

FACTORS INFLUENCING THE IMPLEMENTATION OF E-HEALTH: A SYSTEMIC REVIEW

Dissertation Submitted to



The IIHMR University, Jaipur

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in

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By

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Under the Supervision and Guidance of

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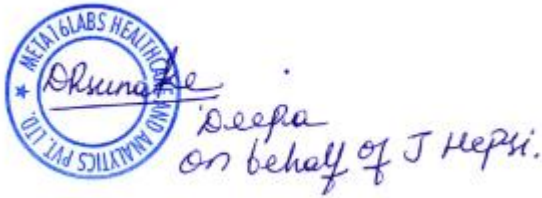
TO WHOMSOEVER IT MAY CONCERN

29th June 2024

This is to certify that **Ms. Shikha Mehta** has successfully completed her internship as a Business Analyst Department of “Platform” from **1st April 2024 to 29th June 2024**. We want to express her hard work, dedication, and contributions during her tenure with us. During her internship, her efforts have contributed positively to our team and organizations, and we are grateful for her contributions.

We wish you all the best in her future endeavours and hope the experience gained during her time with us will contribute to her professional development.

For Meta16 Labs Healthcare & Pvt Ltd



Deepa
on behalf of J Heps.

J Heps
Senior Manager
Human Resources.

APPENDIX D

DECLARATION BY STUDENT

I hereby claim that this dissertation titled **"FACTORS INFLUENCING THE IMPLEMENTATION OF E-Health: A SYSTEMATIC REVIEW"** is the bonafide record of my authentic research work. I claim that it has no longer been submitted to any other university or institution for the award of any degree or diploma. facts derived from the posted or unpublished paintings of others has been duly recounted inside the textual content.

(Signature) 

Shikha Mehta

Date - 03/07/2024

CERTIFICATE

This is to certify that dissertation titled *"Factors Influencing the Implementation of E-Health : A Systemic Review"* is a record of the research work undertaken by Shikha Mehta in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.



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Faculty Guide
IIHMR University, Jaipur
Date 3.7.2024



Dr. Sanjay Gupta
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IIHMR University, Jaipur
Date 03/07/2024

ABSTRACT

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ENROLLMENT NO. – IIHMR-U/01/2022-24/1608

TITLE – “*Factors influencing the implementation of E – Health: a systemic review*”

E- Health - E-Health refers to the use of information and communication technologies (ICT) in healthcare to improve the quality of healthcare services, enhance patient care, and promote health and wellness. It encompasses a wide range of applications and services that leverage technology to support the healthcare system, including the following key aspects: Telemedicine, Electronic Health Records (EHRs), Health Information Systems, Mobile Health (mHealth), Health Informatics, Telehealth, Wearable Health Technology, Patient Portals, E-Prescribing, Health Analytics.

With this backdrop, a descriptive cross-sectional study was carried out to discover and compile current research on the main factors affecting the implementation of e-health systems. The objectives of the study include - Conducting a comprehensive search of relevant databases to identify systematic reviews that analyze factors affecting e-health implementation, establish pre-defined criteria for screening and selecting eligible studies. A systematic search was conducted across relevant databases, articles published between 2010 and 2023 in Medline, PubMed, Research Gate, and Google Scholar. The workings of Digital Health Interventions served as the foundation for 30 eligible articles. The search strategy combined keywords related to e-health, implementation, and factors. Inclusion criteria involved studies published in English within a specific timeframe, those investigating factors influencing e-health implementation, and those using a systematic review methodology. Exclusion criteria included studies focusing on specific e-health technologies or interventions rather than implementation factors in general. Studies meeting the selection criteria undergone data extraction using a standardized data extraction form. Extracted data included study characteristics (authors, publication year, etc.), e-health domain studied, and reported factors influencing implementation. The key results anticipated in the review –

- **Individual Technology:** Usability, interoperability, data security, and training resources.
- **Inner Setting:** Organizational culture, leadership support, workflow integration, and resource availability.
- **Outer Setting:** Legal and regulatory frameworks, reimbursement policies, and infrastructure (e.g., internet access).
- **Health Professionals:** Knowledge, attitudes, skills, and perceived benefits of e-health.
- **Implementation Process:** Stakeholder engagement, change management strategies, and ongoing evaluation.

This systematic review will offer a valuable resource for researchers, policymakers, and healthcare professionals working in the field of e-health. By understanding the key factors that influence successful implementation, stakeholders will be able to make informed decisions to optimize e-health technologies and improve healthcare delivery.

Keywords: E-health, Implementation, Systematic Review, Healthcare Systems

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First and foremost, I would like to offer my deepest thanks and praise to the Almighty for showering his blessings upon me throughout my dissertation journey. His grace and guidance have sustained me during challenging moments and fueled my determination to succeed. I am incredibly grateful for the invaluable opportunity to complete my dissertation at **Meta16 Labs, Bangalore**. It was a true honor and a privilege to work alongside such esteemed individuals. The experience has been nothing short of extraordinary, and I am deeply indebted to the team at Meta16 Labs. My sincerest gratitude goes to **Mr. Anil JJ, CEO, Meta16 Labs**. His unwavering support and belief in my abilities provided the foundation for this entire project. I am particularly thankful for the opportunity to delve into this research under his guidance. His insights and expertise have been instrumental in shaping my understanding of the topic and propelling me forward. I would also like to express my immense appreciation to my organization mentor, **Ms. Mercy Sam, Project Manager, Meta16 Labs**. Her guidance, support, and unwavering motivation were an invaluable source of strength during challenging times. Her ability to encourage and motivate me, especially during moments of doubt, has played a crucial role in my success. It has been a true privilege to work under her leadership and learn from her vast experience. Most importantly, I extend my heartfelt gratitude to my dissertation guide, **Dr. Susmit Jain, Associate Professor, IIMR University, Jaipur**. His constant guidance and unwavering support throughout my dissertation journey have been nothing short of phenomenal. His expertise, insightful feedback, and unwavering belief in my potential have been instrumental in shaping this project and fostering my academic growth. I am truly fortunate to have had the opportunity to learn from and collaborate with such remarkable individuals. This experience has not only enriched my academic journey but has also equipped me with invaluable skills and knowledge that I will carry with me throughout my career. Thank you once again for your invaluable support and guidance.

