



Success Factors for Electronic Medical Records System in the Sri Lankan Public Sector Hospitals: Qualitative Study

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ABSTRACT

The Electronic Medical Records (EMR) system is the foundation for digital health care. The implementation is complex due to many stakeholders and requires heavy investments. Many EMR implementation failures are evident locally and globally. Although globally accepted success factors exist, research has proven that the EMR success factors are context-based. Hence, it has become a significant management need to identify success factors in each information system. EMR systems have existed in Sri Lanka for over 18 years; however, limited Sri Lankan literature exists on EMR success factors. This study aimed to bridge this gap and investigate success factors based on the perspectives of EMR users and management to develop an EMR success evaluation model. The in-depth semi-structured interviews were used as the data collection method. Twenty-five participants were selected based on purposive sampling, and face-to-face interviews were conducted at their work settings. Thematic analysis was used to analyse and interpret qualitative data. This study's findings revealed three new success factors: the change management process, a change champion with efficient leadership skills and financial resources, which are unique to the Sri Lankan public sector context. Further, it was found that the current EMR solution is reasonable and provides the required EMR functionalities for clinical decision making. Therefore, this study concludes that the EMR success depends not merely on the EMR solution but on socio-technical factors, combining technology, people, and processes. This finding is useful for EMR strategic managers in the public health sector to successfully manage future EMR implementations. Furthermore, this study proposes an EMR success evaluation model for the Sri Lankan context, adapted from DeLone and McLean's Information System Success Model, to facilitate quantitative investigations of information system success. Future research could explore the perspectives of health administrators to validate key success factors and further investigate data governance and strategic use of data for better patient care.

Keywords: Change Management Process, Change Champion, Electronic Medical Records, Financial Resources, Health Information System, Public Health Care, Qualitative Research.

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INTRODUCTION

There is enormous potential for digital health systems to provide efficient and effective healthcare services. The foundation of the digital health system is the Electronic Medical Records (Patients' health records) that are updated by authorised clinicians (medical doctors, nurses, pharmacists, laboratory staff, etc.) electronically. Traditionally, these records are maintained on paper-based systems, which have proven inefficient and ineffective (Heart et al., 2017), (Lærum et al., 2004). Many countries attempt to implement EMR first and then integrate those medical records into the Electronic Health Records system, an interorganisational system that shares the EMR data among all the healthcare institutions in a country for better patient care (Mogli, 2012).

The implementation of EMR systems in a complex context such as the public healthcare sector is not limited to the technological aspects, but plays a significant role in the interaction between many stakeholders, the clinical and managerial processes, organisational culture, and political aspects (Sørum et al., 2012). Further, the low implementation is found due to insufficient resources and organisational readiness (Nicholas, 2018), and users' resistance due to their attitude and knowledge (Biruk & Abetu, 2019). The organisational change process requires users to be trained in a new behaviour and a new approach, which should be based on the organisation's social norms and shared values. When the management and users accept the beliefs, core values, and behaviour, a strong culture is developed, enabling the successful implementation and usage of the new system (Sow & Aborbie, 2018). Further, organisational culture, operational and technical readiness, and management and leadership are identified as success factors by many researchers (Heath & Henry, 2013b), (A.-N. Ali, 2014), (Shao et al., 2016), (Tanniru et al., 2018), (Wijenayake & Herath, 2018), (Hussain et al., 2021) despite the widely recognised success factors such as system quality, service quality, information quality, System Use, and User

Satisfaction based on the Information System Success model by DeLone & McLean (DeLone & McLean, 1992), (Rumambi et al., 2017), (Mukhtar S. Al-Hashimi & Mishleen M. Aqleh, 2018). EMR implementations are changing in transition from a manual system to a computer-based system, and this process needs purposeful and directed change management (Parston et al., 2015). The leaders or health administrators need to communicate the vision effectively and drive the change successfully (Safdari et al., 2014). Leadership is instrumental, and it depends on the leader's ability to manage the changes related to both processes and people effectively (K. K. Basu, 2015), (Nicholas, 2018). Good leaders can implement the change, although it is challenging (Lachman et al., 2015). Further, the fear of the unknown, lack of trust and teamwork, politics, and bureaucracy are identified as the implementation barriers (Kotter, 1995).

In Sri Lanka, the EMR system implemented in most of the hospitals is the Hospital Health Information Management System – HHIMS. The first version of the system was developed in 2010 and has been in operation for the last 15 years with multiple updates. Although there was a plan to implement this system in 200 hospitals by 2020 under the digital health program, approximately 80 hospitals have been implemented by 2024 (Information and Communication Technology Agency of Sri Lanka, 2024). The selection of the hospitals to implement the EMR system is decided by the steering committees at multiple levels - National, Provincial, and Hospital-level committees composed of members from the Ministry of Health, Provincial Departments of Health Services, and ICTA (Information and Communication Technology Agency). Some of the hospitals' implementations have been reported as successful, while some hospitals have achieved partial success.

