“ARE HOSPITALS READY TO BE ON CLOUD?”

- Acceptance of Cloud Based H.I.S in Delhi

A Dissertation submitted in partial fulfilment of the requirements for the award of

Post Graduate Diploma in Health and Hospital Management

By

Dr. Kritika Katiyar (PT)

International Institute of Health Management Research

New Delhi - 110075

May, 2013

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ATTUNE
Innovation Infinite

Certificate of Internship Completion

Date: 27.04.2013

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Dr. Kritika Katiyar has successfully completed her 3 months internship in our organization from January 01, 2013 to April 01, 2013. During this intern she has worked on Brand and Business Development under the guidance of me and my team at Attune Technologies Pvt Ltd.

Dr. Kritika was found to be diligent and sincere in her work. She has good leadership qualities, organizational ability and inter-personal skills. She is a good team player and is also capable of working independently.

We wish her good luck for her future assignments.

Mr. Parthasarathy . S
Head – Sales & Marketing

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Certificate from Dissertation Advisory Committee

This is to certify that Dr. Kritika Katiyar, a graduate student of the **Post- Graduate Diploma in Health and Hospital Management**, has worked under our guidance and supervision. She is submitting this dissertation titled "**Are Hospitals Ready to be on Cloud – Acceptance of Cloud Based HIS in Delhi**" in partial fulfilment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management**.

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Faculty Mentor	Organizational Advisor
Designation	Designation
IIHMR Organization, New Delhi	Address
Date	Date

Certificate of Approval

The following dissertation titled "**Are Hospitals ready to be on Cloud? – Acceptance of Cloud Based H.I.S in Delhi**" is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **Post- Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation

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FEEDBACK FORM

Name of the Student: DR. KRITIKA KATIYAR

Dissertation Organisation: ATTUNE TECHNOLOGIES PVT. LTD.

Area of Dissertation: SALES & MARKETING

Attendance: 100% COMPLETE

Objectives achieved: Successfully managed International Medical Fair 2013. This generated 200 leads, converted one to client.

Deliverables: Channel Partners, Number & Accounts, Competition Analysis, Marketing Activities.

Strengths: Communication skills, Leadership activities, Functional knowledge, Straightforwardness.

Suggestions for Improvement: Decision Making, Networking skills.

Signature of the Officer-in-Charge/ Organisation Mentor (Dissertation)

Date: 27-04-2013
Place: Delhi

(S. PARTHASARATHY)
HEAD - SALES & MARKETING

ACKNOWLEDGMENT

I would like to express my sincere thanks and gratitude to **Mr. Parthasarathy, Head - Sales & Marketing**, for giving me an opportunity to carry out my dissertation at Attune Technologies Pvt Ltd, Singapore. His constant support and encouragement has been a source of great inspiration for me. His critical appraisal and pertinent suggestions have helped me in shaping this report. I am extremely obliged for his keen interest, constant support and guidance.

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DR. KRITIKA KATIYAR

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ACRONYMS

HIS – Hospital Information System

NABH – National Accreditation Board for Hospitals and Healthcare Providers

DGEHS – Delhi Government Employee Health Scheme

HIT – Health Information Technology

CAGR – Compound Annual Growth Rate

EMR – Electronic Medical Record

EHR – Electronic Health Record

HIPAA – Health Insurance Portability and Accountability Act

ICD – International Classification of Diseases

PACS – Picture Archival Communication System

ABSTRACT

Objective - To determine the acceptability of Cloud Based HIS in terms of product functionality and affordability in 100-150 bedded private hospitals in Delhi.

Data and Method – It is a cross-sectional study done on 19 Hospitals (100-150 bedded) in Delhi. These hospitals were selected through purposive sampling based on NABH and DGEHS criteria. Questionnaire tool was used to capture the data through personal visits to these hospitals and meeting the key people.

Findings – The findings of the study suggest that 53% of the hospitals find the presentation and processes of their current software to be bad while 36% are less satisfied with the features available to them. In contrast to this result, 45% of the hospitals find Cloud based HIS to have better presentation and processes and 72% are satisfied with the features.

Conclusion - Cloud computing can free medical practices from the burden of supporting IT systems in-house, yet enable open access to data, files, analysis and reporting all within a secure and compliant environment. The hospitals want a change in their current software as per their immediate needs, and they find Cloud technology as their solution to coordinate and exchange information more efficiently.

LIST OF FIGURES

INTERNSHIP REPORT

Objective of Internship

Internship is an integral part of our Postgraduate Programme in Hospital Management. As part of the curriculum, we are required to undergo three months internship with reputed organization to: -

- Learn through assessing the manager in daily operational management.
- Study and address some identified issues, associated with some specific operational areas.
- Enhance our skills in regards to giving practical and effective solutions to day to day problems
- To acquire new skills from our day to day activities to become more effective and efficient in our delivery of results.

Organization Profile

Attune Technologies Pvt Ltd

Attune Technologies Pvt Ltd is a visionary healthcare information technology company that delivers next generation healthcare IT products to the market. It is the only Indian Health IT company that provides software solutions to Labs, Hospitals and Radiology Imaging Centres. While most of the other vendors attempt just implementing the software, the organization focuses primarily on delivering business benefits to its customers. Headquartered at Singapore, the company's main Product Development Centre is in Chennai with other branch offices in Mumbai, Delhi and Hyderabad.

Vision

To manage world's health information

Values

To provide innovative solutions to business problems by appropriate usage of technology

Organization Culture:

Entrepreneurial Culture and Innovation- Attune actively fosters Entrepreneurship and Innovation across the organization. In this era of Knowledge Economy, it strongly believes that the most valuable asset of an organization is its human talent. By promoting Informed Risk taking, Attune provides the ability to tap the combined potential of individual team members to add more value to our customers.

Team Work - One of the critical success factors of Attunes business model is the ability of it's project teams to deliver effective solutions to our Customers. This requires seamless co-ordination and transfer of knowledge among various specialized teams. Ability to work in cross-functional teams is a key pre-requisite for any member coming on board. The Recruitment, Retention, Reward & Recognition Policies are aligned to foster and encourage team work across all levels of the organization.

Positive Contribution - The organization would promote a culture where anyone is free to challenge the ideas of any other person in the organization. Every employee is expected to positively challenge the issues and come out with alternatives and in the end, may be, accept either the position that was initially proposed or the one proposed later based on objective

discussions. Once a decision has been arrived at, the team shall go ahead implementing it without postponing any further.

Position and Description

Designation - Business Development Manager

Job Purpose and Outline

Business development includes a number of techniques designed to grow an economic enterprise. Such techniques include assessments of marketing opportunities and target markets, intelligence gathering on customers and competitors, generating leads for possible sales, follow-up sales activity, formal proposal writing and business model design. Business development involves evaluating a business and then realizing its full potential, using such tools as marketing, sales, information management and customer service.

