

Adoption of Paperless Communication in Promoting Environmental Sustainability: Insights from Marsabit County Teaching & Referral Hospital, Kenya

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Abstract

This study examined the adoption of paperless communication as an eco-friendly practice for promoting environmental sustainability at Marsabit County Teaching and Referral Hospital (MCTRH), Kenya. The study is guided by the Green Information Technology (Green IT) Theory, which emphasizes sustainable ICT practices across their life cycle to promote eco-friendly digital records management and environmental sustainability. A descriptive survey design was employed, targeting hospital staff. Structured questionnaires were administered to 117 respondents, supplemented with key informant interviews picked using stratified random and purposive sampling, respectively, that ensured representation across departments. Validity of the instruments was established through expert review, while reliability was confirmed with Cronbach's alpha values above 0.7. Ethical approval was granted, and informed consent was obtained from participants. Out of the 117 targeted respondents, 114 returned completed questionnaires, yielding a 97% response rate. Quantitative data were analyzed using descriptive statistics (frequencies, percentages, means, and standard deviations), while qualitative insights were thematically analyzed. The results show that respondents strongly acknowledged the role of paperless communication in reducing paper usage, streamlining workflows, and enhancing accessibility. Nevertheless, challenges such as limited ICT infrastructure, inadequate digital literacy, and unstable internet connectivity were identified as barriers to effective adoption. These findings corroborate recent studies highlighting that digital tools reduce environmental footprints while improving operational efficiency. The study concludes that paperless communication holds significant potential for advancing environmental sustainability at MCTRH but requires deliberate support. It recommends the hospital administration to prioritize ICT infrastructure investments, institutionalize policies on paperless communication, and provide regular staff training. Such efforts would enhance both operational efficiency and environmental sustainability outcomes.

Keywords: *Paperless Communication, Digital Records, Environmental Sustainability, ICT infrastructure, Healthcare records management, Kenya*

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1. Introduction

The growing emphasis on environmental sustainability has increased the need for organizations to adopt eco-friendly information management practices. Traditional paper-based systems are costly, inefficient, and environmentally harmful due to deforestation and waste generation. Paperless communication has thus emerged as a transformative solution, employing tools such as electronic documents, digital signatures, automated workflows, and cloud platforms to improve efficiency while reducing reliance on paper (Prasetyo et al., 2020). This shift is also tied to Society 5.0, which promotes technology integration for sustainable development.

Key measurable outcomes of paperless communication include reduced paper consumption, improved workflow efficiency, faster information transfer, and enhanced accessibility. Pandey et al. (2023) observed that these systems lower operational costs, increase productivity, and minimize environmental impacts. In healthcare, where large volumes of records are produced, these outcomes are especially critical. Yousufi (2023) highlighted that cloud-based storage and document management reduce carbon footprints, while Abdekhoda et al. (2024) emphasized that adoption depends on factors such as performance expectancy and organizational readiness. These findings show that paperless communication represents both a technological and socio-technical transformation requiring institutional support.

Globally, paperless systems are increasingly seen as essential to addressing sustainability challenges. Developed nations have invested heavily in digital solutions to enhance efficiency and lower carbon footprints. For example, Hu et al. (2021) demonstrated that in China and Japan, digital visual communication reduced paper use and improved efficiency. Likewise, Enakrire et al. (2024) noted the growth of paperless libraries as part of the Fifth Industrial Revolution, underscoring global momentum toward eco-friendly systems.

In Africa, adoption is growing but hindered by infrastructural and socio-economic barriers such as poor ICT infrastructure, weak internet connectivity, and digital literacy gaps. Still, progress exists. Mncwango (2024) highlighted ICT-driven e-governance as a driver of sustainability, while Erlangga et al. (2023) showed that digital technologies in agriculture enhanced efficiency and reduced paper dependence, lessons applicable to healthcare and governance.

