Dissertation Report

at

TrioTree Technologies Pvt. Ltd.

Factors Affecting Hospital Information System (HIS) Implementation: An Implementor perspective

by

Mr. Saurav Suman

PG/22/106

Under the guidance of

Dr. Sukesh Bhardwaj

PGDM (Hospital & Health Management)

2022-2024

International Institute of Health Management Research, New Delhi

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Saurav Suman** student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at **TrioTree Technologies Pvt. Ltd** from **01/03/2024** to **01/06/2024**

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

Dr. Sukesh Bhardwaj
Mentor
IIHMR, New Delhi

Certificate of Approval

The following dissertation titled " **Factors Affecting Hospital Information System (HIS) Implementation: An Implementor perspective**" at "**TrioTree Technologies Private Limited**" 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. Shiv.	
Dr. Nishikant Jere	
Dr. Sukesh	

Certificate of Dissertation Advisory Committee

This is to certify that **Mr. Saurav Suman**, a graduate student of the **PGDM (Hospital & Health Management)** has worked under our guidance and supervision. She is submitting this dissertation titled **"Factors Affecting Hospital Information System (HIS) Implementation: An Implementor perspective"** at **"TrioTree Technolgoies 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. Sukesh Bhardwaj
Associate Professor
IIHMR, New Delhi

Dr. Zunjar Shriram Gaupale
General Manager Product & Clinical Transformation
TrioTree Technologies Pvt. Ltd.

Feedback Form

Name of Student: Mr. Saurav Suman

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

Area of Dissertation: HIS Implementation

Attendance: 100%.

Objectives achieved: Identified additional factors that are affecting our HIS Implementation

Deliverables: ABDM, API-Integrations. Dashboard

Strengths: Consistently meets his goal, completes all tasks on time and also assists coworkers and helps them to achieve their own goals.

Suggestions for Improvement: Presentation skills can be enchanced little more.

Suggestions for Institute (course curriculum, industry interaction, placement, alumni): Include more depth knowledge about software implementation rather than just focusing on SDLC.

Upgrade

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

Date: 18/07/2024

Place: TrioTree Technologies Pvt. Ltd.

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CERTIFICATE ON PLAGIARISM CHECK

Name of Student (in block letter)	Dr./Mr./Ms.: SAURAV SUMAN		
Enrollment/Roll No.	PGI22/106	Batch Year	2022-24
Course Specialization (Choose one)	Hospital Management	Health Management	Healthcare IT ✓
Name of Guide/Supervisor	Dr./ Prof.: SUKESH BHARDWAJ		
Title of the Dissertation/Summer Assignment	Factors Affecting Hospital Information System (HIS) Implementation: An Implementor Prespective		
Plagiarism detect software used	"TURNITIN"		
Similar contents acceptable (%)	Up to 15 Percent as per policy		
Total words and % of similar contents Identified	2993 13%		
Date of validation (DD/MM/YYYY)	22/7/2024		

Guide/Supervisor

Name: Dr. Sukesh Bhardwaj

Signature: Sukesh

Student

Name: SAURAV SUMAN

Signature: Saurav Suman

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Date: 27/7/24

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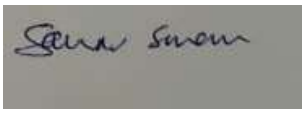
Certificate by Scholar

This is to certify that the dissertation titled **"Factors Affecting Hospital Information System (HIS) Implementation: An Implementor perspective"** and submitted by **Mr. Saurav Suman** Enrollment No. **PG/22/106** under the supervision of **Dr. Sukesh Bhardwaj** for award of **PGDM (Hospital & Health Management)** of the Institute carried out during the period from **01/03/2024** to **01/06/2024** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.



Signature

Acknowledgement

I express my sincere regards to **Mr. Surjeet Thakur,** CEO and Founder of TrioTree Technologies Pvt. Ltd.

I feel to acknowledge my indebtedness and sense of gratitude to my guide **Dr. Zunjar Shriram Gaupale,** General Manager Product & Clinical Transformation, TrioTree Technologies Pvt. Ltd. whose guidance and supervision given to me throughout the course of my internship as well as providing the necessary information regarding the project which shaped the present work as it shows.

My thanks and appreciation also goes to all the members of TrioTree Technologies Pvt. Ltd., whose deliverance and acquaintance of the insights of their departments gave me a wholesome knowledge.

