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Optimizing Rumpon-Based Green Human Resource Management to Improve Fishermen's Quality of Life: The Role of Digital Literacy toward Sustainable Development

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Abstract

Abstract: *This research aims to examine the influence of rumpon-based Green Human Resource Management (GHRM) practices on fishermen's quality of life in Majene Regency, emphasizing the mediating and moderating role of digital literacy within the framework of sustainable development. A quantitative approach was applied using a survey of 395 fishermen, analyzed through the Partial Least Squares Structural Equation Modeling (PLS-SEM) method.The findings reveal that: (1) Rumpon-based GHRM significantly and positively affects fishermen's quality of life and marine ecosystem sustainability; (2) Digital literacy has a positive impact on fishermen's well-being; (3) Digital literacy mediates the relationship between GHRM and quality of life; and (4) Digital literacy strengthens the link between GHRM practices and marine ecosystem sustainability. These results highlight that integrating environmentally conscious HRM practices with digital literacy grounded in local wisdom provides an effective pathway for improving fishermen's welfare while ensuring the conservation of coastal ecosystems.*

Keywords*: green HRM, digital literacy, rumpon, quality of life, sustainability*

1. INTRODUCTION

The fisheries sector serves as the economic backbone of coastal communities in Majene Regency, West Sulawesi. Most residents depend on marine resources, particularly through the use of rumpon, a traditional fish-aggregating device rooted in local wisdom. However, the uncontrolled increase in fishing activities, combined with limited adaptation to technological advancement, has led to new challenges—specifically, the overexploitation of marine resources and the stagnation of fishermen's welfare. The paradigm shift toward sustainable development calls for a human resource management model that emphasizes not only productivity but also ecological responsibility. One relevant approach is Green Human Resource Management (GHRM), which integrates environmentally friendly principles into recruitment, training, performance evaluation, and incentive systems (Renwick et al., 2013). In the context of fishing communities, the implementation of rumpon-based GHRM is believed to enhance fishing efficiency without degrading marine ecosystems. Furthermore, the rise of digital technologies presents new opportunities for improving fishermen's livelihoods. Through digital literacy, fishermen can access real-time information related to market prices, weather forecasts, and government policies (Nikou et al., 2019). Rumpon, as a traditional fishery tool used by the Mandar ethnic group, holds strong cultural and ecological significance. Integrating Green HRM practices with local wisdom can encourage fishermen to adopt environmentally responsible fishing techniques while leveraging digital literacy to enhance their access to information on markets and aquaculture methods. Access to digital technology, in turn, improves operational efficiency and effectiveness (Ahmad K & Parawansa DAS, 2019). Digital literacy refers to the capability to obtain, understand, and utilize information from various digital sources (Haeikal, 2021).

This study is crucial because it offers new insights into how environmentally oriented human resource management can be adapted within local cultural contexts and integrated with digital technologies. Such integration contributes to the creation of sustainable livelihood strategies and improved welfare among fishermen (Adhiana et al., 2023). Moreover, the study aims to provide practical policy recommendations for local governments to promote sustainable coastal development (Hari et al., 2024). However, preliminary observations indicate that most fishermen in Majene have not yet fully utilized digital technology. In reality, digital literacy can act as a catalyst that enhances the impact of GHRM on both quality of life and environmental sustainability.

Based on these considerations, the research seeks to address the following questions:

1. How does the implementation of rumpon-based Green HRM improve the quality of life among fishermen in Majene Regency?
2. What are the key factors in integrating digital literacy into Green HRM practices for fishermen?
3. How does this integrated strategy affect marine ecosystem sustainability?