Sincerely,

Shikha Mehta

Place: Jaipur

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ABBREVIATIONS

IT	Information Technology
EHR	Electronic Health Record
DHI	Digital Health Interventions
ICT	Information and Communication Technologies
E – Health	Electronic Health
WHO	World Health Organization
ITU	International Telecommunication Union
RPM	Remote Patient Monitoring
HCPs	Health Care Providers
LAUNCH	Leadership of digital health technology Uptake among Nurses in Care Homes
DHT	Digital Health Technology
PPI	Patient and Public Involvement

CHAPTER – 1

INTRODUCTION

In contemporary healthcare systems, the adoption of Information and Communication Technology (ICT) for healthcare delivery, or e-health, has grown more and more essential. The aim/objective of this systematic study is to investigate the critical elements that enable policymakers, technology developers, and healthcare organizations to effectively design, carry out, and maintain e-health initiatives. Gathering and synthesizing existing research is the main objective to offer a thorough knowledge of the complex nature of e-health adoption. The evaluation investigates several areas, including user acceptance, organizational preparedness, legislative frameworks, technological infrastructure, and cultural aspects. Its goal is to provide comprehensive advice for those who are involved in the adoption of e-health. This study is important because it can help identify obstacles, provide best practices, and guide decision-making processes related to the deployment of e-health. The research findings hold significance for healthcare establishments seeking to implement or enhance electronic health systems, so propelling the progress of e-health tactics, augmenting healthcare results, and elevating patient encounters. Due to recent social and technological improvements, the focus of digital health has evolved from the organizational use of ICT in primary care or healthcare settings to the individual use of technologies by patients and communities. To improve citizen outcomes while lowering healthcare costs and demand, several nations place a high priority on illness prevention and public health. When it is possible, people are urged to take charge of their own healthcare and make the necessary provisions to live freely. As a result, numerous self-care technologies have been created, developed, and made accessible to patients. These consist of health apps, telehealth and telecare systems, assistive living equipment, and online self-management platforms. With the use of these technologies, people with a spectrum of health and care requirements can live independent lives and receive assistance in managing chronic illnesses. These technologies can help patients and formal and informal caregivers communicate and share information, despite conflicting evidence about their efficacy in improving health and other outcomes. The public uses wearables and other e-health goods and services, such health applications, to keep track of their food and activity. These technologies can also be used to

track other wellness and health parameters, albeit there isn't much proof of their effectiveness. To fully realize the potential advantages of e-health technologies, the assessment emphasizes how critical it is to handle both their opportunities and difficulties. The systematic study identifies the essential elements required for e-health projects to be implemented successfully. Stakeholders can gain significant information by looking at technology infrastructure, organizational readiness, legal frameworks, cultural influences, and user approval. The study's potential to help healthcare organizations embrace and improve e-health systems, which would eventually improve patient experiences and healthcare results, highlights how relevant it is. The trend toward personal usage of digital health technologies highlights the importance of independent living and self-care, mirroring broader technical and cultural developments. These technologies have a great deal of promise to improve communication, information exchange, and general health management, even though their efficacy varies.

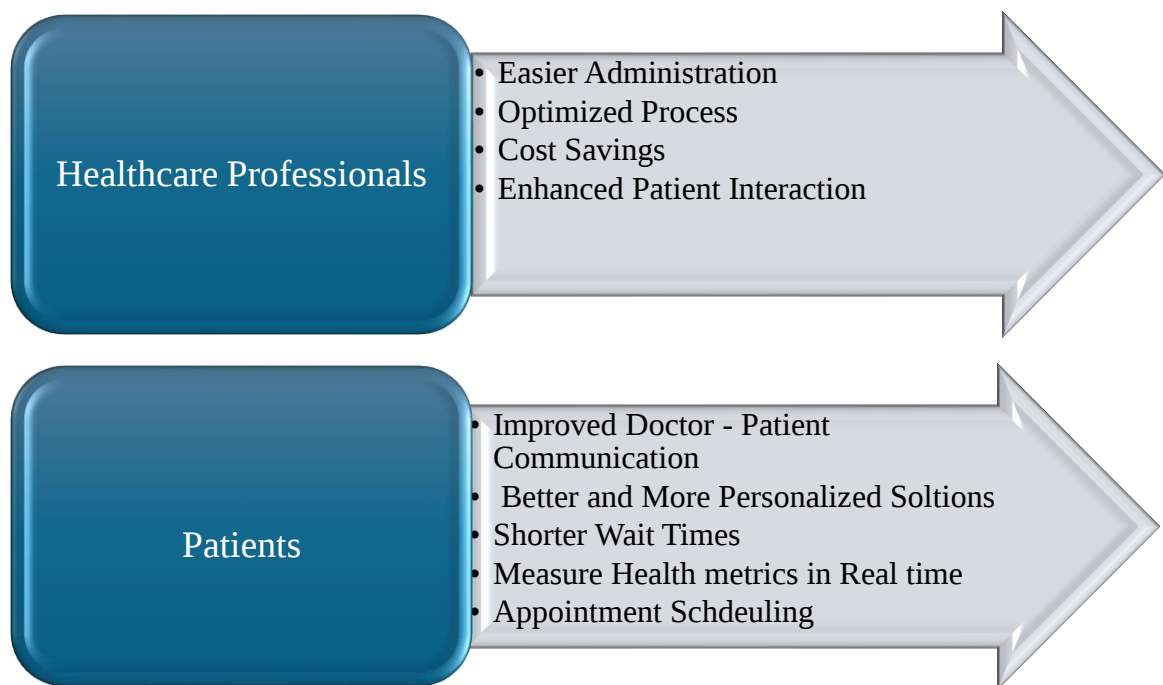


Fig. - 1 Digital Transformation in Healthcare, [Tristate Technology](#)

1. **Better Doctor-Patient Communication:** •

- **Secure Communication Platforms:** These platforms make it easy for patients to connect with doctors in between visits. This encourages ongoing conversation by making it easier to clarify questions, change medication or make modifications, and resolve non-urgent problems.
- **Booking Appointment through Telemedicine:** Telemedicine enables online consultations, saves time on travel and expands the availability of specialists, especially in rural areas.
- **Patient Portals:** These online resources give patients access to lab results, discharge summaries, and medical information in one convenient location. Patients can now be better equipped to participate in their healthcare process as informed participants.

2. **Better and More Personalized Solutions:**

- **Electronic Health Records (EHRs):** EHRs give doctors a complete view of a patient's medical history, allergies, prescriptions, and vaccinations, allowing them to diagnose patients and create personalized treatment plans.
- **Data analytics:** Discover patterns and trends in medical data through advanced analytics, which can then be used to create personalized risk assessments and proactive treatment plans.

3. **Less Waiting Times:**

- **Online Appointment Booking:** This reduces in-person waiting times as patients can book appointments in the way that suits them the best.
- **Virtual Waiting Rooms:** Patients can wait for telehealth visits instead of spending time in actual and real waiting rooms.
- **Automatic Reminders:** Automatic reminders can increase meeting efficiency by reducing no-shows.

4. Effortless View of Personal Health Data:

- **Patient Portals:** As mentioned earlier, these provide easy access to personal health data information, allowing users to monitor and track their health trends, take care of their prescriptions and manage them, and schedule appointments.
- **Wearable Technology and smartphone Apps:** Heart rate, blood pressure, and sleep patterns are just some of the health data that wearable technology and smartphone apps can monitor. Patients can share this real-time data with healthcare providers and monitor their own health to make better decisions.

