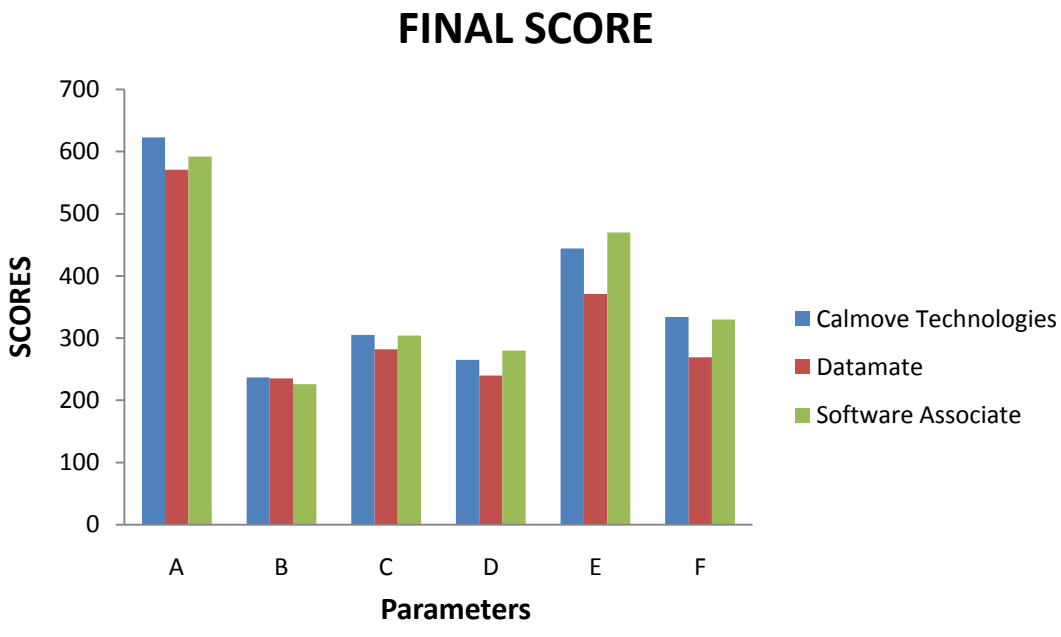


Figure 4.7.1 Showing Comparative Analysis of Overall Requirements on the basis of rating scale (0-5).

Interpretation: Blue, Red and Green coloured bar showing the scores for Calmove Technologies, Datamate and Software Associate Respectively**.**

The Calmove Technologies Scored highest for "Parameter A, C and F". Software

Associates scored highest for "Component D and E". Datamate scored highest for

"Component B".

4. Findings and Discussion:

An ERP system enables an organization to integrate all the primary business process in order to enhance efficiency and maintain a competitive position. However, without successful implementation of the system, the projected benefits of improved productivity and competitive advantage would not be forthcoming.

Calmove technologies have developed the C-Med software for all Branches of Al Abeer hospitals. It is being used by Al Abeer Hospitals situated in Middle East, Saudi Arabia. They are in process of customization of the C-med software for Al Abeer Educity and hospital in Kerala, India.

Following are the salient features of C-Med software:

- Modular architecture
- Centralized Solution

- Integrates the core clinical, support and back office services
- Create user friendly and paperless environment
- Consolidate, summarize and graphical representation of management data
- Online electronic medical record (EMR) and management information system (MIS)
- Optimize the physician's work
- Unique Global Patient ID
- Stringent Security
- Mobile Application
- Intranet / Internet Communication System
- Website
- Integrated EHR
- Patient Interface Portal
- Multi layered security system
- Integrated with electronic, legacy and biometric devicest
- Access control for devices and data
- Facility multiple base rate service charges
- Audit control and respective transaction points
- Centralised monitoring and analysis of insurance claims and settlement
- Centralised stock monitoring
- Centralised system configuration setting control
- Centralised back-up system
- Business continuity and disaster recovery

5. Project management plan

The project has following steps involved in the selection of vendors for HIS and ERP software for Al Abeer Educity. These steps will help in

5.1 Selection of the vendor:

Based on above comparison the vendor selection process has been carried out. A panel of all the heads of all departments were on board and had the discussion about the software. After panel discussion the board member had decided to go with the in-house team for designing of HIS software.

5.2 Comparative Analysis:

After comparing the three different vendors on the basis of functionality and module availability the board has come on decision to go with the Calmove Technologies for the customization of ERP and HMIS for Al Abeer Educity. The above comparative analysis shows the difference among all the three vendors.

5.3 Final Selection of vendor

After comparative analysis the shortlisted vendor had been invited to give there demonstration. One by one the demonstration has been taken place and the evaluation done by all the departmental heads. The feedback has been given on the basis of module availability, user friendliness, user interface and customization according to user software requirement policy.

5.4 Testing of the Software

Calmove technologies have a great strength in their software. The software can very efficiently records all the real time data. Record keeping and maintaining are also easy. Stock ledger can be transformed to various formats for the use of internal and external audits. Software testing has been done according to the user requirements specification and software requirement specification. Test data had been prepared by the back end support staffs and the real time Data testing had been carried out.

Note: The implementation will take place after the completion of the hospital building. The final deployment of the software is still in process.