I am immensely obliged to my institute **IIHMR DELHI**, for providing me with the opportunity to pursue my internship from such a prestigious organization. I sincerely would like to thank **Dr. Sutapa Neogi, Director of IIHMR DELHI**, for her constant motivation and guidance for all our endeavors. I would like to extend my gratitude to **Dr. Sumesh Kumar,** Associate Dean (Academics). I acknowledge with thanks the kind of patronage, inspiration and guidance which I have received from my faculty mentor**, Dr. Sukesh Bhardwaj**

Acronyms/Abbreviations

HIS	Hospital Information System
HMIS	Hospital management information system
SDLC	Software Development Life Cycle
EHR	Electronic Health Record
EMR	Electronic Medical Record
ICT	Information and Communication Technologies
JCI	Joint Commission International
NABH	National Accreditation Board for Hospitals and Healthcare Providers (NABH)
ISO	International Organization for Standardization
IFAH	International Forum for Advancement in Healthcare

Table of content

Introduction

With over 200 facilities currently using TrioTree's HIS web application, the company has emerged as a trailblazer in digital hospital solutions. Recognized as a leading exclusive Health IT provider in India, the UK, and the Middle East, TrioTree Technologies was founded by a group of doctors and engineers who bring decades of experience in the healthcare sector.

Indian Express Healthcare IT Award 2016 (EMR Adoption)

IMC Award (2017) – Patient portal

JCI & NABH Accredited Clientele

Top 100 Healthcare Leaders Award - IFAH 2019

An ISO 9001:2015 and ISO 27001:2013 Certified Company

Currently more than 200 facilities are live running the HISTree at the same time and by the end of this year the organization is going live in 165 facilities of entire Mauritius at the same time.

Organizational Profile

TrioTree's vision is to revolutionize the quality and efficiency of everyday patient experiences with the convergence of healthcare

THE TREE represents the growing state of the company - A strong organic growth.

THE TRUNK the fusion of three unique identities joining in a triple helix, uniting towards a single foliage. The identities being very different in character - strong and vibrant on their own.

THE FOLIAGE represents the united energy. The bubbles - new ideas expanding, taking shape.

OUR SPIRIT- United, Strong, Ideating...

Services provided by TrioTree

HISTree

An Enterprise Hospital Information System. Modules available in HISTree are below

Front Office & Appointment Management	IPD Management	Package & Plans Management System
Emergency Management	Asset Management	Accounts Recievables Management
Physicians- EMR	MRD- Medical Record Department	Queue Management System
RIS & Diagnostics Management	Doctors Accounting	Discharge Summary Managament
Pharmacy Management System	Day Care Management	Document Management System
Inventory & General Stores Management System	Template Designer	Rehabilitation Management
Kitchen & Diet Management	ICU Management	Nursing Management
Transfusion Medicine - Blood Bank	OT Management - operation theatre	Housekeeping & Linen Management
ADT- Admissions, Transfer & Discharge	OPD Management	

Dashboard

TrioTree Technologies dashboards is a modern analytics & BI tool to monitor healthcare KPIs in a dynamic and interactive way for strategy analysis and execution, performance reviews, performance improvement and Data Insights

Operations Dashboard (For Operations Head/COO/CEO)

Finance Dashboard (For Finance Managers/ CFO)

Audit Dashboard (For Quality Champion/Clinical Auditors)

Inventory Dashboard (For Store Managers/SCM Heads)

Clinical Dashboard (For Medical Directors/Clinical Researchers)

Mobile Application

TrioTree Technologies' mobile apps facilitate efficient communication among patients, providers, and caregivers. They enable round-the-clock management of a patient's condition and offer personalized healthcare tailored to each individual.