Key Facets of Job includes –

- Partner with sales staff to identify accounts that have growth potential
- Interact with executives in the customer organization to learn about the customer's business and to strategize about growth plans
- Coordinate all aspects of on-site, customer events (e.g., Attune resources, customer availability, agenda, travel plans)
- Analyze and monitor the performance of the customer base to identify areas of opportunity and to pre-empt customer issues
- Manage own territory and sales targets
- Support the marketing team in delivering appropriate marketing campaigns to the local customer base
- Interact with Product Manager to learn about new products, new vendors, and vendor promotions
- Introduce vendors into accounts to help position specific products

Administrative Activities –

- Arranging both internal and external meetings and conferences and travel plans. (Including domestic and international travel planning)
- Composing and preparing routine correspondence (mainly e-mails and memos)
- Prepare PowerPoint presentations and marketing materials.
- Preparing weekly and monthly pipeline reports and new business proposals.
- Managing routine calls and inquiries from outside vendors, clients, etc.
- Preparing expense reports as necessary.

Key Result Areas –

- Channel Partners
- Number of accounts / value
- Competitor Analysis
- Marketing Activities

Key Relationships (Internal)

- Sales and Marketing team
- Implementation team
- Product development team
- Customer care executives / tele-callers

Key Relationships (External)

- Attune Clients – Hospitals and Labs
- Channel Partners
- Promoters and Distributors
- Third Party Vendors
- Healthcare professionals

Key Learnings

- Understood the product in detail by getting involved in development and testing initially
- Channel Sales and Distribution and its respective way of functioning.
- Brand development; developing brand strategy and statistics systems.
- Strategic Consulting, including business plan & sales strategy development.
- Building market position by locating, developing, defining, negotiating, and closing business relationships.
- Organizing large scale events to highlight the product in the most appropriate manner
- Resolving client issues pre and post implementation
- Mentoring and training the new members in the sales and marketing team.

INTRODUCTION

Health information technology (HIT) provides the umbrella framework to describe the comprehensive management of health information across computerized systems and its secure exchange between consumers, providers, government and quality entities, and insurers. Health information technology (HIT) is in general increasingly viewed as the most promising tool for improving the overall quality, safety and efficiency of the health delivery system[1]

Broad and consistent utilization of HIT will:

- Improve health care quality;
- Prevent medical errors;
- Reduce health care costs;
- Increase administrative efficiencies;
- Decrease paperwork

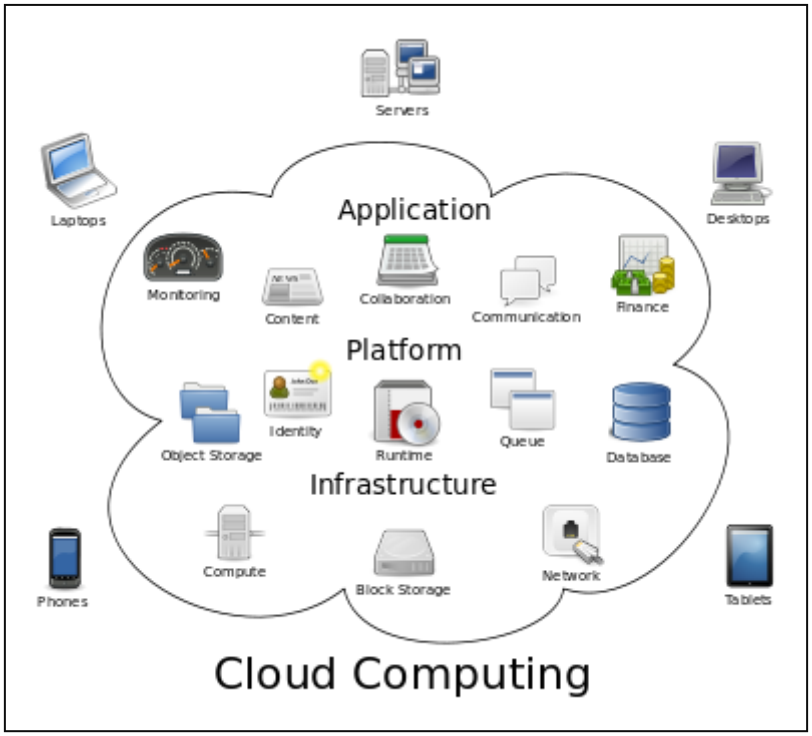
HIT will improve individual patient care, but it will also bring many public health benefits including:

- Early detection of infectious disease outbreaks around the country;
- Improved tracking of chronic disease management; and
- Evaluation of health care based on value enabled by the collection of de-identified price and quality information that can be compared

The healthcare information technology market is estimated to be $53.8 billion by 2014, growing at a CAGR of 16.1%. In U.S alone, the market is expected to grow by $ 17.5 billion by 2016 with a CAGR of 18.7%. The market is expected to grow because of the tremendous demand for general applications which includes electronic medical records, electronic health records, computerized physician order entry system and non clinical systems. It is expected that the market for general applications will grow at an overall CAGR of 13.0% from 2009 - 2014. The main driving element for global healthcare information technology market is the changing government regulations and government initiatives to bring down the healthcare costs.[2]

India is hub of IT and IT enabled service industry. It is often used by big pharmaceutical companies, corporate hospitals and other private health sector. In past decade, health insurance has grown very rapidly which uses IT in collecting, analysis and transferring information when needed. Currently electronic health records (EHR); telemedicine; digital health knowledge resource e.g. digital medical library; hospital information management system; e-learning technologies; health sciences and public health informatics etc uses information technology. Electronic medical record (EMR) services have a high growth potential at an estimated compound annual growth rate (CAGR) of 13.5 percent from 2009 to 2016. With many new private hospitals opening in the next few years, investment in EMR is expected to become a necessity for this hospitals.[4]

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the common use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. End users access cloud-based applications through a web browser or a light-weight desktop or mobile app while the business and user's data are stored on servers at a remote location.[5]



The advantages of cloud computing in health care industry are as follows:

1. **Collaboration**. In many cases specific information may be needed in two places, by different health services providers at the same time. Through cloud technologies, the information is synchronized and shared in real time.
2. **Speed.** Cloud-based tools can upgrade and improve their features faster, less expensively and with minimal or no service interruption. Plus, cloud services enables faster access to important information for health services providers and their patients.
3. **Mobility**. Each mobile app is backed up by a cloud infrastructure. By storing data and computing power in the cloud, health care services providers enable their staff to have access to information anywhere and anytime.
4. **Security and privacy**. Cloud services providers are required to comply with many privacy standards such as HIPAA (Health Insurance Portability and Accountability Act). Today there are several managed cloud providers offering HIPAA compliance.
5. **Decreased costs**. There is no need for the health care institution and doctors to invest in hardware infrastructure and maintenance because these concerns are already taken care of by the cloud computing providers.[6]

RATIONALE

The health care industry faces increased pressure to do more with less whether it's with patients, providers or regulators. Other industries facing similar pressures are increasingly running their business on the "cloud," giving them on-demand access to shared computing resources. The core benefits of cloud computing match perfectly with the demands that health care IT departments are being asked to fulfil. Since Cloud technology has recently entered the healthcare market, we need to know whether the hospitals today are well equipped for this change in terms of technology, product quality, infrastructure, resources and finances. The concerned company's cloud bases HIS is looking for expansion in the Northern India with Delhi as its hub. Hence this market study is being done in medium sized private hospitals (100-150 bedded) in Delhi to understand the growth parameters, and to make the product readily available to its prospective clients on terms favouring their existing resources, both technical and financial.

