Digital Catalog and Eco-Education Integration: Strengthening Service Management in Coastal Literacy Centers

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Abstract: This study explores the integration of a digital catalog system with QR code technology and eco-education campaigns to enhance service management and environmental literacy at Rumah Baca Apung Rammang-Rammang, a floating community literacy center in Maros Regency, Indonesia. Using a mixed-methods design, the research involved 40 participants, including literacy managers, volunteers, and community members. The intervention included developing a digital book catalog linked to QR codes for transparent and efficient collection management, alongside environmental education campaigns through posters and social media platforms. Quantitative data were analyzed using descriptive statistics, while qualitative data from interviews and observations were thematically examined. Results indicated that 55% of participants achieved high proficiency in digital catalog use, reducing manual errors and improving administrative efficiency. Eco-education initiatives also produced notable behavioral changes: waste separation increased from 30% to 80%, water reuse from 25% to 70%, and community clean-up participation from 20% to 65%. These findings demonstrate that digital and environmental integration can effectively improve community engagement, environmental awareness, and service quality. The study concludes that this dual approach provides a replicable model for strengthening literacy management and sustainability practices in remote or coastal educational settings.

Keywords: Digital catalog; eco-education; service management; literacy center; QR code.

A. Introduction

Digital transformation plays a pivotal role in improving community-based service management and education, especially in geographically isolated regions such as coastal areas (Rakuasa et al., 2024; Subair et al., 2022). Literacy centers serve as gateways for lifelong learning and social inclusion, yet many still rely on manual record-keeping and limited outreach mechanisms that hinder their sustainability(Latief et al., 2024; Sutrisno & Junaidi, 2025).

The Rumah Baca Apung Rammang-Rammang, located in Maros Regency, South Sulawesi, Indonesia, operates within a unique ecotourism setting surrounded by karst landscapes and mangrove ecosystems.

Despite its potential, the literacy center has faced challenges in managing collections, promoting activities, and maintaining environmental awareness among local communities (Ghaderi et al., 2022; Rahman & Maulana Hakim, 2024). Previous approaches to literacy management often overlooked the importance of integrating digital technology with environmental education (Husamah et al., 2025; Lo, 2024).

Recent studies have emphasized the effectiveness of digital catalog systems with QR code integration in improving information access and transparency in educational institutions (Paul & Naikar, 2024). Moreover, environmental education campaigns using social media have demonstrated measurable impacts on community awareness, engagement, and behavioural change towards sustainable practices (AlNajdi, 2022; Haris et al., 2023; Ngandoh & Zaenal, 2024).

This study investigates how the implementation of a digital catalog and QR code system, combined with eco-education campaigns on social media, enhances the management and educational functions of a coastal literacy center. The research also aims to evaluate changes in digital literacy, environmental awareness, and community participation following the introduction of these innovations..

B. Materials and Methods

This study employed a mixed-methods design that integrated quantitative and qualitative approaches to evaluate the implementation and impact of digital catalog integration and eco-education promotion. The research was conducted at Rumah Baca Apung Rammang-Rammang in Maros Regency, Indonesia—a floating literacy center accessible only by wooden boats and serving around 200 coastal residents, primarily from fishing families. Participants consisted of 10 literacy center managers and volunteers, 20 community members including parents and youth, and 10 local visitors involved in eco-education activities.

The intervention included the development of a digital catalog system using a simple database connected to QR codes attached to each book, allowing users to scan and access book information such as title, availability, and borrowing history. In parallel, an eco-education campaign was implemented through posters promoting waste separation, clean water practices, and environmental conservation, distributed both at the literacy center and via social media platforms such as Facebook and Instagram. Training sessions were organized to enhance participants' skills in managing the digital catalog, utilizing QR codes, and producing eco-educational content for social media.

