Scientific Research Publishing

Open Journal of Business and Management, 2024, 12, 1135-1157
https://www.scirp.org/journal/ojbm
ISSN Online: 2329-3292
ISSN Print: 2329-3284

A Study of the Effect of Health Records Digitalization on Healthcare Facility Operational Efficiency

Daniel Ng'andu, Lubinda Haabazoka

Graduate School of Business, University of Zambia, Lusaka, Zambia
Email: dan.ngandu@gmail.com, lhabazoka@yahoo.com

How to cite this paper: Ng'andu, D., & Haabazoka, L. (2024). A Study of the Effect of Health Records Digitalization on Healthcare Facility Operational Efficiency. *Open Journal of Business and Management*, *12*, 1135-1157.
https://doi.org/10.4236/ojbm.2024.122060

Received: February 6, 2024
Accepted: March 25, 2024
Published: March 28, 2024

Abstract

Historically, public health spending has consistently accounted for a substantial portion of government expenditure. In line with the 2022 national budget allocation analysis conducted by the Policy Monitoring and Research Centre, it was revealed that over 13 billion kwacha had been allocated to health services. As society continued to age and exerted a growing strain on healthcare systems, healthcare stakeholders actively sought solutions to address pressing concerns, including cost management, data quality, and overall efficiency. The study hypothesized that digitizing medical health records would improve overall health care facility operational efficiency by improving access to patient information, streamlining workflows, reducing documentation errors, and improving communication among healthcare stakeholders. Furthermore, the study aimed to identify potential implementation challenges and barriers, providing valuable insights for healthcare institutions looking to adopt or optimize their EHR systems. The research design used a survey-based approach with a sample size of 150 respondents from ten public health care facilities in Lusaka using an EHR such as SmartCare or paper-based records. The respondents included healthcare professionals, health facility administrators, and data entry clerk personnel. The primary data collection instrument used was a structured questionnaire that targeted key facility operational efficiency indicators such as time efficiency, workflow optimization, documentation accuracy, information accessibility and cost efficiency. The collected data was analyzed using SPSS and Microsoft Excel software. Descriptive statistics were used to summarize and interpret survey responses, while inferential statistics were used to establish relationships and correlations between variables. The study's findings were presented in tables, graphs, and charts, allowing for a thorough understanding of the findings. The results collected and analyzed highlight the significance of addressing these issues to guarantee the success-

ful implementation and utilization of EHRs in healthcare facilities, ultimately resulting in enhanced patient care and operational efficiency. The study's findings add to the growing body of literature on the benefits and challenges of health records digitization in healthcare settings, particularly in Lusaka. The findings provide valuable recommendations for healthcare administrators, policymakers, and IT professionals on how to effectively leverage the benefits of digitized health records to improve operational efficiency and, ultimately, patient care.

Keywords

Digitization, Electronic Health Records, Healthcare Facility, Operational Efficiency

1. Introduction

Public health spending continues to consume a sizable portion of government spending, with over 18 billion kwacha going towards health services according to the 2023 national budget allocation according to the Policy Monitoring and Research Centre analysis of the national budget (PMRC, 2023). With an ageing society increasing the burden on healthcare systems, healthcare actors are looking for solutions to cost, data quality and efficiency issues. The digitization of health records has emerged as a significant technological advancement with the potential to reduce cost, data quality issues, and improve operational efficiency in healthcare facilities.

Improving the quality of healthcare and access to healthcare while controlling costs as populations age and grow, life expectancy increases and public expenditure on healthcare is under pressure are a few of the main challenges for healthcare organizations across the globe. Virtually all the players in the vast and complex healthcare ecosystem are stepping up their digitization and digital transformation efforts because of these and other challenges but they also see the opportunities in digitally transforming healthcare and invest more in digital health (McCall, 2020).

Although digital transformation is a popular point of discussion now, the ideas of digital products, services, and mediums were already well-understood in the 1990s and 2000s (Auriga Press Center, 2016).

As part of the digital transformation in the health sector, Zambia adopted the Electronic Health Record (EHR) called SmartCare that is used for the management of HIV health information in Zambia. Developed due to the identified need to handle large amounts of health information in a secure manner, the SmartCare software is the largest EHR in Africa. In Zambia, SmartCare has expanded since its initiation in 2004 to integrate more health facilities and has harmonised patient records of more than one million individuals across the country. The

uses of smart cards with pin numbers and staff access cards with passwords have alleviated some of the concerns about privacy and security of confidential patient information and made SmartCare a more secure electronic health record (Mweebo, 2014).

Electronic Medical Record (EMR) has a powerful and significant impact in improving the safety, efficiency, and quality of care while protecting patient's privacy and personal rights (Aldosari, 2014). EMR has become an essential part of our modern healthcare field as it is concerned with the complete management of information of different patients, which includes retrieving test results, medication prescription, patient history, etc. Many have considered EMR as an excellent tool for imparting better quality of health care, enhanced clinical decision-making skills, and reduction in long-term medical expenses (McBride et al., 2012).

Electronic Medical Records (EMR), as a health information technology innovation, has been perceived to improve efficiency and increase the effectiveness of health care delivery and to adopt an EMR, many hospitals are actively converting from a paper-based work environment to a paperless electronic record, thus transforming the health information management (HIM) resources (Khatri, 2015; Chaudhry et al., 2006). The primary purpose of an EMR system is to support a high quality effective integrated health care information system, which is independent of the place and time of health care delivery through Information communication technology (Hyppönen et al., 2014). The EMR allows "greater and more seamless flow of information within a digital health care infrastructure, created by electronic health records (EHRs), encompasses and leverages digital progress, and can transform the way care is delivered and compensated".

Evans (2016) states that, As EHRs evolved, they became a digital tool containing the information collected from all the clinicians involved in a patient's care and could be potentially accessed by all authorized clinicians to provide care to that patient, going beyond standard clinical data collected in clinical settings. And according to Saiod et al. (2017), EHRs are real-time, patient-centred records that make information available instantly and securely to authorised users. While an EHR does contain the medical and treatment histories of patients, an EHR system is built to go beyond standard clinical data collected in a provider's office and can include a broader view of a patient's care. Various EHR systems are implemented globally.

According to Walker-Czyz (2016), medical record (EMR) and electronic health records (EHRs) systems have been available in health care settings for several years, with usage of the systems increasing worldwide. The potential to improve patient care outcomes, health care providers' performance, and reimbursement activities have been the core motives for using such computerized clinical systems. Incorporating evidenced-based practice tools into the EMR or EHR systems may promote decision making at the point of care and improve health care quality.

