Internship Training

at

KareXpert Technologies Pvt. Ltd.

Acceptance of Hospital Management Information System among End Users

by

Aashish

Enroll No.- PG/20/002

Under the guidance of

Dr. B S Singh

PGDM (Hospital & Health

Management) 2020-22

International Institute of Health Management Research New Delhi

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(Completion of Dissertation from respective organization)

The certificate is awarded to

Aashish

In recognition of having successfully completed his Internship in the department of

Healthcare Implementation

and has successfully completed his Project on

Acceptance of Hospital Management Information System among end users

Date: 08 March- 08 June2022

KareXpert Technologies Pvt Ltd.

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

We wish him all the best for future endeavors

Training & Development

Manohar

Human resources

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Aashish student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at KareXpert Technologies Pvt Ltd. from 08 April to 08 June 2020.

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

The Internship is in fulfillment of the course requirements. I wish him all success in all his/her future endeavors.

Dr. Sumesh Kumar
Associate Dean, Academic and Student Affairs
IIHMR, New Delhi
Delhi

Dr. B.S. Singh
IIHMR,New

Certificate of Approval

The following dissertation titled **"Acceptance of Hospital Management Information System among End Users"** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **PGDM (Hospital & Health 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.

Name	Signature
Dr Anandi Bora dekar	
Dr. Sukesh Bhardwaj	

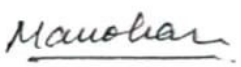
5

Certificate from Dissertation Advisory Committee

This is to certify that **Mr. Aashish,** a graduate student of the **PGDM (Hospital & Health Management)** has worked under our guidance and supervision. He/ She is submitting this dissertation titled "**Acceptance of Hospital Management Information System among End Users**" at "KareXpert Technologies Pvt Ltd." in partial fulfillment of the requirements for the award of the **PGDM (Hospital & Health 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.

Dr. BS Singh
Professor
IIHMR Delhi



Manohar Kumar
Team lead
KareXpert Technologies Pvt Ltd.

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH

NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled Acceptance of Hospital Management Information System among End Users and submitted by Aashish Enrollment No. PG/20/002 under the supervision of Dr. B.S. Singh for award of PGDM (Hospital & Health Management) of the Institute carried out during the period from 08 April 2022 to 08 July 2022 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

FEEDBACK FORM

Name of the Student: Aashish

Name of the Organisation in Which Dissertation Has Been Completed: KareXpert Technologies Pvt Ltd.

Area of Dissertation: Product Delivery (Implementation)

Attendance: 100 %

Objectives achieved: yes, Has completed all the assigned work of implementation with effectiveness and efficiency.

Deliverables: Yes

Strengths: Determined and hard working, always up for learning new things.

Suggestions for Improvement: Would encourage more an understanding different domains better which help in diversified knowledge.

Suggestions for Institute (course curriculum, industry interaction, placement, alumni):

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CERTIFICATE ON PLAGIARISM CHECK

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Abstracts

Background:- An emerging area of research that may help to explain the success or failure of any project to create and implement a hospital management information system (HMIS) is the staff acceptance of the system. This study's objective was to determine how well-liked HMIS was by users in the hospital.

Material and methods- Using a google form questionnaire, this cross-sectional study was carried out in Delhi NCR region. I Sent questionare to the users and got 93 responses.

Results:- The majority of participants showed good acceptability of the HIMS system. My research showed that the majority of participants were familiar with HMIS. The HMIS system was well accepted by approximately half of all participants. This may be a result of their job descriptions, spread of working locations, and prior HMIS experiences. The hospital management can address the bottlenecks with the appropriate steps, such as connectivity issues, error prevention, and a lack of training.

Conclusion:- The HMIS is crucial in boosting user happiness because it increases productivity, lowers costs and confusion, eliminates errors, improves management control, improves efficiency, increases system adoption and usage. User acceptance serves as the cornerstone for assessing the success and efficiency of HMIS deployment. As a result, evaluating the value and effectiveness of the HMIS by looking at user acceptance of the system is one of the most crucial factors for system success.

It results in an improvement in patient care, a smooth patient flow, quick access to laboratory and pharmacy reports, an increase in hospital revenue, and the preservation of patient records from the past. It increases patient happiness and promotes service performance.

ACKNOWLEDGEMENT

I am extremely thankful to everyone at Karexpert private technology Pvt. Ltd. for sharing generously their valuable insight and precious time which motivated me to do my best during my Dissertation.

My learning regarding Dissertation report would not have been possible without in depth discussions with Amrita Aggarwal and KK Ji. I express my gratitude towards him for providing timely guidance, inspiration & unconditional support during my study. And special thanks to Mr. Manohar (account lead) for his active cooperation and support as this study could not have been possible without his constant support and mentoring.

Mentors in IIHMR

I am highly grateful to Dr. B S Singh and Prof. Anandhi Ramachandran and all the faculty members and staff for giving me this opportunity to learn and to add to my phenomenal experience. Without their cooperation and guidance it would not have been possible to conduct my study and complete my training successfully.

A special thanks to my friends Komal, Jai khatri for helping me in my Dissertation in every point of time and the patience and unwavering faith you have in me. You believe in me even when i don’t believe in myself. For that i am eternally grateful.