LITERATURE REVIEW

Cloud computing is a new paradigm that is changing how enterprises, institutions and people understand, perceive and use current software systems. With this paradigm, the organizations have no need to maintain their own servers, nor host their own software. Instead, everything is moved to the cloud and provided on demand, saving energy, physical space and technical staff. Cloud-based system architectures provide many advantages in terms of scalability, maintainability and massive data processing.

It is estimated that Indian hospitals spend close to USD 191 million on IT. It is expected that this spending shall grow at a CAGR 25 percent over the period 2010 - 2020. Cloud computing can potentially address close to 40 percent of the total IT spend by India healthcare (Hospital) industry.

In India, the scope of IT application in both public and private healthcare will be different. While IT systems in public sector can help to drive up efficiency of healthcare delivery infrastructure, IT in private sector can help to address concerns such as managing uneven patient flows for in-patient procedures, cost management and business intelligence. A survey was done in 150 hospitals of India across major cities where most hospitals have adopted the basic level of IT.[7] However; there is still a lot of opportunity for growth. The key functional areas where Hospital IT is leveraging is:

- Administrative functions
- Clinical functions
- Finance and revenue functions

The cloud computing market in the health care sector is expected to grow to $5.4 billion by 2017. Despite this growth, many in health care are still pushing back on cloud computing, citing security and privacy issues. But others are finding better security models and technology in the cloud. Moreover, most health care organizations moving to cloud computing are doing so to reduce operational costs, because many have very limited budgets -- a powerful motivation that will overcome the overblown security and privacy excuses.[8]

Cloud encompasses several variations of service models (i e., IaaS, PaaS, and SaaS) and deployment models (i.e., private, public, hybrid, and community clouds), as defined below.

Infrastructure as a Service (IaaS) provides users with processing, storage, networks, and other computing infrastructure resources. The user does not manage or control the infrastructure, but has control over operating systems, applications, and programming frameworks.

Platform as a Service (PaaS) enables users to deploy applications developed using specified programming languages or frameworks and tools onto the Cloud infrastructure. The user does not manage or control the underlying infrastructure, but has control over deployed applications.

Software as a Service (SaaS) enables users to access applications running on a Cloud infrastructure from various end-user devices (generally through a web browser). The user does not manage or control the underlying Cloud infrastructure or individual application capabilities other than limited user-specific application settings.[9]

Cloud Deployment Models

Deployment of a cloud can be done in the following ways:

Private clouds are operated solely for one organisation. They may be managed by the organisation itself or by a third party, and they may reside on-premises or off it.

Public clouds are open to the general public or a large industry group and are owned and managed by a Cloud service provider.

Hybrid clouds combine two or more clouds (private or public) that remain unique entities but are bound together by technology that enables data and application portability.

Community clouds feature infrastructure that is shared by several organisations and supports a specific community. They may be managed by the organisations or a third party and may reside on-premises or off it.

In major cities across India, we have some of the best hospitals in the world in terms of adoption of technology and provision of high quality of healthcare services. However, the scenario is completely different in rural hospitals, which lack even basic infrastructure, let alone high end technological infrastructure. This means that the doctors, nurses, administrators, and other personnel working in the rural hospitals are not exposed to technology at all, as opposed to their counterparts in the major cities.

There is a need for sustained efforts from both the Government and private sector to create uniformity in healthcare technology adoption. The good news is that cloud technology can make healthcare applications like EMRs, HIS, PACS, and others affordable and easily accessible.

High cost of implementing and managing multiple diverse infrastructural components: The general feeling is that traditional technology requires elaborate infrastructure and manpower to run. For example the computer network requires a separate infrastructure, as opposed to the telephony network. In addition, devices like pagers, nurse call systems, public address systems, etc. requires a different set of infrastructure. There is a need for a common integrated network infrastructure, which can create the 'Foundation for Connected Health'. To capitalise on technology investments now and in the future, hospitals need an integrated IT network that helps diverse entities to collaborate and communicate effectively. The cloud can act as the foundation for connected health to support a range of complex, disparate, and mission-critical applications. The cloud helps the hospitals and healthcare providers to use the applications, hardware, and services on a 'pay per use' model, which allows them to avoid heavy capital expenditure on buying and deploying expensive technology.[10]

From large hospitals and medical groups to smaller community doctor's offices, healthcare organizations are facing new technical and EHR requirements. One of the most significant challenges is ICD-10, the newly revised standards used by the medical coders and billers to document diagnoses. Before healthcare providers can implement ICD-10, however, they must first integrate new HIPAA transaction standards known as ANSI 5010.[11] Adding to security and compliance issues is the trend toward Accountable Care Organizations. ACOs require compliant integrative technology that allows them to connect, track, collaborate, treat, and report across providers and agencies. [12]

Listed below are common use cases where healthcare organizations are gaining value from cloud computing:

- Central management of patient care and claims data
- Reporting and mining clinical data to improve patient outcomes
- Analyzing chemical and biological data for drug discovery
- Meeting High Performance Computing (HPC) capacity needs and processing compute intensive research models such as genome sequencing
- Storing, managing, and analyzing high volumes of images

Here are some leading healthcare companies who have leveraged cloud computing to meet their business needs:

1. Pfizer manages peak computing demands with cloud and avoids high upfront costs

Pfizer‘s high performance computing (HPC) software and systems for worldwide research and development (WRD) support large-scale data analysis projects, clinical analytics, and modeling. Pfizer needed a secure environment to carry out computations for WRD and handle its peak computing needs. They decided to set up an instance of Amazon Virtual Private Cloud (VPC) to provide a secure environment for the HPC systems, thus enabling them to provide compute capacity beyond the capacity of the dedicated systems. Pfizer no longer had to invest in additional hardware and software, which is only used during peak loads and could invest these savings in other WRD activities to explore specific difficult or deep questions in a timely, scalable manner.

2. Cloud computing helps Philips Healthcare to delight partners and customers

Philips Healthcare, a leading global healthcare provider, was relying on a FoxPro based system to help its multi-vendor customers track their purchased equipment and manage service requests. After considering different options, they chose Salesforce as the CRM system and Force.com to build the asset management system with SAP integration for its flexibility, low total cost of ownership, and easy deployment. Using Force.com platform, Philips Healthcare could launch the new app quickly and cost-effectively and achieved improved customer and partner satisfaction.

Platform: Force.com

3. API Healthcare adopts cloud to increase customer reach of their existing on-premise product

API Healthcare, a provider of innovative workforce management solutions for healthcare industry, wanted to create a SaaS-based, customized version of their product for workforce recruitment and attendance for smaller hospitals. Looking for high scalability at low costs, API decided to use Windows Azure platform and engagedCloud First Company, Aditi Technologies to help realize their vision. The cloud-based product enabled API Healthcare to tap new markets of small scale healthcare organizations that were looking for low cost workforce management solutions.