The literature provides evidence in developed and developing countries that strategic planning and future investments in EMR systems are based on the research findings of success factors (Biruk & Abetu, 2019), (Sarker & Hoque, 2016), (Zayyad & Toycan, 2018). This is also confirmed in the Sri

Lanka - Department of Census and Statistics Annual Bulletin in 2021, that timely and accurate information on the use of ICT is essential to justify ICT investments and provide direction based on the changing patterns and demands (Department of Census and Statistics, 2021). However, here is limited scientific research evidence in Sri Lanka, which has deprived the strategic planning of EMR investments (Dayananda, 2020), (Sarathchandra & Rathnayake, 2019). This study aimed to bridge this research gap and answer the research question, "What are the EMR's success factors in the Sri Lankan public sector hospitals? To answer the said research question, three objectives of the study were set: 1. To identify the global success factors through literature, 2. To conduct a qualitative study to identify EMR success factors in the Sri Lankan context 3. To propose an EMR success evaluation model.

LITERATURE REVIEW

Electronic Medical Records

Healthcare systems record patient data during in-person clinical consultations, treatments and investigations. These records are traditionally kept on paper-based systems and do not support data sharing among medical staff members in different units, departments, clinics and hospitals; thus, it hinders effective and efficient healthcare delivery, and the healthcare cost is very high (Oluwabunwa et al., 2016). Due to the paper-based system's reliance on handwritten paper records, a significant workload is associated with filing, retrieving, copying, summarising, and transferring information between departments or institutions. Therefore, Electronic Medical Records (EMR) have become the backbone of digital health systems, transforming traditional paper-based patient medical records into electronic records. EMR of a patient is defined as an updated medical record managed by authorised clinical staff (medical doctors, nurses, pharmacists, laboratory staff, etc.) electronically (Sahama et al., 2013). EMR implementations have been identified as very costly, complex, and challenging. Therefore, post-implementation evaluations are carried

out to investigate success and challenges. It is an important management task in information system theory, and it is evident from the literature that EMR evaluations are carried out in developed and developing countries (Catwell & Sheikh, 2009), (Nicholas, 2018).

EMR success factors

The success factors vary across different contexts and different implementation stages. The researchers have not agreed on one indicator of success. There are widely used post-implementation evaluation theories/models which reflect the success factors, and they can be classified as acceptance/adoption models and success evaluation models. The fundamental philosophies behind Information System adoption and acceptance models are the theory of reasoned action (TRA), the Theory of Planned Behaviour (TPB), the Unified Theory of Technology Acceptance and Use (UTAUT), the Innovation Diffusion theory (DOI), and Social Cognitive Theory (SCT) (Pouyan et al., 2013).

Acceptance and adoption are not equivalent to overall success, although acceptance is a precondition to success. Success measurement in Information System research considers various variables, making success factors ambiguous (DeLone & Mclean, 2002; Kim et al., 2003). The DeLone and McLean (D&M) Information System Success model has been used extensively by researchers to measure the success level with standard success factors. Many researchers have tested and validated this model globally for different contexts, including health information systems such as EMR (Mohd Salleh et al., 2016; Petter et al., 2008; Seddon & Kiew, 1994; Yu & Qian, 2018). The literature suggests several influencing factors other than the standard success factors described in DeLone and McLean's information system success Model (System Quality, Information Quality, Service Quality, User Satisfaction, System Use) (DeLone & McLean, 1992), (Yu & Qian, 2018). Although the EMR software is feature rich and user-friendly, it is not implemented and used successfully if the other organisational and people-related

aspects are not addressed (Lau et al., 2011). Further, many researchers have agreed that this complex change process has many challenges other than the technology-related factors, such as people-related (Hiatt, Jeffrey M), (Creasey, 2012), (Van Laere & Aggestam, 2016), (van Mens et al., 2019) and process-related (Virginio & Dos Reis, 2019), (Li & Collier, 2000). Further, these success factors are context specific.

Table 1 depicts the findings of the literature survey on significant success factors.

Table 1: *Information System Success Factors – Global*

Success Factors	Current Literature
ICT Infrastructure	M. Alshehri & Drew, (2010) Weeks (2012), Bedeley, (2014), International Telecommunication Union (2017), Van Mens et al. (2020)
Human Expertise	Govindaraj et al. (2014), Gholamhosseini & Ayatollahi, (2017), Gyamfi et al. (2017), Deriel et al. (2018), Stylianides et al. (2018)
Change Management	AlMulhem (2020), Fonseca et al. (2021), Nicholas (2018), Rohmah & Subriadi (2020), Sow & Aborbie (2018), Sulistiyani & Susanto (2018)
User Involvement	Bossen et al. (2013), Jawhari et al. (2016), Singh. A & Roopashree (2020), Kernebeck et al. (2022)
Interoperability	Ahmed et al. (2018), Deriel et al. (2018), Kautsch et al. (2017), Sreenivasan & Chacko (2021)
Privacy/Security	Heart et al. (2017), Jewer & Compeau (2021), Nøhr et al. (2017), Terry et al. (2019)
Adequate Training/ skilled users	Aldosari et al. (2018) Gui et al. (2020), Jewer & Compeau (2021), Mehmood et al. (2017), Rammutoa & Blaauw (2017), Yu & Qian (2018)

Financial Resource	Aminpour et al., (2014), Deriel et al. (2018), Gyamfi et al. (2017), Jack Resneck, (2018), Rahman & Islam (2024)
Leadership	Agha et al. (2019), Bonawitz et al. (2020), Deriel et al. (2018), Gui et al. (2020), Junita (2019), Laukka et al., (2020), Sow & Aborbie (2018).