Project Undertaken other than Dissertation

Current, working on the sandbox exit for ABDM

Hardware integration with HIS for entire Mauritius E-health Project (165 facilities)

Looking into Product enhancement

Solely undertook these responsibilities under the guidance of the organizational mentor

- Aayushmaan Bharat Health Account (M1, M2, M3) Integration
- Management Dashboard for Discharge TAT development
- What's app like chat feature integration to the system
- ICD 11 Integration
- Dhamani (Oman) integration
- Payvista payment protocol Integration
- FHIR training to developer

Factors Affecting Hospital Information System (HIS) Implementation: An Implementor perspective

Abstract

More environmentally friendly consumer habits have resulted from the shift to digitization, and the healthcare industry has followed suit by implementing Digital Health Interventions (DHI) more frequently to improve service delivery and accessibility. From the viewpoint of those putting the Hospital Information Systems (HIS) into practice, this study looks at the difficulties they faced. The study looks into what influences the implementation process using a mixed-methods approach that incorporates both qualitative and quantitative techniques. The results demonstrate how important—yet sometimes ignored—socio-cultural aspects are in user approval and system adoption at the operational level.

The research identifies digital literacy as a key challenge specific to the Indian context. Globally, language barriers emerge as the major socio-cultural hurdle, causing delays in successful HIS implementation. By highlighting these often-underestimated factors, the study emphasizes the need for culturally sensitive design and user-centred implementation strategies to ensure successful HIS adoption and optimize healthcare delivery.

Background

The current healthcare sector is undergoing a significant transformation driven by the power of digital integration. This integration involves seamlessly connecting various technologies, systems, and data sources to create a more efficient, coordinated, and patient-centered healthcare ecosystem.

Hospital Information Systems (HIS) plays a crucial role in the modern healthcare delivery system. They streamline workflows, improve data access, and enhance patient care. However, implementing a new HIS can be a complex and challenging process. This survey explores various factors, from the implementer's perspective, that can significantly impact the success of HIS implementation. There are multiple factors that affect the implementation process:

a) Digital literacy
b) Cultural norms and beliefs
c) Language barrier
d) Social hierarchy and power dynamics
e) Patient Education and Awareness
f) Training and support
g) Integration issues

h) Resource constraints
i) Technical Expertise

Methods:

This study is conducted using qualitative and qualitative tools. The tool used in this study primarily includes the years of experience, challenges faced by implementers and factor affecting user acceptance. Assessment of the different factors is analyzed by analyzing the self-structured questionnaire and interview method. Inclusion criteria – various implementers who are involved in the implementation of HIS in different region of world.

Result:

This study highlights that socio-cultural factor, often overlooked during Hospital Information System implementation, can have a significant impact on its success. For instance, cultural beliefs about data privacy might necessitate additional security measures or anonymization options within the HIS. Additionally, the language barrier significantly impacts the success of the system, if not addressed effectively in every phase of implementation.

Conclusion:

In conclusion, successful Hospital Information System implementation does not primarily depend on technical considerations. It requires an acute understanding of the socio-cultural factors that are often overlooked yet significantly impact the project's outcome.

By adopting a holistic approach that addresses both technical and socio-cultural factors, healthcare institutions can achieve a smoother implementation process.

This includes:

- Conducting cultural competency assessments
- Involving diverse stakeholders
- Developing culturally sensitive functionalities
- Implementing ongoing training and support

Introduction:

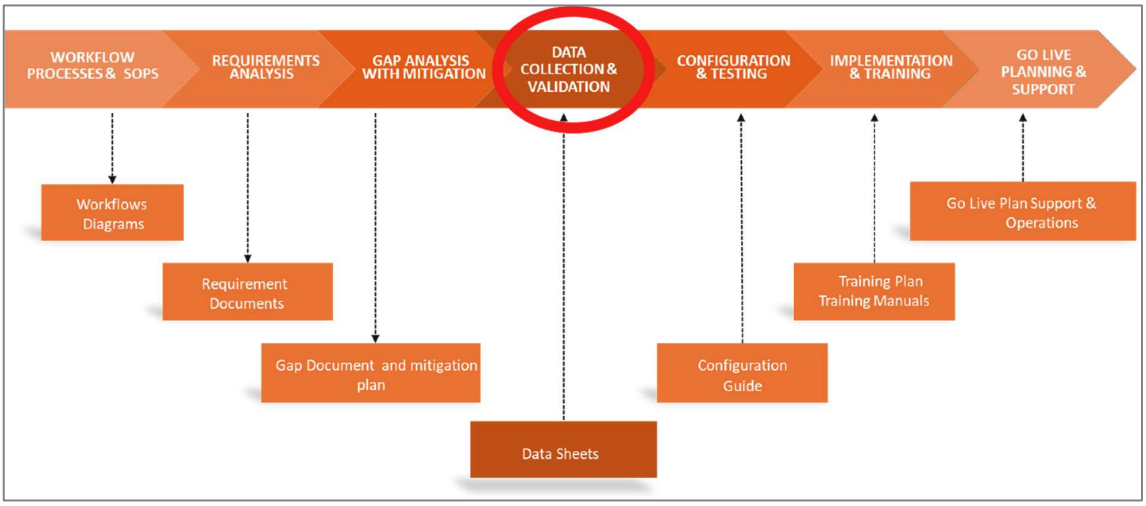
The healthcare industry is rapidly evolving with the integration of digital technologies, aiming to improve patient care, enhance operational efficiency, and reduce costs. However, the success of these technological advancements hinges not only on the technical robustness of the systems but significantly on the socio-cultural factors influencing their adoption and use.