2. LITERATURE REVIEW

Green Human Resource Management (GHRM) Green Human Resource Management integrates environmental principles into HR policies and practices such as recruitment, training, performance evaluation, and rewards (Renwick et al., 2013). Within the context of rumpon-based fisheries in Majene Regency, GHRM reflects a synergy between local wisdom and sustainable HR practices. Guided by the Resource-Based View (RBV) (Barney, 1991), unique local resources—such as eco-friendly fishing practices—can provide a sustainable competitive advantage. Empirical findings indicate that GHRM enhances both employee performance and environmental awareness (Budiono et al., 2025; Mandasari et al., 2023), suggesting that its adaptation in traditional fishing communities may improve both productivity and ecological balance. Digital literacy refers to individuals' ability to access, evaluate, and utilize information through digital technologies

(UNESCO, 2018). In coastal communities, it enables fishermen to access market data, monitor weather conditions, and connect with government information systems. Studies by Nikou et al. (2019) and Prakoso et al. (2024) demonstrate that digital skills significantly improve the operational performance and competitiveness of small enterprises. In the context of GHRM, digital literacy acts as an enabling capability that strengthens the effectiveness of green practices toward sustainability outcomes.

Quality of life encompasses well-being dimensions such as income stability, job security, and access to basic services (Diener et al., 2010). According to the Sustainable Livelihood Framework (Chambers & Conway, 1992), livelihood sustainability is achieved when human, natural, and social capitals are effectively utilized. Studies in coastal regions (Hasnita & Athaillah, 2022) highlight that technological access and environmentally friendly practices play crucial roles in improving fishermen's welfare. Sustainable development emphasizes the harmony between economic growth, social inclusion, and environmental preservation (Hari et al., 2024). The integration of green HR practices and digital literacy supports this equilibrium by promoting efficiency and conservation simultaneously (Soni et al., 2023).

Empirical Foundation, prior studies substantiate the relevance of these constructs: (1) GHRM positively influences sustainability-oriented performance (Anis et al., 2024; Heriyanti et al., 2023); Digital literacy enhances socio-economic empowerment and strengthens the effectiveness of environmental management (Nikou et al., 2019; Haeikal, 2021); (2) Organizational support and eco-culture reinforce green behavioral outcomes (Mawarni & Rastitiati, 2023); (3) These findings collectively establish that GHRM and digital literacy jointly foster fishermen's quality of life and marine ecosystem sustainability.

Model Development and Hypotheses

Drawing from the RBV, AMO theory (Jabbour & de Sousa Jabbour, 2016), and Sustainable Livelihood Framework, this study proposes that rumpon-based GHRM directly enhances both fishermen's quality of life and sustainable development, while digital literacy mediates and moderates these relationships.

H1:Rumpon-based GHRM positively affects fishermen's quality of life;
H2:Digital literacy positively affects fishermen's quality of life;
H3:Digital literacy mediates the relationship between GHRM and quality of life;
H4:Rumpon-based GHRM positively affects sustainable development;
H5:Digital literacy moderates the relationship between GHRM and sustainable development.

This framework highlights that combining environmentally conscious HRM, digital competence, and local cultural wisdom can serve as a strategic model for improving fishermen's welfare and promoting coastal sustainability. It bridges the theoretical domains of green management, digital transformation, and sustainable livelihoods, offering both academic and practical contributions to sustainable human resource development.

3. RESEARCH METHOD

This study employed a quantitative research approach using a survey method to examine the causal relationships among the variables: rumpon-based Green Human Resource Management (X), Digital Literacy (M), Fishermen's Quality of Life (Y_1), and Marine Ecosystem Sustainability (Y_2). Data were analyzed using the Partial Least Squares Structural Equation Modeling (SEM-PLS) technique, which is appropriate for testing both mediating and moderating effects within a complex model. This approach was selected because SEM-PLS is capable of analyzing latent variable relationships that include both reflective and formative indicators (Hair et al., 2021).

The research was conducted in Majene Regency, West Sulawesi Province, one of the regions with the highest concentration of rumpon-using fishermen in western Sulawesi. According to the Department of Marine Affairs and Fisheries (2023), approximately 30,887 fishermen are actively operating along Majene's coastal areas. The population of this study consisted of all traditional fishermen who use rumpon as their primary fishing tool. The sampling technique employed was purposive sampling, based on the following criteria: (1) Fishermen who have been active for at least 10 consecutive years; (2) Those who use rumpon as their main fishing equipment; and (3) Fishermen who possess access to digital devices (smartphones or tablets). Using the Slovin formula with a 5% margin of error, the final sample size consisted of 395 respondents. Primary data were collected through a structured questionnaire distributed directly to respondents. The questionnaire comprised two main sections: Section A: Demographic information (age, education, fishing experience, and ownership of digital devices). Section B: Measurement items for each variable, assessed using a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). The following table provides operational definitions for each research variable used:

Table 1. Operational Definitions of Variables and Measurements

Variable	Definition	Key Indicators
Rumpon-Based Green HRM (X)	A set of environmentally friendly HRM practices grounded in local wisdom and sustainable fishing traditions.	(1) Eco-friendly training programs, (2) Use of sustainable fishing tools, (3) Organizational support, (4) Incentives linked to marine conservation.
Digital Literacy (M)	Fishermen's ability to access, understand, and use digital technology to enhance welfare and marine conservation.	(1) Access to digital devices, (2) Ability to use digital applications, (3) Utilization of market and weather data, (4) Awareness of digital security.
Fishermen's Quality of Life (Y_1)	The level of fishermen's social, economic, and psychological well-being.	(1) Income, (2) Job security, (3) Access to basic services, (4) Social satisfaction.
Marine Ecosystem Sustainability (Y_2)	Efforts to maintain the balance between economic activities and marine ecosystem preservation.	(1) Use of eco-friendly fishing tools, (2) Compliance with fishing zones, (3) Conservation awareness, (4) Energy efficiency.

Source: Author's own work (2025)

Data were processed using SmartPLS 4 software through several analytical stages: Outer Model Evaluation – to assess convergent and discriminant validity, as well as indicator reliability and Indicators were deemed valid if factor loading > 0.70, Average Variance Extracted (AVE) > 0.50, and Composite Reliability (CR) > 0.80. Inner Model Evaluation – to test the structural relationships among latent variables (hypotheses), with significance determined using the bootstrapping procedure. A hypothesis was accepted if p-value < 0.05 and the path coefficient (β) was positive. R^2 and f^2 Analysis – to evaluate the model's explanatory power and the contribution of each variable to the dependent constructs.

4. RESULTS

The validity test results indicated that all measurement indicators achieved a factor loading value above 0.70 and an Average Variance Extracted (AVE) above 0.50, signifying strong convergent validity. Moreover, the Composite Reliability (CR) for each construct ranged between 0.83 and 0.92, confirming a high degree of internal consistency. The Cronbach's Alpha values, all above 0.70, further validated the reliability of the measurement instruments. The assessment of the measurement model (outer model) was conducted to verify the validity and reliability of the constructs. As presented in Table 2, the convergent validity was evaluated using the Average Variance Extracted

(AVE). All constructs exhibited AVE values ranging from 0.61 to 0.67, surpassing the recommended threshold of 0.50 (Hair et al., 2019). This indicates that the constructs explain more than half of the variance of their indicators. Furthermore, internal consistency reliability was assessed using Composite Reliability (CR) and Cronbach's Alpha. The results show that CR values ranged from 0.87 to 0.91, and Cronbach's Alpha values ranged from 0.83 to 0.88. All values exceeded the cut-off value of 0.70, demonstrating high reliability. Consequently, all variables—Rumpon-Based Green HRM, Digital Literacy, Fishermen's Quality of Life, and Marine Ecosystem Sustainability—are deemed valid and reliable for structural model analysis.

Table 2. Outer Model Results:

Variabel	AVE	CR	Cronbach's Alpha	Results
Rumpon-Based Green HRM	0.61	0.88	0.85	Reliabel & Valid
Digital Literacy	0.64	0.87	0.83	Reliabel & Valid
Fishermen's Quality of Life	0.67	0.91	0.86	Reliabel & Valid
Marine Ecosystem Sustainability	0.65	0.90	0.88	Reliabel & Valid

Source: Data processing results (2025)

