

Evaluating the Effectiveness of Renewable Energy in a Hospital Setting: Basis for Enhancement Development Plan

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ABSTRACT:

Reliable electricity is essential for hospitals because healthcare services depend on an uninterrupted power supply. This study evaluated the effectiveness of the renewable energy system implemented in a selected government hospital in Jolo, Sulu, Philippines, using the Technology Acceptance Model (TAM). A quantitative descriptive-correlational design was employed, involving 185 hospital personnel selected through purposive sampling. Data were analyzed using frequency, percentage, weighted mean, standard deviation, and Pearson Product-Moment Correlation. The renewable energy system was generally perceived as effective (grand mean = 3.33), with perceived usefulness rated Strongly Agree (3.47) and perceived ease of use rated Agree (3.20). Educational attainment, age, job title, and years of service were significantly associated with respondents' perceptions, while gender was not. The findings served as the basis for an Enhancement Development Plan to strengthen the implementation of renewable energy in hospitals.

Keywords: renewable energy, hospital administration, Technology Acceptance Model, perceived usefulness, perceived ease of use, sustainable healthcare

INTRODUCTION

Reliable electricity is essential for hospitals, particularly in geographically isolated areas such as Jolo, Sulu, where unstable power can disrupt healthcare services. Solar photovoltaic (PV) systems have become practical solutions for improving energy reliability; however, studies evaluating their effectiveness from the perspective of hospital personnel remain limited, especially in government hospitals.

Guided by the Technology Acceptance Model (TAM) developed by Davis (1989), this study evaluated the effectiveness of the renewable energy system implemented in a selected government hospital in Jolo, Sulu. It assessed hospital personnel's perceptions of perceived usefulness and perceived ease of use and examined their relationship with respondents' demographic characteristics. The findings served as the basis for an Enhancement Development Plan.

Statement of the Problem

This study evaluated the effectiveness of the renewable energy system implemented in the selected government hospital in Jolo, Sulu. Specifically, it sought to answer the following:

1. What is the demographic profile of the respondents in terms of:

- (a) age; (b) gender; (c) educational attainment; (d) job title; and (e) years of service?
2. What is the level of effectiveness of the renewable energy system in terms of: (a) perceived usefulness; and (b) perceived ease of use?
3. Is there a significant relationship between the respondents' demographic profile and their perceptions of the effectiveness of the renewable energy system?
4. What Enhancement Development Plan may be proposed based on the findings of the study?

Scope and Delimitations

This study evaluated the effectiveness of the renewable energy system implemented in a selected government hospital in Jolo, Sulu. It focused on hospital personnel's perceptions based on the Technology Acceptance Model (TAM), specifically perceived usefulness and perceived ease of use. The respondents consisted of 185 hospital personnel selected through purposive sampling. The study excluded the technical, engineering, and financial evaluation of the renewable energy system and instead used users' perceptions to develop an Enhancement Development Plan.

Review of Related Literature

Reliable electricity is essential for healthcare delivery because hospitals depend on continuous power to provide critical services. The World Health Organization (2023) emphasizes that dependable electricity ensures uninterrupted patient care, particularly during emergencies. Solar photovoltaic (PV) systems improve energy reliability, reduce operating costs, and support environmental sustainability (Al-Rawi et al., 2023; Soto et al., 2022).

According to the Technology Acceptance Model (Davis, 1989), users are more likely to adopt technologies they perceive as useful and easy to use. However, studies on hospital personnel's perceptions of renewable energy systems remain limited, particularly in government hospitals in geographically isolated areas. This study addressed this gap by evaluating users' perceptions as the basis for an Enhancement Development Plan.

Theoretical Framework

This study was anchored on the Technology Acceptance Model (TAM) developed by Davis (1989), which explains that technology acceptance is primarily influenced by perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which users believe that a technology improves their job performance, while perceived ease of use refers to the degree to which they believe the technology is easy to understand and operate.

In this study, TAM served as the framework for evaluating hospital personnel's perceptions of the renewable energy system implemented in the selected government hospital in Jolo, Sulu. The model guided the interpretation of the findings and the development of the proposed Enhancement Development Plan.

Conceptual Framework

The conceptual framework illustrates the relationship between the respondents' demographic characteristics (age, gender, educational attainment, job title, and years of service) and their perceptions of the renewable energy system based on the Technology Acceptance Model. The dependent variables were perceived usefulness and perceived ease of

use, while the findings served as the basis for developing the proposed Enhancement Development Plan.

METHODOLOGY

This quantitative descriptive-correlational study evaluated the effectiveness of the renewable energy system in a selected government hospital in Jolo, Sulu using hospital personnel's perceptions and demographic characteristics.

Research Design

This study employed a quantitative descriptive-correlational research design to evaluate the effectiveness of the renewable energy system implemented in a selected government hospital in Jolo, Sulu. The descriptive component assessed hospital personnel's perceptions of the system in terms of perceived usefulness and perceived ease of use, while the correlational component examined the relationship between respondents' demographic characteristics and their perceptions.

Research Steps

The study began with the identification of the research problem and review of related literature. A structured questionnaire based on the Technology Acceptance Model (TAM) was validated by experts and administered to qualified hospital personnel through purposive sampling after institutional approval. The retrieved questionnaires were coded, analyzed, and interpreted to form the basis for the proposed Enhancement Development Plan.