While adopting digital health applications offers many benefits, ensuring a successful implementation process is crucial. This process involves several key steps:

By following a structured implementation process that addresses these key steps, healthcare institutions can increase the likelihood of successful adoption and maximize the benefits of digital health applications.

This research focuses on understanding these factors and dynamics, particularly within the context of HIS implementation by Trio Tree Technologies Pvt. Ltd.

The successful implementation of a digital health application (DHA) goes beyond technical considerations. Socio-cultural factors also play a significant role in influencing not only the implementation process itself but also the ultimate adoption and acceptance of technology within a healthcare system (HIS). Here's a breakdown of this:



Impact on Implementation:

- Cultural Norms and Values
- Educational Background and Literacy
- Social Hierarchy and Power Dynamics

Impact on Adoption and Acceptance:

- Language and Accessibility
- Cultural Perceptions of Health and Illness
- Social Stigma

Literature Review:

Hospital information systems (HIS), e-prescriptions, and electronic medical records (EMR) are among the digital health solutions that the healthcare industry is progressively implementing. These developments are intended to improve patient care, increase engagement, and optimize workflows. Nevertheless, obstacles to obtaining digital health interventions still exist in spite of these initiatives. High data costs, constrictive religious views, minimal privacy concerns, limited support for native languages on most platforms, low user digital literacy, and complex user interfaces are some of these challenges. (1) The ability to obtain, process, and understand basic health information and services and, as a result, take part in decisions pertaining to one's health is known as digital literacy. (2) Difficulties that negatively impact health care measures and outcomes have been linked to limitations in health literacy.

The risk variables that are easily disregarded when there are significant changes in the regulatory, social, economic, and technological landscapes along with a rapid implementation. (4) There are additional obstacles for patients who have access to digital media, such as the requirement for highly developed general literacy to comprehend the content. In order to promote accessibility for all individuals who stand to benefit from eHealth services, health care institutions must similarly identify universal precautions of digital health literacy. (5)

Reference:

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Methodology:

Study area: The study is conducted in a hospital where the implementation is going on or completed by TrioTree Technologies Pvt. Ltd.

Sample size: 81

Study duration: 01/03/2024 – 01/06/2024

Study type & Tools Used: The study is primary in nature which is beed conducted using qualitative and quantitative tools. The tools used in the study primarily include variables such as age, years of experience in the institution, and workplace dynamics of the employee is analyzed by using self-structured questionnaire and informal interview method. Inclusion criteria- employees of TrioTree who are involve in HIS implementation.

Data Collection Procedure: Official permission is taken from the concerned authorities for the collection of the data. Participants are educated about the reason of the study. A written consent is taken from them. Information on these variables is collected through interview methods. While conducting the interview, information is collected with strict confidentiality.

Data Analysis: The information gathered from the tools is statistically analyzed to understand the possible reasons for attrition. The considerations while questioning are mentioned below are which were used while interviewing the sample.

- **Workplace Dynamics:** Interpersonal relationships, team dynamics, and the overall work culture can influence the implementation process.
- **Age and Technological Savviness:** Older staff members may be less comfortable with new technologies compared to younger, more tech-savvy colleagues.
- **User Involvement in Design and Implementation:** Involving end-users in the design and implementation phases can lead to better acceptance and satisfaction with the HIS.
- **Trust in Technology:** Trust levels in the accuracy, reliability, and security of HIS can affect its acceptance among healthcare professionals.
- **Language Barriers:** Language differences can create challenges in training, understanding system interfaces, and communication among team members.