Kenya's experience demonstrates progress alongside persistent challenges. Government initiatives such as Huduma Centres and e-government platforms showcase the potential of digitization for efficiency and sustainability. In healthcare, hospitals are gradually adopting electronic medical records and digital communication systems. However, infrastructure gaps, uneven departmental adoption, and resistance to change remain barriers. Wittenauer et al. (2023) found that electronic immunization registries improved efficiency but required user-friendly designs and staff buy-in, while Nkanata and Ocholla (2023) noted county-level e-government systems improved service delivery but required stronger ICT infrastructure.

This study focuses on Marsabit County Teaching and Referral Hospital (MCTRH), assessing the extent of paperless practice adoption, its cost-saving effectiveness, and its contribution to environmental sustainability. Findings are expected to inform strategies for strengthening eco-friendly practices in healthcare institutions through digital transformation.

1.1 Problem Statement

Despite the growing recognition of digital solutions in promoting sustainability, the adoption of paperless communication at Marsabit County Teaching & Referral Hospital remains inconsistent. Traditional paper-based communication practices continue to dominate in some departments, resulting in unnecessary paper consumption, rising operational costs, and inefficiencies in information sharing. This persistence undermines efforts to reduce the environmental footprint of healthcare operations. While evidence from other contexts highlights the benefits of paperless systems in terms of efficiency and sustainability, there is limited empirical evidence from public hospitals in Kenya, particularly in marginalized regions such as Marsabit. This gap necessitates an investigation into the extent of adoption, challenges, and sustainability implications of paperless communication in this setting.

1.2 Purpose of the Study

The purpose of this study was to examine the adoption of paperless communication as an eco-friendly practice for promoting environmental sustainability at Marsabit County Teaching & Referral Hospital.

1.3 Hypothesis of the Study

H₀: Adoption of paperless communication does not significantly contribute to environmental sustainability at Marsabit County Teaching & Referral Hospital.

H₁: Adoption of paperless communication significantly contributes to environmental sustainability at Marsabit County Teaching & Referral Hospital.

2. Literature Review

2.1 Overview of the literature on Paperless Communication and Environmental Sustainability

This study was guided by the Green Information Technology (Green IT) Theory, which advocates for environmentally sustainable ICT practices across their full life cycle—from planning and design to operations and disposal. The theory is highly relevant as it aligns with eco-friendly digital records management, waste reduction, efficient data handling, and e-waste control, all critical to sustainable healthcare operations (Hernandez, 2020; Singh & Sahu, 2020; Nawi et al., 2024). Its emphasis on governance and organizational structures further supports analysis of policies and practices that influence paperless adoption (Aini & Subriadi, 2022; Huang et al., 2022). Although challenges exist (Kirchner et al., 2024), Green IT provides a robust framework for evaluating current practices and recommending improvements in sustainable records management.

Paperless communication, defined as the shift from paper-based to digital platforms such as electronic documents, signatures, workflows, and collaborative tools, is central to sustainability efforts. Prasetyo et al. (2020) linked it to Society 5.0, where technology drives efficiency and sustainability, with key outcomes including faster communication, reduced paper use, and enhanced accessibility.

Empirical evidence highlights multiple benefits. Pandey et al. (2023) observed cost reduction, higher productivity, and minimized ecological footprints, while Yousufi (2023) emphasized cloud systems for reducing reliance on paper and lowering emissions. Environmental sustainability itself, defined as meeting present needs without compromising future generations

(Ruggerio, 2021), is tracked through indicators such as carbon footprint reduction and renewable energy adoption (Cui et al., 2021; UNEP, 2022). Digitization within records management contributes to these goals by reducing paper, energy use, and waste (Gupta et al., 2021; Böhringer et al., 2021).

Globally, eco-friendly digital practices offer environmental and economic gains. For instance, Ukpoju et al. (2024) reported that U.S. environmental strategies reduced waste while enhancing economic performance. Cultural and societal contexts also shape adoption (Innocent et al., 2024), and Loeb (2024) highlighted challenges in turning awareness into practice in healthcare. Case studies in Turkey and Germany confirmed that digital systems streamline workflows and reduce paper, though legacy practices persist (Unluturk & Utku, 2021; Sayegh et al., 2022).

