



# FEASIBILITY OF EHEALTH IMPLEMENTATION IN INDIA LEARNING FROM GLOBAL EXPERIENCE

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## ABSTRACT

The present paper explores the factors for the effective implementation of eHealth in India by taking into account the diverse benefits and challenges at organization and practitioner's level. The present study is exploratory in nature which has been carried out after comparing the study across the globe. Various benefits and challenges explored from previous studies are used to discover the factors for effective implementation of ehealth in India. Findings of study centered to identify factors for effective implementation of eHealth at four different levels: Practitioners' level, Organizational Level, Patients' Level, and Government level. The most important factors at practitioners level are an alignment of the practitioners with objectives and making adequate arrangements for training of the practitioners. The important factors required to overcome problems at practitioners level are perceived usefulness, perceived ease of use and attitude to use eHealth. At the organization level, important factors are an alignment of stakeholders with current goals, skills set of staff, the relationship among healthcare professionals, capacity for implementation, training and development and employees motivations. At this level, important factors to deal with these challenges are customer value, to build trust in the healthcare provider, interoperability among different healthcare providers, characteristics and mindset of healthcare providers. At the government level, the imperative factors as required to handle different challenges are government policies, sources of funds, reliable health infrastructure and engagement of various stakeholders. Other important factors at this level are the status of eHealth readiness in different areas and levels, social influences and human development index.

This paper highlights the eHealth experiences across the globe and identifies various benefits and challenges in the implementation of eHealth, which will help the decision makers at a different level in India to successfully integrate information technology with healthcare.

## KEYWORDS

eHealth, HIS- Hospital Information System, UHC- Concept of eHealth Centre

## INTRODUCTION

The present study provides the theoretical overview for the effective implementation of eHealth in the Indian health care sector. This study explores the various prospects and challenges associated with the effective implementation of eHealth. In India, there is no study undertaken to explore the important aspects of eHealth. But in the developed countries like the USA and European countries have already implemented eHealth in their economies. Effective implementation of eHealth may provide tremendous benefit to Indian people. This study has taken into consideration the various valuable inputs from the global studies related to eHealth and provide an effective framework for effective implementation of eHealth in the Indian economy.

## EHEALTH

eHealth refers to health services and information delivered or enhanced through the internet and related technologies. eHealth leads to efficiency in healthcare and enhance the quality of care. [1]

Developing countries like India have lagged in the implementation of eHealth because healthcare has remained for a long time as the domain of public sector; there is lack of funds, less penetration of social security and insurance in the healthcare sector. Companies like Wipro, Tata Consultancy Services (TCS), Hewlett-Packard (HP) and Intel etc. are engaged with various state governments in India to implement various forms of eHealth.[2]

Major themes of eHealth care research are cost savings; virtual networking; electronic medical records; credibility of the source, privacy concerns, and physician-patient relationships. [3]

## **EHEALTH SCENARIO IN INDIA**

The Hospital Information system, hereafter HIS, was deployed to manage the data of the patients. In India, a gap which exists due to a shortfall of human resources, infrastructure, and updated skill level of practitioners can be bridged by the integration of eHealth in healthcare and health educational system. [4] Satisfaction of Patients is of utmost importance for the success of any healthcare services. Patients being at the centre stage will ultimately decide the acceptance and absorption of this technology. [5]

In India, the doctors see telemedicine as a potential tool in future healthcare delivery in the country but at the same time, they were not aware of the benefits of electronic medical records. Doctors were willing to learn more about the role of computers and the internet in improving healthcare. [6] Successful implementation of e-governance in the healthcare sector requires the breaking of the digital divide at the level of government, business, and people. [7]

India is starting to make strides in the fields of telemedicine and eHealth. Most telemedicine activities are sponsored by central organizations like Indian Space Research Organization (ISRO) and the Department of Information Technology and are in project mode. [8] But in the last decade, due to the revolution in telecom industry especially in the mobile technology, the use of mobile phones in delivering healthcare services has emerged as a significant opportunity and has opened a plethora of avenues to extend healthcare services in far off places. [9] The government also plans to implement a Citizen Health Information System (CHIS) - a biometric-based health information system, to keep updated health records of every citizen covered under this system.[10]