According to Kondylakis et al. (2020), over the past two years, the coronavirus pandemic (COVID-19) accelerated the adoption of digital solutions to mitigate its impact. As a result, many mobile and desktop applications have been developed to support education, the exchange of information, risk assessment, self-management of symptoms, contact monitoring and decision making, offering easy to use and effective pandemic support digital tools. The pandemic has amplified the need for care provision outside the traditional healthcare settings, facilitating patient self-monitoring using various connected devices, and digital therapeutics that can deliver interventions via apps. Under this context, improving the patient experience is becoming a higher priority for healthcare professionals as stated by Golinelli et al. (2020).

A systematic of review of literature about SmartCare in Zambia recommends that there is urgent need to evaluate how the EHRs are helping health workers perform their work effectively and efficiently as compared to the paper records system.

Statement of the Problem

The current management of health records in Zambia is mainly paper based, which is inefficient, time-consuming, and prone to errors. This can lead to delays in patient care, poor communication between healthcare providers, and difficulty tracking patient progress over time. The adoption of electronic health records (EHRs) in healthcare facilities has been encouraged by the World Health Organization (WHO) to improve healthcare delivery and achieve universal health coverage. Zambia's Ministry of Health (MOH) adopted the WHO guidelines and developed an EHR system called SmartCare in 2004, which digitized medical health records. However, since its adoption, there has been no study on the effectiveness of the SmartCare EHR system in improving healthcare facility operational efficiency.

Studies have shown that EHR systems can improve patient care, increase patient participation, improve care coordination, and enhance patient safety (Eduhealthsystem, 2022; Woldemariam & Jimma, 2023). However, the implementation of EHR systems in low-middle income countries (LMICS) has been challenging due to poor infrastructure, lack of management commitment, standards, interoperability, support, experience, and poor EHR systems (Woldemariam & Jimma, 2023; Bisrat et al., 2021; Silwamba, 2019).

The impact of EHR use on patients' time spent during the different aspects of the visit is rarely investigated. Many studies have shown that physicians are concerned about the amount of time needed for data entry, and the physicians have stated that the data entry time could be better used to provide direct patient care (Jabour, 2020). The patients' waiting time and the consultation time are very important parts of patients' experience that could be impacted by the introduction of EHR systems.

The SmartCare EHR system was developed to meet the needs of the Ministry

of Health in the care of HIV patients, taking into consideration the level of infrastructure development in the health sector in Zambia (Mweebo, 2014). SmartCare has made great strides in improving the quality and efficiency of healthcare services and reducing hospital costs (Bisrat et al., 2021). However, there are still challenges associated with the implementation of SmartCare, including high costs of procurement and maintenance of the EHR system, lack of financial incentives and priorities, poor electricity supply and internet connectivity, and primary user's limited computer skills as stated by Silwamba (2019).

Therefore, this research aimed to evaluate the effect of health records digitization on healthcare facility operational efficiency in Zambia, with a focus on the SmartCare EHR system. The study will investigate the impact of the SmartCare EHR system on patients' waiting time and consultation time, healthcare providers' perception of the system, and the challenges associated with the implementation of the system. The findings of this study will provide insights into the effectiveness of the SmartCare EHR system in improving healthcare facility operational efficiency and inform future efforts to improve EHR implementation in Low-Middle Income Countries (LMICs) such as Zambia.

2. Literature Review

Below is a (see Table 1) summary key findings, critique and research gaps identified in the literature review:

Table 1. Critique of existing studies.

Study	Key Findings	Critique	Research Gaps
Global Context			
Abu Raddaha (2018)	Nurses' confidence in EMR use correlated with experience and perceived consideration of suggestions. Lack of prior experience with EMRs affected confidence. Training and consideration of suggestions were recommended.	Limited to a single hospital setting; no comparative analysis with other regions or healthcare facilities.	Lack of exploration into the direct impact on healthcare facility operational efficiency due to nurses' confidence in EMR use. Need for broader geographic representation.
Aldosari (2018)	Strong positive correlation between perceived usefulness, ease of use, and nurses' acceptance of EMRs. Identified the importance of system quality, management support, and IT support.	Focused on one hospital setting; lacked a comparative analysis with diverse healthcare settings.	Lack of direct assessment of how EMR acceptance translates to healthcare facility operational efficiency. Need for a broader range of healthcare settings for a comprehensive understanding.

Continued

Ajami & Bagheri-Tadi (2013)	Identified various barriers to EHR adoption by physicians. Barriers included time, cost, lack of computer skills, privacy concerns, and interoperability issues.	Primarily focused on physician perspectives and barriers; lacked assessment from a facility operational efficiency standpoint.	Limited exploration of how the identified barriers directly impact healthcare facility operational efficiency. Need for investigation into mitigating these barriers in different healthcare settings.
Budd et al. (2020)	Discussed the role of digital technologies in the COVID-19 response. Emphasized the importance of digital tools in outbreak response but highlighted limitations and barriers, including legal, ethical, and organizational challenges.	Lacked direct ties to healthcare facility operational efficiency; focused on pandemic response.	Need for specific analysis on how digital technologies, including EHRs, influence and contribute to healthcare facility operational efficiency during pandemics.
Katehakis & Kouroubali (2021)	Highlighted the accelerated adoption of digital technologies due to the pandemic. Emphasized the benefits of EHRs in supporting patient care, medical decisions, and research. Advocated for a public-centric approach to EHR services.	Limited focus on direct implications for healthcare facility operational efficiency; more emphasis on the broader digital transformation.	Need for a deeper exploration of how public-centric EHR services directly impact healthcare facility operational efficiency.
Regional Context			
Msukwa (2021)	Users preferred EMRs over paper-based records but highlighted issues with training and post-training support.	Focused on user perceptions; lacked assessment from an operational efficiency standpoint.	Need for evaluation linking user perceptions of EMRs to actual impact on healthcare facility operational efficiency.
Ngugi et al. (2021)	Identified facilitators (system functionalities, training) and barriers (infrastructural issues) to EMR use.	Lack of direct analysis of EMR use's effect on healthcare facility operational efficiency.	Need for a more direct correlation between identified facilitators/barriers and healthcare facility operational efficiency.
Uwambaye et al. (2017)	Majority of participants satisfied with EMRs, with a small fraction favoring paper-based records.	Lacked analysis on how user satisfaction with EMRs impacts healthcare facility operational efficiency.	Need for an assessment of the direct relationship between user satisfaction with EMRs and healthcare facility operational efficiency.
Zambian Situation			
Gumede-Moyo et al. (2019)	SmartCare faced challenges related to data quality, funding, feedback mechanisms, and structural issues.	Primarily highlighted challenges within the SmartCare system without direct ties to healthcare facility operational efficiency.	Need for an in-depth exploration of how SmartCare system challenges directly affect healthcare facility operational efficiency in Zambia.