5. Wearable Technology and Mobile Apps:

- **Real time measurement of health metrics:** These types of technologies allow patients to monitor various health indicators in real time, giving them important information about overall health and well-being.
- People with chronic illness can benefit from this information.

6. Appointment Scheduling:

- **Online scheduling:** Patients can book appointments any time, day or night, throughout the week, online, eliminating the need for phone calls and waiting times. This simplifies the process and increases flexibility.

7. Easier Administration:

- **Electronic Health Records (EHRs):** EHRs reduce the potential of error and save time by eliminating the need for paper charts. When the information is readily available, billing, coding and documentation can be completed more quickly.
- **Automated procedures:** By automating repetitive administrative procedures, such as ordering lab tests, scheduling appointments, and filling prescriptions, you can free up time to focus on patient care.

- **Practice Management Software:** This single platform for managing daily operations integrates multiple management functions such as billing, scheduling and claims processing.

8. Optimized Processes:

- **Greater Workflow Management:** Digital tools can simplify workflow by automating processes and ensuring better coordination and communication between healthcare professionals.
- **Fewer/ Lesser Errors:** By reducing the possibility of human data input, digital systems increase overall accuracy.
- **Improved Sharing of Data and Information:** Secure digital platforms facilitate sharing between physicians, specialists, and laboratories, which promote better educated and team-based care.

9. Healthcare facilities can save money by reducing time and resources for administrative tasks through automation and simplified processes.

- **Better Allocation of Resources:** By monitoring the use of resources and showing opportunities for improvement, digital solutions can facilitate better allocation of resources between departments.
- **Decreased Readmissions:** By preventing problems and rehospitalizations, telehealth and remote patient monitoring can help save total healthcare expenses.

10. Improved Interaction with Patients:

- **Virtual Consultations via Telehealth:** This increases patient convenience and access to care by offering virtual consultations. For managing chronic diseases and follow-up appointments, this can be especially helpful.
- **Secure Messaging Platforms:** These enable prompt responses to queries or concerns as well as improved patient involvement through contact in between appointments.

- **Patient Portals:** These facilitate a more cooperative doctor-patient interaction by enabling patients to manage their health information, make appointments, and refill medicines.

Since technology has been employed in healthcare, diverse levels of success and failures have been experienced when implementing it in healthcare environment settings. As new technologies are applied, other challenges may come up, even though some lawmakers, managers of health services, and health professionals are excited about their adoption. For example, barriers that prevented primary care practices from implementing EHRs. This relates to several problems with the way the caregiving process and clinical processes related to the technical system. Particularly troubling aspects included the project administration/coordination technique used to purchase and set up the IT system and the standard of assistance and training given to EHR users. These challenges highlight the possibility that complex organizational and human transformation processes may be involved in the integration of new technology into healthcare. This could lead to the technology being discontinued or substantially changed, which would constrain the potential to improve patient outcomes or the provision of services, which could lessen its potential to enhance patient consequences or the provision of services.

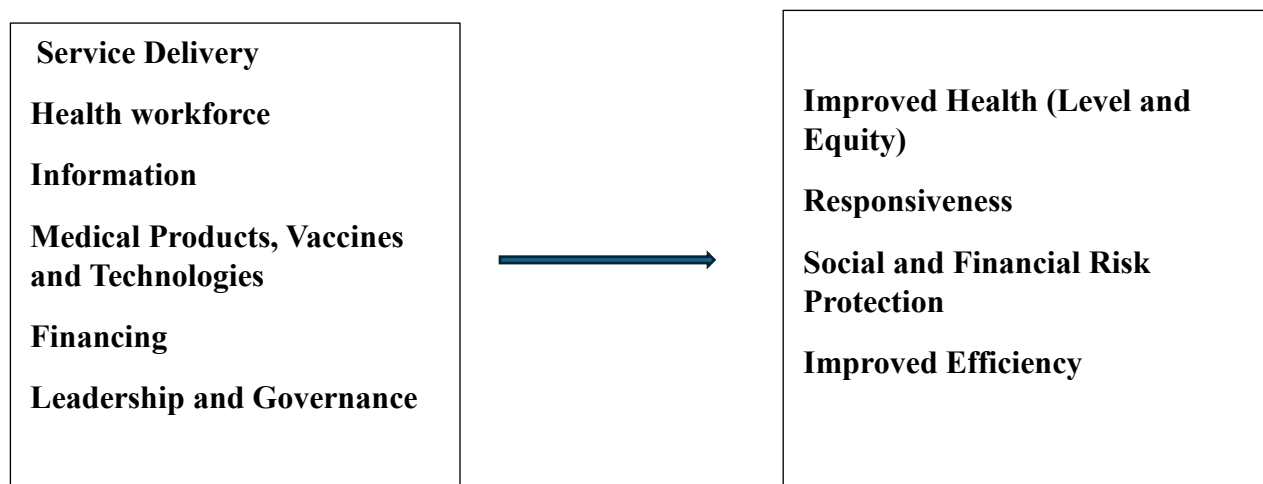


Fig. - 2 Six enablers in national healthcare systems to assess their current baseline state, [Research Gate](#)

Here's a breakdown of six key enablers in national healthcare systems:

- **Service Delivery:**

It encompasses the infrastructure – hospitals, clinics, community health centers – as well as the way services are delivered, like primary care, preventive care, and specialist care. Efficient service delivery ensures accessibility and quality of care for everyone.

- **Health Workforce:**

A skilled and well-distributed health workforce is critical. This applies to doctors, nurses, pharmacists, first responders and public health professionals. The right type of staff in the right places is essential for effective care.

- **Information:**

Strong information systems are the backbone of good healthcare. This includes electronic health records, disease surveillance data, and health management information. Efficient collection, analysis, and use of information helps improve diagnosis, treatment, and public health interventions.

- **Medical Products, Vaccines & Technologies:**

Access to essential medicines, vaccines, and medical technologies is vital. These tools allow for prevention, diagnosis, and treatment of diseases. A functional system ensures these are available, affordable, and up to date.

- **Financing:**

Financing healthcare ensures resources are available to deliver services, train personnel, and invest in technologies. This can come from various sources like government budgets, social security contributions, and private insurance. Sustainable financing is key to ensuring long-term system viability.

- **Leadership & Governance:**

Strong leadership and good governance are essential. This includes clear national health policies, well-defined roles and responsibilities within the system, and effective oversight mechanisms. Effective leadership ensures accountability, transparency, and continuous improvement of the healthcare system.

Here's how the six enablers of national healthcare systems contribute to enhanced health outcome, responsiveness, social and financial risk mitigation, protection and increased efficiency.

1. Service Delivery:

- **Improved Health:** Efficient service delivery ensures people can access preventive care like vaccinations and screenings, leading to early detection and better health outcomes.
- **Responsiveness:** A well-organized system allows patients to access the right care at the right time, reducing wait times and improving patient satisfaction.
- **Social & Financial Risk Protection:** Accessible services prevent minor issues from escalating into expensive emergencies, protecting individuals and families from financial burden.
- **Improved Efficiency:** Streamlined service delivery processes reduce waste and duplication, allowing resources to be used more effectively.