4. Toshiba Medical Systems embraces environmental friendly cloud solution to store terabytes of medical data

Toshiba Medical Systems, a provider of medical equipment and diagnostics imaging systems, needs to backup and store X-ray, CT, and MRI image data recorded by health institutions which has increased drastically due to technological advances in medical diagnostic imaging equipment. Recent legal reforms and the subsequent earthquake and tsunami disasters had reaffirmed the need for backing up medical information. Toshiba Medical Systems decided to set up an external storage service for X-ray, CT and MRI image data recorded by healthcare institutions via Amazon Simple Storage Service (Amazon S3) offered by Amazon Web Service (AWS). By implementing the AWS cloud services they can now implement environmental friendly systems by reducing costs of storage and also reducing space and energy consumption. Safety and security of the data is achieved by utilizing the characteristics of the cloud services offered by AWS.

Platform: Amazon AWS

5. Wellmark leverages Windows Azure Cloud to reduce time to market by 50%

Wellmark Blue Cross and Blue Shield, a health insurance company, wanted to provide custom mobile apps that its members could use to find credentialed healthcare providers and facilities and better manage their healthcare experience. After finding that the required resources to support these new apps were already engaged in other high-priority projects, Wellmark was looking for a cloud option to achieve this. Wellmark engaged with a Microsoft partner and decided to build the back-end services for its new mobile

apps on Windows Azure. With Windows Azure, Wellmark could conserve resources and accelerate time-to-market for the new mobile apps. They also avoided any up-front investments in hardware and software and could achieve cost-effective scalability and superior reliability and security.

6. Nationwide Children's Hospital powers Cancer Research using cloud computing

The Research Institute at Nationwide Children's Hospital had created a Virtual Imaging application which could be used to analyze digital slide images and identify patients suitable to participate in clinical trials. The institute wanted to speed up the image analysis to accelerate the pace of discovery and get trial participants' results sooner. They decided to use Windows HPC Server 2008 R2 SP1 and Windows Azure to accelerate the image analysis process. By using Windows Azure, the institute could realize greater scalability, increased pathologist productivity, and increased speed for placement of patients in clinical trials.

7. Shire Pharmaceuticals uses cloud to quickly provision Business Intelligence capabilities

As a global biopharmaceutical company, Shire had accumulated a disparate system IT landscape as a result of a series of mergers and acquisitions. Shire used SAP Business Objects Business Intelligence platform as a reporting solution and had four different instances of it. They were looking for options that would enable them to provision a BOBJ instance quickly while minimizing costs using cloud technologies. Shire worked with an AWS partner to first replicate a copy of Shire's existing non-production environment on the AWS platform and established connectivity between Shire and AWS. Then, they set up and deployed Shire's SAP BOBJ instance to AWS. Shire could lower costs by having the BOBJ solution in the cloud without having to invest in costly infrastructure and also achieve a good user experience.

8. Regence Group enables online shopping of health plans with Force.com cloud solution

Regence Group, a healthcare insurer in the North West US, wanted to build an ecommerce site to help consumers shop for and purchase health plans. After evaluating different solutions, the Regence Group chose the Force.com platform for the ease, speed, and low cost of developing apps in the cloud. They built a complete application and a Web site using Force.com sites which was used by consumers to browse and purchase healthcare plans, agents and brokers to process applications on behalf of clients. With the new platform, they could manage member acquisition process across multiple departments and increase customer satisfaction.

Platform: Force.com

9. Eagle Genomics uses Amazon's on-demand compute power to analyze genomic data

Eagle Genomics handles and analyzes genomic data for pharmaceutical, agricultural and animal health companies, as well as academic centers. They were looking for an affordable and reliable source of on-demand compute power to support their software and handle the large volumes of data. Since Amazon was the market leader at the time of Eagle Genomics launch, it was decided to use AWS for the computing needs. The major benefits Eagle Genomics finds in AWS is the flexibility of scaling up and down to additional resources. They also benefit from the flexible, low cost and totally reliable infrastructure with top-notch security features.

10. Pathwork Diagnostics fuels its research dreams with cloud computing

Pathwork Diagnostics, a molecular diagnostics company, develops high-value diagnostic tests to aid oncologists in the diagnosis of hard-to-identify cancer tumors for which it is required to process tens of thousands of highly compute-intensive models and find the best model. Considering that such computations can take weeks or months using a mid-size high performance computing resource, they decided to look at cloud computing as a solution. Pathwork selected Amazon Elastic Compute Cloud (EC2) after investigating several cloud providers for scalable compute power. The company realized enormous

savings by avoiding the hardware purchases and was able to accomplish key research innovations which would otherwise have been infeasible.

11. Cloud computing helps Molplex to deliver path breaking drugs faster at a lesser cost!

Molplex, a drug discovery company, required massive computing resources to search through chemical and biological databases to identify new drug candidates for treating tropical diseases such as malaria, tuberculosis, etc. With the Microsoft partnership, Molplex has developed Clouds Against Disease platform. This platform draws its power from cloud computing with Windows Azure for searching through massive chemical and biological databases looking for new drug candidates. Windows Azure helps Molplex saves millions of dollars in startup costs and the speed and high level of detail provided by Windows Azure allows them to explore beyond what would have been possible with traditional hardware resources.

12. Schumacher Group builds custom apps in record time with Force.com cloud platform

Schumacher Group, an emergency medicine practice management company, wanted to build multiple applications for emergency room staffing and billing which could also integrate with existing systems such as PeopleSoft and Tangiers Physician Scheduling System. They easily built and deployed the applications in less than 4 months to 200+ users using Force.com platform and also added Salesforce Chatter for real-time collaboration. They also leveraged Force.com's mobile capabilities that enables users to access the app via Blackberry devices.

13. CRC Health embraces Force.com cloud solution to streamline patient intake process and increase web-generated revenue

CRC Health, a provider of drug and alcohol treatment services, required a platform to manage patient intake, track web entities, and streamline call center operations. They built custom solutions on Force.com platform to track bed availability at their facilities, track websites to measure marketing performance, and manage everything from patient

data to admission status. Using the Force.com platform, CRC Health could increase their web-generated revenue from 4 percent to 26 percent and could gain better visibility into patient, regional, and program level trends.

14. Stat Health Services saves $170,000 in investments and achieves 98 percent patient satisfaction using Windows Azure

Stat Health Services helps cut healthcare costs by connecting doctors with patients for the treatment of minor medical conditions through the Stat Doctors online service. However, the existing Stat Doctors website was not able to scale with the company's expanding needs. They evaluated a number of cloud offerings and hosting providers before selecting Windows Azure due to ease of system management, vision alignment, and compliance with HIPAA guidelines. They developed the new version of the Stat Doctors site using Windows Azure. The cloud solution helped them avoid a $170,000 upfront investment in hardware and software and achieve easy scalability. Windows Azure also offered exceptional availability and uptime, resulting in 98 percent patient satisfaction.

15. KMS Vertrieb und Services AG enhances healthcare by creating a centralized database in the cloud

KMS Vertrieb und Services AG, a data warehouse solutions provider for the healthcare industry, wanted to develop a common healthcare database called EYE ON HEALTH using cloud computing resources. KMS used cloud-based Microsoft SQL Azure database service to create the centralized pool of demographic and clinical data, list of physicians, and infrastructure data that is used by hospitals across Germany. Using EYE ON HEALTH, KMS has improved patient care and helped healthcare professionals and investors to make healthcare management more efficient.