Table of content

ABBREVATIONS

HMIS	Hospital Management Information System
EMR	Electronic Medical Record
LIMS	Laboratory Information Management System
RIS	Radiological Information System
PACS	Picture Archiving and Communication System
ICD	International Classification of Disease
FHIR	Fast Healthcare Interoperability Resources
LONIC	Logical Observation Identifiers Names and Codes
Snomed-CT	Systematized Nomenclature of Medicine- Clinical Terms
RCM	Revenue Cycle Management
CPOE	Computerized Physician Order Entry
UAT	User Acceptance Testing
MIS	Management Information System
RFID	Radio-frequency Identification
CIS	Clinical Information System

Overview of Company

KareXpert started operations in 2018 by Nidhi Jain, an IIT Roorkee Graduate. Started with the vision of incorporating hospitals to provide quality healthcare solutions to their patients anywhere, anytime by digitizing their end-to-end operations.

KareXpert, a Reliance Jio Platform funded venture, has built Digital Healthcare Platform bringing a pre-integrated healthcare stack consisting of Advanced HIMS, EMR/EHR, Telehealth, LIMS, RIS /PACS, Pharmacy, ERS Ambulance, Home Care, Telehealth, e-Claim and Insurance, Inventory and Supply chain management. The platform is designed using global FHIR standards and comply to ICD-10/11, LONIC coding and Snomed-CT. The providers can simply plug-n-play their medical facilities to KareXpert platform.

Today Hospitals are using 10-15 software product vendors for solving multiples point problems and then spending enormous amounts of time and resources in integrating this software continuously, resulting in slower innovation and a broken patient journey. KareXpert Vision is to revolutionize the healthcare Industry by pioneering in Digital Healthcare and transforming Billion people's lives by bringing "Health inclusion" for everyone.

KareXpert enables all six patient journeys to be fully digitized. Patient can use Mobile App, Provider website, make a call to call center, or just walk-in to the Hospital for healthcare services (doctor appointment, lab test, radiology test, order medicine, book ambulance), and these channels are centrally connected using system of records and are fully integrated.

The patient emergency journey is seamless from ambulance pickup to hospital drop, ER registration, transfer to IPD admission or ICU connecting all aspects of the Hospital services. Similarly patient IPD journey is fully integrated from Counselling, ICU, OT, IPD admission, discharge, to transfer. Patient home care journey journey enables nurse visit, doctor visit, home ICU, patient EMR, and very rich patient app.

KareXpert stack directly impact provider financial by both accelerating the hospital revenue and reducing the operating cost. Considering a large proportion of the patient now are TPA patients, KareXpert has e-Claim and RCM (Revenue cycle management) brining much faster processing for claims at IPD discharge time, and filing the claims for payment and tracking the payment electronically.

Similarly KareXpert has integrated Counselling module for better IPD conversion bringing higher revenue to provider. The CPOE (computer physician order entry) of e-Prescription directly connect the patient to provider pharmacy, diagnostics and surgical services such that OPD patient places orders with the provider rather outside.

Telehealth services such telemedicine connects the remote patient directly to the provider. There is very strong billing engine which eliminates the pilferage at every level. The combined effect of these pre-integrated applications directly accelerate the provider revenue.

Based on “Software-as-a-service (SaaS) as a commercial model, it brings much-needed cash flow relief.

Here is the summary of the total scope of work for this implementation plan:

1. KareXpert pre-integrated stack of modules deployment for provider
2. Provider business rules support
3. KareXpert 28 workflows catering all aspects of provider
4. KareXpert Masters Data Uploading, cloud provisioning, and Testing
5. Provider Database migration.
6. Provider 3rd party system integration as per scope of their document
7. Provider Lab machines and PACS integration.
8. Prvoider MIS reports, Prints and EMR templates configuration.
9. AWS Cloud infrastructure setup for UAT, and Testing
10. User training and support during the UAT testing.
11. AWS Production Cloud setup and UAT go-ahead
12. AWS Production cloud go-live and 1-month warranty period.

The deployment of the entire solution has been architected considering the functional and non-functional requirements, such as High Performance, High Availability, , Disaster Recovery, Scalability, Manageability, Information Security and Privacy using Cloud-First and Mobile-First approach with microservices architecture in Kubernetes environment. This will enable next generation system readiness creating “Provider Health Cloud” This truly brings healthcare transformation to make the hospital ready for next wave of technologies such as AI, IoT, AR/VR etc.

KareXpert has 28 golden workflows as part of the system serving all kinds of scenario and patient journey. The same has been demonstrated during deep dive demo sessions to Provider. These workflows will be made available on UAT server for the end user to test before go-live.

Provider may have certain business rules which are not addressed by the Masters Data provisioning. KareXpert has “Rule Engine” to handle such cases. During the UAT testing by the end users, if Karexpert come across UAT punch points then in such a case, Karexpert will provision such business rules as per provider needs.

KareXpert Prints, MIS reports and EMR Templates will be used after logo and branding by the Provider. If there is any changes needed, the Change Request (CR) is captured in the the document change request section.

KareXpert will provide branded mobile app for its prime customers. The logo, favicon, launcher and landing photo to be provided by the Provider for this provisioning. The Provider will be able to use Mobile Phone and Tablets and install the app on both Android and IoS devices.

Vision

Incorporating hospitals to provide quality healthcare solutions to their patients anywhere, anytime by digitizing their end-to-end operations.