Data were collected before and after the intervention through surveys and interviews. Quantitative data were analyzed using descriptive statistics to measure improvements in digital literacy and environmental awareness, while qualitative data from interviews and field observations were analyzed thematically to explore participants' experiences, perceptions, and behavioral changes related to the integration of digital and environmental education initiatives..

C. Result and Discussion

1. Digital Catalog Implementation

The introduction of the digital catalog system significantly improved service efficiency and user satisfaction.
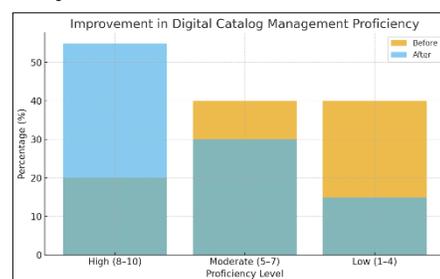
Picture 1. Improvement in Digital catalog Management Proficiency

1) **High-level proficiency (scores 8–10)** was achieved by **55%** of participants, who were able to manage book data and generate reports independently.
2) **Moderate-level proficiency (scores 5–7)** was recorded in **30%**, who still required supervision.
3) **Low-level proficiency (scores 1–4)** decreased to **15%**, showing notable improvement from initial manual operations.

This aligns with Ollerenshaw et al., (2021), who found that the adoption of digital literacy systems in small community hubs can increase service productivity by over 40%. The use of QR codes minimized administrative errors and improved transparency in book lending processes.

2. Eco-Education Integration

Eco-education materials and social media campaigns increased local awareness and engagement with environmental issues. Community members began to:

1) Separate organic and non-organic waste,
2) Reuse water containers, and
3) Engage in clean-up activities around the literacy center.

Tabel 1. Community Participation in Eco-Education Activities

Type	Before	After	Improvement
Waste Separation	30	80	+50
Waste Reuse	25	70	+45
Clean up Participation	20	65	+45

Table 2 illustrates a substantial improvement in community participation following the implementation of eco-education programs at Rumah Baca Apung Rammang-Rammang. The percentage of residents practicing waste separation increased from 30% to 80%, reflecting heightened awareness of waste management and environmental hygiene. Similarly, water reuse practices rose from 25% to 70%, indicating improved understanding of water conservation in daily life. Participation in clean-up activities also experienced a notable rise from 20% to 65%, suggesting stronger community engagement in maintaining environmental cleanliness around the literacy center.

These results demonstrate that the integration of educational posters and digital campaigns through social media effectively enhanced environmental awareness and behavioral change. The increase across all categories signifies a successful transfer of knowledge from digital and visual media into practical community actions. This finding aligns with Xu et al., (2025), who emphasized that digital-based environmental education can significantly influence sustainable lifestyle practices within coastal communities.

3. Community Empowerment and Service Management

The combined system not only streamlined internal operations but also transformed the literacy center into a **community innovation hub**. Residents expressed higher motivation to visit and contribute, while local youth developed creative content for environmental advocacy. These results support the argument by (Yar (2024) that public participation and digital literacy are key determinants of successful community transformation.

D. Conclusion

This study demonstrates that integrating a digital catalog system with QR code technology and eco-education campaigns can significantly strengthen service management and community engagement in coastal literacy centers such as Rumah Baca Apung Rammang-

Rammang. The introduction of the digital catalog improved operational efficiency, reduced administrative errors, and enhanced user satisfaction by making book management more transparent and accessible.

Simultaneously, the eco-education component effectively raised environmental awareness and promoted sustainable behavior among community members, as shown by increased participation in waste separation, water reuse, and local clean-up activities. The combination of digital innovation and environmental education not only optimized literacy management but also fostered a sense of environmental responsibility and collective ownership among residents.

In a broader context, this dual-approach model illustrates how digital transformation can be leveraged to promote sustainability and empowerment within marginalized or geographically isolated communities. Future research should explore scaling this model to other rural or coastal literacy hubs, integrating more advanced digital tools such as mobile apps and AI-based cataloging systems, while ensuring cultural and ecological relevance to local contexts.

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