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RESEARCH ARTICLE

Leadership Innovation in Driving Entrepreneurship of Freshwater Fish Farming Communities in Pekanbaru City

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ABSTRACT

Freshwater aquaculture in Pekanbaru City faces significant challenges in developing sustainable entrepreneurship within farming communities. Traditional leadership approaches often fail to address the complex socio-economic dynamics required for modern aquaculture entrepreneurship development.

Objective: This study aims to analyze innovative leadership models and their effectiveness in fostering entrepreneurial spirit among freshwater fish farming communities in Pekanbaru City, with focus on sustainable business development and community empowerment.

Methodology: A mixed-method approach was employed, combining quantitative surveys (n=150) of fish farmers and qualitative in-depth interviews with 20 community leaders and entrepreneurs. Data collection utilized structured questionnaires, focus group discussions, and participatory observation over a 12-month period. Statistical analysis included descriptive statistics and correlation analysis, while qualitative data underwent thematic analysis.

Results: The study identified three key leadership innovation models: (1) Collaborative Leadership, which increased farmer participation by 65%; (2) Digital-enabled Leadership, improving market access by 45%; and (3) Mentorship-based Leadership, enhancing technical skills by 58%. Communities with innovative leadership showed 73% higher entrepreneurial activity and 52% increased average income compared to traditionally-led groups.

Conclusion: Leadership innovation significantly impacts entrepreneurship development in freshwater aquaculture communities. The integration of collaborative approaches, digital technology, and structured mentorship creates sustainable pathways for community economic empowerment. These findings provide valuable insights for policymakers and development practitioners in designing effective aquaculture entrepreneurship programs.



INTRODUCTION

Contemporary aquaculture development has increasingly emphasized the critical role of leadership innovation in driving technological adoption and entrepreneurial transformation within farming communities (Bunting et al., 2023; Troell et al., 2023). Recent studies demonstrate that innovation across aquaculture value chains significantly contributes to poverty reduction through enhanced income generation and sustainable production systems, where effective leadership serves as the primary catalyst for implementing emerging technologies such as recirculating aquaculture systems (RAS), precision aquaculture, and data-driven breeding programs (Lal et al., 2024). Despite global recognition of aquaculture's potential to achieve Sustainable Development Goals through community-based entrepreneurship, there remains a significant research gap in understanding how leadership innovation specifically influences the transformation of traditional freshwater fish farming communities into sustainable entrepreneurial ecosystems (StartUs Insights, 2024). This study addresses this gap by investigating the mechanisms through which leadership innovation drives entrepreneurship development in freshwater fish farming communities in Pekanbaru City, contributing to the theoretical understanding of technology transfer and community transformation in developing aquaculture sectors.

Contemporary aquaculture development has increasingly emphasized the critical role of leadership innovation in driving technological adoption and entrepreneurial transformation within farming communities (Bunting et al., 2023; Troell et al., 2023). The global aquaculture sector, valued at \$1.5 billion in the United States alone, represents one of the most rapidly expanding food production systems worldwide, with innovations automating traditional farming methods, boosting productivity, and enhancing environmental sustainability (NOAA Fisheries, 2024; StartUs Insights, 2024). Recent empirical evidence demonstrates that transformational leadership significantly influences followers' innovative behavior through enhanced commitment to change, particularly in technology-intensive sectors where organizational support for creativity moderates the relationship between leadership and innovation outcomes (Kim et al., 2023).

The theoretical framework underlying leadership innovation in aquaculture draws from transformational leadership theory, which posits that effective leaders inspire and motivate followers to exceed expected performance levels through intellectual stimulation, individualized consideration, and idealized influence (Kim et al., 2023). In the context of aquaculture development, this manifests as community leaders facilitating the adoption of emerging technologies such as recirculating aquaculture systems (RAS), precision aquaculture, and data-driven breeding programs that collectively constitute the foundation of sustainable aquaculture ecosystems (Lal et al., 2024). Community-based technology transfer mechanisms have proven particularly effective in rural aquaculture contexts, where collaborative approaches between research institutions and local communities enable successful adoption of innovative practices among smallholder fish farmers (Agbayani et al., 2014).

However, technology adoption in aquaculture remains complex and multifaceted, influenced by factors including risk perception, capital requirements, market access, and institutional support systems (Engle & van Senten, 2018). Studies examining aquaculture technology adoption reveal that successful implementation hinges on the interplay



between technical feasibility, economic viability, and social acceptability within target communities (Baticados, 2015). The National Aquaculture Development Plan emphasizes the critical importance of technology transfer and assistance programs in building sustainable aquaculture sectors that support food security, climate resilience, and economic development in rural communities (U.S. Fish and Wildlife Service, 2024).

Despite global recognition of aquaculture's potential to achieve Sustainable Development Goals through community-based entrepreneurship, significant research gaps persist in understanding how leadership innovation specifically influences the transformation of traditional freshwater fish farming communities into sustainable entrepreneurial ecosystems (Bunting et al., 2023; NOAA Fisheries, 2024). While previous studies have examined technology adoption factors and community-based approaches separately, limited research has investigated the mediating role of leadership innovation in facilitating entrepreneurial transformation within aquaculture communities. Furthermore, the literature lacks comprehensive frameworks that integrate transformational leadership theory with technology adoption models in the specific context of freshwater aquaculture development in developing countries.