Mission

KareXpert leader in technology started the Company in 2014 with Specific Purpose: To reinvent and redefine our Indian healthcare system to deliver the promise of "Health is national right for every Citizen"
Creating the 10,000 grid of largest hospitals by 2025

Hospital Management Information System (HMIS)

Hospital management information system(HMIS) are complete, integrated systems that manage the administrative, financial, and clinical aspects of healthcare. They are regarded as a vital component of the healthcare system because of the importance of their role in managing all patient data and other comprehensive medical data, as well as documenting all medical services provided to the patient, including investigations, diagnoses, treatments, follow-up reports, and important medical decisions.

"Computer systems that collect, store, process, retrieve, display, and communicate timely information needed in practise, education, administration, and research" are defined as "computer systems that collect, store, process, retrieve, display, and communicate timely information needed in practise, education, administration, and research."

Furthermore, there are numerous advantages to using (HMIS), including the reduction of errors, increased speed of care, accuracy, and lower health costs by coordinating services and improving quality of care. Because traditional paper-based medical records are bulky and difficult to maintain, these issues can be easily solved by implementing HMIS. To put it another way, HMIS is primarily concerned with the patient, as well as medical and nursing care and the administrative difficulties that go along with it.

As a result, rather than evaluating technical elements of the systems, it is critical to assess how consumers (users) recognise and rate their acceptance with HMIS, and to listen to customers rather than developers.

The acceptance of hospital employees in using hospital information management systems (HIMS) is a developing research subject that can explain the failure of any HIMS development and deployment project in hospitals. The purpose of this study was to see how well HMIS was accepted by users at the hospital.

After deployment, an effective HMIS accomplishes its goals. The system's success is based on user happiness, which is obtained through repeated use, resulting in the desired outcomes.

Acceptance was "ultimately a state experienced inside the users head" and thus a response that "may be both intellectual and emotional," and it was regarded as a fundamental idea of information system evaluation that could not be overlooked in any experiment.

In any case, HMIS users evaluate a system's quality in everyday use, and if they are not accepting the system's quality, the quality of the service integrated in the system, or the quality of the information supplied by the system, they will not utilise it correctly or

efficiently. User acceptance is a combination of ease of use and the degree to which the system supports the user's ability to work.

Users' expectations requirements are based on what they see and hear about the system and how they interpret how it will operate for them. Any of these parties can be neglected, resulting in a lack of expertise, skills, information, requirements, and expectations. This is especially true in hospital settings, when medical workers may be wary of new technology and refuse to use it.

A favourable user attitude toward information technology (IT) can have a significant impact on system adoption and implementation, with attitudinal behavioural constraints being the most common negative. In addition, whether or not the end user receives proper training will impact whether or not the system's implementation goes smoothly.

Poor HMIS design may lead to resistance and frustration among healthcare workers. As a result, the attitude of healthcare providers toward using HMIS and its design has a substantial impact on the successful HMIS deployment.

Engaging healthcare professionals and providing strong organisational support before and during the implementation activities are important strategies for successful management of HMIS development and implementation. These could lessen resistance and unfavourable attitudes, as well as boost healthcare workers' acceptance and satisfaction with HMIS.

Hospital Information Management System Benefits:-

We have now made clear the significance of HMS; it is now up to us to choose the best type for our requirements and goals. Here, we provide further details about the advantages of HMIS and the effects they have on healthcare systems.

Easy access to patient data:- With only a few clicks, HMIS enables easy access to all patient-related data stored on a system. The user can be given access to data such as patient history, current disease, doctors involved, test results, billing information, and many more. These facts will aid in making connections regarding the patient, such as their precise diagnosis, pertinent treatments, and medications.

The Electronic Health Record (EHR), often known as the Electronic Medical Record (EMR):- This system of electronic medical records can be compared to a patient's health record. Based on the patient's name, the medical record number, or the doctor's record number, information is retrieved.

Higher Data Security: By utilising HMIS at your hospital, the patient data can be kept completely secure. Only a small number of authorised personnel can have access to it. With HMS, all of the data is kept secure by keeping the login credentials secure on a server or in the cloud.

Improved Visibility and Transparency: The Hospital Management Information System (HMIS) enhances the full management process' visibility and transparency, as well as the accuracy of all records.

Enhancing Quality Control:- The quality control of the hospital's goods and services is improved through the hospital management system.

Easy Access to System Features:- Authorized users may easily use management system facilities thanks to hospital management system, which also protects them from unauthorised users.

Challenges of Implementation:-

Workflow alignment: A flexible system can be created manually, but it may not be understandable to everyone, which could result in work being done twice. A software that doesn't support the workflow will put stress and inefficiencies on the current system. Standardizing the procedure and making sure the software supports it are both crucial.
Uncertain expectation: It's not uncommon for people to believe that the software will take care of all of their issues. This should be addressed from the outset of planning, during user demonstrations and hands-on training.

Incorrect or incomplete data: It is possible to forget to enter certain data into the system when information is captured offline, especially. The reports we produce will be of poor quality and either useless or lead to incorrect interpretation and judgments if we use incomplete data.

Utilizing Online: Users are typically habitual to using the HMIS offline. Continue making manual entries, then enter them into the system thereafter. This could be the result of uncertainty or resistance. This is effort duplication, and it frequently results in inadequate data and confusion due to the manual system's and HMIS's different information sources.