In Africa, digital adoption is tied to sustainability. Khurshid et al. (2024) found that ICT diffusion lowers CO₂ emissions, while Nathaniel et al. (2021) noted urbanization pressures necessitating green strategies. Yet, Bimir (2020) warned of e-waste risks undermining gains. Erlangga et al. (2023) demonstrated that mobile technologies enhanced efficiency in agriculture, insights transferable to healthcare institutions like Marsabit County Teaching & Referral Hospital.

Kenya faces urgent sustainability challenges due to population growth and urbanization. Green initiatives, such as digital libraries, show promise but face infrastructure and adoption barriers (Mwanzu et al., 2023; Maina et al., 2024). E-government has improved transparency but is hindered by digital literacy and cybersecurity gaps (Esther et al., 2023). In healthcare, digital records reduce paper but require supportive infrastructure, usability, and staff acceptance to succeed (Wittenauer et al., 2023; Otieno et al., 2023). Literature demonstrates that while paperless communication supports sustainability globally and in Kenya, success at Marsabit County Teaching & Referral Hospital depends on overcoming infrastructural, cultural, and e-waste challenges.

3. Methodology

The study employed a descriptive survey research design, integrating both quantitative and qualitative approaches. This design was considered suitable for gathering comprehensive data on practices, perceptions, and implications of paperless communication for environmental sustainability. The target population comprised 117 staff members drawn from various departments at Marsabit County Teaching and Referral Hospital (MCTRH). Out of these, 114 respondents successfully participated, yielding a response rate of 97%, which was deemed sufficient for meaningful analysis. Purposive and stratified random sampling techniques were applied. Purposive sampling was used to select key informants, mainly departmental heads and ICT officers, who were considered critical in providing in-depth insights. Stratified random sampling was applied to the rest of the staff to ensure fair and proportional representation of personnel across different hospital departments. This approach guaranteed diversity of perspectives and minimized sampling bias.

Data collection employed structured questionnaires administered to staff alongside semi-structured interviews with key informants. The questionnaire incorporated a 5-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree) to measure perceptions. To ensure validity, the instruments were reviewed by subject experts and pre-tested among a pilot group of respondents to refine clarity and eliminate ambiguities. Reliability was established using Cronbach's alpha coefficient, with all variables recording

values above the acceptable threshold of 0.7, confirming satisfactory internal consistency. Quantitative data were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations. Qualitative data obtained from interviews were transcribed, coded, and thematically analyzed to triangulate the quantitative findings. Ethical approval for the study was obtained from the relevant review committee, and permission was sought from the hospital administration. Informed consent was obtained from all participants, and confidentiality of responses was strictly maintained.

4. Results and Discussion

4.1 Background Information

Out of 117 distributed questionnaires, 114 were returned fully completed, yielding a 97% response rate. This high response rate enhanced the credibility of the findings. The high response rate ensured that the data collected was both reliable and reflective of the target population. The background information collected focused on the demographic characteristics of the respondents, including education level and work experience, as these factors were considered relevant in influencing perceptions of eco-friendly digital records management practices, as shown in Table 1.

Table 1: Distribution of Respondents by Education Level

Education Level	Frequency (n)	Percentage (%)
Certificate	4	3.5
Diploma	75	65.8
Bachelor’s Degree	34	29.8
Master’s or other mixed degrees	1	0.9
Total	114	100.0

The results in Table 1 indicate that most respondents, 75 (65.8%), possessed diploma qualifications. This dominance highlights the typical academic entry requirement for many professionals within Kenya’s public health sector, especially in areas such as nursing, clinical medicine, and laboratory services. Diploma-trained personnel often serve as frontline workers who are actively engaged in creating, updating, and managing patient records, making them central actors in the hospital’s transition to environmentally friendly digital records management. The next largest group consisted of respondents with bachelor’s degrees, numbering 34 (29.8%). This category likely includes medical officers, specialized clinicians, and administrative staff whose broader academic exposure may influence their understanding of sustainability concepts and willingness to adopt digital innovations.