- **Resistance to Change:** Resistance from staff who are accustomed to traditional methods of record-keeping can hinder the implementation process.
- **Educational Background:** The level of education and familiarity with technology among healthcare staff can influence their ability to use HIS effectively.
- **Training and Support Provided:** The quality and extent of training and ongoing support provided to users can significantly impact their ability to use the system effectively.
- **Cultural Norms and Values:** Different cultural attitudes towards technology and change can impact how HIS is perceived and adopted.
- **Management Support:** Strong leadership and commitment from management are crucial for driving the adoption and successful implementation of HIS.

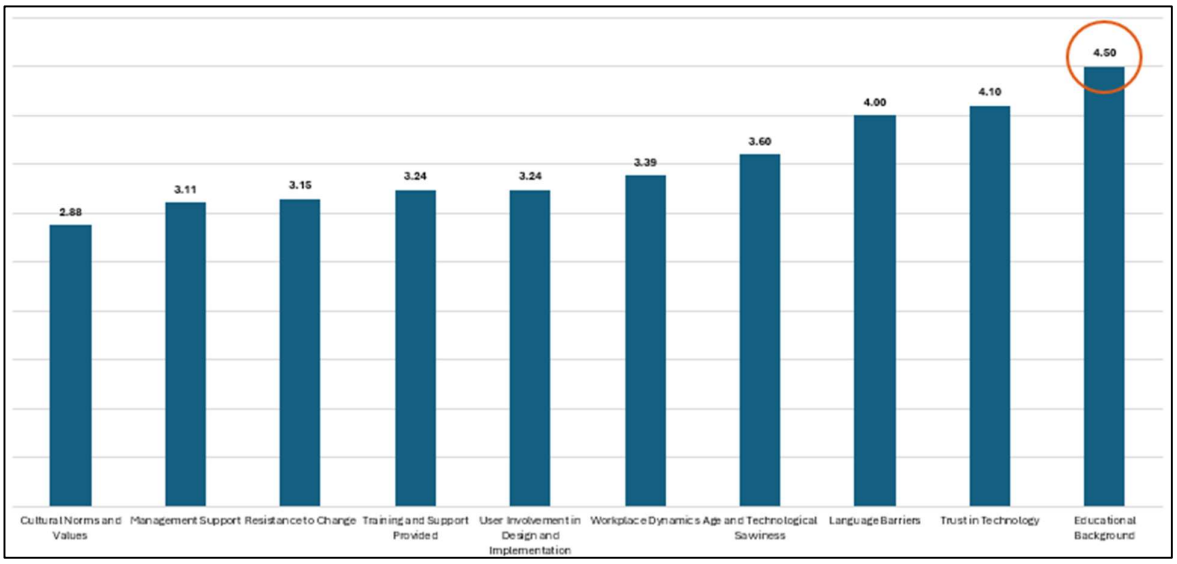
Objective

a. The core objective of this study is to explore what all factors are affecting the implementation process.

b. To Identify the Potential Barriers during implementation phase.