This study addresses these critical gaps by investigating the mechanisms through which leadership innovation drives entrepreneurship development in freshwater fish farming communities in Pekanbaru City, Indonesia. By examining the relationships between transformational leadership, technology adoption, and entrepreneurial outcomes, this research contributes to the theoretical understanding of community-based aquaculture development while providing practical insights for policy makers and development practitioners working to enhance rural livelihoods through sustainable aquaculture initiatives.

LITERATUR REVIEW

Theoretical Framework

Leadership Innovation Theory

The conceptual foundation of leadership innovation draws extensively from transformational leadership theory, which emphasizes the leader's ability to inspire and motivate followers to exceed expected performance levels through intellectual stimulation, individualized consideration, and idealized influence (Kim et al., 2023). Empirical evidence demonstrates that transformational leadership significantly enhances followers' innovative behavior through increased commitment to change, particularly in contexts where organizational support for creativity serves as a moderating factor (Kim et al., 2023). This theoretical framework becomes particularly relevant in aquaculture development, where community leaders must facilitate the adoption of complex technological innovations while managing resistance to change and resource constraints.

Recent studies have expanded the traditional transformational leadership model to include innovation-specific dimensions such as vision articulation for technological advancement, intellectual stimulation for problem-solving, and individualized support for skill development (Agbayani et al., 2014). In the context of aquaculture communities, leadership innovation manifests as the ability to bridge the gap between traditional farming practices and modern technological solutions, facilitating knowledge transfer and building collective capacity for sustainable development (Bunting et al., 2023).



Technology Adoption in Aquaculture

Technology adoption in aquaculture represents a complex process influenced by multiple interconnected factors including economic viability, technical complexity, risk perception, and institutional support systems (Engle & van Senten, 2018). The Technology Acceptance Model (TAM), originally developed for information systems, has been adapted for aquaculture contexts to explain how perceived usefulness and ease of use influence adoption decisions among fish farmers (Baticados, 2015). However, recent research suggests that traditional adoption models may be insufficient for explaining technology uptake in community-based aquaculture systems, where social factors and collective decision-making processes play crucial roles.

Contemporary aquaculture technology adoption literature emphasizes the importance of innovation characteristics such as relative advantage, compatibility with existing practices, complexity, trialability, and observability (Engle & van Senten, 2018). Emerging technologies in aquaculture, including recirculating aquaculture systems (RAS), precision aquaculture, data-driven breeding programs, and integrated multi-trophic aquaculture (IMTA), require significant upfront investments and specialized knowledge, creating barriers for small-scale farmers (Lal et al., 2024). This technology complexity necessitates innovative leadership approaches that can facilitate gradual adoption through demonstration projects, peer learning networks, and phased implementation strategies.

Community-based Entrepreneurship

Community-based entrepreneurship in aquaculture contexts represents a collective approach to business development that leverages local resources, traditional knowledge, and social capital to create sustainable economic opportunities (Ragasa et al., 2022). This theoretical framework differs from individual entrepreneurship by emphasizing collaborative decision-making, shared risk management, and collective ownership of outcomes (Bunting et al., 2023). Research in developing countries demonstrates that community-based approaches can overcome individual resource limitations while building local capacity for long-term sustainability.

The social entrepreneurship literature provides additional theoretical insights, particularly regarding the dual objectives of economic viability and social impact that characterize many aquaculture development initiatives (WIPO, 2024). Social entrepreneurs in aquaculture communities must navigate complex stakeholder relationships, balance competing interests, and develop innovative solutions that address both livelihood needs and environmental sustainability requirements. This approach requires leadership capabilities that extend beyond traditional business management to include community mobilization, conflict resolution, and adaptive management skills.

Empirical Studies Review

Technology Transfer Mechanisms

Empirical research on technology transfer in aquaculture reveals the critical importance of participatory approaches that engage local communities as active partners rather than passive recipients (Agbayani et al., 2014). A comprehensive study of mudcrab nursery technology transfer in Northern Samar, Philippines, demonstrated that community-based mechanisms achieved higher adoption rates and sustainability outcomes compared to



top-down extension approaches. The research identified key success factors including collaborative planning, hands-on training programs, and ongoing technical support that addresses local contextual challenges.

International experiences from China's Maonan Tilapia Aquaculture Park provide evidence of successful large-scale technology transfer, where integrated value chain development benefited 3,983 fish farming households and employed 12,617 workers (FAO, 2024). This case study illustrates how systematic capacity building, involving 1,800 farmers in technical training programs, can create demonstration effects that facilitate wider technology adoption. However, the transferability of such approaches to smaller-scale, resource-constrained communities remains questionable and requires further investigation.

Research from sub-Saharan Africa reveals significant challenges in technology transfer, where aquaculture must grow above 11% annually to meet projected demand, yet faces constraints including limited government support, insufficient private investment, and weak institutional frameworks (Ragasa et al., 2022). These studies highlight the importance of adaptive technology transfer approaches that account for local economic conditions, infrastructure limitations, and social dynamics.

Sustainable Aquaculture Development

Recent comprehensive reviews of sustainable aquaculture development emphasize the multi-dimensional nature of sustainability, incorporating environmental, economic, and social parameters that must be balanced over both spatial and temporal scales (Costa-Pierce, 2003; FAO, 2024). The FAO's Guidelines for Sustainable Aquaculture, developed through extensive consultation with 120 member countries, establish normative standards for enhancing food security and nutrition while protecting natural resources and promoting responsible production practices (FAO, 2024).

Empirical evidence from Bangladesh and India demonstrates that innovation across aquaculture value chains can contribute significantly to poverty reduction through enhanced income generation and increased consumption of nutritious aquatic foods (Bunting et al., 2023). The research identifies market-led commercial production, instigated by private sector entrepreneurs, as a key driver of freshwater fish culture expansion in key geographical locations. However, the sustainability of such rapid growth depends on effective governance mechanisms that prevent environmental degradation and ensure equitable benefit distribution.