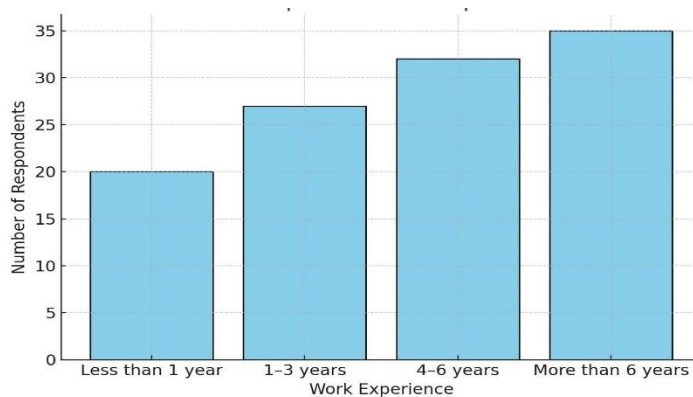
Those with certificate qualifications were only 4 (3.5%), probably representing auxiliary or support staff whose role in records management is largely operational rather than strategic. The

smallest group, comprising just 1 respondent (0.9%), held a master's or other advanced mixed degree. Despite their limited representation, such individuals are important as they may occupy leadership or specialized positions capable of shaping policies on sustainable records management. The variety in academic qualifications demonstrates that the study captured perspectives from different levels of professional expertise, echoing the argument by Sibandze et al. (2018) that diverse educational backgrounds are instrumental in fostering awareness and integrating professional values into practice. This diversity is critical in evaluating how levels of education influence staff attitudes toward the adoption and implementation of eco-friendly records management systems.

4.2 Work Experience

Respondents were asked to indicate the number of years they had served at the County Teaching and Referral Hospital, and their work experience levels varied as presented in Figure 1. The summary highlights the diversity in length of service among participants, reflecting a combination of both newly recruited and long-serving staff. This blend enriches the data by providing a balance between innovative perspectives from newer employees and the institutional knowledge held by more experienced personnel.

Figure 1: Distribution of Respondents by Work Experience



As shown in Figure 1, the largest segment of respondents was those with more than six years of service, totaling 35 participants (30.7%). This substantial proportion of long-serving employees reflects a depth of institutional knowledge and experience with the progression of records management systems at Marsabit County Teaching & Referral Hospital. These findings resonate with Choi (2021), who emphasized that experienced staff are often more effective in executing organizational roles due to their comprehensive understanding of client needs developed over years of service. Such staff members are also more likely to have directly observed the shift from paper-based approaches to digital methods, equipping them with valuable insights into both the benefits and challenges of adopting eco-friendly digital records systems. The second largest group consisted of employees with four to six years of experience, accounting for 32 respondents (28.0%), suggesting that many staff have attained considerable professional stability while remaining open to new technological innovations.

Those with one to three years of work experience represented 27 respondents (23.7%), reflecting a notable share of early-career professionals. This group likely brings fresh perspectives and stronger adaptability to technological tools, particularly those that support sustainable practices. Meanwhile, the smallest category included staff with less than one year

of experience, making up 20 respondents (17.5%). Although relatively new to the hospital environment, these individuals provide useful insights on how easily new employees can be integrated into existing digital systems and sustainability initiatives.

Overall, the distribution of work experience across all groups demonstrates a mix of long-tenured professionals and newer entrants, allowing the study to capture a balanced view of how eco-friendly records management practices are adopted and perceived across different levels of experience within the hospital.

The background results suggest that the respondents represented a diverse workforce in terms of education and experience. Such diversity provided a balanced view of perceptions toward paperless communication and environmental sustainability. Staff with higher education and longer work experience may bring deeper insights into operational challenges and opportunities, while younger employees or those with shorter tenure may offer fresh perspectives on the integration of digital technologies.

4.3 Descriptive Results on the Adoption of Paperless Communication

The descriptive results on paperless communication practices are presented in Table 2. Respondents were asked to indicate their level of agreement with various statements related to paperless communication and its role in promoting environmental sustainability.