Convergent validity was assessed using the Average Variance Extracted (AVE). According to established standards (e.g., Hair et al., 2019), an AVE value of 0.50 or higher indicates adequate convergent validity, implying that the construct explains more than half of the variance of its indicators. The results show that all constructs—Rumpon-Based Green HRM, Digital Literacy, Fishermen's Quality of Life, and Marine Ecosystem Sustainability—exhibited AVE values ranging from 0.61 to 0.67. Reliability was evaluated using two metrics: Composite Reliability (CR) and Cronbach's Alpha. The generally accepted threshold for these metrics is 0.70 for exploratory research, though values above 0.80 are considered satisfactory for confirmatory research. The R^2 test results demonstrated that both endogenous variables were well-explained by their predictors, showing strong explanatory power:

Table 3. Inner Model Results:

Endogenous Variable	R^2	Interpretation
Fishermen's Quality of Life	0.62	Strong (62% of variance explained by Rumpon-based GHRM and Digital Literacy)
Marine Ecosystem Sustainability	0.55	Moderate to Strong (55% of variance explained by Rumpon-based GHRM and Digital Literacy)

Source: Data processing results (2025)

Following the validation of the measurement model, the structural model was evaluated to assess the predictive power of the proposed framework. Overall, the R2 results demonstrate that the proposed model has substantial explanatory power. The exogenous variables (Rumpon-based Green HRM and Digital Literacy) play a critical role in predicting both the social aspect (Quality of Life) and the environmental aspect (Marine Ecosystem Sustainability) within the studied context. The Q^2 predictive relevance value was 0.47 (>0), indicating that the model has good predictive capability and theoretical relevance.

Table 4. Hypothesis Testing Results:

Hypothesis	Path Relationship	Path Coefficient (β)	p-value	Conclusion
H1	Rumpon-Based GHRM → Fishermen's Quality of Life	0.52	<0.01	Supported

Hypothesis	Path Relationship	Path Coefficient (β)	p-value	Conclusion
H2	Digital Literacy → Fishermen's Quality of Life	0.38	<0.05	Supported
H3	Rumpon-Based GHRM → Quality of Life (Mediated by Digital Literacy)	0.21	<0.05	Supported
H4	Rumpon-Based GHRM → Marine Ecosystem Sustainability	0.41	<0.01	Supported
H5	Rumpon-Based GHRM × Digital Literacy → Marine Ecosystem Sustainability	0.19	<0.05	Supported

Source: Data processing results (2025)

Table 4 presents the results of the structural model assessment, detailing the path coefficients and significance levels (p-values) for the proposed hypotheses. The bootstrapping method was employed to test the significance of the path coefficients.1. Direct Effects (H1, H2, and H4) the analysis confirms that Rumpon-Based Green HRM has a significant and positive influence on Fishermen's Quality of Life (beta = 0.52, $p < 0.01$), thereby supporting H1. This suggests that the implementation of Green HRM practices in Rumpon management substantially improves the fishermen's well-being. Similarly, Digital Literacy demonstrates a positive and significant effect on Fishermen's Quality of Life (beta = 0.38, $p < 0.05$), supporting H2. This indicates that higher digital competency contributes directly to better life quality standards for fishermen. Furthermore, Rumpon-Based Green HRM significantly impacts Marine Ecosystem Sustainability (beta = 0.41, $p < 0.01$). Thus, H4 is supported, highlighting the critical role of Green HRM in fostering environmental sustainability. The results reveal that rumpon-based Green HRM significantly enhances both the quality of life and environmental awareness among fishermen. Digital literacy plays a crucial dual role—acting as a mediator that transmits the positive effects of GHRM on welfare, and as a moderator that strengthens the impact of sustainable HR practices on marine ecosystem preservation.

5. DISCUSSION

The findings demonstrate that rumpon-based Green Human Resource Management (GHRM) has a positive and significant influence on fishermen's quality of life. Environmentally oriented training and the use of sustainable traditional fishing devices have enhanced productivity while reducing operational costs. These results are consistent with Renwick et al. (2013) and Budiono et al. (2025), who found that green HRM practices foster both efficiency and employee well-being. In the local context of Majene, implementing GHRM reflects an adaptive strategy that connects economic and ecological dimensions. Rumpon, as a maritime cultural heritage of the Mandar ethnic group, functions not only as a fishing tool but also as a strategic medium for integrating local wisdom into modern HRM principles.