2. Health Workforce:

- **Improved Health:** A skilled workforce provides high-quality care, leading to better diagnoses, treatments, and overall health outcomes.
- **Responsiveness:** Having enough qualified personnel ensures patients can get the care they need without long delays.

- **Social & Financial Risk Protection:** A well-trained workforce can help prevent illness and manage chronic conditions, reducing the need for expensive interventions.
- **Improved Efficiency:** Skilled professionals can deliver care more effectively, reducing unnecessary tests and procedures.

3. Information:

- **Improved Health:** Strong data analysis helps identify disease trends and target public health interventions, leading to improved population health.
- **Responsiveness:** Information systems allow healthcare providers to access patient records easily, improving coordination and continuity of care.
- **Social & Financial Risk Protection:** Data can be used to identify high-risk populations and target preventative measures, reducing the overall burden on the system.
- **Improved Efficiency:** Information systems can streamline administrative tasks and reduce errors, leading to better use of resources.

4. Medical Products, Vaccines & Technologies:

- **Improved Health:** Access to essential medicines, vaccines, and technologies allows for prevention, early diagnosis, and effective treatment of diseases.
- **Responsiveness:** New technologies can enable faster diagnosis and treatment, improving patient outcomes.
- **Social & Financial Risk Protection:** Vaccines prevent costly outbreaks, and effective treatments reduce the need for extended hospital stays.
- **Improved Efficiency:** Advanced technologies can automate tasks and improve diagnostic accuracy, leading to more efficient care delivery.

5. Financing:

- **Improved Health:** Sustainable financing allows for investment in preventive care, new technologies, and workforce training, leading to better health outcomes.

- **Responsiveness:** Adequate funding ensures healthcare providers have the resources they need to deliver quality care to all patients.
- **Social & Financial Risk Protection:** Financial security protects individuals from the financial burden of healthcare costs.
- **Improved Efficiency:** Efficient financing avoids waste and allows for investment in cost-saving measures like preventative care.

6. Leadership & Governance:

- **Improved Health:** Strong leadership sets clear goals and priorities for improving population health.
- **Responsiveness:** Good governance ensures the system is accountable to the public's needs and adapts to changing circumstances.
- **Social & Financial Risk Protection:** Effective leadership promotes policies that ensure equitable access to healthcare and financial protection.
- **Improved Efficiency:** Clear policies and oversight mechanisms help reduce waste and ensure resources are used effectively.

CHAPTER – 2

LITERATURE FREVIEW

S.No.	Study name	Year	Author	Location	Methodology	Salient Features
1	Digital Transformation in Healthcare: Technology Acceptance and Its Applications	2023	Angelos I. Stoumpos, Fotis Kitsios, Michael A. Talias	Greece	Literature Review	According to the World Health Organization, telemedicine presents great potential for lowering diagnostic variability, enhancing clinical management, and enhancing the delivery of healthcare services globally. According to the World Health Organization,

						telemedicine enhances cost-effectiveness, quality, accessibility, and efficiency. By removing barriers to the physical distance between patients and healthcare providers, telemedicine can benefit historically underserved populations.
2	Implementation of digital health interventions in Rehabilitation : A scoping review	2023	Louise Pearce, Nathalia Costa Catherine SherringtonLeanne Hassett	Australia	Literature Review	For digital interventions to be successfully included into rehabilitation therapy, their implementation must be well thought

						out and customized. Future rehabilitation research should prioritize employing implementation science methodologies to study and evaluate implementation while testing the efficacy of digital therapies in order to keep up with the rapid advancement of technology.
3	Meaningful patient and public involvement in digital health	2022	Rebecca Baines, Hannah Bradwell, Katie Edwards, Sebastian Stevens, Samant	UK	Electronic databases MEDLINE, EMBASE, PsycINFO, CINAHL,	Although progress has been made over the last ten years, there are still

	innovation, implementation and evaluation: A systematic review		ha Prime , John Tredinnick- Rowe, Miles Sibley, Arun angsu Chatterjee		Scopus and ACM Digital Library MEDLINE	a few obstacles that prevent patients and inventors from working together to improve the quality, frequency, and duration of PPI in digital health innovation. Certain hindrances and facilitators, including the significance of data security and privacy, seem exclusive to PPI in the realm of digital innovation. Given the benefits and consequences of digital
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						health, more should be done to support innovators and patients in getting actively involved in these breakthroughs from the beginning.
4	Influence of Factors on the Adoption and Use of ICT-Based eHealth Technology by Urban Corporate People.	2022	Masuda Begum Sampa, Md. Nazmul Hossain, Md. Rakibul Hoque, Rafiqul Islam, Fumihiko Yokota, Mariko Nishikitani, Akira Fukuda, Ashir Ahmed	Dhaka, Bangladesh	cross-sectional survey	Based on the overall impact, it seems that increasing the impression of a PHC system's utility is the first step towards enhancing its usage. This is followed by raising health awareness and the notion of using the

						system, both of which were expected to have a positive and initial influence on use behavior.
5	Digital healthcare: the future	2022	Charles JT Butcher, Wajid Hussain	London, UK	Electronic Questionnaire	The COVID-19 pandemic is driving a digital revolution in healthcare that will change many of the basic components of medical treatment. We are aware that there may be numerous detours and bumps in this path to advancement.
6	Dyadic digital health interventions:	2021	Kelly M Shaffer, Lindsay S	USA	Literature Review	While most behavioral and

	Their rationale and implementation		Mayberry, Emily Georgia Salivar, Brian D Doss, Amanda M Lewis, Kimberly Canter			psychosocial digital health interventions have been created with the requirements of the person in mind, targeting days two interdependent people can more thoroughly address the needs of both parties and their relationship.
7	Understanding factors critical to the implementation of e-health in chronic disease management: A realist review protocol	2021	Nida Shahid, Valeria E Rac, Joanna Bielecki, Whitney Berta	Canada	Literature Review	The purpose of this review is to provide readers with a more comprehensive understanding of the factors that must be present for

						persons receiving any kind of care setting to accept e-health therapies.
8	Current e-Health Challenges and recent trends in e-Health applications.	2021	Muhammad Mudassar Qureshi, Amjad Farooq, Muhammad Mazhar Qureshi	Lahore, Pakistan	Review Articles	The primary focus areas of eHealth include: 1) electronic health record management. 2) communication infrastructure and networks. 3) patient data standardization; 4) security and privacy. 5) Research and international and national cooperation. Applications pertaining to citizens and

						patients are essential components of eHealth.
9	Factors affecting the adoption of e-health system in the Kingdom of Saudi Arabia	2020	Fahad Alanezi	Saudi Arabia	Designed Questionnaire	The study sheds light on the Saudi government's initiatives to improve health services for its people and the amount of money allocated to the health department to address health-related issues.
10	The Adoption and Implementation of Digital Health Care in the Post COVID-19 Era	2020	Giselle S. Mosnaim, Hilary Stempel, David Van Sickle, and David A. Stempel, Evanston, Denver, Colo;	USA	Literature Review	These days, telehealth is integrated into the electronic health record (EHR) either because it is part of the

