

Assesing the Impact of ICT Adoption and Staff ICT Competence on the Efficiency of Health Care Systems

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Abstract

The efficiency of the healthcare system has been largely affected by the increasing adoption of information and communication technology (ICT), particularly in the developing world. In Sri Lanka, a few mHealth initiatives have been implemented to improve the management of data, administrative efficiency, and service delivery, particularly within government hospitals. However, very little empirical information is available about the significance of ICT adoption, staff ICT competence, and the efficiency of the healthcare system. The relationship between ICT adoption, staff ICT competence, and healthcare system efficiency is explored for the chosen public hospitals within the Ampara district, specifically within the Eastern province of Sri Lanka. A higher degree of knowledge, skills, and abilities among healthcare staff could result in improved operational performance, based on the results, indicating a strong positive correlation between staff ICT competence and healthcare system efficiency. Moreover, it was found that the healthcare system was strongly, positively, and favorably associated with ICT adoption, particularly the adoption of HISs, mHealth, and other electronic applications for healthcare delivery. The higher the adoption of ICTs within hospitals, the higher the degree of gains towards increased administrative process efficiencies, accuracy of records, and service delivery speed. Based on this research, it is clearly established that increasing the efficiencies of public healthcare systems is largely dependent upon staff ICT competence and adoption. It is proposed that higher ICT training for healthcare staff should be given the highest priority by the administration of hospitals, governments, and lawmakers. Such training programs are imperative for advancing the optimal growth of public healthcare institutions such as those found within the Ampara district of Sri Lanka.

Keywords: Health care systems, Health Information Management System, Electronic medical records

Introduction

Internationally, Information Communication Technology (ICT) is increasingly becoming a vital part of any modern healthcare facility. Electronically Stored Medical Records (EMRs), Hospital Information Systems (HIS), Health Information Management Systems, or for example, initiatives under the Information Communication Technology Agency of Sri Lanka (ICTA)/Ministry of Health, Sri Lanka, have largely accounted for the widespread adoption of ICT solutions towards

optimizing service delivery, management, patient traffic, and administrative matters within a hospital setup.

The Hospital Health Information Management System (HHIMS) is one such initiative by Sri Lanka on a national scale in this area too. The initiative by ICTA and the Health Ministry to digitize patient data, make outpatient and inpatient services more organized, and improve government hospital data reporting was undertaken to achieve this in the form of the HHIMS system. Millions of patient data are in digital form today thanks to the successful rollout of the HHIMS in many government hospitals across the country. Though significant strides have been taken in this area, there can be observed some disparity in the use of these systems by the nation as a whole in their operations as part of this health sector. Better-equipped hospitals are entirely integrated into the use of systems like HHIMS, whereas most other health centers in remote, undeveloped parts of the country are yet to adopt whole solutions in the use of ICTs, using only manual systems' solutions in most cases.

Studies that are currently available in developing nations demonstrate that the extent to which a healthcare institution can benefit from ICT adoption is typically dependent on two factors: (1) the degree of ICT adoption, or the presence and use of more comprehensive electronic systems (EMR/HIS, lab, pharmacy, patient management, etc.); and (2) the level of ICT competence and willingness of the staff, or the knowledge, digital literacy, and skills of health-care workers and administrative personnel. Research findings have linked efficiency in hospital settings, patient throughput, accuracy in record-keeping, and using data to make decisions when these two requirements are met. In Sri Lanka, these issues are very pertinent (more especially, in less urban or rural districts like the Ampara district Eastern Province). The national digital health agenda, according to the Sri Lanka Digital Health Blueprint, is centered on expanding ICT-based solutions for all public hospitals and healthcare facilities, including those at the provincial and district levels, in order to promote integrated health-information exchange, improve service quality, and provide equitable access. Given these dynamics, an empirical study evaluating the combined effects of ICT adoption and staff ICT competency on the effectiveness of healthcare in Sri Lankan public hospitals appears to be necessary. This study aims to close this gap by focusing on hospitals in Ampara District. It investigates the theory that hospitals with higher ICT adoption rates that is, those with complete HIS/EMR systems and more ICT-savvy staff are more productive in terms of reduced patient wait times, improved data management, more accurate records, and less administrative red tape.

This will enable the study to provide evidence-based conclusions to national health information authorities, hospital executives, and health policy makers. In order to realize the potential of digital

health transformation throughout Sri Lanka, these lessons may be used to further investments in technology infrastructure, training, and capacity building.

Use of ICT in hospitals and Eastern Province Sri Lanka.

For the last ten years, the Sri Lankan government's Ministry of Health and the Information and Communication Technology Agency (ICTA) have been overseeing a national ten-year plan regarding digital health. This new initiative to digitize patient data and make the outpatient and inpatient services easier and more effective on a national scale is called the Hospital Health Information Management System (HHIMS). The state hospitals have been progressively implementing the HHIMS and digital health projects. There are tens of thousands of digital patient records reported by the government.