Modules of HMIS:- There are many modules in HMIS which are explained below

ADT / REGISTRATION

The Patient Appointment, Registration, Admission, Discharge, and Transfer module is largely concerned with patient appointments, registration, admission, discharge, and transfer. The patient can schedule an appointment with the hospital, fill out a registration form, and receive a unique Patient ID number (which serves as a permanent reference number for the patient) as well as a unique visit ID number (Changes with each visit of the patient). The patient's socio-demographic profile, including the patient's

name, Patient ID number, Visit ID number, and age/sex, is displayed on the title bar of every screen after routine registration details have been submitted in the system. The module makes bed reservations, admissions, and transfers easier, depending on availability and other considerations such as normal discharge, housekeeping, and so on. The module assists the user in creating a complete record of all patients, including their personal and medical information, based on defined reference criteria.

BILLING

The Billing module is responsible for billing charges related with hospital services. It covers registration, services/packages, bed occupancy, pharmacy/material goods, blood bank, Operation Theater, diet, and ambulance billing for outpatients and inpatients, among other things. The Billing module also handles the financial clearances required at various stages for using hospital services/facilities.

The billing module assists the hospital in managing corporate, insurance, and hospital insurance accounts, as well as billing patients in each category in accordance with contract parameters.

NURSING

The Nursing module allows the user to keep track of inpatient activities and keep track of progress comments. Viewing service/pharmacy orders, placing service/pharmacy orders, revoking a patient discharge, recording/amending a patient's temperature, pressure, and pulse readings, administering drugs, and transferring a patient from one nursing station to another are all functions that the Nursing module can perform.

OPERATION THEATRE (OT)

The Operation Theater (OT) module allows users to process and monitor data and services in the operating room. Pre-operation and post-operation notes are also kept in the Operation Theater module. OT also allows for the recording of anaesthetic notes, OT checklists, and ward checklists, among other things.

CONSULTATION

The module enables the user to access patient details such as the doctor's real examination of the patient, the history that was recorded, and the results of the physical examination. Doctors can process and report clinical service information and consultation notes using the clinical documentation capability included into this module. Access to a patient's medical file and treatment information is also made possible through this. Using this module, the consulting physician might request admission for an outpatient.

SCM

The Windows-based, user-friendly Service Center Manager (SCM) module of the HIS is available. You can keep track of the service orders and schedules kept at the service centres inside a hospital using the Service Center Manager module. You can view the specifics of servicing schedules with this module. You can set up the staff members' daily working schedules and hours using this module. This module can also be used to configure the capacity and unavailability of service centres.

LABORATORY INFORMATION SYSTEM (LIS)

The Laboratory Information System (LIS) module helps the user manage every aspect of a clinical laboratory in a hospital and makes it easier to maintain comprehensive result histories and track numerous samples.

BLOOD BANK

Users can manage blood inventory, blood orders, donor and recipient information, record blood test results, and test and cross-match blood units in the hospital's blood bank with the use of the Blood Bank module.

MASTERS

The Masters module gives the user the ability to set up many configurations and parameters, such as how the hospital is organised, how doctors are assigned, where different facilities are located, and what services are supplied, among other things. Using the Masters module, the user can configure and customise each HIS module.

MRD

The MRD Folder is a physical collection of patient-related documents, either from the HIS system or outside of it, assembled in a physical folder to track the patient's medical history, to aid in diagnosis and treatment, and to be used as evidence in medical litigation or for study. This is kept in the hospital's Medical Records Department (MRD). If a patient's medical records are deemed to be of interest to the hospital by the user, the patient is given one MRD Folder volume at the time of their first visit. If the patient's current MRD Folder volume is unable to accommodate more paper documents, further MRD Folder volumes can be established for them.

SECURITY

Assigning user roles and privileges and keeping track of all network activity are both made easier by the Security module for the administrator. It assists in compiling a complete record of all roles and users of every network module, as well as all activity, including log-ins and log-offs, and privileges given to each role and user.

Literature Review

1 A study on the level of acceptance of the hospital management information system among nursing officials working in teaching hospitals was conducted in 2021 by Mahla M, Talati S, Gupta AK, Agarwal R, Tripathi S, and Bhattacharya S. To ascertain the amount of HMIS acceptance, a study was conducted. The study includes a questionaire on HMIS acceptance that the investigator prepared in order to assess the validity of the survey. The total number of nurses using HIMS was 2402. By setting the margin of error at 5% and the confidence interval at 95%, the sample size was determined. The calculations revealed that the sample size was 248. They found that 174 participants, or 67.96 percent, had a positive attitude toward the HMIS system. Their research showed that the majority of participants were familiar with HIMS.

2 In 2019 Mohammed Sk, Yoseef HR, Ghalab Ahamed SA carried out a study on hospital management information system user satisfaction. Descriptive comparative research design was used for this study. Al-Rajhy Assiut University Hospital for Liver was the site of the investigation. All e-HIS users (n = 250) were included in the study's subject; (20 physicians,200 staff nurses and 30 e0mployees). One instrument for gathering data had two components: a questionnaire about users' happiness and a data sheet on personal and professional qualities. They discovered that the majority of the subjects under investigation had gained positive experience, and the biggest percentage of them (60%) were satisfied with the use of electronic health data. Among (doctors, nurses, and personnel) and user happiness, there were highly statistically significant differences.