Source: *Author*

Although many researchers have used the DeLone & McLean model extensively, its scope has conceptual implications because it excludes organisational and contextual factors. Further, these researches have not revealed or focussed on the data governance factors and usage of large data set for strategic decision making. Therefore, the DeLone and McLean model has been adapted by researchers with new dimensions and excluding some dimensions to suit the context.

EMR success factors in Sri Lanka

The EMR literature is limited in the Sri Lankan context. The comprehensive article by Dayananda, M (2020) presented in his concept paper the factors influencing the adoption of the EMR system under six themes – i.e. human, technical, organisational, financial, legal, and change management factors. Another research revealed that the continuous training of hospital staff over a 2-to-3-year period is considered the main secret of success (Pole, 2010). The EMR system users' behavioural Intention affects Actual Use, while Performance Expectancy and Effort Expectancy significantly affect behavioural intention in healthcare settings in Sri Lanka (Jeyakodi & Herath, 2016). The strong leadership (champions), financial support for procuring advanced laboratory equipment, more training sessions for staff, attitude development sessions, and workshops on policies and benefits of EMR are key challenging factors (Wijethunga, 2017). Leadership is considered an important factor in reengineering the public sector business process in the Sri Lankan context (Rehan et al., 2018). Table 2 presents a

summary of the existing literature on success factors relevant to the Sri Lankan context. This limited Sri Lankan literature remains broad and there is no evidence of a focused qualitative study, indicating the need to explore into context-specific success factors in public sector hospitals.

Table 2: *EMR Success Factors – Sri Lanka*

Success Factors	Current Literature
Financial investments, Continuous efforts	G. G. D. Y. Nishantha et al, (2009)
Training	Pole, D. (2010)
Involvement of user, management support, project sponsorship	Munasinghe, P. G., & Ranaweera, H. M. B. P.(2012)
Behavioural Intention affects the Actual Use	Jeyakodi, T., & Herath, D. (2016).
Leadership, Financial Support, Training	Wijethunga, P. U. (2017)
Training, System Quality	Jayawardena, A. S., Wickramasinghe, S., & Wimalaratne, S. (2016)
Human, financial, professional, technical, organisational and legal	Bae et al. (2016)
Leadership	Rehan, S., Bandara, W., & French, E. (2018)
Human, Technical, Organisational, Financial, Legal, and Change Management	Dayananda, M. (2020)

System Quality, Service Quality, Information Quality, Training, Infrastructure	Karthika, S., and Sathiyathuma. J (2023)
Technology Infrastructure, Standardised protocols, Expertise, Funding	Rahulan K, Paul Roshan G & Seralathan T (2024)

Source: *Author*

METHODOLOGY

This study used a social constructionist approach to explore the success factors based on the perspectives of EMR users and managers. The subjective, varied, and multiple meanings of respondents' experiences and insights allow the researcher to look for the complexity of views rather than narrow the meanings into a few categories or ideas (Creswell, 2013). The exposures and experiences of clinical staff members in different hospitals, EMR strategic managers at ICTA and the Ministry of Health were investigated thoroughly to determine success factors. Therefore, the social constructionist approach is considered the most suitable approach for this study. Further, this qualitative research allows for exploring and understanding the research problem, which involves a sample of data, and inductively building the theory (Creswell, 2014).

Data Collection and Analysis

Based on the prior research (Zinszer et al., 2013) and (Abbasi et al., 2023) the in-depth semi-structured interviews were selected as the data collection tool. It allows the researcher to have face-to-face meetings to observe respondents' verbal and non-verbal information. The purposive sampling technique was used to identify the EMR users and key personnel involved in the digital health project in the

Information and Communication

Technology Agency (ICTA), the digital health implementation agency in Sri Lanka and the Ministry of Health. Further, the purposive sampling strategy was used to select hospitals in the Western Province where the EMR system had been implemented within the past three years and had the highest EMR users. The in-depth interviews took place in their work settings, and the hospital health administrators chose the dates and times. The research objectives, process, and data usage were explained to the participants before the interviews. Further, the participants' consent was obtained before the interview, and no audio recording was carried out due to the participants' request. Interviewers' quotes from the transcripts were masked to protect confidentiality. The University of Kelaniya Ethics Committee approved the protocol for this study. Thematic analysis was used as the data analysis method, and all the interview transcripts were analysed and interpreted using themes. It helped to answer the research question. Microsoft Excel software was used to document and tabulate the codes.

Validity and Reliability

Semi-structured interview questions were designed and pre-tested to enhance the validity of the data collection process. Open coding was used by the researcher to identify initial categories from the transcripts. Through iterative analysis, these categories were further refined into themes, ensuring both analytical rigour and reliability of the findings. The trustworthiness of the thematic analysis is established using Lincoln and Guba's (1985) criteria during each phase of thematic analysis through data triangulation (Nowell et al., 2017).

RESULTS AND DISCUSSION

The study respondents

The 25 respondents of this study include twenty clinical staff: Nine medical doctors, five nurses, four pharmacists, and two record officers (with more than 2 years' experience in using EMR) and five strategic management staff from ICTA and the Ministry of Health.