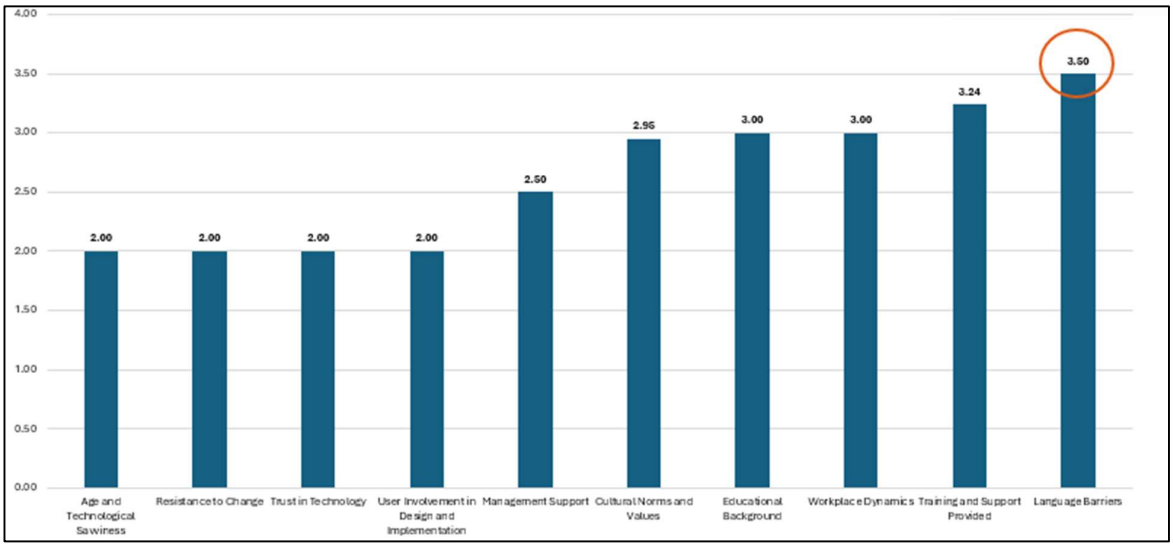
Result

Finding 1:



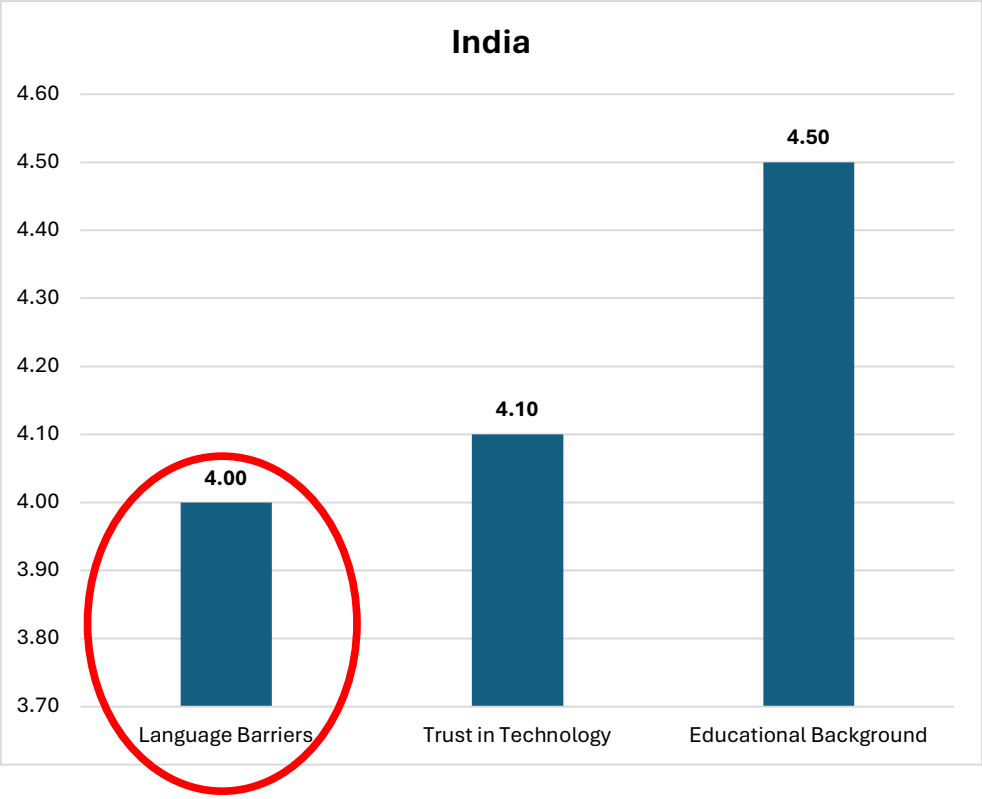
- **Educational Background** identified as the main factor for Implementation across India.
- Due to delay in Data Collection and Validation, Project timeline extended by **upto 8%** in almost **30% of ongoing implementation** and **15% in completed implementation**.
- Complaint issue under ticket flagged as "***different than promised deliverable***" reported to support in **30% of implementation.**

Finding 2:



- **Language Barrier** identified as the main factor for Implementation outside India.
- Due to delay in Data Collection and Validation, Project timeline extended by **upto 22%** in almost **10% of ongoing implementation** and **30% in completed implementation**.
- Complaint issue under ticket flagged as "***different than promised deliverable***" reported to support in **20% of implementation**.