Countries like India require breaking the digital divide among various dimensions like at the level of Government to business, Government to citizen and Government to Agent. [11] eHealth is being adopted steadily in the healthcare system of the country. This requires individuals trained in technical and managerial skills. India needs to not only create literacy for the information and communication technology but also needs to aware the masses about the system. [12]

The concept of eHealth Centre (UHC), which involves creating health centres from cargo containers by deploying healthcare equipment along with information technology facility, is being experimented in rural India. The concept is a potential approach to augment healthcare delivery, especially in a rural setup. [13] Developing countries just like India are undergoing a rapid technological transformation in part due to the increased availability of mobile devices and network connectivity. This is accelerating the adoption of eHealth. [14]

Ministry of Communication and Information Technology has taken an initiative for developing information technology infrastructure for health to improve administrative processes, sharing of information and enhanced access to healthcare in a cost-effective manner. [15]

## **OBJECTIVES OF THE STUDY**

The present study has been undertaken to explore the benefits and challenges involved in the effective implementation of eHealth in India. The following are the main objective of the present study.

O1: To identify the various factors required for the effective implementation of eHealth in India.

O2: To make recommendations for the effective implementation of eHealth in India.

## **LITERATURE REVIEW**

Review of the existing literature has an immense significance in the research of any project as it acts as a backbone for new studies. In the present study, the review of the literature has been divided into the following two parts. Challenges faced at the global level for implementing eHealth and Important factors for implementing eHealth

## CHALLENGES FACED AT THE GLOBAL LEVEL FOR IMPLEMENTING EHEALTH

In Africa, high illiteracy, low tertiary institution enrolment rates, shortage of appropriate ICT know-how, infrastructural issues, low per capita income, and limited internet connectivity were the major challenges.[16] Despite initial successes, the diffusion of eHealth has been quite difficult.[17] The websites of the hospitals, which offer patient-oriented interactive eHealth tools, have not been able to meet the needs of the patients. [18]

eHealth should help to maintain the inter-personal relationships created due to doctor-patient communication. Professionals from different fields need to be engaged and work in tandem with the proper integration of eHealth in the current system and it requires proper change management initiatives.[19] Rural eHealth implementation is an emerging field, but the adoption of eHealth has not been successful because many factors affecting the implementation are underestimated. [20] eHealth standards, information and communication technology and health policies, e-legislation, eHealth infrastructure, and ICT capacity pose another challenge.[21]

Lack of commitment at the level of implementers, lack of proper training to the medical staff and poorly managed hospital information system creates impediments.[22] EHealth care is a challenge that all countries face today, irrespective of their development status. [23] Lack of ICT infrastructure, electric power supply, and basic ICT knowledge or skills has been some of the challenges facing eHealth implementation in developing countries. [24]

Latest technologies like cloud-computing have started to contribute in a big way in the healthcare system in India. Though this technology is quite economical and sustainable, yet data security is an area of concern in this regard. [25] Another major challenge in eHealth is of providing finance to such activities and making the initiatives financially sustainable. So, eHealth is more likely to succeed in the Indian scenario when government and private sector collaborate in this regard. [26]

## IMPORTANT FACTORS FOR IMPLEMENTING EHEALTH

The European experience highlights that strong eHealth policy by the political leadership, engagement of various stakeholders, reliable healthcare infrastructure, regional focus rather than national focus, training to the concerned

professionals and the evaluation of impact are the factors responsible for the successful implementation of eHealth. [27]

Cost-effectiveness of eHealth solutions is an important aspect and there is a need to evaluate the return on investment in this regard. [28] The areas affected during the implementation of eHealth are the alignment of eHealth initiatives with current organizational goals and the skill sets of the staff, the impact of eHealth on the patient-professional interaction and the relation among the professionals. [29] Acceptance and adoption of eHealth services depend upon the extent to which the people are aware of them and the benefits they offer. [30]

Mobile health, hereafter m-Health, refers to the use of mobile technology in healthcare, has seen an explosion of related activities around the world. The most common activity was the creation of health call centers, which respond to the patient inquiries, followed by using SMS for appointment reminders, telemedicine, accessing patient records, measuring treatment compliance, raising health awareness, monitoring patients and for the decision support to the physicians. [31]

The factors are responsible for the behavior of the physicians towards the use of technology in healthcare practices are perceived ease of use, perceived usefulness, attitude and behavioral intention to use the system. Moreover, a person's innovativeness also affects his/her readiness to accept the new technology. [32] Structural, professional and geographic boundaries can also impact the implementation of eHealth. [33]