3 In 2015 Khalifa M, MD carried out a study on the Hospital Information system Acceptance and satisfaction- A case study of a tertiary care hospital. The main goal of this study was to assess the acceptance and satisfaction of hospital information systems (HIS) among various healthcare professionals by examining the influential factors that might boost or lower acceptance and satisfaction levels. This was done in order to offer solutions for an HIS implementation that would be successful. Data from various categories of HIS users were directly gathered for the study using unbiased quantitative survey methodologies. A demographic user information portion, a general HIS assessment section, a section about computer accessibility and availability, a piece about HIS and patient care, and a section about happiness with HIS made up the five components of the questionnaire. They discovered that the majority of users are happy with the HMIS.

4 In August 2017 Handayani PW, Budi I, carried out a study on User acceptance factors of hospital information systems and related technologies. In order to help researchers and hospital management create appropriate acceptance models to

raise the quality of HIS, this study reviews the literature on the key acceptance factors related to hospital information systems (HIS) and related technologies from the viewpoints of user groups (medical staff, hospital management, administrative personnel, patients, medical students, and IT staff). They carried out searches in academic works authored in English and completely accessible by the authors that were stored in major web databases. The articles under review deal with telemedicine or telehealth, electronic medical records (EMR), picture archiving and communication systems (PACS), radio frequency identification (RFID), computerised physician order entry (CPOE), clinical information systems (CIS), health information technology (HIT), clinical information systems (CIS), health information systems (HIS), and picture archiving and communication systems (PACS). 1,005 articles were extracted using a predetermined string, and the outcomes were validated and verified. The findings of this study revealed 15 user acceptance variables for HIS and associated technologies that had been consistently mentioned in at least five earlier studies. These elements had to do with organisational, technological, and individual elements. Additionally, the user acceptability of HIS and related technologies in each user group describes various outcomes.

5 A study on hospital information system adoption across educational hospitals was conducted in 2020 by Barzegari S, Ghazisaeedi M, Askarian F, et al. This study looked into the educational hospitals' perceptions of the hospital information system (HIS). 400 nurses, doctors, and paramedical staff made up the sample for this cross-sectional study, which was conducted using the census sampling method. The unified theory of the acceptance and use of technology (UTAUT) questionnaire was employed in this study to gather data. The findings of this study demonstrated that the UTAUT model had a direct and considerable impact on how well-liked HIS was.

6 This study was conducted by Alipour J et al. 2020 Although the users' intentions to accept HIS were at a desirable level, only perceived usefulness of the system was at a satisfactory level, while perceived ease of use, human factors, technological factors, and organizational factors were at a relatively desirable level from the users' perspective. Perceived usefulness of the system, social influence in human factors, system quality in technological factors, perceived ease of use, and top managers' support in organizational factors had the highest impact on users' intention to accept a HIS.

7 The results of this study found by Handayani PW et al. 2021 and state that15 user acceptance factors related to HIS and related technologies that were frequently identified by a minimum of five previous studies. These factors were related to individual, technological, and organizational factors. In addition, HIS and related technologies' user acceptance factors in each user group describe different results.

8 This study done by Hussain R et al. 2021 and state that While implementation of HMIS they have found significant advantages in the opinion of physicians, such as ease in reviewing patients' medical records, data analysis, and providing paperless patient care, it should nevertheless be preceded by formal training of all physicians regarding its use. Many physicians consider HMIS to be more TC, especially in circumstances where the patient load is overwhelming.

9 In this study through the understanding of the identified critical factors affecting physicians' HIS acceptance, the planners and managers should ensure that hospital information systems to be introduced into a hospital are useful and ease to use. Effort should be focuses on providing sufficient top management support, selecting qualified project team members, and delivering higher system quality in addressing physicians' clinical needs. Thus, our research results can help planners and managers understand key considerations affecting HIS development and use, and may be used as a reference for system design, development and implementation. (Chen R et al. 2012)

10 This study conducted by Aldosari B et al. 2018 identified and established that nurses had a positive attitude towards perceived usefulness and ease of use concerning the acceptance of EMR. The use of EMRs within a healthcare facility helps in ensuring clinical care efficiency and safety of patients. The EMRs are certainly an advantage over the paper based records when it comes to maintaining precise and accurate information about patients like significant medical information and life-saving word of warnings relating to a certain health issue. Moreover, the integration of EMR technology and structured record system with the physicians work would allow the healthcare facilities to enhance the quality of care and greatly help patients particularly those with significant health problems.

11 This study state that it is reasonable for hospitals to focus efforts on specific factors influencing acceptance of and resistance to EMR use and, before a system is selected, to consider the effects of vendor selection and level of interface integration on acceptance of use. (Darby AB et al. 2019)

12 Although the users' intentions to accept HIS were at a desirable level, only perceived usefulness of the system was at a satisfactory level, while perceived ease of use, human factors, technological factors, and organizational factors were at a relatively desirable level from the users' perspective. Perceived usefulness of the system, social influence in human factors, system quality in technological factors, perceived ease of use, and top managers' support in organizational factors had the highest impact on users' intention to accept a HIS. Simplifying the use of the system through educating users and providing comprehensive and special guidelines suited to the user's specialty or department, incorporating users' work needs into HIS capabilities, and involving users in the development, implementation, and education steps of the HIS software are essential to upgrade the system to an ideal level, increase user satisfaction, and enhance the system acceptance to an optimal level. (Alipour J et al. 2019)

OBJECTIVE

To evaluate the acceptance of hospital management information systems (HMIS) among end users.

RESEARCH QUESTIONS

What is the acceptance level of HMIS among end users?