16. Hospital Housekeeping Systems builds next-generation mobile apps with Force.com cloud platform

Hospital Housekeeping Systems (HHS), a provider of support service management systems for the healthcare industry, was looking for an easy way to give their remote

employees real-time access to performance and hospital data on iPad and iPod touch devices. They decided to use Force.com and built a suite of apps to automate processes in accounting, finance, marketing, etc and provide mobile access to 500+ users for viewing and updating records on-site at hospitals. They also build other custom apps for quality assurance, automated record management, bed management, payroll and HR management. HHS could achieve faster room turnaround, improved service, and increased customer satisfaction thanks to mobility, data quality, and business visibility achieved.

OBJECTIVES

The main objective of this study is to determine the acceptability of Cloud Based HIS in terms of product functionality and affordability in 100-150 bedded private hospitals in Delhi.

Specific Objectives:

1. To study the existing HIS product functionality in 100-150 bedded hospitals of Delhi.
2. To determine the Cloud Based HIS product acceptability in these hospitals.
3. To find out the financial affordability of these hospitals towards Cloud Based HIS.

DATA AND METHODS

Type of Study: Descriptive/ Cross-sectional

Study Unit: 100-150 bedded Hospitals in Delhi (19 Hospitals)

Key Personnel – Directors, IT Managers, Administrators.

Sample Design – Purposive Sampling has been done. According to the Delhi Medical Association, there are 63 private 100-150 bedded hospitals in Delhi NCR. 32 are NABH accredited, out of which 19 hospitals are DGEHS recognized. This filtration was done to get quality data as per the requirement of the study from these hospitals.

Tools and Techniques:

Open and Closed ended questionnaire tool was used and the data was obtained by visiting these hospitals and meeting the key personnel. The software was given on trial basis to these 19 hospitals for a period of one week to get the responses regarding functionality of Cloud based H.I.S.

RESULTS AND FINDINGS

(I) Current software functionality

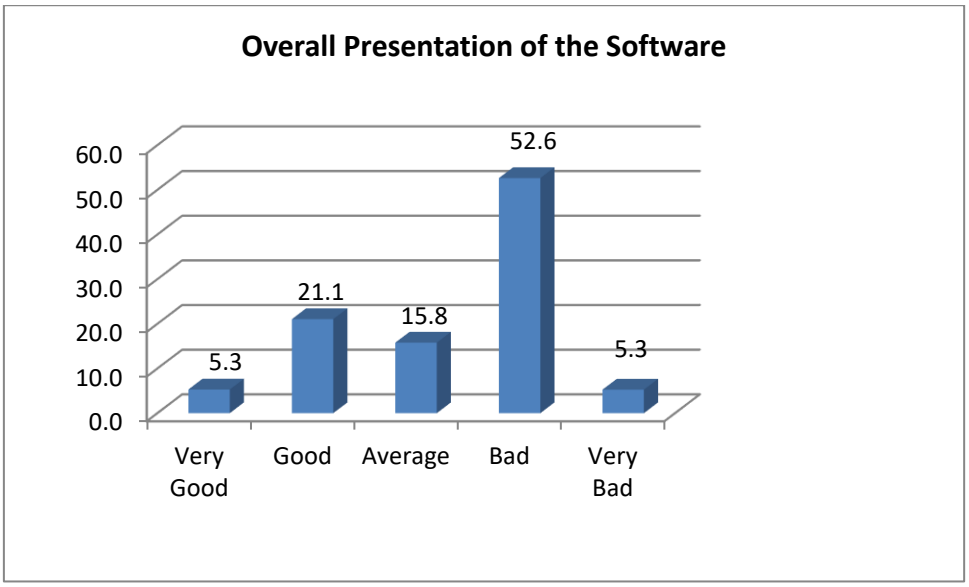


Fig: 2 : Overall presentation of the existing software in the hospitals

For the existing software being used in these hospitals, 10.5% feel that their current software presentation is very good whereas an equal percentage feels that it is very bad. Around 36.8% of the hospitals have given an average response towards their software's presentation.

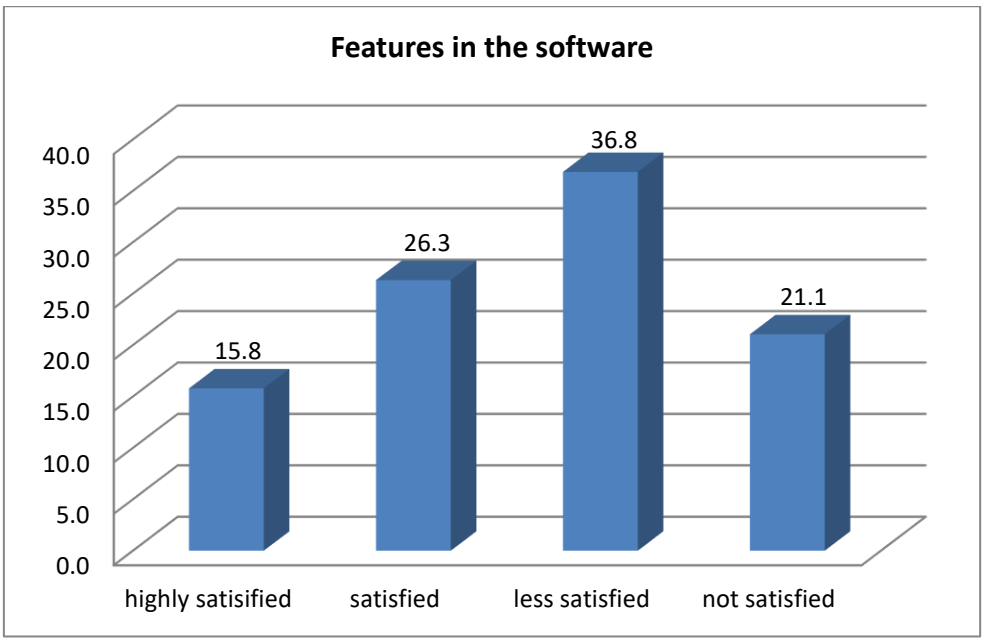


Fig 3 : Hospitals satisfaction towards the features in their current software

As seen above, regarding the feature satisfaction of the current software, 36.8% of the hospitals are less satisfied with the software while only 15.8% of them are highly satisfied.