After outlining and describing the many works of literature, we concluded that the body of knowledge already in existence will serve as a solid foundation for understanding of the user perception on the effectiveness and efficiency of EMR in comparison to paper-based records. The studied literature or research offers a strong foundation upon which the current study can build and construct or recommend actions that can assess the user perception on the effectiveness and efficiency of EMR in comparison to paper-based records in Zambia.

On the other hand, the researcher found that the approach used lacked some amount of trust because it was either qualitative or quantitative in character, based on the literature study. This does not provide enough information on its own because combining secondary and primary data is necessary to comprehend the difficulties in assessing the user perception on the effectiveness and efficiency of EMR. This is where this study steps in by utilizing the mixed technique to paint a clearer picture of the problems surrounding the problem that has been found. It is important to note that using a mixed method will, according to the research, assist to obtain a more comprehensive image than a solitary quantitative or qualitative study because it combines the advantages of both approaches.

The other research gap found in the examined literature is that there has been essentially no study of the assessment of the user perception on the effectiveness and efficiency of EMR in comparison to paper-based records in Zambia. In addition, the majority of the literature studied generally paid more attention to how digital healthcare is applied than it did to assessment of the user perception on the effectiveness and efficiency of EMR related obstacles.

3. Theoretical Framework

The theoretical framework for the study on the effects of implementing digitized electronic health records (EHRs) on operational efficiency in healthcare institutions can be based on several relevant theories as follows:

3.1. Cybernetic Control Theory

The theory postulates how digital, interactive, and interrogative technologies enhance the performance of any process with the help of improving the process flow integration. The performance is increased due to the involvement of a feedback loop into the process. With the help of data provided, managers can build various strategies for the organization. The theory shows the importance of timely feedback and controlling the deviations in the processes flow. With the help of this theory, digital technology provides a platform by which healthcare organization can trace the real-time data and information for increasing integration in their routine processes. For example, hospital administrator and restorative staffs can have access to the continuous real-time data with precise information because of digital technology adoption in an emergency as well as a usual scenario.

3.2. Stakeholder Theory

Stakeholder Theory is a view of capitalism that stresses the interconnected relationships between a business and its customers, suppliers, employees, investors, communities, and others who have a stake in the organization. The theory argues that a firm should create value for all stakeholders, not just shareholders. In 1984, R. Edward Freeman originally detailed the Stakeholder Theory of organizational management and business ethics that addresses morals and values in managing an organization. His award-winning book Strategic Management: A Stakeholder Approach identifies and models the groups which are stakeholders of a corporation, and both describes and recommends methods by which management can give due regard to the interests of those groups. The theory has become a key consideration in the study of business ethics and has served as a platform for further study and development in the research and published work of many scholars. Since the 1980s, there has been a substantial rise in the theory's prominence, with scholars around the world continuing to question the sustainability of focusing on shareholders' wealth as the most fundamental objective of business. We aim to be the hub of leading stakeholder research and thinking by providing resources to new scholars, students, and business leaders.

On the other hand, stakeholder theory is one of the management approaches that makes it possible for managers to have a comprehensive perspective on their responsibilities for organizational activities. From the perspective of this approach, the organization is viewed as a bundle of communications among its various activities of stakeholders. Therefore, the main purpose of this theory is to support managers to determine a balance between the various relationships that can affect the organization in achieving its goals. Moreover, managers are required to integrate the efforts of different actors in the process of creating value.

3.3. Technology Acceptance Model (TAM)

Davis FD (1989) proposed an analytical model to predict user acceptance in the use of computer technology. It is considered as one of the most widely used and fit models to examine the behavioral and social intentions that influence the acceptance of technology (Wu JH, 2008). This study also examined the factors affecting the attitudes of the nursing staff towards the implementation and usage of EHR system and takes into consideration, the variables laid upon by Davis's Technology Acceptance Model (TAM). According to TAM, the behavior of adopting information system technology is linked to the intent of using a specified system, which is determined by the perceived usefulness from the user's point of view and by perceived ease-of-use. Therefore, Davis developed and validated two distinct variables: perceived usefulness and perceived ease of use. Perceived usefulness referred to the level of belief in people about the fact that using the system will help them in achieving better work performance and whether they will use such technology or not. Perceived ease of use refers to the level or degree to which the user considers or believes that the information system is easy to use

and effortless. In terms of predicting the factors influencing the acceptance of technology across many contexts such as health care, TAM has proven to be the most favorable model in that regards (Vithanophas & Pacharapha, 2010). This study intends to determine the attitude, intention and factors influencing the acceptance and adoption of EHRs from user's point of view.

The study intended to get a complete understanding of the effects of integrating digitized EHRs on operational efficiency in health care facilities by incorporating various theoretical viewpoints. The theoretical framework lead the research process by informing the selection of variables, research methods, and data analysis techniques, allowing for a systematic evaluation of the underlying mechanisms and interactions involved in the study.

3.4. Diffusion of Innovations Theory

Diffusion of Innovation (DOI) Theory, developed by E. M. Rogers in 1962, is one of the oldest social science theories. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system (Rogers, 2003: p. 249). This theory can be used to analyze how EHR systems are adopted within healthcare settings. It provides a framework to understand the stages through which an innovation (EHR systems) passes (from knowledge, persuasion, decision, implementation, to confirmation) and the factors influencing its adoption (like relative advantage, compatibility, complexity, trialability, and observability). Applying this theory can help identify strategies to enhance the uptake of EHRs among healthcare professionals.

3.5. Socio-Technical Systems Theory

Sociotechnical systems design (STS) as conceived by Trist, Emery and others (Trist & Bamforth, 1951; Trist, Higgin, Murray, & Pollock, 1963) was intended to enhance the performance of work systems by recognizing the ways in which the behaviours of human actors affect the operation of technology. More specifically, better operational performance could be achieved when the knowledge and capabilities of workers were leveraged to help deal with technological uncertainty, variation and adaptation. This theory emphasizes the importance of considering both social and technical aspects when implementing new technology. In the context of EHRs, it suggests that successful implementation requires attention not just to the technological system, but also to the social system, including staff training, workflow redesign, and change management.