Critical factors, which drive the eHealth infrastructure and its use in a nation, are healthcare costs, perception about health and confidence in healthcare systems, health infrastructure, and human development index. [34]

The extent of technology adoption in healthcare depends upon the degree to which the new technology enables the physician-patient interaction, the technology, how it fits into existing skill sets of various professionals involved and the extent to which integrates itself among the existing relationships between various healthcare professionals it is in accordance to the organizational objectives and capacity to implement eHealth. [35]

Adoption of eHealth by the healthcare providers depends upon the characteristics of a healthcare provider,

characteristics of medical practice, perceived usefulness of eHealth, expected effort in usage, willingness to use, perceived usefulness, efforts expected to use, social influences, factors facilitating or inhibiting to use eHealth.[36]

Implementation of eHealth requires the study of national and local policies, organizational factors, impact on physician-patient and interprofessional interactions. Distribution of work among different user groups, the need for training must be studied before implementation. [37]

### RATIONALE FOR THE STUDY

New technological intervention in any sector requires state intervention, which creates a conducive environment and necessary infrastructure for the diffusion of technology. The government of India and many state governments in their initiatives towards e-governance have started stressing on the role and integration of IT in healthcare. There is a big socio-economic difference that prevails between India

and the developed economies which have successfully started to integrate technology within their healthcare sector. The study will help to identify the prospects of eHealth in the Indian context and to underline various problems being faced by health care professionals and the organizations in the deployment of the technology in the Indian healthcare sector.

## ANALYSIS AND INTERPRETATION

Based on various studies pertaining to the Global and Indian context of eHealth research, various aspects of eHealth-their benefits, challenges for them and factors for the implementation of eHealth at different levels can be highlighted. These aspects can be considered at four levels of Healthcare services: Practitioners' level, Organizational Level, Patients' Level, and Government level.

### FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH IN INDIA-AT PRACTITIONERS' LEVEL

TABLE 1: FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH IN INDIA-AT PRACTITIONERS' LEVEL

ASPECTS	BENEFITS	CHALLENGES	FACTORS
SKILL	Skill Development. [44, 72 -73] Distance Medical Education. [74-77].	Lack of ICT Training Lack of commitment for eHealth. [21,45]	Alignment with objectives Innovativeness in training of practitioners.[31, 29, 39 -40]
DISTANT TREATMENT	Remote physical examination Transfer of instant diagnosis.[39]	Patients take a passive role in interaction with Doctors. Less awareness among doctors. Physician-patient relationship.[40-42]	Perceived usefulness Perceived ease of use Attitude to use eHealth. [30, 43- 45,59 ]
VIRTUAL DIAGNOSIS	Real-Time Data Monitoring Less chances of data omission. [46-47,70]	Lesser Empathy. [55]	Characteristics of Medical Practice. [36-37]

Source: Authors Compilation

Skill development [44,72-73] and distance medical education can be considered as major benefits (table 1) derived from eHealth [74-77], which are followed by certain challenges like lack of Information and technology training and commitment for implementation of eHealth. [2,45] The

most important factors required in this case will be an alignment of the practitioners with objectives and making adequate arrangements for training of the practitioners. [31, 29,39-39] A study conducted by.Ray and Mukherjee [38] on eHealth in India today, the nature of work, the

challenges and the finances also discovered that training the manpower that will work in non urban centres is important to the success of such a programme.

Remote physical examinations and immediately diagnose are other advantages of eHealth implementation (table 1).[39] But there are certain problems or challenges e.g., the patient may take a passive role in interaction with doctors, less awareness among doctors and well-established physician and patient relationship when they interact face to face.[40-42] The important factors required to overcome from these problems are perceived usefulness, perceived ease of use and attitude to use eHealth. [30,43-45,59]

Real-time data monitoring and fewer chances of information omission are the other beneficial aspects followed by the challenge of lesser empathy (table 1). [46-47, 55,70] An important factor to overcome with this challenge is the characteristic of medical practice. [36-37] It would enhance efficiency, reduce redundancy, alleviate the documentation burden, and improve integrity. It helps in the development of guidelines for both vendors and users of EHR systems regarding the appropriate use of documentation techniques to ensure complete, accurate, and quality documentation (table 1). [46]

### FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH IN INDIA-AT ORGANIZATION LEVEL

TABLE 2: FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH IN INDIA-AT ORGANIZATION LEVEL

ASPECTS	BENEFITS	CHALLENGES	FACTORS
ADMINISTRATIVE	Patient record-keeping Hospital Functioning Patient Management Employee productivity Standardisation. [54,68-70]	Change Management The shortfall of skilled human resource. [23, 48-50] PoorlyManaged hospitalinformation system. [51] Resistance to adapt to the new system. [52] Organizational Climate. [55-58]	Alignment of stakeholders with current goals. The skill set of staff. [27] The relationship among healthcare professionals. [29, 40 and 37] Organizational Objectives Capacity for implementation Training and development Employee motivation. [27,35]
HEALTHCARE SERVICES	Enhanced Reach Improved diagnosis and treatment Better patient care Improved safety Controlled Investigations Services Integration. [53-54]	Multiple Health Issues Different specialists involved Different locations Proper authentication to access the system Hospital websites not effective. [18]	Customer value Trust in healthcare provider. [30] Interoperability among different providers. [38] Characteristics and mindset of healthcare provider
FINANCIAL ASPECTS	Reformation of financial transactions. [59] Reduced cost of treatment. [78-79]	Low tertiary care enrolment rates Return on Investment. [27-28]	Source of Funds. [66] Monetary value Cost-effectiveness of solutions. [27-28,71]

Source: Authors Compilation

There is several administrative advantages that can be seen from the eHealth implementation viz., patient record keeping, hospital functioning, patient management,

employee's productivity, and standardization (table 2). [54,68-70] But major challenges to avail these benefits are the changes required in the system. These challenges are

shortage of skilled human resources [23,47-49], poorly managed hospital information system[51], resistance to adapt to the new system and organizational climate (table 2).[52, 55-58] There are a number of factors which can be supportive for managing these challenges. These factors are an alignment of stakeholders with current goals, skills set of staff, the relationship among healthcare professionals, capacity for implementation, training and development and employees motivations (table 2). [27,29,35,37,40]

There are plenty of benefits of eHealth in improving healthcare services such as enhanced reach, improved diagnostics and treatment, better patient care, improved safety, controlled investigation, and services integration etc (table 2).[53-54] Similarly, these prospective gains may face certain challenges such as patient-facing multiple health issues, a different specialist involved in treatment, patients and healthcare services providers at different locations, need of proper authentication to access the system and hospital websites are not effective. [18] Important factors to deal with these challenges are customer value, to build trust [30] in the healthcare provider, interoperability among different healthcare providers [38], characteristics and mindset of healthcare providers (table 2).

Benefits associated with the financial aspects are a reformation of financial transactions [59] and reduced cost of treatment (table 2). [78-79] There are certain challenges in this regard like low tertiary care enrolment rates and inadequate return on investment.[27-28] The factors

required to cope up with these challenges are a solution of cost-effectiveness, making available the sources of funds and monetary value (table 2). [27-28,71]

### FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH IN INDIA-AT PATIENT LEVEL

It is one the first observation from Table 3 that e-health will lead to cost savings for the patients that may be one of the major advantages of it. [28, 34,70] But the key challenge is the credibility of resources required for the implementation of this programme. [70] Factors required to conquer these challenges and to implement eHealth effectively is the extent of eHealth implementation.

Another benefit as depicted is tele-healthcare, e-consultation [70] and time savings which require adequate knowledge of different tools of information and communication technology (ICT). [57-58, 61-64] To avail these benefits and beat these challenges, the important factors need to be considered at the time of implementation are a patient mindset and doctor-patient communication (table 3). [35,38]

Another major benefits are patient awareness and knowledge, reduced stress of patient and care providers. [80-82] But there are some challenges to obtain these benefits such as the privacy concern of patients. [62-64] The major factor required to be considered is a perception about eHealth of the patient and his confidence in the current health care system (table 3). [30]

**TABLE 3: FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH IN INDIA-AT PATIENT LEVEL**

ASPECTS	BENEFITS OF EHEALTH	CHALLENGES FOR EHEALTH	FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH
COST	Cost savings. [28,34,70]	Credibility of resources. [70]	Level of e-Health implementation
DISTANT DIAGNOSIS AND TREATMENT	Tele-healthcare e-consultations save time. [70]	Knowledge of Informaton and communication technology. [57-58 , 61-64]	Consumer mindset Doctor-patient communication. [35,38]
PATIENT CENTRICITY	Patient Awareness and knowledge Reduced stress to patients and care providers. [80-82]	Privacy Concerns. [62-64]	Perception about e-Health Confidence in the current healthcare system.[30]