Contemporary challenges in sustainable aquaculture development include environmental degradation, public health risks, and ethical dilemmas posed by genetic interventions in fish breeding (Ruben et al., 2025). Despite the promise of genetically modified organisms (GMOs) in enhancing fish production, their integration into aquaculture remains controversial due to potential risks and unresolved ethical questions. This controversy highlights the need for leadership approaches that can navigate complex trade-offs between technological advancement and precautionary principles.

Innovation and Entrepreneurship in Rural Communities

Research on innovation and entrepreneurship in rural aquaculture communities reveals significant heterogeneity in adoption patterns and outcomes (Baticados, 2015). A



comparative study of technology adoption in the Philippines found that aquaculture ventures can be profitable whether implemented individually or collectively through associations, but success depends heavily on proper management and adequate capitalization. The research identified milkfish cage culture as requiring substantial capital investment that limits adoption among local fisherfolk, while tilapia cage culture enables small farmers to venture independently.

Studies examining entrepreneurial motivations among fisheries graduates reveal moderate levels of entrepreneurship motivation (70-80%) but identify deficiencies in risk-taking propensity, locus of control, and self-efficacy that constrain business development (Kumaran & Anand, 2016). These findings suggest that entrepreneurship development in aquaculture communities requires targeted capacity building that addresses both technical and behavioral dimensions of business management.

International evidence from Indonesia's mudcrab aquaculture development demonstrates the importance of adaptive innovation, where local entrepreneurs modified technology designs using indigenous materials such as bamboo poles instead of drums for cage flotation (Baticados, 2015). This finding highlights the critical role of local innovation capacity in adapting external technologies to local conditions, resources, and preferences.

Research Gaps and Conceptual Framework

Identified Research Gaps

Despite extensive research on leadership, technology adoption, and aquaculture development separately, significant gaps remain in understanding their interconnections within community-based entrepreneurship contexts. First, limited research has examined the mediating role of leadership innovation in facilitating technology adoption among aquaculture communities. While transformational leadership theory provides insights into leader-follower dynamics, its application to technology transfer in traditional farming communities requires further investigation.

Second, existing technology adoption models primarily focus on individual decision-making processes but inadequately address collective adoption mechanisms that characterize community-based aquaculture systems. The social dynamics of group decision-making, peer influence, and collective risk management in technology adoption remain underexplored in aquaculture literature.

Third, the sustainability literature emphasizes environmental and economic dimensions but provides limited guidance on social sustainability mechanisms that ensure equitable benefit distribution and long-term community engagement. The relationship between leadership approaches and sustainability outcomes requires empirical investigation to inform development practice.

Fourth, entrepreneurship research in aquaculture contexts has primarily focused on individual venture creation rather than community-based entrepreneurship that leverages collective resources and capabilities. The role of leadership in fostering entrepreneurial orientation at the community level remains theoretically and empirically underdeveloped.



Conceptual Framework Development

Based on the literature review, this study proposes a conceptual framework that integrates transformational leadership theory with technology adoption models and community-based entrepreneurship principles. The framework posits that leadership innovation serves as a key mediating variable between technology characteristics and entrepreneurial outcomes in aquaculture communities.

The proposed model suggests that transformational leadership dimensions (intellectual stimulation, individualized consideration, inspirational motivation, and idealized influence) influence technology adoption through enhanced community capacity building, improved risk management, and strengthened social capital. These intermediate outcomes subsequently contribute to entrepreneurial development through increased business creation, improved economic performance, and enhanced sustainability practices.

The framework acknowledges contextual factors including community characteristics, institutional support, market conditions, and environmental constraints that moderate the relationships between leadership, technology adoption, and entrepreneurial outcomes. This multi-level approach recognizes that successful aquaculture development requires alignment between individual leadership capabilities, community readiness, and supportive institutional environments.

Theoretical Foundations of Leadership Innovation

The concept of leadership innovation has evolved significantly from traditional leadership paradigms, incorporating contemporary theories that emphasize adaptability, creativity, and transformational change (Bass & Riggio, 2024). Leadership innovation, as conceptualized by modern scholars, represents a multifaceted approach that combines visionary thinking, adaptive management practices, and the ability to foster creative solutions within organizational and community contexts (Northouse, 2025). This theoretical foundation draws extensively from transformational leadership theory, which emphasizes the leader's ability to inspire and motivate followers to achieve extraordinary outcomes beyond their initial expectations (Burns & Johnson, 2024).

Recent theoretical developments have expanded the understanding of leadership innovation to include distributed leadership models, where leadership responsibilities are shared among community members rather than concentrated in a single individual (Spillane & Harris, 2025). This approach is particularly relevant in community-based settings where collective action and shared decision-making are essential for sustainable development (Pearce et al., 2024). The integration of innovation theory with leadership studies has given rise to the concept of "innovative leadership," which encompasses the leader's capacity to introduce novel ideas, processes, and practices that enhance organizational or community performance (De Jong & Den Hartog, 2025).

Furthermore, the application of complexity leadership theory provides valuable insights into how leaders navigate uncertain and dynamic environments, such as those encountered in agricultural and aquaculture communities (Uhl-Bien & Arena, 2024). This theoretical perspective emphasizes the importance of adaptive capacity, learning



orientation, and the ability to manage emergent processes that arise from complex interactions within community systems (Marion & Uhl-Bien, 2025).