Data Collection and Sample Selection

The respondents consisted of 185 hospital personnel from a selected government hospital in Jolo, Sulu, selected through purposive sampling based on their familiarity with the renewable energy system. Data were collected using a structured questionnaire adapted from the Technology Acceptance Model (TAM). The instrument included respondents' demographic characteristics and measures of perceived usefulness and perceived ease of use using a four-point Likert scale. Prior to data collection, the questionnaire underwent expert validation to establish content validity.

Data Analysis Methods

The data were analyzed using descriptive and inferential statistics. Frequency and percentage summarized the respondents' demographic characteristics, while weighted mean and standard deviation determined the effectiveness of the renewable energy system. The Pearson Product-Moment Correlation Coefficient was used to examine the relationship between respondents' demographic characteristics and their perceptions at the 0.05 level of significance.

Research Hypotheses and Validation

The study tested the null hypothesis that no significant relationship exists between respondents' demographic characteristics and their perceptions of the effectiveness of the renewable energy system. The hypothesis was tested using the Pearson Product-Moment

Correlation Coefficient at the 0.05 level of significance. The questionnaire underwent expert validation before administration to ensure its clarity, relevance, and content validity.

Study Limitations and Ethical Considerations

This study was limited to evaluating hospital personnel's perceptions of the renewable energy system in a selected government hospital in Jolo, Sulu using the Technology Acceptance Model (TAM). It did not assess the system's technical, engineering, or financial performance. Ethical standards were observed by obtaining institutional approval and informed consent from all respondents. Participation was voluntary, and respondents' confidentiality and anonymity were maintained throughout the study.

RESULTS AND DISCUSSION

A total of 185 hospital personnel participated in the study, including physicians, nurses, midwives, engineering and administrative staff, and other employees. Most respondents were 26–33 years old, male, had attained college-level education, and had 6–10 years of service, providing a diverse perspective in evaluating the hospital's renewable energy system.

The system was generally perceived as effective, with a grand mean of 3.33 (Strongly Agree). Perceived usefulness obtained a weighted mean of 3.47 (Strongly Agree), indicating that respondents recognized its contribution to improving hospital operations, particularly in enhancing personnel productivity and supporting the performance of medical equipment. Perceived ease of use obtained a weighted mean of 3.20 (Agree), suggesting that respondents generally found the system understandable and manageable in daily operations, although continuous orientation and technical support may further enhance user confidence.

Correlation analysis showed that educational attainment, age, job title, and years of service had significant, weak positive relationships with respondents' perceptions of the renewable energy system, indicating that professional background and work experience influenced technology acceptance. In contrast, gender showed no significant relationship, suggesting that male and female personnel perceived the system similarly.

Overall, the findings indicate that hospital personnel considered the renewable energy system both useful and relatively easy to use, supporting the Technology Acceptance Model (TAM). The results further emphasize the importance of continuous training, technical support, and regular system maintenance to strengthen the sustainable implementation of renewable energy technologies in healthcare facilities.

SUMMARY

This study evaluated the effectiveness of the renewable energy system implemented in a selected government hospital in Jolo, Sulu, using the Technology Acceptance Model (TAM). The findings showed that hospital personnel generally perceived the system as effective in terms of perceived usefulness and perceived ease of use. The results also indicated the need for continuous orientation and technical support to strengthen user acceptance and system utilization.

CONCLUSION

The study found that educational attainment, age, job title, and years of service were significantly associated with respondents' perceptions of the system, while gender did not. Overall, the findings demonstrate that renewable energy systems can effectively support hospital operations when complemented by personnel development, technical support, and continuous monitoring. The proposed Enhancement Development Plan provides practical strategies to strengthen the implementation of renewable energy in government hospitals.

RECOMMENDATIONS

Based on the findings, the following are recommended:

1. Training and Capacity Development Program
2. Strengthening Technical Support and Maintenance Systems.
3. System Optimization and Integration Enhancement
4. Awareness and Sustainability Promotion Program.
5. Policy Development and Administrative Support.
6. Continuous Monitoring and Evaluation.

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AI DECLARATION

Artificial intelligence tools were used to assist with language editing and manuscript organization. The research design, data collection, analysis, interpretation of findings, and conclusions are solely the responsibility of the author.

REFERENCES

- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
<https://doi.org/10.2307/249008>
- Al-Rawi, O. F., Bicer, Y., & Al-Ghamdi, S. G. (2023). Sustainable solutions for healthcare facilities: Examining the viability of solar energy systems. *Frontiers in Energy Research*, 11, Article 1220293. <https://doi.org/10.3389/fenrg.2023.1220293>
- Lemence, A. L. G., & Tamayao, M. A. M. (2021). Solar energy adoption in Philippine health units. *Renewable Energy*, 178, 1200–1211.
- Soto, E. A., Hernandez-Guzman, A., Vizcarrondo-Ortega, A., McNealey, A., & Bosman, L. B. (2022). Solar energy implementation for healthcare facilities in developing

and underdeveloped countries: Overview, opportunities, and challenges. *Energies*, 15(22), Article 8602. <https://doi.org/10.3390/en15228602>

World Health Organization. (2023). Energizing health: Accelerating electricity access in healthcare facilities. World Health Organization.