METHODOLOGY

- Target Population- End users of HMIS like Doctor, Nurse, Laboratory and pharmacy department, Administration staff.
- Study area and design: - This cross-sectional study was conducted in Delhi NCR Region hospitals.
- Analysis tools and techniques :- Charts, Graphs is used for visualisation, SPSS is used for Statistical analysis.
- Sample size: - Total response received is 93.
- Sampling method: - Non probability Convenience Sampling.
- Data collection: - Data has been collected through online questionnaires.

Analysis

Demographics

Age of the User	Count	%
Less thaan 25 years	22	24 %
25-30 years	44	47 %
More than 30 years	27	29 %
Total	93	100 %

Table 1 charts explain the demographic information of the respondents. This study was purposely focused on the population who have used Hospital management information systems before in their professional life. The total respondents were 93. Out of which 24% respondents are below 25 year of age, 29% are above 30 year and 47% are between 25-30 years of age.

HMIS user type	Count	%
Doctor	17	18 %
Nurse	33	36 %
Pharmacist	21	23 %
Admisistration staff	16	17 %
Technician	6	6 %
Total	93	100 %

Majority of the respondents are the nurses who have exposure or used HMIS before. The doctors, pharmacist, administrator and technicians are also involved in this study.

Years of Experience	Count	%
Less than 1 year	42	45
1-2 year	27	29
2-5 year	13	14
6-10 yrs	6	7
11-15 yrs	4	4
more than 15 years	1	1
Total	93	100

Among 93 respondents, the majority of the respondents have less than 1 year of experience with HMIS, 29% have 1-2 years of experience and only 1% of the respondents are those who have more than 15 years of experience with HMIS.

Reliability Statistics

Cronbach's Alpha	N of Items
.721	12

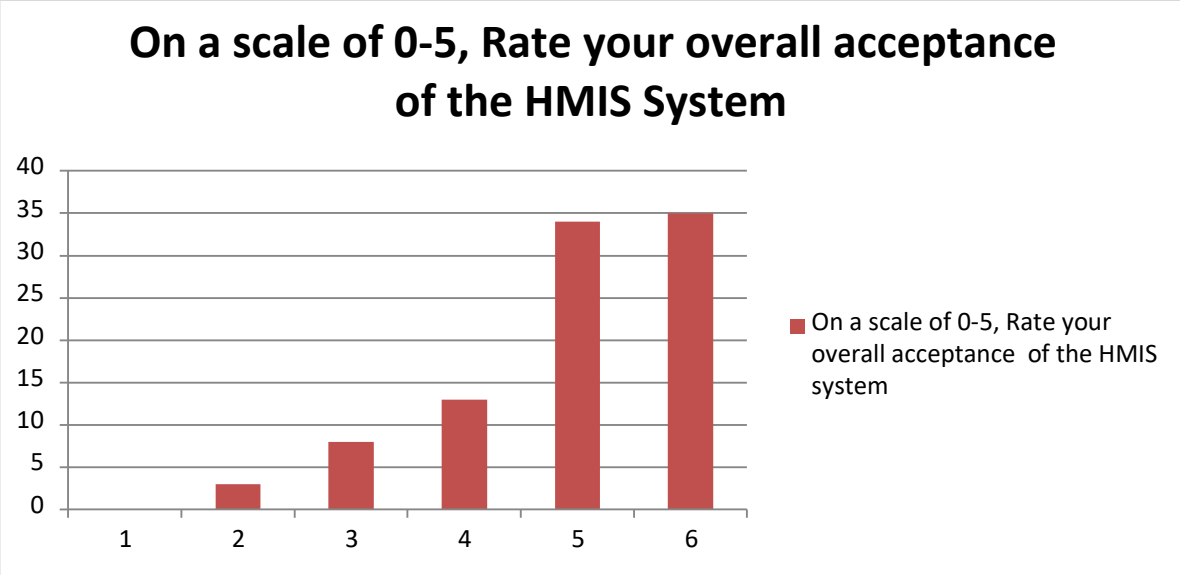
Reliability statistics for likert scale questions founded Cronbach's Alpha value is 0.721 which shows that data is completely reliable for further analysis.

Descriptive statistics

HMIS user acceptance table	Score	Answer

	(mean)	
HMIS performance speed is acceptable	1.917	Disagree
HMIS is user friendly and easy to use	3.720	Agree
HMIS improves access to patient information	4.578	Strongly Agree
HMIS software has improved the existing workflow	4.054	Strongly Agree
HMIS makes easy to input the data into the software rather than writing on paper	3.860	Agree
HMIS software has reduced the overall patient turnaround time	2.812	Neutral
HMIS software has reduced the miscommunication between the users	3.774	Agree
Ordering of medication, investigations, visits, cross referrals has been made easier by the software	3.624	Agree
Clinical decision support in the software for warning of drug interaction and contradictions, out of range test levels and reminders is useful and help to avoid errors	3.677	Agree
Software is more time consuming as compared to the paper record	3.645	Agree
Do you ever get annoyed while using the system	2.817	Neutral
On a scale of 0-5, Rate your overall acceptance of the HMIS system	3.817	Agree
Grand Total Score	3.724	Agree

According to the descriptive statistics i found that the more than half of the users are agreed on most of the questions while half of users are Disagree for the the system performance speed acceptability and most of the users state that they have neutral view for the annoyeness of the system.



Further respondents were asked about their overall acceptance and satisfaction with the performance of the software. So according to their response, majority of the respondents have high acceptance and satisfaction with the software.

Correlations between the user training and the acceptance of the HMIS system.