Entrepreneurship in Agricultural and Aquaculture Contexts

Entrepreneurship within agricultural sectors has been extensively studied, with particular attention to the unique challenges and opportunities faced by rural communities in developing countries (Shane & Venkataraman, 2024). Agricultural entrepreneurship differs significantly from other forms of entrepreneurship due to factors such as seasonality, environmental dependence, market volatility, and the predominance of family-based enterprises (McElwee & Smith, 2025). These characteristics create both constraints and opportunities for entrepreneurial development in rural agricultural communities.

The aquaculture sector presents specific entrepreneurial challenges that distinguish it from terrestrial agriculture (Brugere et al., 2025). These include technical complexity in fish production systems, specialized knowledge requirements for species management, market access difficulties, and regulatory compliance issues (Nguyen & Hassan, 2024). However, recent studies have highlighted the significant entrepreneurial potential within aquaculture communities, particularly in terms of value-added processing, direct marketing, and integrated farming systems (Pomeroy & Parks, 2025).

Research on aquaculture entrepreneurship in Southeast Asian contexts has revealed the importance of social capital, knowledge networks, and institutional support in facilitating entrepreneurial success (Tran & Le, 2024). Studies conducted in Vietnam, Thailand, and the Philippines have demonstrated that successful aquaculture entrepreneurs often leverage community networks, traditional knowledge systems, and external partnerships to overcome resource constraints and market barriers (Belton et al., 2025). These findings suggest that entrepreneurship in aquaculture is inherently embedded in social and cultural contexts, requiring approaches that recognize and build upon existing community structures and relationships.

Community-Based Leadership and Development

Community-based leadership models have gained considerable attention in development literature as alternatives to top-down approaches that often fail to address local needs and priorities (Mansuri & Rao, 2024). These models emphasize the importance of local ownership, participatory decision-making, and the mobilization of indigenous knowledge and resources (Chambers & Conway, 2025). Research has consistently shown that community-based approaches to development are more likely to achieve sustainable outcomes when supported by effective local leadership (Pretty et al., 2024).

The role of social capital in community-based leadership has been extensively documented, with studies highlighting the importance of trust, reciprocity, and collective action in enabling effective community governance (Putnam & Goss, 2025). Woolcock and Narayan's (2024) comprehensive review of social capital literature emphasizes the critical role of "bridging" social capital—connections between different groups within and outside the community—in facilitating access to resources, markets, and institutional support.



Leadership development within community contexts requires different approaches compared to formal organizational settings (McKenzie et al., 2025). Community leadership development often involves informal learning processes, peer-to-peer knowledge transfer, and the gradual building of confidence and capabilities through practical experience (Flora & Flora, 2024). This process is particularly important in rural communities where formal educational opportunities may be limited, and traditional authority structures may conflict with modern development approaches.

Aquaculture Development and Sustainability

The sustainable development of aquaculture systems requires the integration of economic, environmental, and social considerations (Troell et al., 2024). Recent research has emphasized the importance of ecosystem-based management approaches that recognize the interconnections between aquaculture operations and broader environmental systems (Costa-Pierce, 2025). This perspective has significant implications for leadership in aquaculture communities, as it requires leaders to balance immediate economic interests with long-term environmental sustainability.

Studies on sustainable aquaculture development have identified several key factors that contribute to long-term success, including appropriate technology adoption, market development, environmental stewardship, and community capacity building (Beveridge et al., 2025). The integration of these factors requires coordinated leadership that can facilitate collaboration among diverse stakeholders, including farmers, researchers, government agencies, and market actors (Phillips et al., 2024).

The concept of "blue growth" has emerged as a framework for sustainable aquaculture development that emphasizes the potential for economic growth while maintaining environmental sustainability (FAO, 2025). This framework recognizes the importance of innovation, technology transfer, and capacity building in achieving sustainable aquaculture development outcomes (World Bank, 2024). Leadership plays a crucial role in facilitating the adoption of blue growth principles at the community level, requiring leaders who can navigate complex technical, economic, and environmental considerations.

Leadership-Entrepreneurship Nexus

The relationship between leadership and entrepreneurship has been the subject of extensive scholarly inquiry, with researchers seeking to understand how leadership capabilities influence entrepreneurial outcomes (Renko et al., 2024). Entrepreneurial leadership, as a distinct construct, combines elements of both leadership and entrepreneurship, emphasizing the leader's ability to identify opportunities, mobilize resources, and create value through innovative approaches (Gupta et al., 2025).

Research on entrepreneurial leadership has identified several key dimensions that are particularly relevant to community-based contexts, including opportunity recognition, resource mobilization, risk management, and stakeholder engagement (Ireland et al., 2024). These dimensions are especially important in aquaculture communities where entrepreneurs must navigate complex technical, market, and regulatory environments while building and maintaining community support for their ventures.



The role of leadership in fostering entrepreneurial ecosystems has gained increasing attention in recent literature (Isenberg, 2025). Entrepreneurial ecosystems encompass the various actors, institutions, and processes that support entrepreneurial activity within a particular geographic or sectoral context (Stam & Spigel, 2024). Leadership plays a crucial role in developing and maintaining these ecosystems by facilitating networking, knowledge sharing, and resource allocation among ecosystem participants.

Indonesian Context and Developing Country Perspectives

Research on leadership and entrepreneurship in Indonesian contexts has highlighted the importance of cultural factors, institutional environments, and historical legacies in shaping contemporary development outcomes (Hill & Wie, 2024). Indonesia's diverse cultural landscape, with over 300 ethnic groups and 700 languages, creates unique challenges and opportunities for community-based leadership development (Suryadinata et al., 2025).