4. Conceptual Framework

Figure 1 outlines the conceptual framework of the study. It shows the effects of implementing digitized electronic health records (EHRs) on operational efficiency in health care facilities:

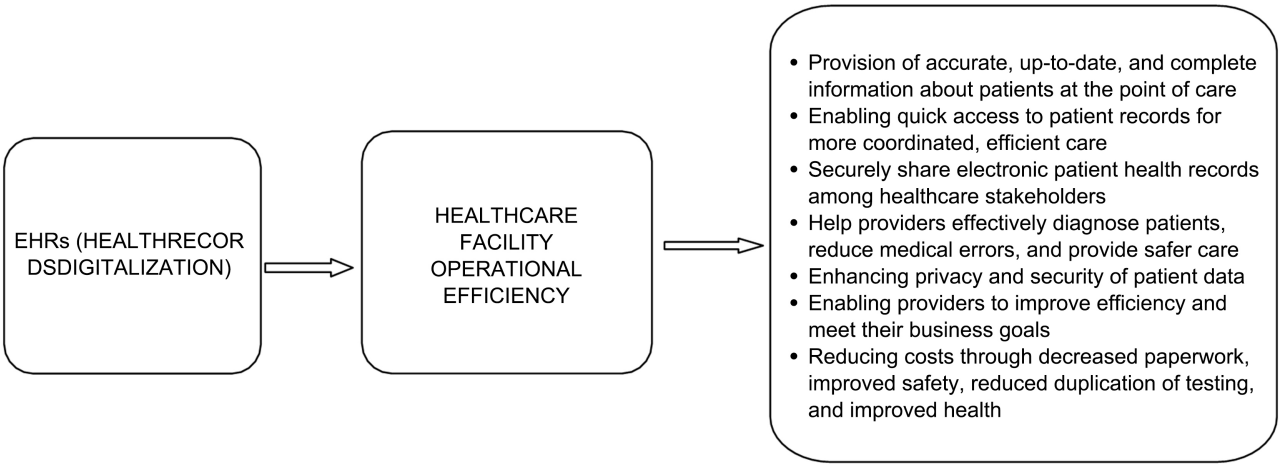

Figure 1. Conceptual framework.

The conceptual framework shows that the introduction of digitized EHRs in healthcare facilities has a direct influence on operational efficiency based on the research premise. Greater access to patient information, faster workflows, fewer documentation errors, and greater communication among healthcare stakeholders all contribute to this impact. Furthermore, numerous implementation obstacles and impediments may influence implementation effectiveness, acting as moderating variables. The research took place in healthcare facilities in Lusaka, Zambia.

The above conceptual framework can be simplified into Equation (1) as follows:

$$\begin{aligned} &\text{Operational Efficiency}\left(\text{OE}\right) \\ &= f\left(\text{EHR Adoption Utilization Effectiveness, Challenges}\right) \end{aligned} \tag{1}$$

where:

- OE represents the operational efficiency in healthcare facilities.
- EHR Adoption is the extent to which EHRs are adopted in healthcare facilities.
- EHR Utilization reflects how EHRs are used in these settings.
- EHR Effectiveness compares the efficacy of EHRs against traditional paper records.
- Challenges denote the barriers in EHR implementation and their impact on efficiency.

This formula encapsulates the core aspects of the conceptual framework, illustrating that operational efficiency in healthcare facilities is a function of these various EHR-related factors.

5. Research Methodology

5.1. Research Design

Orodho & Kombo (2002) further define a research design as the scheme, outline

or plan that is used to generate answers to research problems. The study will adopt a descriptive research design. The mixed methodology approach was used, where both qualitative and quantitative data was obtained. The qualitative method helped to obtain in-depth information whilst the quantitative helped generalize the results. Advantage of mixed methodology is that it reflects participant's point of view. There are various research designs in research such as cross-sectional, longitudinal, descriptive, experimental, observational, exploratory, causal design just to mention a few. The most suitable research design for this study will be the descriptive research design as the study will seek to establish if the factors influencing the adoption of e-services by the informal sector under the Extension of Coverage to the Informal Sector exists between the independent and dependent variables which are Performance Expectancy, Social Influence, Effort Expectancy and Facilitating Conditions.

With the descriptive design, the study can identify the independent and dependent variables, to test units and to randomize participants in the study. This should create representative samples free from bias and thereby reduces sampling error. With this type of design, there is no need to study a whole population, but a sample can be drawn from the population and the results can be inferred to the population. Not only that, but the study will also need to statistically analyse the data.

5.2. Population of the Study

The target population included all health workers working in various health posts within Lusaka and who are using EHRs in their clinical practice during the data collection phase. All health workers will be purposively sampled to participate in the study. The total population for the study is expected to be 243 health care workers, healthcare facility administrators and data entry clerks within Lusaka district at ten public health care facilities using an EHR to administer patient care.

5.3. Sample and Sampling Procedure

Determining the sample sizes involves resource and statistical issues. Usually, researchers regard 100 participants as the minimum sample size when the population is large (Alshibly, 2018). This study will use a sample size of 150 from a population of 243 people in ten public healthcare facilities using an EHR in Lusaka, with a 5% margin of error, 95% confidence level and with a response distribution of 50%. Below is the Equation (2) used to arrive at the sample size:

$$x = Z\left(c/100\right)2r\left(100-r\right) \tag{2}$$

$$\text{Sample size}\left(n\right) = Nx/2 \tag{3}$$

$$\text{Margin of error}\left(E\right) = Sqrt\left[\left(N-n\right)x/n\left(N-1\right)\right] \tag{4}$$

where N is the population size, r is the fraction of responses that you are interested in, and $Z(c/100)$ is the critical value for the confidence level c.

5.4. Data Collection

The type of data collection methods used in this research had a profound influence on the quality of data collected from the respondents. Therefore, in view of the above, this study utilized two major data collection methods: primary and secondary data collection methods. The primary data collection methods involved the use of questionnaires, which were developed through a collaborative process involving subject matter experts in healthcare informatics and operational efficiency. The questionnaire was based on key themes identified in the literature review, ensuring alignment with our research objectives. The study targeted healthcare professionals, administrators, and clerks at ten public healthcare facilities in Lusaka using EHR systems. A stratified sampling method was used, ensuring representation across different roles and experience levels with EHR systems. Facilities were selected based on their adoption stage of EHRs to capture a range of perspectives on digitalization impacts. The questionnaire was administered electronically via email and in-person for those with limited internet access, ensuring broad participation.