Table 3 below presents their demographic information.

Most senior and experienced EMR users were suggested by the hospital administrators, and none of them declined the invitation to participate. During the interviews at the fifth hospital, data saturation was reached. Nevertheless, a sixth hospital was included to confirm and ensure the completeness of the data.

The major themes from the analysis of the semi-structured in-depth interview transcripts and observations made during the interviews. The thematic analysis revealed three main themes: Change Management, Change Champion and financial resources as EMR success factors in the Sri Lankan public health care sector. The themes and sub-themes are presented in Table 4.

Table 3: Demographic information of the study respondents

Institution	No	Designation	Gender	Age-Group
Hospital 1	1	Change Champion	M	30-40
	2	Director – Planning	M	30-40
	3	Medical Doctor	F	30-40
	4	Record Officer	F	20-30
	5	Pharmacist	F	30-40
Hospital 2	6	Medical Doctor	M	40-50
	7	Nurse	F	30-40
	8	Record Officer	M	20-30
Hospital 3	9	Change Champion	M	40-50
	10	Former Change Champion	F	30-40
	11	Nurse	F	30-40
	12	Pharmacist	M	30-40

Hospital 4	13	Medical Doctor	M	30-40
	14	Nurse	F	30-40
Hospital 5	15	Medical Doctor	M	40-50
	16	Nurse	F	30-40
	17	Pharmacist	F	30-40
Hospital 6	18	Medical Doctor	F	30-40
	19	Nurse	F	30-40
	20	Pharmacist	M	30-40 years
ICTA	21	Project Director	M	40-50 years
ICTA	22	Program Manager	M	30-40 years
ICTA	23	Project Manager	M	30-40 years
Ministry of Health	24	Director – Health Information Unit	M	40-50 years
Ministry of Health	25	Senior Registrar – Health Information Unit	M	30-40 years

Source: Author

Table 4: Themes and Sub-themes summary

Theme	Codes – Subthemes	Participants
Change Management	Infrastructure	1,4,2,6,8,12,15,18
	Training, Reassurance	1,2,3,4,5,6,7,8,9,10,12,14,16,17,18
	Roles & Responsibilities	5,12, 17, 20, 21
	Monitoring	1, 2,8, 18,22
	Standard Process	1,3,4,6,8,9,10,14,15,16,17,18,22,23,24
Change	Clear Vision	1,2,9,10

Champion		1,2,3,4,6,8,9,10,11,12,14,15,16,17,18,
	Commitment	1,2,3,4,9,10,11
	Leadership	1,2,3,4,5,6,7,8,10,11,12,14,15,17,18,19,20
	Collaboration	1,2,9,10,14,15
	Motivation	1,9,22,23
Financial Resources	Treasury involvement	1,2,9, 10, 22, 23
	Budget (Ministry, Hospital)	1,9,22,23
	Rigid process	

Source: Author

Theme 1 - Change Management

Most respondents (80%) mentioned that the change process from paper-based medical records to Electronic Medical records had been challenging, and there were no standard guidelines. The five sub-themes were identified and shown in Figure 1: Digital Infrastructure, Training, Responsibilities, Monitoring, and Standard process were drawn in the change management theme based on the experiences faced by clinical and administrative staff throughout the implementation and adoption of the EMR system.

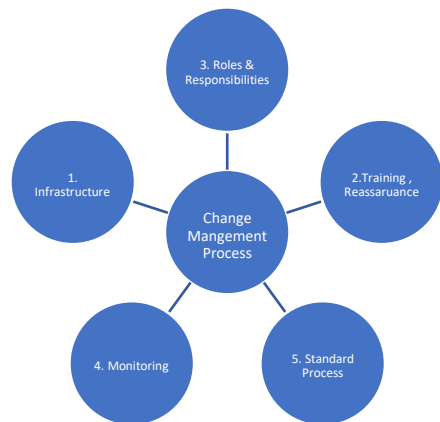


Figure 1: Theme 1 – Change Management – Sub Themes

Digital Infrastructure

Digital infrastructure is defined as any EMR system's lifeline, including hardware, software, network, technical staff, etc. (Fritz et al., 2015; van Mens et al., 2020). Respondents 1,4,6,8,15, and 18 said that they experienced issues related to digital infrastructure, such as hardware and network, which required new purchases and maintenance. Further, respondents 2 and 12 mentioned that the power cuts were a significant problem, so they could not use the EMR system due to the unavailability of required hardware. This has impacted their daily operational activities, and sometimes, they have had to share the computers or do manual recordkeeping until the power supply is available. This finding is aligned with many other researchers who have found that it is impossible to implement and adopt any digital health interventions successfully without proper infrastructure. (Mohammad Hossein, 2012), (Fanta & Pretorius, 2018), (Veronika & Jayathilaka, 2021). Further, maintaining this infrastructure is considered important for smooth clinical operations. When the computers are non-functioning and the network is not working, immediate attention to repairs is a must to ensure that the daily clinical operations are not disturbed (Menachemi & Collum, 2011).