The results also confirm that digital literacy significantly improves fishermen's quality of life. This finding aligns with Nikou et al. (2019) and Park & Jo (2019), who argue that digital literacy enables coastal communities to access market information, monitor weather conditions, and optimize fishing efficiency. Fishermen with higher levels of digital literacy tend to use navigation applications, online fish markets, and information-sharing platforms, leading to greater operational efficiency and expanded marketing reach. Consequently, digital literacy contributes not only to economic improvement but also to increased confidence and resilience amid market uncertainties. The study also reveals that digital literacy mediates the relationship between GHRM and fishermen's quality of life. This suggests that green HRM practices can achieve optimal outcomes only when accompanied by digital capability, allowing fishermen to apply environmentally friendly knowledge effectively.

This finding resonates with the Ability–Motivation–Opportunity (AMO) Theory (Jabbour & de Sousa Jabbour, 2016), which posits that individual performance enhancement depends on both

personal competencies and available opportunities. In this study, digital literacy represents the ability component, empowering fishermen to transform GHRM initiatives into tangible welfare improvements. The statistical analysis further confirms that rumpon-based GHRM positively affects marine ecosystem sustainability ($\beta = 0.41$; $p < 0.01$). This supports Ostrom's (2009) concept of community-based resource management, which emphasizes the effectiveness of locally governed systems in maintaining ecological balance. Fishermen who participated in green HRM training exhibited stronger environmental awareness by adhering to fishing zone regulations, adopting eco-friendly materials, and actively engaging in artificial reef restoration projects. Thus, GHRM fosters a culture of conservation among local fishing communities.

The moderation analysis reveals that digital literacy strengthens the effect of GHRM on marine sustainability ($\beta = 0.19$; $p < 0.05$). This means that fishermen with advanced digital skills are more capable of applying GHRM knowledge effectively—using technology to monitor fishing activities, access weather data, and report environmental violations to authorities. This finding extends the GHRM literature by highlighting digitalization as a reinforcing mechanism within sustainability-oriented HR practices (Mas'ud *et al*., 2024). It is particularly relevant since previous GHRM research has predominantly focused on formal industrial sectors, whereas this study demonstrates its applicability to traditional coastal communities. Based on the empirical results, several practical and policy implications can be formulated, develop integrated GHRM training programs that incorporate local wisdom (rumpon) as a core component of coastal empowerment policies and expand digital infrastructure in fishing areas, including internet access and technological capacity-building programs for coastal residents. Adopt green employment principles by recognizing and rewarding fishermen who demonstrate environmentally responsible practices, and establish digital fishermen communities to facilitate knowledge sharing about market opportunities, technological tools, and marine conservation initiatives.

6. CONCLUSIONS

This study demonstrates that rumpon-based Green Human Resource Management (GHRM), when integrated with digital literacy, has a significant positive impact on both the quality of life of fishermen and the sustainability of marine ecosystems in Majene Regency, West Sulawesi. The key findings can be summarized as follows: (1) Rumpon-based GHRM enhances fishermen's welfare by promoting eco-friendly training, conservation-based incentives, and organizational support mechanisms; (2) Digital literacy directly contributes to higher income levels, improved work efficiency, and greater job security among fishermen; (3) Digital literacy serves both as a mediator—bridging the influence of GHRM on welfare—and as a moderator—strengthening the relationship between GHRM and environmental sustainability. Overall, the findings support the Ability–Motivation–Opportunity (AMO) Theory, indicating that digital skills act as an essential ability factor that amplifies the motivational and opportunity-driven aspects of green HRM initiatives. This study enriches the theoretical landscape of Green HRM by introducing a localized and community-centered perspective within a traditional maritime setting. It highlights the importance of digital sustainability—where technology and environmental consciousness jointly shape human resource development and ecological preservation in rural coastal areas.

IMPLICATIONS FOR RESEARCH

The integration of environmental HRM, digital literacy, and local wisdom provides a novel model for sustainable community development. It shows that sustainability-oriented HR practices must evolve beyond organizational boundaries, adapting to informal and community-based contexts. Moreover, this study contributes to the digital sustainability discourse, illustrating that digital empowerment can amplify the social and ecological outcomes of green management initiatives.

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