In this study, secondary data were meticulously selected from a diverse array of sources to enrich the primary data collected via questionnaires. The selection encompassed peer-reviewed academic journals, comprehensive industry reports, and authoritative government publications from the period 2010 to 2023, with a geographical focus on studies conducted within Zambia and similar healthcare contexts globally. These documents were chosen for their direct relevance to the digitalization of health records and their impact on operational efficiency in healthcare facilities. A thorough content analysis was employed to extract pertinent data, focusing on insights related to the adoption, challenges, and outcomes of EHR implementations.

Primary data from questionnaires were integrated with secondary data from literature to provide a holistic view of EHR impacts on operational efficiency. This mixed-methods approach allowed for a richer analysis, enabling not just the confirmation of trends but also the exploration of nuanced insights into EHR implementation challenges and benefits.

6. Research Results and Analysis

Data analysis involved both quantitative and qualitative methods. Quantitative responses were analysed using Statistical Package for Social Sciences (SPSS version 27) for descriptive and inferential statistics, exploring relationships between EHR adoption levels and perceived operational efficiency. The presentation of the qualitative data findings was conducted utilising the software application Microsoft Excel.

6.1. Demographic Information Analysis

Table 2 provides a crosstabulation of the gender of the respondents and how long they worked at the health facility (in months). Many of the respondents reported to have worked at their respective health facilities for more than 24 months. Of which, out of the 66 that had worked at their health facility, 25 were male and 41 were females. On the other hand, only 22 respondents; 8 males and 14 females, had worked at their health facility for less than 6 months. The range with the lowest number of frequencies was the range from 13 to 18 months, having 14 respondents: 6 males and 8 females.

Table 3 provides a cross tabulation of gender and the age of the respondents. Results show that majority of both genders, were in the 26 - 30 years range, with 21 being male and 39 females. The next age range with the highest frequency of respondents was the range 31 to 35 years, having 15 males and 18 females, giving a total of 33 respondents. While the other ranges, 20 - 25, 36 - 40 and those above 40 years, all had a frequency of 19 respondents falling in each of the ranges.

The respondents were further asked their occupation in their health facility. Figure 2 shows that many of the respondents, 48% of the recorded 150 responses were healthcare professionals (e.g., doctor, nurse, pharmacist). 29% of the respondents were Data Entry Clerks, while 15% were health facility administrators, 3% were counsellors and 2% were peer mentors. The rest of the occupations indicated by the respondents included peer mentors, facility case worker, clinical officer general and peer educators, all had a representation of 1% each.

Table 2. Cross tabulation of Gender*Years worked at health facility.

Variable	Description	Years worked at health facility (in months)					Total
		<6	6 to 12	13 - 18	19 to 24	Above 24	
Gender	Male	8	9	6	6	25	54
	Female	14	18	8	15	41	96
	Total	22	27	14	21	66	150

Table 3. Cross tabulation of Gender*Age.

Variable	Description	Age (in years)					Total
		20 - 25	26 - 30	31 - 35	36 - 40	Above 40	
Gender	Male	7	21	15	7	4	54
	Female	12	39	18	12	15	96
	Total	19	60	33	19	19	150

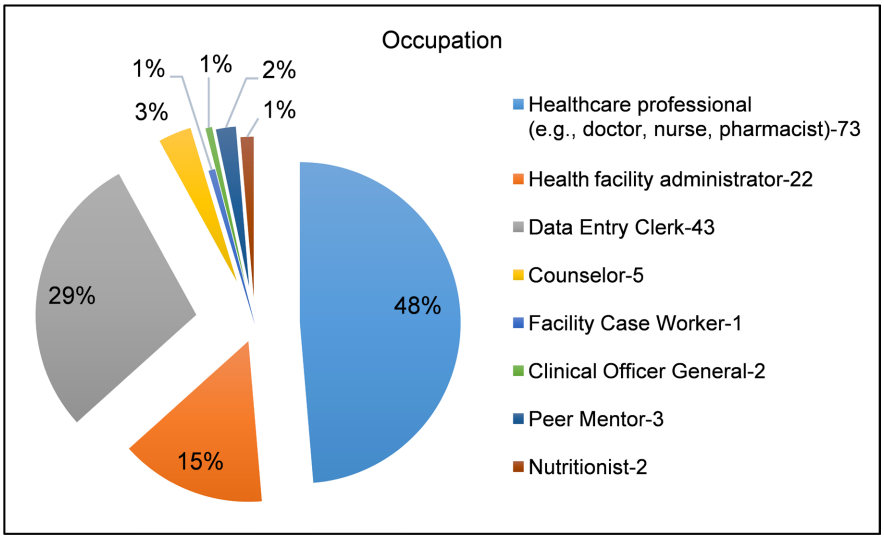

Figure 2. Occupation of respondents.

6.2. Descriptive Statistics

6.2.1. Perceived Impact on Operational Efficiency

In the analysis of the responses (see **Table 4**), it was found that the mean value, exceeding 3, indicates that many respondents expressed agreement with the provided statements. Moreover, the standard deviation, notably smaller than the mean, implies that the data points closely cluster around the mean, signifying low variability in the data.

Furthermore, the examination of responses reveals that all response distributions exhibited negative skewness, denoting that a greater proportion of responses were concentrated toward the lower end of the scale, with fewer at the higher end. In contrast, the kurtosis statistic displayed positive values for all responses, suggesting that the distributions were more peaked and had heavier tails compared to a normal distribution. This observation indicates the potential presence of extreme scores or outliers within the data.

6.2.2. Implementation, Challenges and Barriers

The analysis of responses in this study indicates several key points about the data. Firstly, the mean value of all responses, which was found to be greater than 3, suggests that many respondents agreed with the statements under consideration. Secondly, the examination of the standard deviation revealed that it was considerably smaller than the mean. This indicates that the data points were closely clustered around the mean, signifying low variability within the dataset.

Furthermore, it was observed that all responses exhibited negative skewness, consistent with the findings presented in **Table 5**. This negative skewness, where values are less than 0, implies that a higher proportion of responses fell towards the lower end of the scale, with fewer responses at the higher end.

Lastly, when considering kurtosis statistics, it was noted that some statements had negative kurtosis, while others had positive kurtosis. Negative kurtosis values

Table 4. Description for items on perceived impact on operational efficiency.

Items	Mean	Std. Dev.	Skewness	Kurtosis
Digitized EHRs (e.g., SmartCare) have improved access to patient information	3.71	0.965	−0.986	0.942
Digitized Electronic Health Records (e.g., SmartCare) have made things easier by simplifying how we do tasks	3.74	0.93	−1.081	1.209
The use of digitized Electronic Health Records (e.g., SmartCare) has led to a decrease in mistakes and inaccuracies in documentation.	3.66	0.858	−0.962	0.958
Digitized Electronic Health Records (EHRs), such as SmartCare, have enhanced communication and collaboration among healthcare professionals.	3.63	0.979	−1.12	1.033
Digital Electronic Health Records (EHRs), such as SmartCare, have made it more convenient to access and retrieve patient information.	3.79	0.887	−0.854	0.656

Table 5. Description for items on implementation, challenges and barriers.