Training

Most respondents mentioned that they did not have ICT know-how and were unfamiliar with EMR systems initially. This is evident as Sri Lankan government statistics show that the computer literacy rate was 39% in 2022 (Department of Census and Statistics, 2022). This contributed to the clinical staff's lack of confidence and interest in adapting the

EMR system, which demanded comprehensive awareness and training programs before the implementation (Dayananda, 2020; Perera & Withanage, 2008; Wijenayake & Herath, 2018). Information Systems to be used effectively, adequate user training is considered very important to ensure that clinical staff are knowledgeable and skilled to operate the system and can benefit from the new system

(Mehmood et al., 2017; Van Hau & Kuzic, 2010). This research revealed that all the hospitals conducted awareness sessions, formal training sessions, on-the-job training, etc., on different scales. Most of the respondents mentioned they received formal training. However, respondents 6 and 8 mentioned they transferred recently and only had on-the-job training from their supervisors. Respondents 1 and 9, who had been change champions, highlighted that it was a challenge to change the staff's attitude, improve morale, build team spirit, and convince the staff of the new system's benefits. Further, hospitals do not have professional IT staff; hence, a small group of staff members were trained in the maintenance of hardware and networking.

Roles & Responsibilities

The new EMR system influences the changes in role and responsibilities of the clinical and administrative staff compared to the paper-based medical record system. Therefore, it is important to understand the changing job roles, responsibilities and accountabilities; otherwise, they feel job insecurity (Khalifa, 2013; Khubone et al., 2020). Respondents 1 and 8, who are record officers, mentioned that their jobs have changed completely, and new responsibilities have been added to issue patients' barcodes and token numbers. The new responsibilities of medical doctors and pharmacists in using the EMR system were also evident. Respondents 5,12, 17 and 20, who are pharmacists, said they must issue the drugs based on the e-prescriptions in the system, and stock balances are automatically calculated. Understanding the new responsibilities and the impact of the tasks is very important to avoid operational issues and ensure effective use of the system.

Monitoring

"Monitoring is generally defined as the continuous process of collecting and analysing data to compare how well an intervention is being implemented against expected results" (WHO, 2016). The EMR implementation is a long process, and it takes many months before and after the "go live". Therefore, continuous monitoring to find out

barriers and difficulties to find solutions immediately helped in the success of the implementation (Matton et al., 2015). Respondents 1, 2 and 9 mentioned that they had the practice of monthly progress review meetings at the beginning of the implementation, and the representatives of each clinical and administrative staff category attended. Corrective actions were taken immediately, either with the support of hospital management, ICTA or the Ministry of Health. Respondents 8 and 18 said the review meetings helped to discuss the problems and make suggestions for improvement. The majority (12/25) were not aware that regular meetings to discuss the EMR issues were conducted. This is because some hospitals have stopped the monitoring process after the implementation, and the change champion handles if an issue is reported. These findings align with the current literature findings (Cadde et al., 2008) that monitoring is an essential process to ensure the sustainability of the system (Cristóbal, 2017).

Standard Process

The change management process includes various factors such as organisational, interoperability, psychological, social, legal, and ethical, which impact the sustainable implementation of digital health interventions (Fanta & Pretorius, 2018). Current literature proves that following a standard process, as opposed to making workarounds and reactive decision making, is one of the success factors in EMR implementation (Sumner, 2015), (Keshavjee, Bosomworth, Copen, Lai, Kucukyazici, Liani, et al., 2006), (Alshamlan & Al-mudimigh, 2011). However, respondents 1, 9 and 10 mentioned that the Sri Lankan EMR implementation was ad-hoc, and each hospital used its own process with the support from ICTA and the Ministry of Health. Most (15/25) respondents mentioned that a standard process with guidelines and manuals could have been beneficial at the adoption stage. This finding is aligned with the literature that indicates effective governance with

“ground rules” for change management is an important contributor to success (Canda Health Infoway, 2015). Based on the context of the public sector and a complex change process, a standard process can reduce experiments, save efforts, time, and money.

Theme 2 - Change Champion

Transformational leaders can inspire and motivate employees to achieve high levels of work engagement (Faupe & Süß, 2019). The transformational leader can develop a good relationship with the staff, reduce their unwillingness, and foster championing behaviour (Islam et al., 2020). Therefore, the transformational leader is considered a “Change Champion” who is interested and determined to make changes happen. He / She can bring effective organisational development and change to achieve the goals and objectives (Hendy & Barlow, 2012), (Thakhathi, 2018), (Islam et al., 2020). This research identified five subthemes, as shown in Figure 2, that change champions should possess to achieve success: Communicating a clear vision, commitment, motivation, leadership, and collaboration.



Figure 2: Theme 2 Change Champion – Sub Themes

Communicate the vision

Developing a clear vision and communicating it with all the stakeholders is identified as a key success factor in change management (Kotter, 1995). A clear vision would articulate why change needs to happen

and provide direction for successful implementation. It is the responsibility of the change champion to translate this vision into reality (Canada Health Infoway, 2013). If the vision is unclear, the users are not interested in collaborating and participating. Respondent 1 mentioned that it was essential to make staff understand the long-term vision of the EMR system and how it supports building the digital health care system for improved patient care. Respondents 2, 9, and 10 said that communicating the EMR vision and benefits helped to gain the staff's interest in adopting the system.