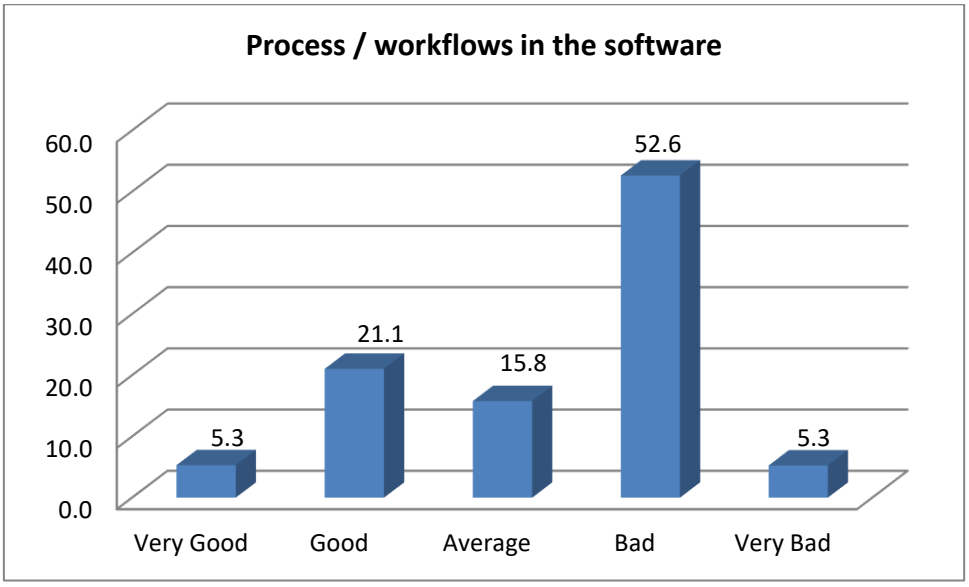


Fig 4: Rating towards the processes available in the hospital's current software

52.6% of the hospitals consider that the processes their current software is having is bad while only 5.3% of them feel that it's very good and an equal percentage feels that it's very bad.

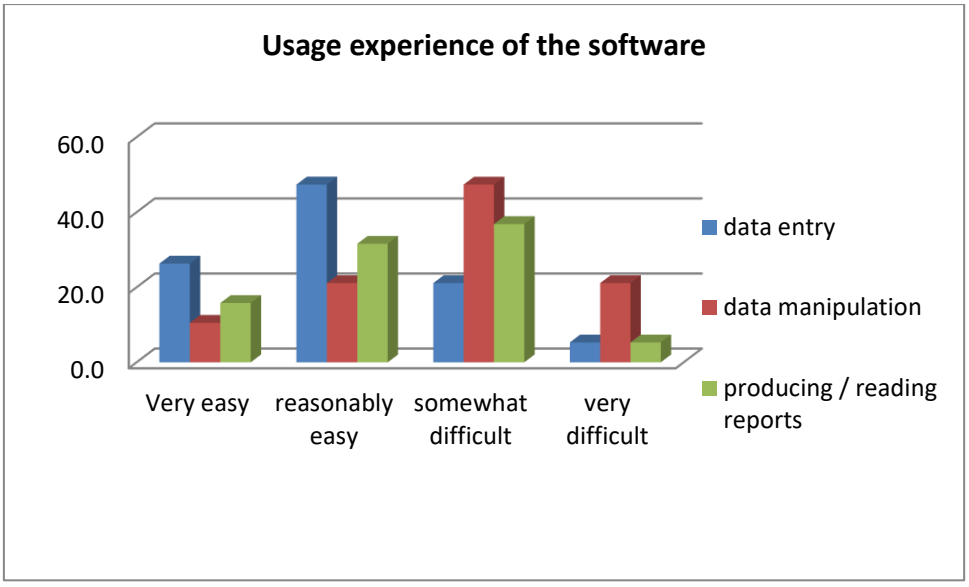


Fig 5 Ease of use of the current software on three parameters – data entry, data manipulation, reports.

As seen above, 47% of the hospitals find that data entry in their current software is reasonable easy while 5.3% feel that it's very difficult. On the other hand, for data manipulation, 45% of hospitals feel that it's difficult and for report generation, 37% of hospitals find it as a difficult task in their current software.

(II) Cloud Based HIS product Functionality – Post Demo/ Trial Use

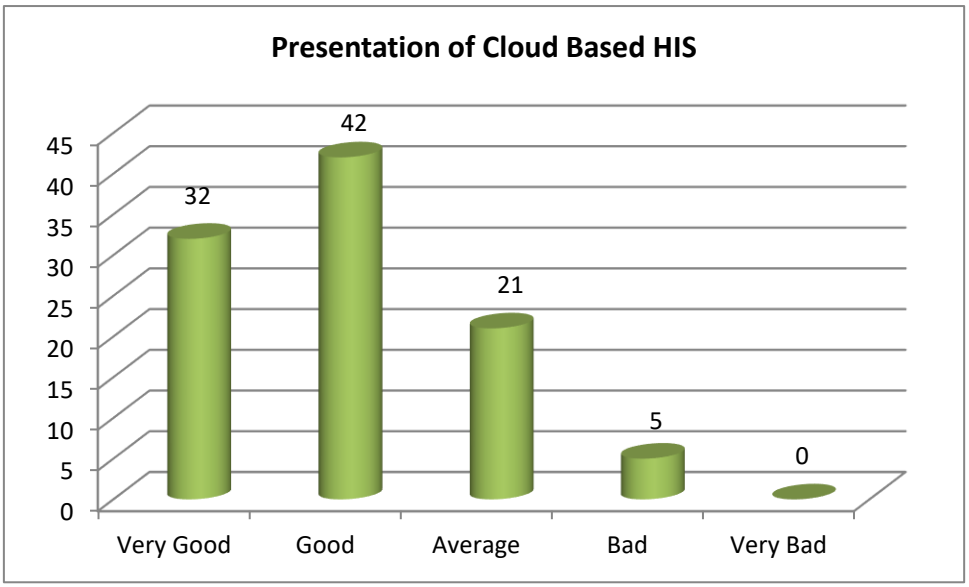
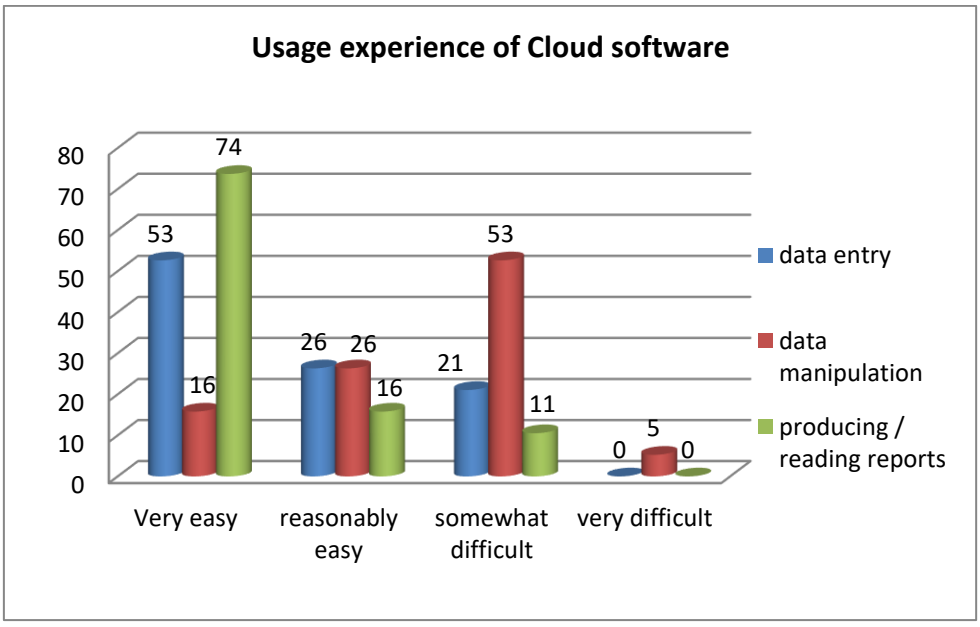


Fig 6: Rating towards presentation of the Cloud based software by the study hospitals

As seen above, 68.4% of the hospitals under study consider the presentation of cloud based HIS as very good in terms of it's functionality and use. None of the hospitals felt that it's presentation is not up to the mark or bad.