Items	Mean	Std. Dev.	Skewness	Kurtosis
A lack of resources (such as funding or technical support) has acted as a barrier to the successful implementation of Electronic Health Records (EHRs)	3.73	0.976	−0.921	0.636
Reluctance among healthcare professionals to embrace changes impacted the adoption of Electronic Health Records (EHRs)	3.59	0.928	−0.563	0.031
Concerns about the security of patient data and the protection of patient privacy were significant obstacles in the implementation of EHRs	3.43	1.12	−0.688	−0.264
Lack of training for staff on EHR systems impacted on the successful implementation of these systems	3.73	0.996	−0.997	0.899
Lack of adequate human resource as impacted the adoption the Electronic Health Systems (EHRs) like SmartCare	3.69	0.942	−0.846	0.531
Difficulties in combining Electronic Health Records (EHR) systems with existing healthcare systems or infrastructure presented obstacles to smooth implementation	3.26	1.096	−0.813	−0.253

(less than 0) suggest a distribution that is flatter and less peaked than a normal distribution, indicating a lack of extreme scores. Conversely, positive kurtosis values (greater than 0) indicate a distribution, that is more peaked and has heavier tails than a normal distribution, suggesting the presence of extreme scores or outliers in the data.

In summary, the analysis of responses in this study highlights the agreement among respondents, low variability in the data, a tendency for responses to be skewed towards the lower end of the scale, and the presence of both flatter and more peaked distributions, depending on the specific statements considered.

6.2.3. Overall Satisfaction and Recommendations

In the analysis of responses (see Table 6), it became evident that the mean value, exceeding 3, signified a predominant agreement among the respondents with the statement. Additionally, examining the standard deviation revealed that it was significantly smaller than the mean, indicating a tight clustering of data points around the mean. Consequently, the dataset was characterized by low variability.

Moreover, the examination of responses unveiled negative skewness across all responses. This negative skewness, falling below 0, implied a concentration of responses toward the lower end of the scale, with fewer responses toward the higher end. The kurtosis statistic also exhibited a negative value, implying a distribution that was less peaked and flatter in comparison to a normal distribution. This observation indicated an absence of extreme scores in the dataset.

7. Summary, Conclusions and Recommendations

7.1. Summary of Findings

The first objective of the study was to assess how widely EHRs are adopted and used in healthcare facilities and their direct impact on operational efficiency.

The study revealed a mixed picture of EHR adoption among healthcare facilities, with varying degrees of integration and utilization. While a significant number of respondents (107) had been using EHRs for more than three years, indicating a group of early adopters, others had only recently adopted the system or had not yet implemented EHRs at all. This suggests a need for further efforts to promote EHR adoption across the healthcare sector.

Table 6. Description for overall satisfaction and recommendations.

Items	Mean	Std. Dev.	Skewness	Kurtosis
Overall, how satisfied are you with the digitized EHR system in terms of improving operational efficiency in your health care facility?	3.35	1.118	−0.326	−0.719

The study also explored the impact of EHR utilization on operational efficiency. Findings indicate that EHRs have the potential to streamline workflows, reduce errors, and enhance patient care. For instance, EHRs can facilitate electronic documentation, improve communication between healthcare providers, and provide real-time access to patient records. However, the full realization of these benefits may depend on factors such as the level of EHR adoption, the quality of EHR implementation, and the training of healthcare providers in EHR use.

The second objective was to analyze the differences in effectiveness between EHRs and traditional paper-based records in healthcare facilities.

The study revealed a mixed pattern regarding the utilization of paper-based and electronic health records. A substantial portion of respondents (101 out of the 150 responses) reported using both systems simultaneously, indicating an ongoing transition towards fully digital records. This hybrid approach suggests the persistence of legacy paper-based systems or a gradual shift to EHRs. Conversely, 35 of respondents adopted EHRs exclusively, demonstrating the effectiveness of electronic records in streamlining healthcare processes. Additionally, 14 respondents were found to be using both paper-based records and EHRs at the same time. This contrast underscores the ongoing evolution of record-keeping practices in healthcare facilities.

The third objective was to evaluate how EHRs affect operational efficiency, focusing on care processes, resource management, and service delivery.

The study revealed a positive perception of EHRs among healthcare professionals, with most participants acknowledging their potential to enhance operational efficiency. Healthcare providers reported improved access to patient information, streamlined task completion, reduced errors and inconsistencies in documentation, enhanced communication and collaboration, and greater convenience in accessing patient data. These perceived benefits align with the anticipated impact of EHRs on operational efficiency.

To further assess the influence of EHRs on operational efficiency, the study examined their impact on care processes, resource utilization, and overall service delivery. Findings indicated that EHRs have contributed to improved care processes through standardized care protocols, clinical decision support tools, and automated reminders. Additionally, EHRs have led to more efficient resource utilization through inventory management systems, patient tracking capabilities, and real-time scheduling tools. Overall service delivery has also benefited from EHRs through enhanced patient engagement, reduced readmission rates, and improved patient satisfaction.

Finally, the fourth objective was to examine the main challenges and barriers to EHR implementation in healthcare facilities and how these affect operational efficiency.

The study revealed several challenges and barriers that impede the adoption and implementation of EHR systems in healthcare facilities, with significant

consequences for operational efficiency. These challenges include resource limitations, resistance to change among healthcare professionals, security and privacy concerns, inadequate staff training, staffing shortages, and integration difficulties. These issues hinder workflow, increase workloads, and strain resources, ultimately leading to reduced efficiency and potential compromises in patient care. To ensure the successful implementation and utilization of EHRs, healthcare facilities must prioritize addressing these challenges. By overcoming these obstacles, healthcare facilities can reap the full benefits of EHRs, including enhanced patient care, improved operational efficiency, and reduced costs.

7.2. Conclusions

In conclusion, a holistic approach that combines resource allocation, training, security measures, change management, staffing considerations, integration planning, continual evaluation, and collaboration is necessary to maximize the benefits of EHR adoption. By addressing these recommendations, healthcare facilities can optimize operational efficiency, improve patient care, and successfully navigate the complexities of EHR implementation.