Commitment

The commitment of the change champion is another significant factor for a successful digital health implementation (Sánchez et al., 2005). Without genuine commitment, the challenges in digital health interventions may not be achieved. This change process takes a long time and consistent commitment until the system is fully operational; hence, motivating the users and managing the constraints is essential (Ingebrigtsen et al., 2014). Further, it helps to ensure adequate resources and support from clinical staff to facilitate the implementation (Keshavjee, Bosomworth, Copen, Lai, Kucukyazici, Lilani, et al., 2006). If the change champion is committed, he/she can influence employee commitment; otherwise, the urgency of the change fades away, and implementation is not successful. Most (15/25) respondents highlighted that their EMR leader (Change Champion) had to spend long hours and face many constraints and resistance. Respondents 1, 2, 3, and 4 strongly believed that the current success level is due to the strong commitment of their change champions, who worked tirelessly day and night, sacrificing their personal time. However, a few respondents, 11 and 12, highlighted that their change champion was inefficient and not committed, which has impacted the implementation of the EMR. Therefore, it is evident that the change champion's commitment to drive the clinical staff towards successful implementation is vital,

especially in the public health sector context. This finding is supported by the existing literature (Bass, 1997; Shaw et al., 2012). However, finding a highly committed change champion is a challenge in the public sector due to its cultural and political environment.

Motivation

Motivation is an internal force of a human that provides direction and determination at work. (Zayyad & Toyman, 2018), (Shonhe & Grand, 2020). A motivated employee can act and do whatever is necessary to achieve the goals or vision. The motivation stimulates inner strength, pushing toward the vision, and higher motivation levels directly impact the EMR implementation. (Heath & Henry, 2013a). The current research findings have revealed that the demotivation of the leaders is the primary source of resistance (McGinn et al., 2011), (Gheni et al., 2017). The respondents 1, 2, 9 and 10 mentioned that they experienced the importance of consistent motivation despite resistance, challenges and constraints to meet the EMR objectives. Respondents 14 and 15 said the initial motivation of their change champion has faded away, and they cannot meet with him to discuss their practical concerns. Therefore, it is evident from these study findings that continuous self-motivation to meet the challenges and operational issues is a success factor in driving towards the vision. In the Sri Lankan public sector context, employee performance appraisal is not effective and is not considered for career progression; this could impact the change champions' self-motivation (Opatha, 2013). Therefore, new strategies must be introduced to motivate these leaders and drive success.

Leadership

The change champion must have the leadership quality for sustainable change management to transform a traditional paper-based hospital into an ERM-based hospital. Out of many leadership styles, such as transactional, transformational, charismatic, bureaucratic, etc., transformational leadership is more relevant in EMR implementations.

Transformational leadership is defined as “the process of influencing major changes in the attitudes, beliefs, and values of followers to a point where the goals of an organisation and the vision of the leader are internalised and followers achieve performances beyond expectations” (Bass, 1990, p. 20). Many researchers have found that leadership is one of the success factors in EMR (Dayananda, 2020; Ross et al., 2016; Tanzania, 2013). This literature is confirmed by the respondents of this study, who have witnessed how the change champion’s leadership skills have impacted the success. In the public sector, changes are complicated because employees prefer to continue in their comfort zones and routine practices. Therefore, strong leadership is required to motivate the clinical and administrative staff toward EMR success. Respondents 1 and 9 mentioned that they applied different strategies to get the users’ support, even personally. They were persistent and treated staff with respect, even when they did not support the change. Further, they mentioned that continuous efforts were needed to convince the staff. Respondents 2, 3, 4, 10 and 11 mentioned that they strongly believe that without their Change champion’s leadership skills, the EMR implementation would not be possible because it was a challenge to get the resources and support from different stakeholders. It is clearly shown in this study’s findings that there should be a highly motivated, goal-oriented, strong leader who works hard and takes on challenges. The results of this study strongly supported the literature that there is a significant relationship between transformational leadership and the successful implementation of an EMR system (Heath & Henry, 2013b), (Agha et al., 2019).

Collaboration

There are many organisations involved in EMR implementation, and the support from the multi-disciplinary internal staff, such as the Hospital director, planning officers, medical doctors, nurses, pharmacists,

Laboratory staff, record officers, etc. and external parties, such as vendors, the ministry, the treasury, and ICTA, etc., is a challenge. The lack of collaboration was revealed as one of the constraints in implementing e-government initiatives in many countries (S. Basu et al., 2012), (Mackie, 2015), (Amegavi et al., 2017). Most (11/25) of the clinical staff who participated in this study found that the change champion could collaborate successfully with the stakeholders to resolve operational issues faced by the EMR users. However, respondent 19 mentioned that she experienced a delay in getting the laptop repaired, and the change champion could not collaborate with the external vendors effectively. Further respondents 5, 15 and 17 said their change champion could not convince the other departments to get a release from their routine work to attend the scheduled training. This study’s findings support the existing research that a change champion has to collaborate with many stakeholders (internal and external) from the beginning to the end of the implementation and to sustain the usage (Govindaraj et al., 2014), (Kuziemy, 2015), (M. Ali & Miller, 2017).