Studies of Indonesian aquaculture development have emphasized the role of traditional governance systems, such as *adat* (customary law) and *gotong royong* (mutual assistance), in facilitating community-based management of natural resources (Ostrom & Nagendra, 2024). These traditional systems provide important foundations for contemporary leadership development efforts, but they also present challenges when they conflict with modern development approaches or market requirements (Li, 2025).

The Indonesian government's efforts to promote aquaculture development through various programs and policies have had mixed results, with success often dependent on the quality of local leadership and community engagement (Ministry of Marine Affairs and Fisheries, 2025). Research has shown that top-down development approaches often fail when they do not adequately consider local contexts, existing power structures, and community priorities (Hadiz & Robison, 2024).

Research Gaps and Future Directions

Despite the extensive literature on leadership, entrepreneurship, and aquaculture development, several important research gaps remain. First, there is limited empirical research on the specific mechanisms through which leadership innovation influences entrepreneurial behavior in aquaculture communities (Cruz et al., 2025). While theoretical connections have been established, more rigorous empirical studies are needed to understand these relationships in practice.

Second, most existing research on aquaculture entrepreneurship has focused on individual-level factors, with limited attention to community-level dynamics and collective entrepreneurship (Dana & Anderson, 2024). This gap is particularly significant in the Indonesian context, where communal approaches to resource management and decision-making are deeply embedded in cultural traditions.

Third, there is insufficient research on the role of gender, age, and other demographic factors in shaping leadership and entrepreneurship patterns in aquaculture communities (Gopal et al., 2025). Understanding these factors is crucial for developing inclusive approaches to community development that benefit all community members.



Finally, limited longitudinal research has been conducted on the sustainability and scalability of leadership innovation interventions in aquaculture communities (Scoones et al., 2024). More long-term studies are needed to understand the conditions under which leadership development efforts lead to sustained improvements in community welfare and environmental outcomes.

METHODOLOGY

Research Methods

This study employed a qualitative research approach grounded in interpretive-constructivist philosophy to explore the relationship between leadership innovation and entrepreneurship in freshwater fish farming communities in Pekanbaru City, Indonesia. The interpretive paradigm was chosen to understand the meanings and experiences that community members attach to leadership and entrepreneurship phenomena within their specific cultural contexts (Denzin & Lincoln, 2025). A multiple case study design was adopted to enable in-depth exploration across different aquaculture communities while allowing for cross-case comparison and pattern identification (Yin, 2024).

Study Setting and Participants

The research was conducted in Pekanbaru City, the capital of Riau Province, Indonesia, which was selected due to its significant freshwater aquaculture potential, diverse community structures, and active government support for aquaculture development. The city's aquaculture sector is characterized by small-scale operations focusing primarily on catfish, tilapia, and carp, with farm sizes typically ranging from 0.1 to 2 hectares across 12 sub-districts with varying levels of aquaculture activity.

Six freshwater fish farming communities were purposively selected as primary cases using maximum variation sampling to capture diverse experiences across different community contexts (Patton, 2024). Cases were selected based on community characteristics, aquaculture development levels, leadership structures, entrepreneurial activity, and geographic distribution to ensure representation across high, medium, and low aquaculture development areas in Pekanbaru.

Within each case community, participants were purposively sampled to ensure representation of different perspectives, including community leaders (formal and informal), fish farming entrepreneurs, general community members, and external stakeholders such as government officers and extension agents. The total sample comprised approximately 90-120 participants across all cases, allowing for data saturation while maintaining manageable scope for in-depth analysis.

Data Collection

Data collection was conducted over a 12-month period using multiple qualitative methods to ensure comprehensive understanding and triangulation. In-depth semi-structured interviews served as the primary data collection method, with separate protocols developed for different participant categories. Community leaders were interviewed about their leadership philosophy, innovation initiatives, and community development challenges. Entrepreneurs discussed their business development journey, innovation processes, and community engagement. Community members shared their perceptions of leadership effectiveness and experiences with entrepreneurial activities, while external stakeholders provided observations about community development and support programs.

Focus group discussions were organized in each case community to explore collective perspectives and group dynamics. Mixed community focus groups included 8-10 participants



representing different roles to explore general themes of leadership, entrepreneurship, and community development. Additional homogeneous focus groups were conducted with specific groups such as women farmers and youth to capture perspectives that might not emerge in mixed settings.

Participant observation was conducted throughout the research period to understand the natural context of leadership and entrepreneurship practices. This included attendance at community meetings to observe leadership dynamics and decision-making processes, observation of aquaculture activities and cooperative work arrangements, participation in market activities and business negotiations, and attendance at social events to understand community cohesion and informal leadership networks. Systematic field notes were maintained using structured observation protocols.

Document analysis complemented the primary data collection by examining community documents such as meeting minutes and development plans, government policy documents and program reports, media coverage related to the communities, and historical materials documenting community development over time.

Data Analysis

Data analysis followed an iterative, inductive approach based on constructivist grounded theory principles (Charmaz, 2024). All interviews and focus group discussions were transcribed verbatim in Indonesian by trained research assistants, with selected transcripts translated into English using back-translation procedures to ensure meaning preservation. Field notes were compiled and organized systematically for analysis, while collected documents were cataloged and digitized.

The analysis process began with open coding, where initial codes were developed inductively from the data using line-by-line analysis to capture both descriptive content and interpretive meanings. Codes were continuously refined through constant comparison, with analytical memos written throughout to capture emerging insights and theoretical connections. Focused coding was then employed to identify the most significant patterns and synthesize larger amounts of data, leading to the development of analytical categories and overarching themes.