Finding 3:


India
4.60
4.50
4.40
4.30
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4.00
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3.70
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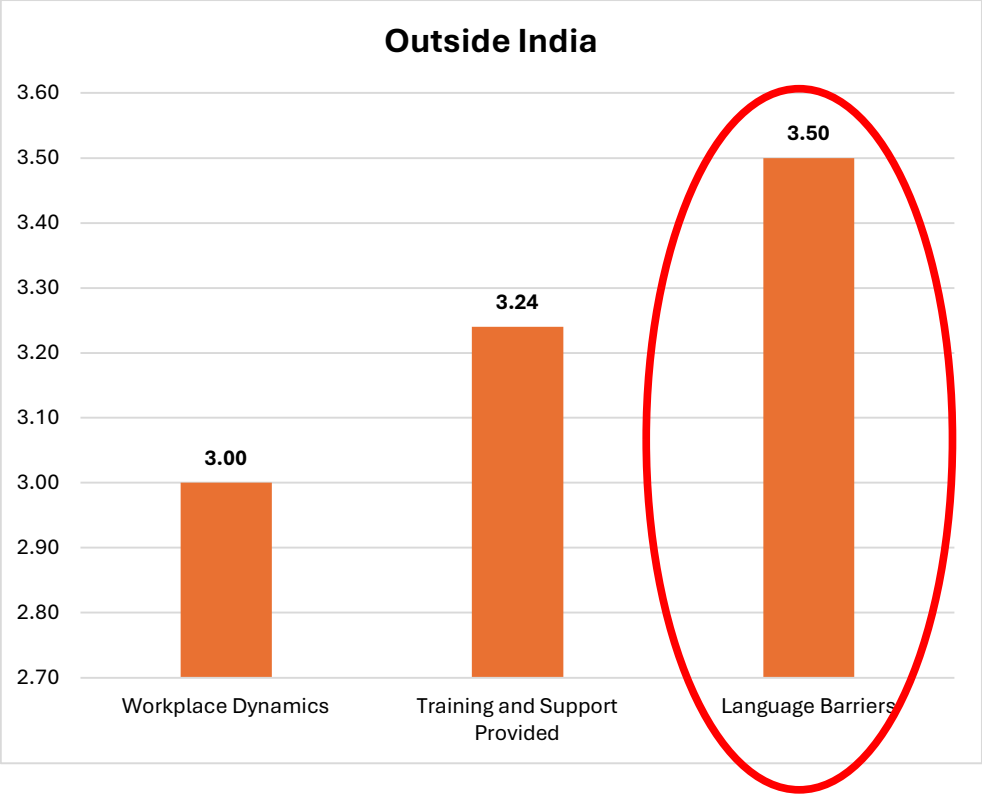
4.10
4.50
Language Barriers
Trust in Technology
Educational Background


Outside India
3.60
3.50
3.40
3.30
3.20
3.10
3.00
2.90
2.80
2.70
3.00
3.24
3.50
Workplace Dynamics
Training and Support Provided
Language Barriers

- Among top 3 factors comparison India vs Outside **Language Barrier** identified as common factor which is affecting the implementation.

Discussion:

The factors that can affect the successful implementation of digital health solutions can be categorized as:

a) **Technical Factors:** Limited technical infrastructure, such as internet access or compatible devices, can restrict user participation.
b) **Accessibility Concerns:** The lack of accessible interfaces or features for users with disabilities can further limit inclusivity.
c) **Socio-Cultural Factors:** Cultural beliefs, attitudes towards technology, and user literacy levels can influence acceptance and adoption.The socio cultural factor which are taken into consideration are:
    - Cultural norms and values
    - Management Support Resistance to Change
    - Training and support provided
    - User involvement in design and implementation
    - Workplace dynamics
    - Age and technical savviness
    - Language barrier
    - Trust in technology
    - Educational background

While technical limitations and accessibility concerns are recognized challenges in implementing digital health solutions, socio-cultural factors are often overlooked. However, these factors can significantly hinder the implementation process.

A lack of digital literacy, particularly across India, has been identified as a major factor hindering the implementation of digital health interventions. Users with limited digital skills may struggle to understand the benefits and functionalities of these interventions, creating challenges for adoption.