There are some indicators of the early and prolonged computerization of hospitals in the Eastern Province. In 2009, computerization of the storage of medical records for twenty hospitals in the Eastern Province was underway as noted in Pole's discussion of the electronic patient records pilot schemes. A number of hospitals, such as the Batticalo Teaching Hospital and Trincomalee General Hospital, had transferred large volumes of outpatient and admissions-related clinical information into computerized systems.

Hospitals within the Ampara district have remained the focus of several information system initiatives that were government and donor-funded. Base hospitals within the district, and Base Hospital Ampara specifically, initiated the computerization process as early as 2005 through the Epidemiology Unit and WHO involvement in implementing a computer-based hospital information system at Base Hospital Ampara (and other hospitals identified as eligible hospitals) – one of the first concerted efforts made within the district to computerize clinical and surveillance data. Incomplete computerizations were also pursued within several hospitals within the Eastern Province – including Ampara General Hospital – through initiatives such as the government/ICTA HHIMS implementation and for-profit MDS/EMR installations.

However, the government and the private sector are still working to ensure even more digital services are offered at the district level, as can be seen in the more recent operational success of Ampara, which includes the provision of the e-channelling services, the integration of devices related to the HHIMS systems, and the training of implementation for the Ampara General Hospital. It is also important to note that the deployments are well-timed since they represent the benefits of the current scale-up and the over-the-counter trial projects of Ampara.

Empirical data on employee competency, ICT adoption, and outcomes.

However, another body of evidence has shown that staff competency and system integration play pivotal roles as mediators; hence, ICT implementation cannot solely ensure efficiency gains. The

findings on the installations of HHIMS & EHIS systems in Sri Lankan hospitals suggested that training and use of the system improved accuracy, timeliness, and administrative processes. On the other hand, those with low staff competency, lack of system integration, or sub-optimal implementation of EHIS systems experience no benefits (reports on evaluations & pilot implementations of HHIMS & EHIS systems).

Both international and regional studies confirm Sri Lankan experience in that introducing ICT in hospitals in developing countries has led to shorter patient waiting times, improved data quality, and improved management information; although these are contingent on preparedness, infrastructure, and training (in sub-Saharan African, South Asian, and ASEAN studies respectively). This means that evidence supports a joint effects hypothesis that (a) personnel's ICT competence and (b) the level and volume of adoption of the technology are co-predictors of reported efficiency gains.

Impact on research in the Eastern Province and Ampara.

Together, these sources indicate that Ampara and the Eastern Province as a whole present a fitting and appropriate backdrop within which the impact of staff competency and ICT implementation on hospital efficiency can be discerned. has also documented evidence related to early-pilot-stage computerization and recent digital health initiatives (HHIMS, e-channelling, and private company initiatives) that present differences on which the hypothesis that gains on efficiency – specifically faster processing, better records, and optimal reporting – can be linked to better implementation levels and staff competency can be examined.

Literature Review

Healthcare Systems' Use of ICT.

EMRs, HIS, telemedicine, computer-based diagnostic tools, and data analytics tools constitute the ICT infrastructure in healthcare facilities. Essentially, based on research from developing countries, a well-optimized ICT system has far-ranging results such as increased productivity, decreased administrative mistakes, and fast decision-making processes (Adane et al., 2019; Mwantimwa, 2019). In support, for example, a research study undertaken in Kenyan healthcare facilities showed that implementing ICT systems in healthcare facilities significantly helped to make financial management, registration, and healthcare delivery applications remarkably positive (Mukuna, 2016). Conversely, in reference to sub-Saharan Africa, implementing ICT in healthcare facilities increased patient flow, decreased hospital stay, and helped to make reporting systems accurate (Mwantimwa, 2019).

Among the most relevant digital projects initiated in Sri Lanka is the Hospital Health Information Management System (HHIMS), which has been introduced by the Health Ministry and the Information and Communication Technology Agency in Sri Lanka to monitor handling of patient

information, make inpatient and outpatient care easier, and boost the efficiency of reporting (ICTA Sri Lanka, 2023). Nevertheless, it has been reported that not all public hospitals are using ICT in equal proportions, and there are problems concerning infrastructure, networking, and integration in rural and provincial hospitals (Digital Health Blueprint, Health Ministry, Sri Lanka, 2023).

IT proficiency and healthcare efficiency.