6. Activity Allocation

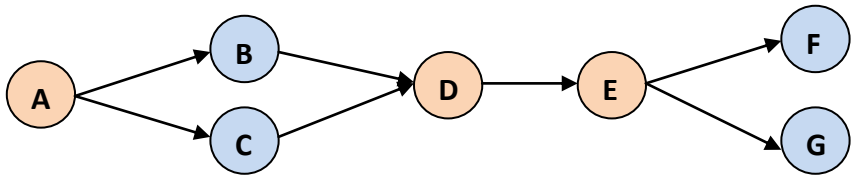


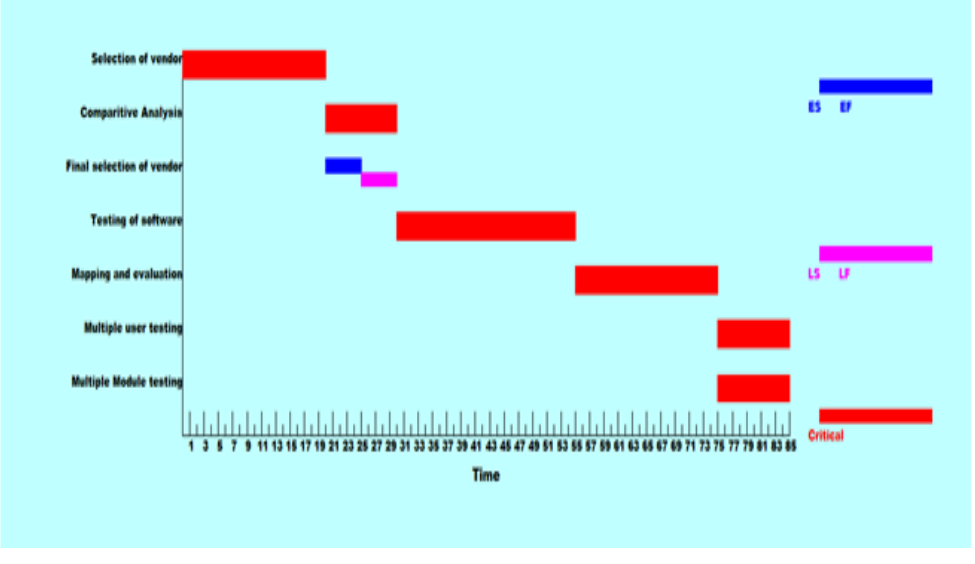
Figure 6.1. Showing Activity and Time Allocation

Work code	**Work**	**Time Allocated To Each Work**	**Precedence Work**
A	Selection of vendor	20 days	
B	Comparative Analysis	10 days	A
C	Final selection of vendor	5 days	A

D	Testing of software	25 days	B, C
E	Mapping & Evaluation of software	20 days	D
F	Multiple user testing	10 days	E
G	Multiple module testing	10 days	E

Table 6.1. Showing Activity and time Allocation

7. Time Allocation



Note: (ES; Early start, EF; Early Finish)

(LS; Late start, Late Finish)

(Critical Path)

Figure 7.1. Showing the Activities with their start and finish time, critical path of the task according to Gantt chart.

8. Lesson Learned

The following learning happened from the study:

- ERP ecosystem in India
- Key Market Players of HIS Software in India
- Vendor Selection for HIS Software
- Comparative study on the basis of Module availability and functional availability
- Analyzing the modules according to the workflow of hospital

- Mapping of modules, its components and sub components
- Statistical analysis of collected data
- Floor wide and Department wide mapping of IT-asset for Hospital
- Negotiation for the purchase of IT-asset for hospital.

9. Recommendations

- There is a need of experienced IT manager for the organization.
- Proper invitation letter draft for IT vendor, to invite them for their software demonstration.
- All department heads should be present during the demonstration.
- Prior booking of conference room for the demonstration.
- Every selection committee team member must view the entire demonstration.
- There should be a software selection committee.
    - Committee leader
    - ERP Package - business decision, not an IT decision
    - Members Commitment – Time
    - At Least one member – Write Checks and Take Final Calls
    - Involve Final Decision Maker as much as possible

REFERENCES

[1] M, Grostick S, Hanken M, et al. Health information: management of a strategic resources. Philadelphia: W.B. Saunders Company; 2001:654–659.

[2] Adler, K.G. (2005 Feb) "How to Select an Electronic Health Record System", Fam Pract Manage. 12(2), 55–62.

[3] Ahmadi M, Barabadi M, Kamkar M. (1389) Evaluation of Hospital Information Systems in the Medical Records, Health Information Management Journal l7(1), 16–23.

[4] Aiatolahi, H. Study of users' viewpoint about ADS-9 software in The Teaching hospitals of the Iran Medical Sciences University [Thesis in Persian]. Tehran: School of Medical Information Management, Iran university of Medical Sciences; 2002.

[5] Al-Mashari, M., and Zairi, M. (1999) BPR implementation process: An analysis of key success and failure factors. Bus. Process Manag. J. 5(1), 87–112.

[6] Al-Nashmi, Maha Eissa. The role of vendors in health information systems implementation: Assessing the perception of healthcare executives and vendors University of Pittsburgh; 2003. Available at: http://proquest.umi.com.

[7] Beynon-Davies, P., Information systems failure and risk assessment: The case of the London Ambulance Service Computer Aided Despatch System. In Proceedings of the European Conference on Information Systems. Proceedings of the 3rd European Conference on Information Systems. Athens: Greece; 1995.