			Madison, Wis; and San Francisco, Calif			EHR or because the EHR documents the care episode needed for billing. For RPM to be easily accepted into daily practice, it must be integrated into the EHR and give the HCP a single platform. The EHR is required to transmit patient data and alarms, such as patient laboratory results reporting.
11	Digital Health Technology: factors	2020	Katherine Curtis, Sheila Brooks	England	Interviews with managers,	Although DHT hasn't been

	affecting implementatio n in Nursing Homes				residents and relatives, and nurses from five nursing homes.	implemented consistently thus far, it can increase communicatio n and the identification of residents' health risks in nursing homes. Therefore, in order to determine the variables that can influence the deployment of DHT in these settings, the LAUNCH (Leadership of Digital Health Technology Uptake Among Nurses in Care Homes) study was conducted.
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12	Digital healthcare: regulating the revolution	2018	Rishi Duggal, Ingrid Brindle, Jessamy Bagenal	London, UK	Literature Review	Digital health, also known as e-health, is the umbrella term for a number of different technologies, such as electronic personal health records, mobile health apps (m-health) that support and track healthy behaviors, connected biometric sensors (e.g., continuous glucose monitoring), video link consultations (also known as "telemedicine"), and decisional
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						support systems that use algorithms derived through mining clinical datasets.
13	Electronic Health Records – Then, Now and in The Future	2016	R.S Evans	USA	Literature Review	It would have been difficult to predict how EHRs would be used in the future due to new technology. To promote precision medicine and a learning health system, both new and because of emerging technologies, it would have been challenging to forecast how

						EHRs would be utilized in the future. Both new and old EHR technologies will contribute to the creation of international standards for interoperable applications that use data from the social, medical, behavioral, and environmental domains to communicate, interpret, and act sensibly on complex medical information to advance precision medicine and
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						a learning health system.
14	Exploring the challenges of implementing e-health: A protocol for an update of a systematic review of reviews.	2015	Jamie Ross, Fiona Stevenson, Rosa Lau, Elizabeth Murray	London, UK	Literature Review	It looked at the obstacles and enablers encountered in earlier e-health implementation initiatives and produced potential implementation plans. The results of this research provide a chance to evaluate whether factors influencing the adoption of e-health change or evolve over time, serving as an update to a prior

						systematic study.
15	The Electronic Health Record and its Contribution to Healthcare Information Systems Interoperability	2013	Sandra V.B. Jardim	Portugal	Survey	When it comes to health, interoperability refers to the capacity of computer programs and heterogeneous health information systems to communicate, exchange data reliably, efficiently, and consistently, and to make use of such data. This is a crucial idea for electronic

						health records since it assesses the capacity for collaboration and communication across various health sector organizations, facilitating the sharing of information via EHRs and other medical systems.
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CHAPTER – 3

METHODOLOGY

Research Questions –

Which technological advancements are most important for the effective execution of e-health efforts in various healthcare contexts and settings?

Objective –

1. The goal of research on the variables affecting e-health implementation through a systemic review is to thoroughly identify, dissect, and summarize the complex components that affect the incorporation and successful integration and implementation of e-health initiatives in various healthcare environments.
2. To help healthcare organizations successfully plan, deploy, and maintain e-health systems and ultimately enhance patient outcomes and healthcare delivery, the research intends to offer actionable insights and evidence-based suggestions.

Methodology –

Type of Research – The research design is Descriptive Cross – Sectional Study

Based on the selection criteria, articles published between 2010 and 2023 that were accessible on Medline, PubMed, Research Gate, and Google Scholar were screened and chosen. The workings of Digital Health Interventions served as the foundation for 30 eligible articles.

E-health and implementation served as the foundation for the search approach. The search strategy combined free-text words and headings for medical subjects.

E- health-related medical subject headings include:

1	Information on Medical Informatics
2	Information Systems for Management
3	Computer Assisted Decision making
4	Computer Assisted Diagnosis
5	Computer Assisted Therapy
6	Computerized Medical Records System
7	Medical Records System
8	Electronic Mail
9	Video Conferencing
10	Telemedicine
11	Networks for Computer Communication
12	Internet/ Online

Table – 1 E- health-related medical subject headings

TERMINOLOGY:

Although the word "e-health" has been in use since 2000, the concept—which encompasses overlapping categories related to telemedicine, telehealth, and telemonitoring and varies by intent, stakeholders, and contexts—has not yet been definitively defined. The phrase and its meanings are continually evolving to consider changes in language use and more sophisticated conceptualizations, including the difference between telemedicine and telehealth. The term "telemedicine," which was coined in the 1970s, describes the practice of providing clinical data, education, and medical care remotely using telecommunications technology. Since the late 1990s, "telehealth" has been widely accepted and is frequently used as a synonym for the earlier word "telemedicine." These days, it is thought to be a more all-encompassing term that covers teleconsultations between patients and physicians. Telemonitoring, or remote patient monitoring, is included in the category of chronic care along with illness management and care coordination. "E-health" describes digital health interventions that are utilized to provide care, including proactive measures like remote patient monitoring and professional coordination. In this proposed review, it is used

synonymously with and in place of digital health interventions, telemonitoring, remote monitoring, or telemedicine.

Systemic Review –

Inclusion Criteria –

1. English language.
2. **Systematic reviews:** In these cases, relevant works were identified through an organized search of bibliographic and supplementary databases; publications that did not follow a particular standard were excluded using open methodological standards; and the findings were presented precisely.
3. **Narrative reviews:** Appropriate literature will be deliberately chosen from the field of research, and theoretical or topical criteria will be utilized to include works based on kind, relevance, and perceived significance. The goal of these reviews is to summarize, debate, and critique findings.

Exclusion Criteria –

1. Non-English language.
2. Secondary analysis used pre-existing datasets to showcase the overall findings of individual research projects.
3. Editorial discussions arguing for a certain field of research or tactic.

STRENGTHS AND LIMITATIONS:

STRENGTHS:

1. The study generates a thorough overview of the field of e-health implementation, and it will not be limited to any specific healthcare setting or health condition.
2. The results offer some recommendations on how to tackle the difficulties encountered by the public while engaging, interacting and enrolling in DHIs.
3. In addition, a thorough table of identifiers was made, and knowledge gaps were discovered to motivate additional research that would enhance our understanding of involvement and enrollment in DHIs. These could help to overcome some of the

challenges that arose during the initial phases of adoption, enabling individuals to quickly and easily register for digital health products and services. Health professionals, administrators of health services, investigators, policy makers, private enterprises, and others may also gain from this.