Theme 3 – Financial Resources

Any digital health program requires financial resources for implementation and sustainability (Pereira et al., 2022). Funding opportunities are scarce in developing countries; hence, providing finances in the public sector is a difficult (Palabindala et al., 2016), (Rahman & Islam, 2024). Operations are impacted if finances are unavailable to purchase or maintain the required infrastructure on time. The ICTA and hospital administrators mainly face this issue. Figure 3 shows the three themes derived from the interviews related to the financial resources.

Rigid process

The public health care sector has a rigid bureaucracy and hierarchical structure, leading to slow financial decision-making. Respondents 22 and 23 mentioned that government financial policies and controls delayed the realisation of allocated budget

from the treasury. This constrained or delayed the EMR implementation.

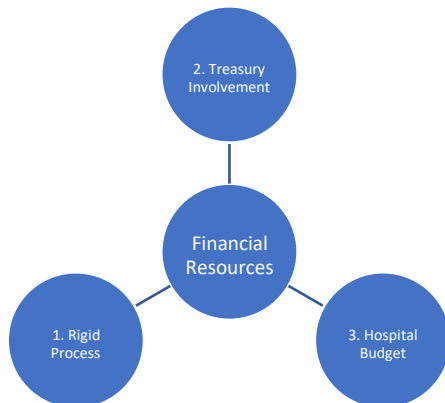


Figure 3: Theme 3 – Financial Resources – Sub Themes

Further, respondent 9 highlighted that one of the main hurdles faced was the funds released from the Ministry of Health, which was time consuming and challenging due to the strict processes. This finding is comparable to the existing literature in other contexts as well. The adequate budgets for information systems implementation are essential, and the availability of funds when required helps to minimise delays (Narattharaksa et al., 2016; Nøhr et al., 2017; Rehan et al., 2018)

Treasury Involvement

Although EMR budgets have been approved, ICTA must work with the treasury for finance realisation. Respondents 22 and 23 said that the ICTA was initially approved to manage the digital health budgets, but lately, the responsibility was transferred to the Ministry of Health. The delay in money transactions from the treasury led to significant delays in the EMR implementation. Respondents 1 and 9 highlighted that their hospitals had to find financial support from various outside organisations due to difficulty in releasing the allocated budget, due to treasury guidelines. These financial process constraints have become a barrier to the implementation of EMR systems. This finding is consistent with the literature in developing countries (McGinn et al., 2011). Further, Kumar & Mostafa (2020) mentioned that most

developing countries rely on external financial assistance, and the implementation is affected due to the approval process of the financial organisations.

Budget

The initial financial support to set up the EMR system at each hospital is provided by the ICTA from the allocated Digital Health budget. After implementing the system, the hospital's annual budget is used for regular maintenance, new purchases, and operational costs. It is evident from the respondents 1, 9, 10, 22, and 23, that some hospitals experienced annual budgetary limitations to maintain the digital infrastructure. Respondent 2 also shared his experience that the hospitals are constrained by an inadequate IT budget for IT system maintenance, and the hospital director sometimes approaches non-governmental organisations for funding. Respondent 2 also stated that several hospitals experienced an insufficient annual budget at the hospital level for EMR maintenance.

Financial resources are crucial for EMR implementation and sustainability. However, this factor is controlled by the government policies and regulations. Public health care sector finances are governed by hierarchical levels, such as the Treasury, Ministry, provincial, and hospital levels. Hence, the hospital administrators experience this financial constraint, which impacts EMR systems. These research findings are similar in other countries, and information systems fail or are delayed due to budgetary constraints (Rahman & Islam, 2024).

These three themes revealed in this study are unique and significant to the success of the EMR system in Sri Lanka. Although these factors have been discussed in global literature, they are broadly highlighted in Sri Lankan literature. Due to the culture and administrative processes in the public sector hospitals, a highly motivated, strong leader is instrumental in driving the hospital-level EMR implementation. Having a standard change management process and sufficient

financial resources reduces the implementation constraints. Succinct

EMR success evaluation - The proposed Model

These study findings provide valuable insights from the perspectives of the clinical staff on EMR success in Sri Lankan public health sector hospitals. Although the EMR system (software features) is considered good and valuable, many challenges are faced in implementing and adopting the EMR system from a sociotechnical perspective (Nguyen et al., 2014), (Yusof & Sahroni, 2018). EMR implementations are complex and involve many stakeholders; hence, the change process is not only technology-related but involves processes and people (Canada Health Infoway, 2013; Sulistiyan & Susanto, 2018). This study also proved that the EMR system (HHIMS software characteristics) cannot achieve the intended benefits and increase system usage. Other significant factors, such as organisation-related, people related, and task-related, govern success. After analysing the factors identified through literature and the perspectives of the participants of this study, it is evident that there should be a strong change management process and committed leadership to manage organisational and people behaviours. EMR success to meet the intended objectives of the digital health program can only be achieved if the people, processes, and technology are embedded (Canada Health Infoway, 2013; Chevers, 2018; Lee et al., 2007; Sørsum et al., 2012). Although clinical staff are not tech-savvy, they can be trained to adapt to digital systems and get the benefits. Further, negative attitudes must be eradicated through rigorous awareness sessions and providing visual evidence of hospitals where the EMR system has been successfully implemented. To overcome the socio-technical challenges, such as resistance, lack of collaboration, lack of knowledge, negative attitudes, lack of knowledge of digital health benefits, public sector cultural and behavioural practices, etc., there should be efficient transformational leadership and strong change management processes.