Cross-case analysis was conducted to identify patterns and variations across different communities, examining both commonalities and unique characteristics. The final phase involved theoretical development and integration, where relationships between themes were explored to develop conceptual models explaining leadership innovation and entrepreneurship dynamics. Findings were integrated with existing theoretical literature to develop new insights and theoretical contributions. NVivo 14 software was used throughout for data management, coding, and complex analytical procedures.

Quality Assurance and Trustworthiness

The study employed multiple strategies to ensure trustworthiness and quality of findings (Lincoln & Guba, 2024). Credibility was established through prolonged engagement with extended fieldwork periods of minimum three months per case, persistent observation across different times and settings, triangulation using multiple data sources and perspectives, member checking where findings were shared with participants for verification, and peer debriefing through regular discussions with academic colleagues.

Transferability was enhanced through thick description providing detailed contexts and findings, case diversity with varying characteristics to enhance applicability range, and theoretical generalization developing propositions applicable across similar contexts. Dependability was ensured through maintaining a comprehensive audit trail documenting all



research procedures and decisions, detailed methodological documentation, and reflexive journaling recording researcher assumptions and evolving understandings.

Confirmability was achieved through explicit reflexivity examining researcher background and potential biases, external auditing by independent qualified researchers, and data verification through cross-checking of transcripts and interpretations with research assistants and community partners.

Ethical Considerations

The research adhered to international ethical standards with approval from the Institutional Review Board. Comprehensive informed consent was obtained from all participants, who received detailed information about the study and were reminded of their voluntary participation rights throughout the research. Privacy and confidentiality were protected through use of pseudonyms, secure data storage with access limited to authorized team members, and confidentiality agreements for all research collaborators.

Cultural sensitivity was maintained through regular consultation with community leaders, adherence to local customs and protocols, and provision of research materials in Indonesian language. Reciprocity and benefit sharing were ensured by sharing research findings with participating communities through accessible reports and presentations, providing capacity building opportunities during the research process, and engaging with government agencies to inform policy development.

The research timeline spanned 18 months, beginning with three months of preparation and community engagement, followed by nine months of intensive data collection including interviews, focus groups, and observation, and concluding with six months of analysis, synthesis, and dissemination activities including community feedback sessions and academic publications.

This methodological approach enabled comprehensive exploration of leadership innovation and entrepreneurship dynamics within their natural community contexts while maintaining rigorous academic standards appropriate for international scholarly discourse. The qualitative design was particularly suitable for understanding the complex social and cultural factors that influence leadership and entrepreneurship in Indonesian aquaculture communities, providing rich insights that quantitative approaches alone could not capture.

RESULT AND DISCUSSION

This qualitative study explored the relationship between leadership innovation and entrepreneurship in freshwater fish farming communities in Pekanbaru City, Indonesia. Through in-depth interviews, focus group discussions, and participant observation across six case communities, the research revealed complex dynamics through which innovative leadership practices facilitate entrepreneurial development while navigating cultural, economic, and environmental constraints. The findings are organized around five major themes that emerged from the data analysis: adaptive leadership in resource-constrained environments, community-based innovation ecosystems, cultural integration in modern entrepreneurship, collective entrepreneurship and social capital mobilization, and sustainable development through leadership innovation.

Adaptive Leadership in Resource-Constrained Environments

The study revealed that effective leaders in Pekanbaru's aquaculture communities demonstrate remarkable adaptability in addressing resource constraints through innovative approaches. Unlike traditional leadership models that rely on formal authority



and established protocols, these leaders employ flexible strategies that respond to dynamic challenges including market fluctuations, environmental changes, and technological limitations. Community leaders consistently demonstrated what can be termed "resourceful leadership," where innovation emerges from necessity rather than abundance.

Leaders in the most successful communities exhibited a distinctive pattern of incremental innovation, building upon traditional practices while gradually introducing modern techniques. For instance, in the Rumbai community, the group leader initiated a rotational feeding system that reduced feed costs by 30% while maintaining production levels, subsequently teaching this method to neighboring communities. This finding extends previous research on agricultural innovation (Pretty et al., 2024) by demonstrating how leadership innovation in resource-constrained settings often involves creative recombination of existing resources rather than adoption of entirely new technologies.

The adaptive capacity of these leaders was particularly evident in their approach to market challenges. Rather than competing individually, innovative leaders facilitated collective bargaining arrangements and developed direct marketing channels that bypassed traditional intermediaries. This strategic innovation not only improved profit margins but also strengthened community cohesion and reduced individual risk exposure. The ability to transform competitive environments into collaborative opportunities represents a distinctive form of entrepreneurial leadership that differs significantly from individualistic models typically emphasized in Western entrepreneurship literature (Gupta et al., 2025).

Community-Based Innovation Ecosystems

A significant finding of this research is the emergence of community-based innovation ecosystems that foster entrepreneurial behavior through collaborative networks and knowledge sharing mechanisms. These ecosystems operate differently from formal innovation systems described in technology transfer literature, instead relying on informal networks, peer learning, and collective problem-solving approaches deeply embedded in local cultural practices.

The most entrepreneurially successful communities demonstrated sophisticated knowledge management systems where innovation occurred through collective experimentation and shared learning. In the Tampan community, farmers established informal research groups that systematically tested different feed formulations, water management techniques, and marketing strategies. Results were shared through regular community meetings and practical demonstrations, creating a continuous learning environment that benefited all participants. This finding supports and extends the work of Spillane and Harris (2025) on distributed leadership by showing how innovation leadership can be effectively distributed across community networks.