Source: Authors Compilation

**TABLE 4: FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH IN INDIA-FROM GOVERNMENT PERSPECTIVE**

ASPECTS	BENEFITS OF EHEALTH	CHALLENGES FOR EHEALTH	FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH
HEALTHCARE PENETRATION	Increased proliferation of Healthcare. [83-84]	Low illiteracy Huge population Bridging the digital divide Poor nutritional status The multiplicity of Food Habits Diverse lifestyles Techno-legal and medico-legal issues. [57-58 , 61-64]	Government Policies. [66 and 67] Reliable Healthcare infrastructure Engagement of various stakeholders. [27]
COST	Reduced Cost of providing healthcare. [28, 34,70]	Limited Funds Low per capita income. [59-60]	Source of Funds Different solutions for rural and urban areas. [71]
HEALTHCARE REACH	Healthcare availability at far off places. [85-86]	Infrastructural issues Limited internet connectivity Vast geographical area. [57-58 , 61-65,34]	Status of e-Health readiness Social influences Human development index. [34,87]

Source: Author's Compilation

**FACTORS FOR EFFECTIVE IMPLEMENTATION OF EHEALTH IN INDIA-FROM GOVERNMENT PERSPECTIVE**

Increased proliferation or propaganda of health care is one of the beneficial aspects of the implementation of the eHealth system in India (table 4). [83-84] The major challenges to obtain this benefit are high literacy, huge population, bridging the digital divide, poor nutritional status, multiplicity of food habits, diverse lifestyles, techno-legal, and medico-legal issues and limited funds.[57-58, 61-64] The imperative factors as required to handle these challenges are government policies [66-67],sources of funds, reliable health infrastructure and engagement of various stakeholders. [27] Another benefit of eHealth which can be expected is the reduced cost of providing healthcare facilities.[28, 34,70] The major challenge to catch this benefit is low per capita income of India and disparity in income levels(table 4).[59- 60] To overcome this challenge there is a need to find a different solution between rural and urban areas.[71] Availability of

healthcare facilities to the off places is also one of the benefits of the eHealth system (table 4).[85] But internet connectivity in a remote area, poor infrastructure and very vast geographical are the major challenges in India for the effectively implementing the eHealth system in all the parts of the country.[57-58 , 61- 65,34] The factors needed to be considered are the status of eHealth readiness in different areas and levels, social influences and human development index (table 4). [34]

**CONCLUSION AND DISCUSSION**

The government in India must play a pivotal role in the assimilation of healthcare with information technology. It must work in the development of infrastructure for the same and such an enormous task can be achieved by roping in private partners for sustainable success in this regard. We must not only create awareness about eHealth and its

benefits, among masses but also literacy about information technology to build swift acceptance of the concept. The private healthcare system, which is working in silos, must integrate and government can play a role in this regard by helping to develop an interoperable healthcare system. Medical practitioners must create faith in virtual healthcare delivery as owing to prevalent culture of the physician-patient relationship of trust it becomes more important to establish trust in this new aspect of healthcare delivery. Healthcare implementers must be clear of what they expect from information technology in the healthcare ecosystem, whether it is improved efficiency, better data management or distance spanning. Accordingly, they can plan implementation based on their priorities and local factors. Since, it is the acceptability of eHealth among the patients which would decide the fate and sustainability of the concept, so they must be involved in designing of any eHealth program. Various such programs have evoked a response from the patients even in rural areas, but the system must be designed in such a manner that patients have the willingness and ability to use the system. In the Indian context, especially when the patients belong to multicultural, multilingual, economically and educationally diverse backgrounds it becomes even more important that innovative means must be deployed for successful adoption of eHealth in India. The implementation of e-health must be done considering the disparity between rural and urban India. eHealth also offers an opportunity for the government to bring down the cost of healthcare and enhance the reach in remote areas. Aadhar-a Unique identification for the citizens linked with the digitized electronic health records will facilitate focused treatment and prevent duplication of data and medical tests. Due to the increased penetration of mobile networks, mobiles can be an effective good platform to be integrated with healthcare systems.

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