7.2.1. Recommendations

Based on the findings of the study, a set of recommendations emerges to facilitate the effective adoption and utilization of Electronic Health Records (EHRs) in healthcare facilities:

- **Ensure Adequate Resources and Support:**

1) Allocate sufficient funding and technical support for the successful implementation and ongoing maintenance of EHR systems.

2) Provide healthcare professionals with the necessary tools, infrastructure, and training to effectively utilize EHR systems.

- **Prioritize Data Security and Compliance:**

1) Implement robust security measures, including encryption, access controls, and audit trails, to protect patient data within EHR systems.

2) Adhere strictly to data protection regulations to safeguard patient information and alleviate concerns about data security.

- **Address Staffing Needs and Human Resources:**

1) Assess staffing needs and consider hiring or training additional personnel to support EHR implementation and ongoing system maintenance.

2) Ensure adequate staffing levels, particularly during the initial stages of EHR implementation, to streamline operations and address potential challenges.

- **Foster Effective Change Management:**

1) Engage healthcare staff in decision-making processes related to EHR adoption.

2) Communicate the benefits of EHR implementation transparently to alleviate resistance and foster a culture of acceptance.

3) Identify and involve EHR champions within the organization to promote

the system and encourage its adoption.

- **Plan for Integration and Compatibility:**

1) Assess compatibility with legacy systems and ensure seamless data exchange between different components of the healthcare ecosystem.

2) Develop a robust integration strategy to prevent disruptions during implementation and streamline overall operations.

- **Emphasize Continuous Monitoring and Evaluation:**

1) Regularly seek feedback from healthcare professionals and patients to identify issues and opportunities for improvement.

2) Adopt an iterative approach that ensures EHR systems evolve to meet changing needs and remain user-friendly.

- **Promote Knowledge Sharing and Collaboration:**

1) Encourage knowledge sharing and collaboration among healthcare facilities to expedite the learning curve and address common challenges.

2) Facilitate the exchange of experiences and best practices between facilities with longer EHR usage and those in the early stages of adoption.

3) Create a supportive community where insights are shared, challenges are collectively addressed, and collective learning can thrive.

7.2.2. Limitations of the Study

Sample Size and Generalizability: The study's sample size may be limited, potentially affecting its representativeness. Future research could benefit from larger and more diverse samples to improve the generalizability of findings to a broader range of healthcare facilities and settings.

Self-Reported Data: The study relied on self-reported data from healthcare professionals, which may be subject to bias or inaccuracies. Future studies could incorporate objective measures or data validation to enhance the reliability of the findings.

Cross-Sectional Design: The study employed a cross-sectional design, capturing data at a single point in time. Longitudinal research could provide insights into the evolving nature of EHR adoption and its long-term impact on operational efficiency and patient care.

Regional Variations: The study's findings may be influenced by regional or geographical variations in healthcare practices and resources. Future research could explore how regional disparities affect EHR adoption and its challenges and benefits.

Qualitative Insights: While the study provided valuable quantitative data, qualitative research methods, such as interviews or focus groups, could offer deeper insights into the experiences, perceptions, and motivations of healthcare professionals during EHR adoption.

7.2.3. Recommendations for Future Studies

Longitudinal Research: Future studies should adopt a longitudinal approach to track EHR adoption and its impact over time. This would allow for a more

comprehensive understanding of how EHRs evolve within healthcare facilities and how their effects change over the years.

Comparative Analysis: Comparative studies that examine EHR adoption and its effects in different healthcare systems, countries, or regions can reveal valuable lessons and best practices for overcoming specific challenges and optimizing EHR utilization.

Patient Outcomes: Future research should explore how EHR adoption impacts patient outcomes, safety, and satisfaction. Understanding the direct benefits to patients can further justify the investment in EHR systems.

Healthcare Provider Perspectives: Investigating the perspectives of different healthcare provider roles (e.g., physicians, nurses, administrators) separately can reveal variations in how EHR adoption affects various stakeholders within healthcare facilities.

Cybersecurity and Privacy: Given the growing importance of data security, research should continue to focus on the development and assessment of robust cybersecurity measures within EHR systems to safeguard patient data and address privacy concerns.

Health Equity: Future studies should consider the potential impact of EHR adoption on health equity, including disparities in access to care and health outcomes among different patient populations.

Cost-Benefit Analysis: Conducting cost-benefit analyses can help quantify the financial implications of EHR adoption, considering both initial implementation costs and long-term benefits in terms of operational efficiency and improved patient care.

In conclusion, while the present study provides valuable insights into EHR adoption and its impact on operational efficiency in healthcare facilities, there remain several avenues for future research to build upon and expand our understanding of this dynamic and evolving field.

Acknowledgements

The author acknowledges the willing support of the study participants from healthcare facilities in Lusaka Zambia. The author would also like to acknowledge the support of faculty the Graduate School of Business, and his supervisor Dr. Lubinda Haabazoka.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Abu Raddaha, A. H. (2018). Nurses' Perceptions about and Confidence in Using an Electronic Medical Record System. *Proceedings of Singapore Healthcare, 27,* 110-117. https://doi.org/10.1177/2010105817732585

Ajami, S., & Bagheri-Tadi, T. (2013). Barriers for Adopting Electronic Health Records (EHRs) by Physicians. *Acta Informatica Medica, 21,* 129-134.

Aldosari, B. (2014). Rates, Levels, and Determinants of Electronic Health Record System Adoption: A Study of Hospitals in Riyadh, Saudi Arabia. *International Journal of Medical Informatics, 84,* 330-342. https://doi.org/10.1016/j.ijmedinf.2014.01.006

Aldosari, B. (2018). *Assessment of Factors Influencing Nurses Acceptance of Electronic Medical Record in a Saudi Arabia Hospital.* University for Health Sciences, Riyadh. https://doi.org/10.1016/j.imu.2017.12.007

Alshibly, H. (2018). *Re: How to Calculate Sample Size in Research Work Based on Knowledge and Attitude of Participants?* https://www.researchgate.net/post/How-to-calculate-sample-size-in-research-work-based-on-knowledge-and-attitude-of-participants/5a4b2ba0615e277fd82ab4c4/citation/download

Auriga Press Center (2016). *Digital Transformation: History, Present, and Future Trends*. https://auriga.com/blog/2016/digital-transformation-history-present-and-future-trends/

Bisrat, A., Minda, D., Assamnew, B., & Abegaz, T. (2021). Implementation Challenges and Perception of Care Providers on Electronic Medical Records at St. Paul's and Ayder Hospitals, Ethiopia. *BMC Medical Informatics and Decision Making, 21,* Article No. 306. https://doi.org/10.1186/s12911-021-01670-z