Regarding the ease of usage of the cloud software, 53% and 74% of the hospitals have found it very easy to use the software for data entry and reporting respectively whereas 53% of the hospitals find data manipulation as difficult on cloud based HIS. None of the hospitals in the study found data entry or reporting as very difficult in the cloud software.

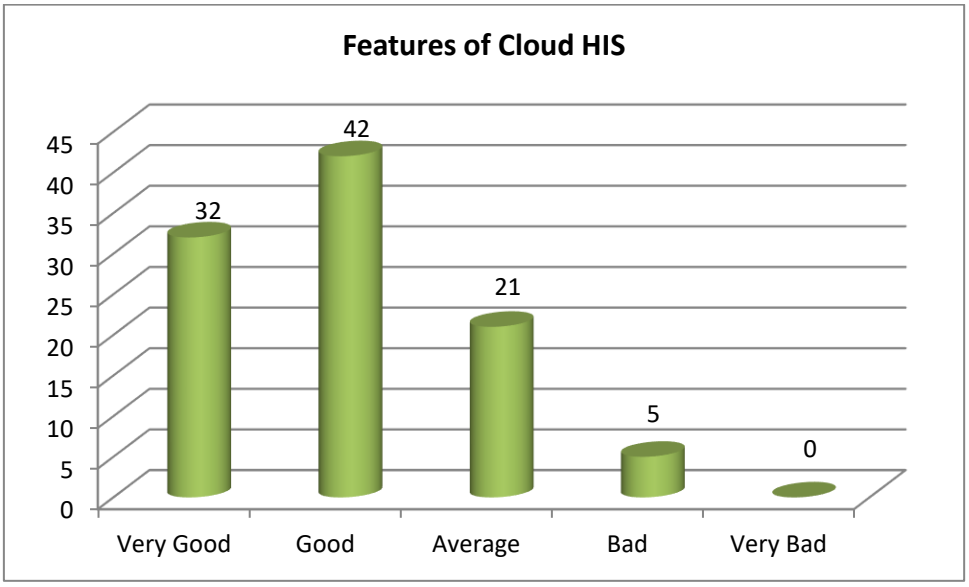


Fig 7 : rating towards the features present in the Cloud based HIS

74% of the hospitals found the various features in the cloud based HIS to be very good. The study did not abotain any negative response from any of the hospitals for this parameter assessment.

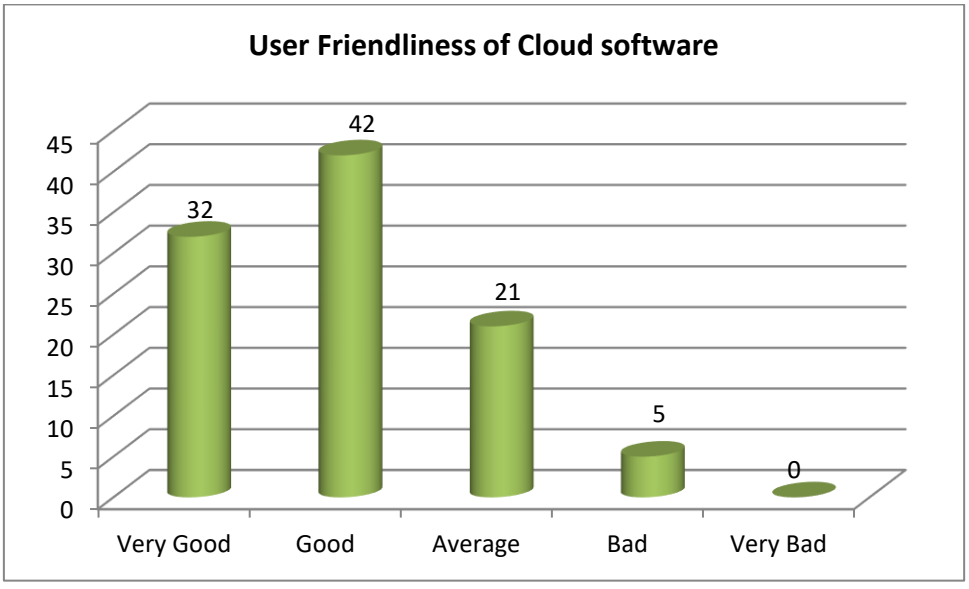


Fig 8 : response on user friendliness of cloud based H.I.S

From the above, we can see that 42 % of the hospitals found the Cloud software to be user friendly, as compared to 21% who thought it to be average. However, none of them felt that the software is not user friendly at all.

(III) Financial affordability of the hospitals

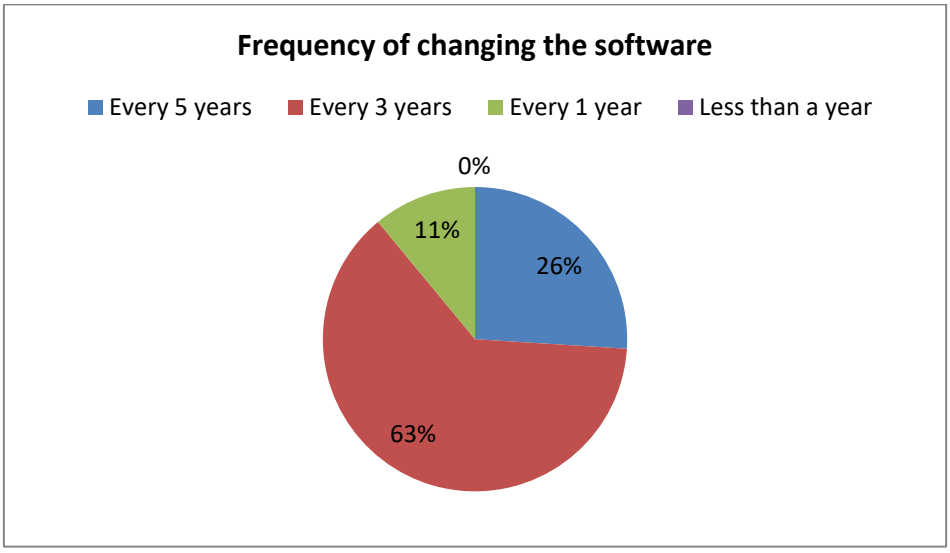


Fig 9: hospitals changing the software - frequency

As seen from the above, 63% of the hospitals change their software every 5 years whereas, 11% of them change it every year. These figures depict the willingness to change their software towards a better product at a defined time frame either out of product failure or due to financial affordability.