Correlations	Training
Acceptance	0.882266940939668

From the above table we can state that the user training and the acceptability of the system among end users are highly correlatable.

Correlations	Age
Do you ever get annoyed while using the system	-0.1889
HMIS performance speed is acceptable	0.1732
HMIS is user friendly and easy to use	0.0413
HMIS improves access to patient information	0.5180
HMIS software has improved the existing workflow	-0.0540
HMIS makes easy to input the data into the software rather than writing on paper	-0.1120
HMIS software has reduced the overall patient turnaround time	-0.0481
HMIS software has reduced the miscommunication between the users	0.3539
Ordering of medication, investigations, visits, cross referrals has been made easier by the software	0.0976
Clinical decision support in the software for warning of drug interaction and contradictions, out of range test levels and reminders is useful and help to avoid errors	0.1246
Software is more time consuming as compared to the paper record	-0.0057
On a scale of 0-5, Rate your overall acceptance of HMIS system	0.0648

From the table 2.4 we can say that the with increasing in age there is no correlation between the overall acceptance of the software.

Correlations	Years of Experience
Do you ever get annoyed while using the system	0.4298
HMIS performance speed is acceptable	0.6495
HMIS is user friendly and easy to use	0.8379
HMIS improves access to patient information	0.7527
HMIS software has improved the existing workflow	0.3471
HMIS makes easy to input the data into the software rather than writing on paper	0.4833
HMIS software has reduced the overall patient turnaround time	0.0391
HMIS software has reduced the miscommunication between the users	0.5872
Ordering of medication, investigations, visits, cross referrals has been made easier by the software	0.4412
Clinical decision support in the software for warning of drug interaction and contradictions, out of range test levels and reminders is useful and help to avoid errors	0.3563
Software is more time consuming as compared to the paper record	0.6190
On a scale of 0-5, Rate your overall acceptance of HMIS system	0.8631

From the table we can say that with increasing the years of experience of the HMIS System acceptability is increasing among the end users.

Chi Square test:-

User Training	HMIS system accepted	HMIS system not accepted	Total
Given	37	15	52
Not given	17	24	41
Total	54	39	93

User Training	HMIS system accepted	HMIS system not accepted	Total
Given	54*52/93= 30.2	39*52/93= 21.8	52
Not given	54*41/93= 23.8	39*41/93= 17.19	41
Total	54	39	93

Note: The expected frequencies refer to the values we would have expected, given the total numbers of 52 and 41 users in the two groups, if the null hypothesis , stating that there is no difference between the two groups i.e training given and training not given is true.

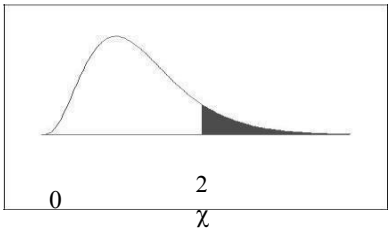
Df (Degree of Freedom) = 1

x2 = 8.19

- Since our calculated chi-square, 8.19 is greater than the critical value, 3.841, we reject the null hypothesis . Critical value is calculated from the table given below for the p value of 0.05 and df is 1.

- We conclude that the users whom training has benn given are having more acceptance towqards the HMIS system more than for those who have not received training

Chi-Square Distribution Table



Chi-Square (χ^2) Distribution

Degrees of Freedom	Area to the Right of Critical Value									
	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01	0.005
1	—	—	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.071	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.299
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.042	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.194	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.257	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.954	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

Doctor Perception towards the acceptance of the Hospital management information system.

While implementation of HMIS was found to have significant advantages in the opinion of physicians, such as ease in reviewing patients' medical records, data analysis, and providing paperless patient care, it should nevertheless be preceded by formal training of all physicians regarding its use. Many physicians consider HMIS to be more TC, especially in circumstances where the patient load is overwhelming.

Nurses perception towards the acceptance of Hospital management information system

This study identified and established that nurses had a positive attitude towards perceived usefulness and ease of use concerning the acceptance of EMR. The use of EMRs within a healthcare facility helps in ensuring clinical care efficiency and safety of patients. The EMRs are certainly an advantage over the paper based records when it comes to maintaining precise and accurate information about patients like significant medical information and life-saving word of warnings relating to a certain health issue

Pharmacists perception towards the acceptance of Hospital management information system

This study identifies that most of pharmacists believe that hospital management information system ease the process of pharmacy as this has reduced medication erros like writing errors, dosage errors, etc. And also save their time by as they get their daily stock consumption report on single click and also can be able to find the old bill which ever they want on by searching by the name instead o searching in bundels of bill.

Perception of technician towards the Hospital management information system

This study shows that most of the technician agreed that hospital management information system ease the process of laboratory. It generate barcodes that help to process right sample for the right patient. And they also agreed that the report generation process make the task easier. And if they are using integration system with LIMS, they are not supposed to enter data manually. It make the task easier.

Discussion:-

The Hospital management information system plays a significant role in creating user acceptance by making using it more efficient, reducing costs and confusion, eliminating failures, improving management control, increasing users' skills to use the system, improving efficiency, increasing adoption and usage of a system, and improving end users' satisfaction.
User acceptance is the corner stone to assess the efficiency and effectiveness of adoption HMIS. Therefore, one of the most crucial criteria for system success is gauging the value and efficacy of the electronic information system through analysing users' satisfaction. A variety of systems' failures have been linked to many contributing elements, but the hospital management information system (HMIS) installation is most successful when users accept it.