Table 2: Responses on the Adoption of Paperless Communication

Statement	SD	D	N	A	SA	F	%	Mean	Std. Dev.
The Marsabit County Teaching & Referral Hospital has significantly adopted paperless communication.	6 (5.3%)	21 (18.4%)	23 (20.2%)	48 (42.1%)	16 (14.0%)	114	100	3.412	1.104
Paperless communication can lead to cost savings for the Marsabit County Teaching & Referral Hospital.	9 (7.9%)	2 (1.8%)	8 (7.0%)	63 (55.3%)	32 (28.1%)	114	100	3.939	1.067
Paperless communication can positively impact the environment.	7 (6.1%)	2 (1.8%)	8 (7.0%)	59 (51.8%)	38 (33.3%)	114	100	4.044	1.017

The results presented in Table 2 indicate a generally favorable view of paperless communication within Marsabit County Teaching & Referral Hospital. Regarding the statement that the hospital has substantially embraced paperless communication, 64

respondents (56.1%) either agreed or strongly agreed, 23 (20.2%) remained neutral, while 27 (23.7%) expressed disagreement ($M = 3.41$, $SD = 1.10$). The highest level of agreement emerged in relation to cost reduction, with 95 respondents (83.4%) concurring that paperless communication helps minimize expenses, compared to only 11 (9.7%) who disagreed ($M = 3.94$, $SD = 1.07$). Likewise, 97 respondents (85.1%) agreed or strongly agreed that the practice has positive environmental implications, while 9 (7.9%) disagreed and 8 (7.0%) were neutral ($M = 4.04$, $SD = 1.02$). These findings are consistent with the observations of Prasetyo et al. (2020), who found that the adoption of paperless systems improves efficiency and contributes to sustainability in both healthcare and education contexts.

Insights from interviews further elaborated on the realities of implementation. Several staff members explained that digital tools such as WhatsApp groups and email have reduced the use of printed memos, though departmental disparities remain. One respondent remarked that *“Nursing often circulates memos electronically, but the administration still requires some paper notices.”* Another emphasized that reduced printing and photocopying have already resulted in considerable cost savings. These perspectives resonate with Unluturk and Utku (2021), who reported that hospitals in Turkey achieved notable reductions in paper use through digital communication platforms, though lingering reliance on traditional methods hindered full transition.

Overall, the combination of quantitative and qualitative findings shows that paperless communication at Marsabit County Teaching & Referral Hospital has been partially embraced but is inconsistently applied across departments. Staff broadly recognize its financial and environmental value, yet established routines and uneven adoption restrict its effectiveness. Previous studies highlight that successful implementation demands not only adequate infrastructure but also institutional enforcement and user adaptation. For Marsabit, this suggests the importance of developing formal communication policies, expanding staff capacity building, and embedding digital practices in daily operations to optimize benefits. In line with this, Sayegh et al. (2022) demonstrated that digital communication technologies in healthcare enhanced efficiency while reducing paper dependence, thereby reinforcing sustainability outcomes.

The results align with earlier findings that paperless communication fosters eco-friendly practices in healthcare institutions. Susanto F. et al (2021) emphasized that the utilization of paperless systems reduces paper usage and enhances information efficiency. Similarly, Tatlı et al. (2024) observed that user acceptance and organizational support are key determinants of successful adoption. These corroborations suggest that while MCTRH is making progress, investments in infrastructure, digital literacy, and policy frameworks are crucial to achieving sustainable outcomes.

5. Conclusion

The study concludes that paperless communication has significant potential to promote environmental sustainability at Marsabit County Teaching and Referral Hospital. Most respondents agreed that paperless practices reduce paper consumption, improve workflow efficiency, and enhance accessibility. However, infrastructural challenges, digital literacy gaps, and limited organizational support hinder uniform adoption. Addressing these gaps is key to maximizing the benefits of paperless communication.

6. Recommendations

The study recommends that the hospital administration should prioritize investment in ICT infrastructure and reliable internet connectivity to support the smooth adoption of paperless communication systems. The Hospital Administration should organize regular training and capacity building for staff to enhance digital literacy and foster acceptance of digital workflows. In addition, they need to develop clear policies to institutionalize paperless communication across all hospital departments, ensuring consistency and sustainability in practice. Finally, the government and other stakeholders are urged to provide the necessary resources and support to enable the hospital to implement and sustain environmentally friendly digital communication practices.

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