Budd, J., Miller, B. S., Manning, E. M., Lampos, V., Zhuang, M., Edelstein, M., Rees, G. et al. (2020). Digital Technologies in the Public-Health Response to COVID-19. *Nature Medicine, 26,* 1183-1192. https://doi.org/10.1038/s41591-020-1011-4

Chaudhry, B., Wang, J., Wu, S., Maglione, M., Mojica, W., Roth, E. et al. (2006). Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care. *Annals of Internal Medicine, 144,* 742-752. https://doi.org/10.7326/0003-4819-144-10-200605160-00125

Eduhealthsystem (2022). *How Do Electronic Health Records (EHR or EMR) Improve the Quality of Care*. https://www.eduhealthsystem.com/blog/how-do-electronic-health-records-ehr-or-emr-improve-the-quality-of-care/

Evans, R. S. (2016). Electronic Health Records: Then, Now, and in the Future. *Yearbook of Medical Informatics, 25,* S48-S61. https://doi.org/10.15265/IYS-2016-s006

Golinelli, D. et al. (2020). How the COVID-19 Pandemic Is Favouring the Adoption of Digital Technologies in Healthcare: A Literature Review. *MedRxiv*. https://doi.org/10.1101/2020.04.26.20080341

Gumede-Moyo, S. et al. (2019). A Qualitative Inquiry into Implementing an Electronic Health Record System (SmartCare) for Prevention of Mother-to-Child Transmission Data in Zambia: A Retrospective Study. *BMJ Open, 9,* e030428. https://doi.org/10.1136/bmjopen-2019-030428

Hyppönen, H., Saranto, K., Vuokko, R., Mäkelä-Bengs, P., Doupi, P., Lindqvist, M., & Mäkelä, M. (2014). Impacts of Structuring the Electronic Health Record: A Systematic Review Protocol and Results of Previous Reviews. *International Journal of Medical Informatics, 83,* 159-169. https://doi.org/10.1016/j.ijmedinf.2013.11.006

Jabour, A. M. (2020). The Impact of Electronic Health Records on the Duration of Patients' Visits: Time and Motion Study. *JMIR Medical Informatics, 8,* e16502. https://doi.org/10.2196/16502

Katehakis, D. G., & Kouroubali, A. (2021). The EHR as an Instrument for Effective Digital Transformation in the Post COVID-19 Era. In *The Fourth International Workshop*

on Semantic Web Meets Health Data Management (SWH) Co-Located with the 20th International Semantic Web Conference (ISWC 2021) (pp. 8-19). https://ceur-ws.org/Vol-3055/paper1.pdf

Khatri, N. (2015). Effective Implementation of Electronic Medical Records and Health Information Technologies. *Missouri Medicine, 112,* 41-45.

Kondylakis, H. et al. (2020). COVID-19 Mobile Apps: A Systematic Review of the Literature. *Journal of Medical Internet Research, 22,* e23170. https://doi.org/10.2196/23170

McBride, S., Delaney, J. M., & Tietze, M. (2012). Health Information Technology and Nursing. *AJN, 112,* 36-42. https://doi.org/10.1097/01.NAJ.0000418095.31317.1b

McCall, B. (2020). COVID-19 and Artificial Intelligence: Protecting Health-Care Workers and Curbing the Spread. *The Lancet Digital Health, 2,* e166-e167. https://doi.org/10.1016/S2589-7500(20)30054-6

Msukwa, M. K. B. (2021). *User Perceptions on Electronic Medical Record System (EMR) in Malawi*. University of Malawi.

Mweebo, K. (2014). *Security of Electronic Health Records in a Resource Limited Setting: The Case of Smart-Care Electronic Health Record in Zambia*. Edith Cowan University.

Ngugi, P. N. et al. (2021). Users' Perception on Factors Contributing to Electronic Medical Records Systems Use: A Focus Group Discussion Study in Healthcare Facilities Setting in Kenya. https://doi.org/10.21203/rs.3.rs-331806/v1

Orodho, A., & Kombo, D. (2002). *Research Methods*. Kenyatta University.

Policy Monitoring and Research Centre (PMRC) (2023). *PMRC National Budget Analysis 2024*. Policy Monitoring and Research Centre.

Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). Free Press.

Saiod, A. K., Van Greunen, D., & Veldsman, A. (2017). Electronic Health Records: Benefits and Challenges for Data Quality. In S. Khan, A. Zomaya, & A. Abbas (Eds.), *Handbook of Large-Scale Distributed Computing in Smart Healthcare* (pp. 123-156). Springer. https://doi.org/10.1007/978-3-319-58280-1_6

Silwamba, A. (2019). Issues Surrounding Adoption of Electronic Health Records in the Zambia Defence Force: A Case Study of Kalewa Urban Health Centre. *Textile International Journal of Public Health Special Edition, 13*. https://doi.org/10.21522/TIJPH.2013.SE.19.02.Art013

Trist, E. L., Higgin, G. W., Murray, H., & Pollock, A. B. (1963). *Organizational Choice: Capabilities of Groups at the Coal Face under Changing Technologies; the Loss, Re-Discovery and Transformation of a Work Tradition*. Tavistock Publications. (Reissued 1987, New York, NY: Garland)

Trist, E., & Bamforth, K. (1951). Some Social and Psychological Consequences of the Longwall Method of Coal-Getting. *Human Relations, 4,* 3-38. https://doi.org/10.1177/001872675100400101

Uwambaye, P. et al. (2017). Health Care Consumer's Perception of the Electronic Medical Record (EMR) System within a Referral Hospital in Kigali, Rwanda. *Rwanda Journal Series F: Medicine and Health Sciences, 4,* 48-53. https://doi.org/10.4314/rj.v4i1.7F

Vithanophas, V., & Pacharapha, T. (2010). Information Technology Acceptance in Healthcare Service: The Study of Electronic Medical Record (EMR) in Thailand. In *PICMET 2010 Technology Management for Global Economic Growth* (pp. 1-5). IEEE. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5603355&isnumber=5602021

Walker-Czyz, A. (2016). The Impact of an Integrated Electronic Health Record Adoption

on Nursing Care Quality. *The Journal of Nursing Administration, 46,* 366-372. https://doi.org/10.1097/NNA.0000000000000360

Woldemariam, M. T., & Jimma, W. (2023). Adoption of Electronic Health Record Systems to Enhance the Quality of Healthcare in Low-Income Countries: A Systematic Review. *BMJ Health Care Inform, 30,* e100704. https://doi.org/10.1136/bmjhci-2022-100704