Although DeLone and McLean's Information Systems Success Model is widely used to evaluate information systems (Bashiri et al., 2023) literature suggests that this model has been adapted to suit the contexts (Mustafa et al., 2024).

The following EMR success evaluation model, as shown in Figure 4, is proposed based on the findings of the literature and this qualitative study. The success factors of the Sri Lankan public sector EMR

System (HHIMS) are EMR characteristics: system quality, information quality, Service quality and Change Management Strategy: Change Management Process and Change

Champion. These factors impact the EMR system's usage to achieve the success of the digital health program objectives. The EMR system characteristics, such as system quality (the software features to meet the clinical operations in a hospital), information quality (the detailed and summary reports with timely and relevant information to support clinical decision making) and service quality (technical support for users to handle operational issues), are primary requirements for any information system.

In DeLone and McLean's model, user satisfaction mediates between system characteristics and Net benefits (success) and has a relationship to the system use. However, some researchers argue that system usage and user satisfaction are interrelated. If there is high usage, it implies users are satisfied and motivated to use the system due to the benefit realisation (Bokhari, 2005). However, some research empirically proved that there is no positive impact of "System Use" on "User Satisfaction" and "User Satisfaction" on "Perceived Benefits" (Tilahun & Fritz, 2015), (Ojo, 2017), (A. Alshehri & Hadoussa, 2025).

In this context, when the government identifies a hospital for EMR implementation, it is mandatory to use the system for day-to-day operations, which is a push implementation. Since the users' daily routine tasks are carried out using this system, the usage is considered a success

factor to achieve the intended objectives. Although user satisfaction is considered a success factor in much research, some researchers have revealed that user satisfaction is not a critical success factor to net benefits or the overall success (Ojo, 2017), (Çelik & Ayaz, 2021). Therefore, “User Satisfaction” is not included in the proposed model as a success factor. Although the financial resource factor is identified as a critical success factor in this study, it was not incorporated into the proposed evaluation model, because intended research participants for the quantitative study validating this research model are grassroots level EMR users who are not involved in financial aspect and not aware of financial constraints.

Characteristics of ERM System

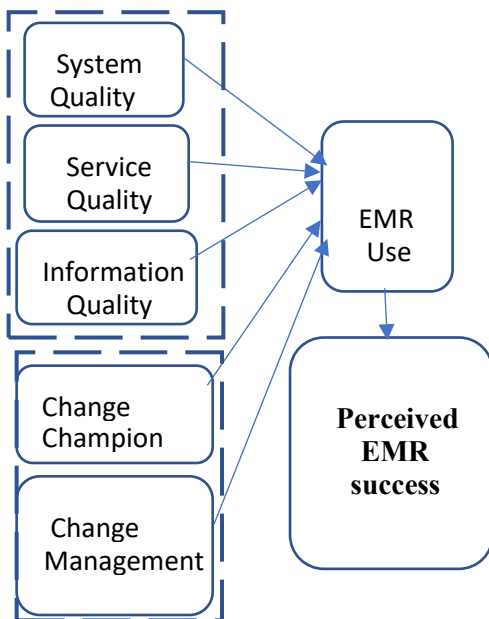


Figure 4: *Proposed EMR Evaluation Model*

Change Management Strategy

Since financial considerations fall within the purview of management, future research could engage management-level stakeholders such as the Ministry of Health's financial department, Provincial Health Services,

ICTA, and hospital administrators to capture this dimension more comprehensively.

CONCLUSION

In Sri Lanka, EMR systems have existed for over 18 years, and significant investments have been made; however, exploratory research evidence on success factors is limited. This study investigated the perspectives of EMR users and implementation managers. The findings reveal three new success factors unique to the Sri Lankan public health care sector: the change management process, the change champion and financial resources. Further, it was found that the current EMR software is good enough to manage the hospital-level requirements; however, it does not support building interconnections between hospitals to provide much better patient care. Further, the EMR system has been implemented in most hospitals at the Outpatient Departments (OPD) and pharmacies only. The implementation of the system in all

the departments will provide complete patient information. Therefore, guidelines and processes for the EMR change management at each hospital must be documented, and a skilled change champion must be assigned to successfully drive the change process in all the departments. It is also crucial that policy decisions are made to ensure budgetary allocations for this digital health intervention. The EMR strategic managers can consider these success factors for nation-wide implementation and ensure EMR success in Sri Lanka. Researchers can validate the proposed EMR success evaluation model in the Sri Lankan context and quantitatively assess the success level.

These findings contribute to existing literature, and this study validates that the EMR is a sociotechnological solution that includes technology, processes, and humans, not only an IT solution. This theoretical contribution is significant for academics and EMR strategic managers, as it provides context-based EMR success factors in a developing country to plan future EMR

implementations. However, this research is limited to only six hospitals, and the participants were mostly clinical staff not the health administrators at hospital level. Further, the data governance, interoperability and usage of data for strategic decision making are not investigated. Future researchers can extend this research by addressing the limitations.

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