LIMITATIONS:

1. The search was limited to a certain period, which may have excluded some relevant studies.
2. Newer technologies like augmented and virtual reality are on the horizon, which could limit the assessment's conclusions even though it did highlight a few digital health goods and services.

CHAPTER - 4

RESULTS

Problems with participation and enrollment in digital health study of the papers/articles incorporated in the evaluation disclosed four main categories and various subcategories pertaining to obstacles and enablers to participation in and registration in DHIs.

The major categories were –

- **Personal Intervention and Motivation -**

The first category identified by the review's analysis's results was personal agency and motivation. Some articles claim that people who are personally motivated to regain their health and who want other choices and influence over the process are more likely to sign up for and take part in DHIs. A few people thought that by employing technology to encourage weight loss and keep them active, they could prevent disease and maintain their health. Others joined DHI because it was more flexible in terms of where and when they could get healthcare services and health information. In certain cases, this made people feel less nervous. However, for several others, a hurdle was their lack of knowledge about DHIs or their inability to understand how technical advancements may help them with their health. Several people decide against using technology because they believe it to be only entertaining or a hindrance to daily life. This issue was exacerbated by a lack of enthusiasm among certain individuals to value and enhance personal health through digital means, as they felt that their healthcare provider should oversee this rather than them. A study found that some individuals chose not to enroll in the technology because they believed DHIs to be gloomy and would act as a constant reminder for those who did not meet their health objectives. Another difficulty was that many people already employed alternate methods of managing their health, such as keeping track of physiological indicators and lifestyle choices on paper-based systems or soliciting help from close relatives, friends, peers, or medical experts. The short rates of enrollment and involvement in DHIs were influenced by all these factors.

Personal Agency and Motivation	Barrier	Facilitator
Motivation	Indifference of motivation to understand health	Motivation to improve health conditions.
Awareness and understanding	Unaware or clueless of how a DHI could be helpful	Ability to understand a DHI
Personal Agency	Alternative way of managing illness and documentation	Capability to manage personal health information

Table – 2 Personal Intervention and Motivation

- **Personal life and values -**

Personal life and values are the next domain that affects how successfully patients and the public engage with and enroll in DHIs. The results of the tests show that people who believed the technical advancements were useful, could be adopted to suit their necessities, or were easy to incorporate into their daily lives choose to enroll. It is also easier for someone who is already tech savvy or digitally literate to register for DHIs because they have the skills and information necessary to take part. Furthermore, several individuals valued the privacy provided by online health services since it let them feel more at ease and avoided the embarrassing situations they occasionally ran into in real life. Because they don't have the time, energy, or desire to participate in DHIs, people with demanding employment, hectic personal lives, or those who are responsible for taking care of family members prefer not to. The safety and security of personal health information worried a few participants because it may be bargained in an online environment. It might mean that personal data could be inadvertently or maliciously disclosed to friends, family, employers, or coworkers, or that it could be used by the government authorities or private companies to transgress citizens' morals. Another barrier to registering for DHI was spotty Internet and computer access. In other cases, this happened

because people lacked access to reasonably priced technology and the high prices of purchasing the required hardware, software, and Internet services. Insufficient digital literacy posed a noteworthy obstacle to DHI participation and enrollment, as individuals with minimal or no technological background found it challenging to engage in the program. In a few instances, this problem was worsened by the fact that some people found it difficult to communicate with DHIs because English was not their first language.

Personal Life and Values	Barrier	Facilitator
Personal Lifestyle	Busy lifestyle and engaged routine	DHI do not affect personal lifestyle
Skills and Equipment	Insufficient digital knowledge	Good digital literacy and good connectivity
Security and Privacy	Privacy and security concerns	Understands the privacy and security

Fig. 3 Personal Life and Values

- **Engagement and enrolment approach**

The kind of active strategy used to educate people and the public about DHI and encourage them to enroll is a significant cause that influences engagement and enrollment. When people received direct assistance or personal suggestions from friends, family, or peers, they were more likely to collaborate and embrace technology; while those who did not receive adequate support were shown to be unable to do so. Engagement and enrollment strategies that strongly endorsed technical advancements and, where possible, tailored to the individual proved to reach and persuade the proper people to join. Sadly, few individuals were aware of DHIs or that the technological advancements could be utilized to help them in their medical needs and necessities as they were not extensively publicized and promoted.

People may have had a limited understanding of the potential benefits of DHI due to the engagement techniques' inadequate use of public health education. Low levels of engagement seem to be the outcome of people not being extremely driven or interested in signing up for technology. The recruitment approach presented another difficulty because some used technical language and didn't explain why the technology was vital to people or how to join up. Some people would not join DHIs because they lacked the backing of respectable medical professionals or healthcare organizations, believing that the technology could only be of limited utility if their doctor or nurse did not advocate for its usage. If physicians or medical-related groups did, however, support the technology, users appeared to feel reassured that signing up was worthwhile.

Engagement and Enrolment Approach	Barrier	Facilitator
Direct Support	Inadequate support from family and friends	Adequate Support from family and friends
Personal Advice	Insufficient/lack of trusted advice	Suggestions from family and friends
Clinical endorsement	Lack of clinical/healthcare endorsement	Clinical endorsement for DHI

Fig. 4 Engagement and Enrolment Approach

- **Quality of the DHI -**

The last and final factor influencing how patients and the public can be engaged in and enrolled in DHIs is the amount of information and communication made possible by technological advancements. Some

participants seemed to be driven to sign up because they could quickly and easily access the social support, they required to manage their illness by using technology. Others chose digital products or services because they provided a constant, direct channel of communication with their healthcare practitioner; as a result, they became members of DHI. In one case, participants said that they signed up for a DHI because of medical errors they experienced because of the lack of technology in the health sector. They thought that using electronic technology to improve the quality of their medical services and information and reduce errors was a wise move. Furthermore, because users believed computerized technology to be faster and easier to use, it tended to encourage enrollment when combined with other programs and devices. Some, on the other hand, felt that because technology could not replicate the nuances of human interaction, they would receive worse care when using this kind of electronic medium. They also resented how impersonal technology was. For patients who valued their positive relationship with their doctor and considered them as a vital social support system, especially when delicate health concerns were complicated, this was essential. They therefore appreciated their therapy interaction with their doctor and did not mind being enrolled in DHIs. People also considered a digital good or service's usability when judging its quality. Some consumers thought that health information found online could be unreliable and of low quality, depending on the source. Certain digital amenities and products would not be used by consumers without a licensed health professional's guidance. Another concern was identity fraud when patients attended virtual sessions with clinicians they had never met in person and were not sure whether to trust the advice given.