The purpose of the current study was to evaluate how well-liked the HMIS is accepted by the users in Delhi NCR hospitals.

According to the study's findings, all doctors, nurses, and other users concur that using an electronic system makes it simple to access and retrieve patient data, giving them the opportunity to quickly and accurately gather information for scientific research. Additionally, the majority of them concurred that the system is simple to use and has the capacity to view and evaluate patient data as a whole. Additionally, a majority of them concurred that electronic records speed up turnaround times and that they were happy with the correctness of the system, format output, and ease of supply monitoring provided by these records.

Using electronic health records (EHRs) provide thorough clinical documentation that serves as a comprehensive source of data on medical and non-medical patient information, enabling customers to make informed decisions and reducing medical errors.

According to our survey, over a third of the participants felt that using the HIMS system was on average difficult. We are also concerned about it. In order to protect hospitals from potential litigation, accurate data entry is crucial for patients as well. The HMIS system's ease of use is crucial since a challenging HMIS system might negatively impact user acceptance of HMIS system usage.

The majority of participants said they appreciate using this HMIS system at work. A worker who appreciates their work will be more productive and well-liked, which is a positive indicator for any firm.
Less than half of the participants said they were aware of the HMIS's error avoidance mechanism. Nearly one-third of the participants among them thought it was simple to fix the mistake. Less than half of the participants said the programme met their expectations in their response (user-friendly experience).

Only one-third of participants overall said the system is flexible to use. This may be the main cause of the majority of participants' responses that they frequently grow agitated and irritated with the system. One of the key factors affecting user acceptance is system adaptability

Conclusion:-

Our study concluded that the overall user acceptance for HIMS is good although there is a lot of scope for improvement.

It is reasonable for hospitals to focus efforts on specific factors influencing acceptance of and resistance to HMIS use and, before a system is selected, to consider the effects of vendor selection and level of interface integration on acceptance of use.

Improving the system's performance and availability is essential for its acceptance, happiness, and overall success. The HMIS requires improvements in the software's responsiveness, speed, and availability of desktops, laptops, and mobile computers. Some software aspects, like font size, need to be more user-friendly or, when possible, user-adjustable. By utilising modern, cutting-edge technology like automatic speech recognition and dictation systems, the labor-intensive and time-consuming traditional methods of data entry via keyboards can be reduced.

There should be an enhancing organisational support for users through increased training for both new and seasoned users, more protected and dedicated time during working hours for users to learn and practise using the system following implementation or upgrade, and better user manuals and materials for training as well as for users to refer to when they run into issues. The vendor needs to provide more technical support.

There should be a provision of better and more dependable channels of communication and feedback, as many users reported that they have been making suggestions and occasionally coming up with solutions to issues, but that their chances of successfully contributing to the improvement of HMIS were decreased by the poor communication and lack of dependable feedback mechanisms. The majority of users expressed great enthusiasm for the study and survey's execution and unanimously agreed that it should be repeated frequently to track and raise user acceptability and satisfaction of the HMIS while concentrating on pressing problems and high-priority concerns.

Recommendation

1 Organizational support for users includes more time during working hours for users to learn and practise using the system following implementation or an upgrade, as well as more training for both new and experienced users.

2 Improve the usability, clarity, and accessibility of documentation and instructions for all HMIS users.

3 Use online support as much as feasible; the system should be quickly flexible and easily reversible to provide users the chance to correct mistakes and inaccurate information.

4 Users should always have access to support staff from the IT department to reduce the risk of data loss.

5 Encourage HMIS users to take part in process design since they will be the system's long-term users.

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Annexure 1

Informed Consent

My name is Aashish, a student of IIHMR Delhi, pursuing a PGDM course in Hospital and healthcare management. I am carrying out a study on the Hospital Management Information System – Acceptance and Satisfaction. To achieve this, I am kindly requesting to participate in this academic research by filling out the questionnaire.

· Participation in this study is fully voluntary.

· The information obtained will be used for academic purposes only and will never be used against you.

· The information got from you will be kept confidential.

Your participation will be highly appreciated.

Annexure 2

Acceptance of Hospital management information system among end users

Questionnaire

Demographic information:-

1 Age : <25, 25-30, >30
2 HMIS Users Job Type- Doctor, Nurse , Pharmacist, Administator, Technicians
3 Years of Experience- - Less than 1 year, 1-2 year, 2-5 year, 6-10 yrs, 11-15 yrs, more than 15 years

Acceptance:-

Please tick on the following statement regarding the HMIS functionalities. Rate on a 4- point scale where: 1- Strongly disagree, 2-Disagree, 3- Agree, 4- Strongly agree

1. Have you received appropriate training on how to use the HMIS software – yes , No
2. HMIS performance speed is acceptable
3. HMIS is user friendly and easy to use
4. HMIS improves access to patient information
5. HMIS software has improved the existing workflow
6. HMIS makes easy to input the data into the software rather than writing on paper
7. HMIS software has reduced the overall patient turnaround time
8. HMIS software has reduced the miscommunication between the users
9. Ordering of medication, investigations, visits, cross referrals has been made easier by the software
10. Clinical decision support in the software for warning of drug interaction and contradictions, out of range test levels and reminders is useful and help to avoid errors

11. Software is more time consuming as compared to the paper record
12. Do you ever get annoyed while using the system
13. overall acceptance of the HMIS system