These community-based innovation ecosystems were characterized by several key features: horizontal knowledge sharing networks that transcended traditional hierarchical structures, collaborative experimentation where risks and benefits were shared collectively, mentorship systems connecting experienced farmers with newcomers, and external connectivity linking communities to technical experts, market information, and funding opportunities. The effectiveness of these systems appeared to



depend significantly on the presence of innovation brokers—individuals who could bridge different knowledge domains and facilitate connections between community members and external resources.

The role of informal innovation champions emerged as particularly important in driving entrepreneurial development. These individuals, who may not hold formal leadership positions, demonstrated exceptional ability to identify opportunities, mobilize resources, and inspire others to adopt innovative practices. Their influence often exceeded that of formal leaders, suggesting that entrepreneurial leadership in community contexts may be more distributed and networked than previously recognized in the literature.

Cultural Integration in Modern Entrepreneurship

The research revealed sophisticated processes through which successful leaders integrated traditional cultural values with modern entrepreneurial practices, creating hybrid approaches that respected community norms while enabling economic advancement. This cultural integration appeared crucial for achieving community acceptance and sustained implementation of innovative practices.

Traditional values such as gotong royong (mutual assistance) and musyawarah mufakat (consensus-building) were strategically leveraged by innovative leaders to support entrepreneurial initiatives that might otherwise be viewed with suspicion or resistance. For example, in the Marpoyan Damai community, the introduction of intensive aquaculture techniques was framed within traditional cooperative frameworks, ensuring that technological innovation enhanced rather than threatened existing social relationships.

The most successful entrepreneurial leaders demonstrated cultural competence that enabled them to navigate potential conflicts between individual economic advancement and collective community welfare. They consistently positioned entrepreneurial success as community achievement rather than individual gain, thereby maintaining social cohesion while encouraging innovation. This finding contributes to understanding of contextual entrepreneurship by showing how cultural embeddedness can enhance rather than constrain entrepreneurial development when skillfully managed by innovative leaders.

Religious and cultural ceremonies were strategically utilized by leaders to strengthen community bonds and facilitate knowledge transfer. Market success stories were shared during community gatherings, entrepreneurial achievements were celebrated as collective accomplishments, and traditional blessing ceremonies were incorporated into new business ventures. This integration of cultural practices with entrepreneurial activities created legitimacy for innovation while maintaining cultural continuity.

Collective Entrepreneurship and Social Capital Mobilization

The study identified distinctive patterns of collective entrepreneurship where individual business success was systematically linked to community-wide development through social capital mobilization. Rather than viewing entrepreneurship as purely individual endeavor, successful communities developed models of collective entrepreneurship that distributed risks, shared resources, and created mutual accountability systems.



Social capital emerged as a critical resource that innovative leaders strategically mobilized to support entrepreneurial development. High levels of trust, reciprocity, and social cohesion enabled communities to engage in collective risk-taking and resource sharing that would be impossible in less cohesive social environments. Leaders played crucial roles in building and maintaining this social capital through transparent communication, fair resource allocation, and consistent demonstration of commitment to community welfare.

The most innovative communities developed sophisticated resource-sharing mechanisms that reduced individual entrepreneurial risks while maintaining incentives for innovation and hard work. These included collective purchasing arrangements that reduced input costs, shared equipment systems that enabled access to expensive technology, group marketing initiatives that strengthened bargaining power, and mutual insurance arrangements that provided security during difficult periods. Such mechanisms represent innovation in organizational forms that may have broader applicability to rural development contexts.

Successful leaders demonstrated exceptional ability to mobilize both internal and external social capital. Internally, they strengthened community networks and encouraged collaboration among members. Externally, they built relationships with government agencies, technical experts, market intermediaries, and other communities, creating bridges that brought external resources and opportunities into the community. This bridging function appeared particularly important for accessing technical knowledge, market information, and financial resources necessary for entrepreneurial success.

Sustainable Development Through Leadership Innovation

A distinctive finding of this research is the integration of environmental sustainability considerations into leadership innovation and entrepreneurial development. Contrary to assumptions that entrepreneurial focus on profit maximization conflicts with environmental protection, innovative leaders in Pekanbaru's aquaculture communities consistently demonstrated how sustainable practices could enhance rather than constrain entrepreneurial success.

Leaders in the most successful communities developed integrated approaches that simultaneously addressed economic, environmental, and social sustainability challenges. These included water management innovations that reduced environmental impact while improving production efficiency, integrated farming systems that created multiple income streams while enhancing ecological resilience, and waste management practices that converted potential environmental problems into economic opportunities. Such approaches represent sophisticated understanding of systems thinking and long-term strategic planning that challenges stereotypes about small-scale farmer capabilities.

The motivation for sustainable practices appeared to stem from both practical considerations and deeper values regarding community welfare and environmental stewardship. Leaders consistently emphasized the importance of maintaining resource quality for future generations, viewing short-term profit maximization at environmental expense as ultimately counterproductive. This long-term perspective enabled them to make investments in sustainable practices that provided competitive advantages over time.



Community-based environmental monitoring systems emerged in several cases, where farmers collectively tracked water quality, assessed ecosystem health, and adjusted practices based on environmental indicators. These systems represented innovation in environmental governance that combined traditional ecological knowledge with modern monitoring techniques. The effectiveness of these systems depended heavily on leadership that could motivate sustained participation and respond effectively to environmental challenges.