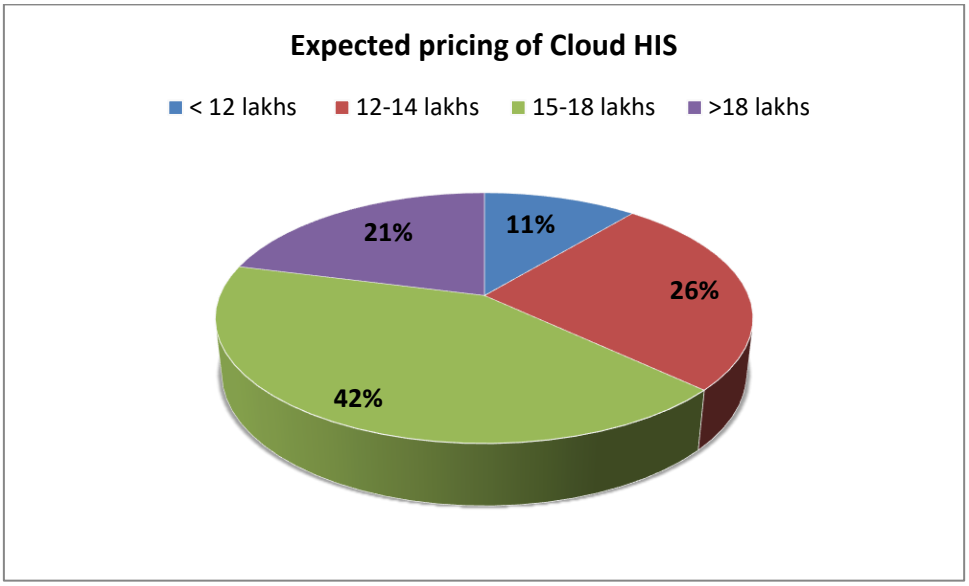


Fig: 10 expected price of Cloud HIS given by the study hospitals

Where the actual pricing of cloud HIS may vary depending on the hospitals, still, 42% of the hospitals feel that the software provided to them for demo is available between 15-18 lakhs.

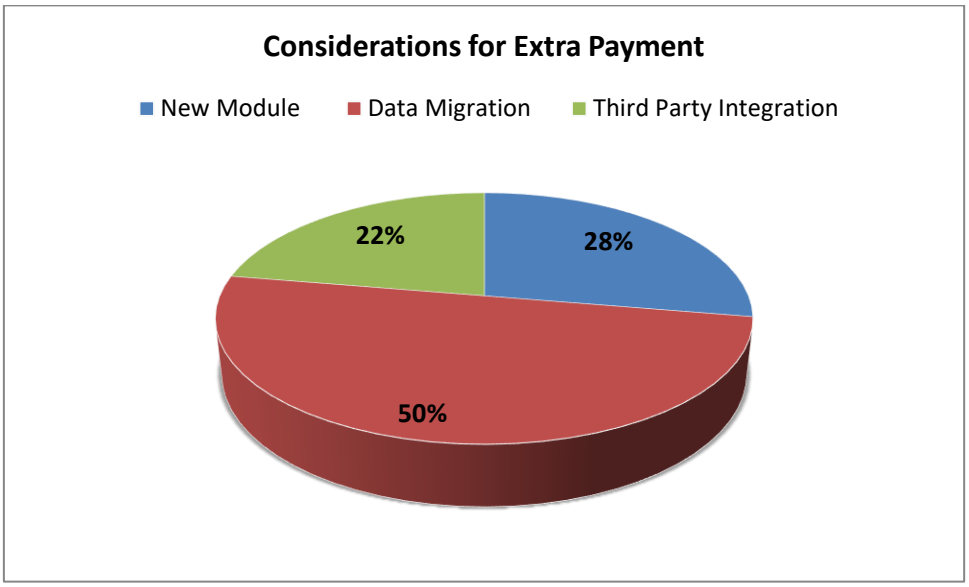


Fig:11 Considerations for extra payment by the study hospitals

Almost 50% of the hospitals are ready to pay extra for data migration, followed by only 22 % for an additional module. 28% of the hospitals are ready for third party integration. These figures tell us that the hospitals are ready to migrate all the previous records on the Cloud by paying extra, and only 22% of them feel that an extra module is required i.e a majority accepts the product as it is available and do not require changes in it.

DISCUSSION AND RECOMMENDATIONS

As in any industry considering a technology migration, cost is a major concern. Yet, cloud computing proves much more cost effective than internally supporting and maintains servers, hardware, software and technical personnel who are often not experts in EHR. To optimize the effectiveness of cloud computing and to achieve efficiencies, we expect organizations to adopt standardized processes and focus on achieving differentiation through collaborative partnerships and use of information. Common processes, data and standards can improve quality and operational effectiveness. Rapid, flexible and scalable IT can change how information is used and delivered.

When transitioning to cloud computing, healthcare organizations must ensure the following:

- Systems must be adaptable to various departmental needs and organizational sizes. Different healthcare organizations and departments will have their respective diverse sensitivities as to the uptime availability, system responsiveness, latency, and scalability requirements for their healthcare IT applications and workflow. These factors back to whether a cloud solution deployment model is public or private, is located on-premise or off-premise, the cloud delivery method (e.g., SaaS). Different cloud based design patterns can be appropriately applied to address these sensitivities dependent upon the healthcare providers' needs and sizes but must be evaluated on a case-by-case basis.
- Architectures must encourage a more open sharing of information and data sources. The healthcare industry is slowly moving toward an information-centric care delivery model that facilitates data / information sharing and collaborative workflow. While steps have been made in standardizing medical data formats and vocabularies, the adoption of secure mechanisms for widespread, interoperable information exchange between all of the healthcare players (e.g., providers, patients, government agencies, insurance companies) is slow in coming.
- Scalability is a must as more patients enter the system and more data becomes digitized. A cloud infrastructure, such as one utilized for EMR, can quickly "burst" above its initial designed workload capability, when the need arises. This

distinguishes cloud computing as a utility-like resource whose resources change based on the healthcare providers changing needs.

- Portability is needed as doctors and patients would benefit from the ability to remotely access systems and data. Cloud based solutions provide ease of healthcare data and application access as they are ubiquitous and available virtually anywhere there is an Internet connection or Wi-Fi connectivity. Strategies must include the necessary management policies (e.g., change management), technologies (e.g., encryption), and software tools for mobile / remote device access to comply with all pertinent regulations, laws and organizational procedures.

CONCLUSION

Cloud computing can free medical practices from the burden of supporting IT systems in-house, yet enable open access to data, files, analysis and reporting all within a secure and compliant environment. It's how cloud computing coupled with secure hosting and advanced processing can help the healthcare industry meet the challenges of a changing practice management landscape. Security is one of the main concerns of Cloud Computing. This makes it necessary to maintain a secure, safe, and authorized environment for the prevention of information leakage. Another drawback with Cloud Computing approach is, that at the end user loses control over the remote servers, their software, or their security factors. A huge amount of data gets accumulated in these central servers over the years and it may eventually be difficult (or even impossible) to migrate massive amounts of data from the provider. The cloud computing model is suited to healthcare applications due to the volume of dynamic and diverse sources of information. Cloud computing can help clinicians and hospitals to coordinate and exchange information more efficiently. The use of cloud computing architecture helps in eliminating the time and efforts, needed to roll a healthcare IT application in a hospital.

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