Quality of DHI	Barrier	Facilitator
Quality of Digital Health Information	Poor Quality Information	Previous bad experience of service without DHI
Quality of Digital Health Interaction	Lack of trust in Digital Health Interaction	Honest interactions with healthcare provider online
Usability	Complex Registration in DHI	DHI is easy to use and enroll

Fig. 5 Quality of DHI

CHAPTER - 5

DISCUSSION

After complete analysis of reviews, following were the factors obtained that were impacting the implementation of e-health:

Global Theme	Internal Factors		External Factors	
Local Theme	ICT infrastructure and e-health technologies		Health Policy	
	ICT skills and knowledge			
	Technical support			
	Security Concerns		Funding	
	Doctor patient Relationship			
	Lack of basic medical facilities			
	Demographic factor such as age		Bureaucracy	
	Resistance to change			
Theme Derivation/ source of information	A description of information relating to Technology		A description of information pointing to policy issue	
	A description of information relating to ICT and skills			
	A description of information relating to IT department			
	A description of information relating to Privacy of patient Information		A description of information pointing to money, funds and budget	
	A description of information relating to interaction between doctor and patient			
	A description of information relating to medical equipment			
	A description of information relating to old and young medical doctors		A description of information relating to system authority	
	A description of information relating to change in work process & procedure			

Fig 6 Factors obtained during the analysis.

INTERNAL FACTORS -

- **ICT infrastructure and e-health technologies:**

The health sector is one of the key areas that need the application of ICT to improve the value of healthcare delivery to all populations. ICT infrastructure and a range of technologies are necessary for the application of e-health. Regrettably, e-health technologies are not present in many hospitals worldwide. The ICT tools are meant to be used for purchasing and administrative operations. A lot of doctors complained about the poor infrastructure required to implement e-health. E-health, like any other electronic system, makes use of a variety of technologies. The adoption of e-health is significantly impacted by infrastructure. In the context of a developing country, this assumes even greater significance. Key technology, computer systems, and utilities that could improve the infrastructure of healthcare delivery—things procurement departments do—are absent from hospitals in these countries. The adoption of e-health is significantly impacted by infrastructure. Purchasing departments typically possess superior ICT infrastructure compared to medical experts. Pen and paper, simple database systems, and human memory remain the primary ICTs used in many public hospitals for healthcare administration. It is therefore necessary to make several pieces available in order to facilitate the adoption of e-health systems in hospital settings.

- **ICT skills and knowledge:**

In addition to being costly to develop, e-Health infrastructure requires ICT know-how and proficiency for efficient e-project utilization. Medical practitioners with ICT skills will likely encourage primary care to adopt and use e-health. This is because doctors with ICT expertise can identify the possible benefits of e-health in the workplace. The low ICT knowledge and skills of physicians in the health industry can be blamed for the low adoption of e-health in public hospitals. As a result, they can find it difficult to embrace the use of e-health technologies. For acceptance and operation success, medical staff must be properly trained

and equipped to use e-health. Medical schools ought to teach ICT, and as part of their in-service education, recently graduated physicians ought to take part in e-health training seminars. Furthermore, the lack of ICT expertise among medical practitioners makes the use of e-health challenging. To reduce technical complexity, information and communication technology knowledge and skills are essential.

- **Technical support:**

An IT specialist's technical help is also required for the execution of an IT project. Technical support is necessary for the system to operate and be maintained. The assistance provided by IT departments is another factor that facilitates the implementation of e-health systems. It seems that e-health systems cannot function without technological support. ICT infrastructure should be in place in hospitals, and IT employees should be familiar with medical technology.

- **Security concerns:**

ICT adoption in the health sector is negatively impacted by the numerous security and privacy breaches that occur with them. This is so that when technology is utilized in healthcare, users of e-health may be sure that their information won't be released without permission. The protection of patient information is one of the cornerstones of the medical sector. Data privacy, confidentiality, and security concerns have been identified as factors influencing e-health adoption. The stakeholders anticipate that e-health data confidentiality will be on par with systems that keep paper records. In ICT ethics, privacy and security are the two subjects that are discussed the most. To properly understand the nascent field of e-health, patients and providers must, therefore, have confidence that the information being shared is secure and confidential. Thus, concerns regarding the security and privacy of e-health systems could jeopardize the technology's potential for success and discourage physicians from implementing it more extensively in public hospitals if they are not appropriately addressed.

- **Healthcare provider–patient relationship:**

The relationship between a physician and a patient is among the most significant interpersonal relationships in healthcare. According to the physicians, e-health systems have the potential to improve or worsen the relationship between a doctor and patient. Some medical professionals believe that e-health can improve patient-doctor communication by making information easier to obtain. Doctor-patient connection has always been, and continues to be, a basic component of healthcare. Physicians are also concerned about how their interactions with patients may change if they use e-health technologies. e-Health tools have the power to shift the ownership of medical data. The impact of e-health on access to medical information has developed into a strategy for altering patient obligations.

- **Insufficient basic medical facilities:**

The absence of accessible basic medical services has also limited the usage of e-health. Most hospitals worldwide have complained about not having enough easily available basic medical equipment for use in patient care. E-health systems won't be useful if patients don't have access to the proper instruments.

- **Demographic factors:**

Because age is correlated with both the adoption and use of technology, age is a demographic factor that adds to the digital divide. The way people acquire and use technology is significantly influenced by their age. Compared to their more seasoned colleagues, younger doctors are more flexible when it comes to employing technology.

- **Resistance to change:**

Adoption of technology has the power to drastically change interactions, protocols, and work processes. If the adjustment doesn't sit well with the staff, though, they will most likely reject it. Doctors need to overcome some challenges, such as change resistance, in order to integrate ICT into their work operations.

EXTERNAL FACTORS:

- **Health strategy/plan:**

Building a trustworthy e-health system requires a sound health plan. The adoption of e-health systems is impeded in certain countries by several problems with health policy. Therefore, the absence of a well-defined health policy may impede the implementation of e-health systems at all levels of healthcare. According to this research, some governments may not have a clear plan in place to promote the adoption of e-health technology in public hospitals. While some countries have an e-health plan that was developed with WHO assistance based on the ITU/WHO toolkit, the plan necessary to guide e-health expansion and technological distribution in public hospitals is limited.

- **Funding:**

For example, the Ministry of Health in Zimbabwe found it difficult to finance the acquisition of modern technology for healthcare facilities because of the Ministry of Finance's insufficient budgetary allocation to the health sector (Furusa, S. and Coleman, A., 2018). Most hospitals have severe budgetary constraints because of underfunding. Therefore, it is envisaged that hospitals will run on a minimal IT budget. This implies that the financing of the healthcare sector has an impact on the adoption of e-health. Adoption of e-health is strongly correlated with increased spending, even in wealthy countries; emerging nations ought to see a similar relationship. There are claims that the inadequate government backing for the health sector in many different nations makes it difficult to allocate significant financial resources for the acquisition of the ICT resources required for the industry. Adopting computerized health infrastructure is costly, hence increased funding for the health sector is required in many developing countries. The health sector is underfunded in several developing countries, which makes it difficult to set aside substantial quantities of money for the acquisition of the required ICT equipment. Therefore, improved funding may lead to a greater rollout of e-health systems and services.