Individuals with limited digital health literacy often show greater resistance to adopting new digital health technologies. This resistance stems from several concerns, including:

a) **Data Privacy:** Concerns about data privacy and security are a major barrier for users with low digital literacy. They may not fully understand how their data is collected, used, and protected, leading to hesitation in using digital health tools.
b) **Other Concerns:** Beyond data privacy, other concerns might include:
    - Difficulty understanding technical instructions or navigating user interfaces.
    - Lack of trust in the technology or its effectiveness.
    - Worries about potential disruption to existing healthcare routines.

Studies examining online health information have identified that many are written at ≥12th grade reading level, far beyond the 6th grade reading level recommended for medical educational material.

While a successful digital health implementation relies on every step of the process, data collection and validation can be a particular bottleneck. User factors, such as limited digital literacy or concerns about data privacy, can complicate this stage, leading to increased resource requirements.

Due to delay in Data Collection and Validation, Project timeline extended by up to 8% in almost 30% of ongoing implementation and 15% in completed implementation.

Beyond India, language barriers pose a significant challenge to the implementation of digital health solutions. Communication difficulties due to language differences can hinder data collection and training processes. Here's how:

Limited User Participation: Users who don't understand the instructions or interface in their native language may be less likely to participate in data collection efforts.

Data Quality Issues: Inaccurate translations can lead to errors in collected data, impacting the quality and effectiveness of training models.

Due to delay in Data Collection and Validation, Project timeline extended by **up to 22%** in almost **10% of ongoing implementation** and **30% in completed implementation**.

Complaint issue under ticket flagged as "*different than promised deliverable*" reported to support in 30% of implementation.

While all socio-cultural factors hold importance, language barriers and digital literacy stand out as critical considerations for enhancing user acceptance of digital health solutions.

Conclusion:

Digital health services are changing how hospitals are storing and manging the patient data for maintaining the continuity of care. This technology also holds immense promise for enhancing patient experience and engagement, ultimately impacting care delivery.

However, a significant barrier faced by implementors of digital health:

- Users with limited digital literacy
- Trust on technology
- Language barrier

These limitations can hamper project timelines, decrease user acceptance, and ultimately hinder the adoption of the entire digital health system.

Mitigating the impact of socio-cultural factors is very important for a smooth implementation. This can involve:

- **Understanding user needs:** conducting through need assessment to identify cultural belief, language preferences and digital literacy levels with the target population.
- **User involvement:** user involvement is crucial for designing culturally sensitive digital health systems which helps in building trust and enhance the user experience.
- **Community Engagement:** Involving key stakeholders from the community throughout the process fosters trust, addresses anxieties, and ensures the technology aligns with local needs and practices.
- **Localization Efforts:** Developing interfaces and training materials in multiple languages to cater to diverse user populations.
- **Culturally Sensitive Approaches:** Designing data collection methods that are sensitive to local cultural contexts and communication styles.

We now call for more concerted measures to have an optimal impact on the socio-cultural factors and to address the most strategic needs to ease the life of people who are implementing the digital Health Solution

Supplementary

Instrumentation- Questionnaire

INTRODUCTION AND INFORMED CONSENT

Namaste! My name is _____. I am a postgraduate student at International Institute of Health Management Research, Delhi and currently working as Associate Business Analyst (Intern) at TrioTree Technologies Private Limited. The purpose of this study is to find out the impact of social and cultural dynamics to the implementation of HIS.

If you agree to participate in this study, you will be asked some questions. You are selected randomly for this study, and this will usually take about 15 - 20 minutes.

Your privacy is of utmost importance. All personal information collected during this study will be kept confidential and will only be accessible to the researcher and authorized personnel. Your identity will be protected by assigning a unique identifier to your data.

Your participation in this study is entirely voluntary. You may choose to withdraw at any time without penalty. However, we hope that you will participate in this study since your participation and information is important for us. At this time, do you want to ask me anything about the study?

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I asked has been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Name of Participant : _____

Date of Interview : _____ / _____ / _____

Signature : _____

Name of employee						
Age						
Sex						
Experience in Implementation (In Yrs.)						
Implementation Site (India / Outside India)	☐ India ☐ Outside India					
Rate your answer (1 - 5)						
Workplace Dynamics						
Age and Technological Savviness						
User involvement in Design and Implementation						
Trust in Technology						
Language Barriers						
Resistance to Change						
Educational Background						
Training and Support Provided						
Cultural Norms and Values						
Management Support						
Any other comment						
Notes:						

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