These skills, sources of knowledge, and capabilities necessary for efficient usage of ICT technology are known as staff ICT competency. Worker capacity has a tremendous influence on the adoption rate of ICT technology, as confirmed in various research studies. A healthcare practitioner with greater technical skills would have greater potential for using EMRs and HIS technology for speedy patient information handling, accurate data entry, and better provision of services (BMC Medical Informatics and Decision Making, 2013; International Journal of Health Policy and Management, 2015). Training & capacity-building in using ICT technology to its fullest potential has been discussed in various research studies. In a cross-sectional study in Myanmar, staff ICT readiness played a key critical role in reaping the greatest benefit for successful implementation of EMRs and their positive outcomes in healthcare services (Htay et al., 2021). A staff member in a hospital having less technical knowledge to work with ICT technology would not find it easy to work in digital record technology, and hence the less-anticipated efficiency would be achieved in such circumstances in Sri Lankans.

This study type is mainly concentrating in large teaching hospitals or the implementation of policies at the national level in Sri Lanka, even though the main concern of the majority of the literature available emphasizes the role of ICT adoption and the ICT competency of employees. There is a lack of empirical studies related to the provincial hospitals in the Ampara District, Eastern Province of Sri Lanka, in relation to the funded healthcare system of the country, wherein the ICT competency of employees has diffused considerably and the adoption of ICT is unevenly distributed. This study can assist in the simultaneous estimation of ICT adoption and the ICT competency of employees, in relation to the impact of hospital efficiency.

Research Objectives

According to the literature, this paper will seek to:

Determine the correlation between ICT use and efficiency of healthcare system in the Ampara District public hospitals in Sri Lanka.

Test the influence of staff ICT competence on the operational efficiency of healthcare systems at the same hospitals.

Methodology

The study applied a quantitative cross-sectional survey study design in understanding the relationship between staff ICT skills and the adoption of ICT and healthcare system efficiency in the public hospitals of Ampara District. The staff working in the administrative and medical sections of the selected government hospitals within the districts of Ampara formed the target population of the study. However, since it was not practically applicable to conduct the study using the whole population, the study applied the convenience and purposive sampling method in determining the size of the sample, which ranged from 60 to 100 respondents. The methodology ensured representation of the various categories of staff members within the study, such as the clinical, nursing, administrative, and IT staff.

Table 1: Pearson Correlation Between ICT Competence, ICT Adoption, and Healthcare System Efficiency

Variables	ICT Competence	ICT Adoption	Healthcare System Efficiency
ICT Competence	1	.542**	.486**
ICT Adoption	.542**	1	.618**
Healthcare System Efficiency	.486**	.618**	1

**Correlation is significant at the 0.01 level (2-tailed).

The relationships between ICT competency, ICT adoption, and healthcare system efficiency were examined using the Pearson Product-Moment Correlation analysis. The results indicate a statistically significant positive link between ICT competency and ICT use ($r = 0.542$, $p < 0.01$), suggesting that a hospital's level of ICT adoption increases with employee ICT competency. Furthermore, there is a positive and substantial correlation between ICT competence and the healthcare system's efficiency ($r = 0.486$, $p < 0.01$), indicating that higher staff ICT competency is linked to better healthcare operations.

Additionally, there is a high and statistically significant association ($r = 0.618$, $p < 0.01$) between the adoption of ICT and the effectiveness of healthcare systems. This study implies that the efficiency of healthcare service delivery increases with the adoption and use of ICT systems, such as hospital information systems and electronic medical records. The association coefficients generally show that ICT adoption and staff ICT competency are important for improving the effectiveness of healthcare systems. The statistically significant results provide empirical support for the presence of significant correlations between the variables used in the study's methodology and therefore rejecting the null hypotheses.

Conclusion

This research enabled the researcher to examine the link between the adoption of ICT, the skill levels of hospital staff regarding ICT, and the effectiveness of the health system at government hospitals in the Eastern Province of Sri Lanka. Effective use of the health system has been found to positively correlate with the skill levels of hospital staff regarding ICT, as well as the adoption of ICT, based on the analysis of the data collected through a structured questionnaire conducted through the use of the Pearson Product-Moment Correlation. Based on the findings, hospitals with higher usage of health information technology and more ICT-skilled personnel would be likely to perform well in terms of their functionality at hospital level.

The study also indicated that a lack of adequate ICT competency among staff workers implies that ICT adoption is not a guarantee for optimal efficiency gains. The role of human resources in ensuring that the gains achieved from investments in information technology for the healthcare sector are also emphasized by the significant link between ICT adoption and competency. That these challenges exist despite the regional framework for the implementation of integrated measures, such as the development of technological infrastructure, among others, that currently prevail within the context of the Eastern Province, where resource constraints are common, is a fact. On the whole, in the sense that it offers evidence rooted in the Sri Lankan context, specifically in public hospitals, it can be said the research forms a supplement to the meager empirical evidence available on the relationship between ICT and the efficiency of healthcare in the country. It makes important inputs to the table of hospital administrators, policymakers, and healthcare strategists on the fact that the most important steps in ensuring the efficiency of existing healthcare structures are related to improved employee ICT literacy. Improvement in the way research is conducted to validate the results might be achieved through the use of a larger sample or performance indicators.

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