- **Bureaucracy:**

The health sector has somewhat inflexible and unadaptable authority structures. The usage of e-health in hospitals has been decided by the ministry itself. It is not the place for hospitals, especially district and central hospitals, to conduct e-health programs at their scale. As a result, the ministry is lacking initiative when it comes to providing medical services through e-health. Therefore, the use of new technologies in public institutions is prohibited by stringent regulations within the healthcare industry. For instance, changing policies inside government agencies is subject to stringent laws and regulations in Zimbabwe (Furusa, S. and Coleman, A., 2018). Therefore, public hospitals are not an exception.



Fig. 6 Benefits of Partnership between Public and Private Sectors, [Research Gate](#)

Public-Private Partnerships (PPPs) offer a unique approach to infrastructure development and service delivery by combining the resources and expertise of the public sector (government) with the efficiency and innovation of the private sector (businesses). Here's a breakdown of the key benefits outlined in the provided content:

1. Faster Project Delivery and Improved Monitoring:

- **Private Sector Efficiency:** Businesses often have extensive experience in streamlining projects, employing efficient construction methods, procurement strategies, and project management techniques. This expertise translates to quicker completion times compared to traditional government-led initiatives.
- **Clear Performance Benchmarks:** PPPs can incorporate measurable performance benchmarks into contracts. These benchmarks act as specific targets that track progress on factors like schedule, budget, and quality. This transparency allows for better monitoring by both public and private partners, ensuring projects stay on track.

2. Boosted Infrastructure and Local Development:

- **Financing Essential Infrastructure:** PPPs can attract private investment for infrastructure projects that governments might struggle to fund entirely on their own. This allows for the development of crucial infrastructure like improved transportation networks, utilities, and public services.
- **Local Growth:** Better infrastructure creates a ripple effect, leading to positive local development. Improved transportation networks connect businesses and residents more efficiently, upgraded utilities enhance quality of life, and modern public services attract investment and talent.

3. Enhanced Technical and Technological Cooperation:

- **Bridging the Knowledge Gap:** The private sector often possesses advanced expertise in engineering, technology, and construction. Through PPPs, this knowledge can be transferred to the public sector.
- **Collaborative Innovation:** By working together, the public and private sectors can leverage their combined expertise to develop more creative and effective solutions for infrastructure projects and service delivery.

4. Flexible Service Provision and Cost Reduction:

- **Demand-Responsive Service Delivery:** PPPs can be structured to allow for adjustments in service delivery based on actual demand. This ensures resources are used efficiently and helps control costs. For example, a toll road might adjust pricing based on traffic volume.

5. Shared Risks:

- **Risk Mitigation:** PPPs can be structured to share risks between the public and private sectors. This can be particularly beneficial for governments, as it reduces the financial burden of potential project failures. For instance, the private sector might assume the risk of cost overruns if construction delays occur.

6. Cooperative Growth through Private Sector Involvement:

- **Collaborative Environment:** PPPs foster a more collaborative environment between the public and private sectors. This benefits both parties.
- **Mutual Benefits:** The public sector gains access to private sector expertise and resources, leading to improved project outcomes. The private sector gains access to new markets and business opportunities through involvement in PPPs.

7. Easing Strain on Public Finances:

- **Private Investment:** PPPs attract private investment for infrastructure projects, freeing up public funds for other critical government priorities. This can help address budget constraints faced by governments.

8. Encouraging Innovation:

- **Profit Motive as a Catalyst:** The private sector's profit-driven nature incentivizes the development of innovative technologies and creative solutions for public projects. Companies are constantly seeking ways to improve efficiency and reduce costs, which can lead to advancements in construction materials, project management techniques, and service delivery models.

CHAPTER - 6

CONCLUSION

The digital revolution is transforming healthcare delivery, and e-health solutions are poised to revolutionize healthcare access, quality, and efficiency, particularly in developing nations. While the potential of e-health is undeniable, significant challenges hinder its widespread adoption in public healthcare facilities across these countries. This conclusion emphasizes the need for a multi-pronged approach to bridge the gap and unlock the true potential of e-health in these settings. The current state of e-health in developing countries paints a concerning picture. While some governments have initiated e-health strategies, implementation remains patchy. Public healthcare facilities often lack the infrastructure, resources, and expertise to utilize e-health effectively. This creates an uneven landscape where central hospitals might have basic e-health systems, but community hospitals lag far behind. This disparity necessitates targeted policies that specifically encourage and empower public healthcare organizations to embrace e-health. The research highlights a critical factor for successful e-health implementation – a holistic understanding of the influencing factors. These factors encompass a complex interplay of government regulations, information and communication technology (ICT) infrastructure and expertise, funding, healthcare facility capacity, and technical assistance. Recognizing these factors is crucial for crafting effective policies and interventions. The challenges faced by healthcare professionals in public institutions further underscore the need for a comprehensive approach. Physicians often lack the training and support necessary to integrate e-health into their workflows. This highlights the importance of targeted training programs, user-friendly interfaces, and ongoing technical support to ensure healthcare professionals feel comfortable and empowered to utilize e-health tools. By addressing these challenges, developing countries have a significant opportunity to leverage the power of e-health. Here are some key strategies to consider:

Developing a National E-health Strategy:

A comprehensive national e-health strategy that addresses infrastructure, funding, governance, and capacity building is crucial. This strategy should prioritize public healthcare

facilities and ensure resource allocation is targeted to overcome infrastructure and expertise gaps.

Investing in ICT Infrastructure: Building robust ICT infrastructure, including reliable internet connectivity and secure data storage solutions, is fundamental. This includes allocating resources to ensure rural and remote areas are not left behind in the digital transformation of healthcare.

Enhancing Capacity Building:

Training programs for healthcare professionals in e-health utilization, data analysis, and information security are essential. This fosters a culture of digital literacy and equips healthcare professionals with the skills needed to effectively leverage e-health tools.

Public-Private Partnerships:

Collaborations between government, private sector players, and non-profit organizations can leverage expertise and resources to accelerate e-health implementation. Public-private partnerships can contribute funding, technological know-how, and technical assistance to support public healthcare facilities.

Promoting User-Centric Design:

E-health solutions should be developed with user needs in mind. This necessitates involving healthcare professionals and patients in the design process to ensure the technology is user-friendly, culturally appropriate, and addresses specific healthcare needs.

Data Governance and Security:

Robust data governance frameworks are essential to protect patient privacy and ensure data security. Developing clear policies on data ownership, access, and sharing builds trust and encourages wider adoption of e-health technologies.

In conclusion, e-health presents a transformative opportunity for developing nations to improve healthcare access and quality. By recognizing the challenges, implementing targeted policies, and investing in capacity building, developing countries can bridge the digital divide and reap the benefits of e-health in their public healthcare facilities. Addressing these issues

will ensure the benefits of e-health reach all healthcare institutions, ultimately improving health outcomes for populations in developing countries.

CHAPTER - 7

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APPENDIX H

PLAGIARISM REPORT

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