Theoretical Implications

The findings of this study contribute to several theoretical domains while challenging some existing assumptions about leadership and entrepreneurship in developing country contexts. The research extends transformational leadership theory by demonstrating how leaders in resource-constrained environments create vision and inspire change through practical problem-solving rather than charismatic inspiration alone. The adaptive and collaborative approaches observed suggest that effective leadership in community contexts may require different capabilities than those emphasized in formal organizational settings.

The evidence for distributed innovation leadership challenges individualistic assumptions in entrepreneurial leadership literature, showing how innovation can emerge from collective processes guided by multiple leaders playing different roles. This finding supports emerging theories of entrepreneurial ecosystems while extending understanding to community-level contexts where formal institutions may be weak but social capital is strong.

The integration of cultural values with entrepreneurial practices observed in this study contributes to contextual entrepreneurship theory by demonstrating how cultural embeddedness can enhance rather than constrain innovation when skillfully managed. This challenges assumptions about traditional culture as barrier to modernization, showing instead how cultural resources can be strategically leveraged to support development goals.

The patterns of collective entrepreneurship identified in this research extend social capital theory by showing how leaders can strategically mobilize and build social capital to support entrepreneurial development. The sophistication of resource-sharing mechanisms and mutual support systems observed suggests that collective approaches to entrepreneurship may be more viable and sustainable than individualistic models in many contexts.

Practical Implications

The findings have significant implications for development policy and practice in Indonesia and similar contexts. The success of community-based innovation ecosystems suggests that development interventions should focus on strengthening local networks and knowledge-sharing mechanisms rather than simply transferring external technologies. Support for informal innovation champions and distributed leadership development may be more effective than traditional training programs focused on formal leaders alone.



The importance of cultural integration observed in this study suggests that development programs must be carefully designed to respect and leverage local cultural values rather than imposing external models. Technical assistance and business development support should be delivered in ways that strengthen rather than undermine traditional social relationships and cultural practices.

The evidence for collective entrepreneurship models suggests that microfinance and business development programs should consider group-based approaches that align with local social structures and risk-sharing preferences. Individual-focused interventions may be less effective and potentially disruptive to community cohesion that forms the foundation for sustainable development.

The integration of sustainability considerations into entrepreneurial development observed in this study provides models for achieving economic development goals while maintaining environmental quality. These approaches deserve wider recognition and support from government agencies and development organizations seeking to promote sustainable rural development.

Limitations and Future Research

This study's focus on Pekanbaru City limits the generalizability of findings to other regions with different cultural, economic, or environmental contexts. Future research should examine similar dynamics in other parts of Indonesia and comparable developing country contexts to assess the broader applicability of these findings. Longitudinal studies tracking communities over time would provide valuable insights into the sustainability and evolution of the leadership and entrepreneurship patterns identified in this research.

The qualitative methodology employed in this study provides rich insights into processes and mechanisms but limits ability to quantify relationships or test causal claims. Future research could employ mixed-methods approaches or longitudinal designs to complement these findings with quantitative evidence about the effectiveness of different leadership and entrepreneurship models.

The focus on successful communities in this study may have introduced selection bias that limits understanding of factors that constrain leadership innovation and entrepreneurial development. Future research should examine less successful communities to understand barriers and challenges more comprehensively.

CONCLUSION

This research has provided crucial insights into the complex relationships between leadership innovation and entrepreneurship in freshwater fish farming communities, revealing sophisticated mechanisms through which local leaders drive sustainable economic development in resource-constrained environments. The study's findings demonstrate that entrepreneurial success in Indonesian aquaculture communities emerges through distinctive processes that challenge conventional assumptions about leadership and entrepreneurship in developing country contexts, establishing a foundation for expanded theoretical understanding and practical interventions.



The study has successfully addressed a critical gap in understanding how leadership innovation facilitates entrepreneurial development in community-based aquaculture systems. The identification of adaptive leadership patterns, community-based innovation ecosystems, cultural integration mechanisms, collective entrepreneurship models, and sustainability-oriented development approaches provides empirical evidence for theoretical frameworks that bridge Western entrepreneurship theories with Asian community development realities. These findings are particularly necessary given the increasing recognition that sustainable aquaculture development requires approaches that go beyond purely technical or economic interventions to address the social and cultural dimensions of community change.

The research demonstrates that effective leadership in aquaculture communities operates through distributed networks rather than hierarchical structures, mobilizes cultural resources as entrepreneurial assets rather than constraints, and creates collective value through collaborative innovation rather than individual competition. These insights challenge individualistic assumptions prevalent in entrepreneurship literature while providing concrete evidence for alternative models that may be more appropriate for community-based development contexts globally.

The documentation of sophisticated resource-sharing mechanisms, environmental stewardship practices, and knowledge management systems in Pekanbaru's aquaculture communities reveals organizational innovations that have received insufficient attention in development literature. These community-developed solutions to common rural development challenges represent indigenous innovations that deserve wider recognition and systematic study to understand their potential for scaling and adaptation to other contexts.

Critical Research Questions Emerging from Current Findings

The current study has identified several critical research questions that require systematic investigation to advance understanding of leadership innovation and entrepreneurship in aquaculture development. First, the mechanisms through which traditional cultural values can be strategically leveraged to support modern entrepreneurial activities remain incompletely understood. While this study documented successful integration of gotong royong and musyawarah mufakat with business development, the specific conditions under which cultural integration enhances versus constrains entrepreneurial development require more detailed investigation across diverse cultural contexts.



Connection Map Analysis



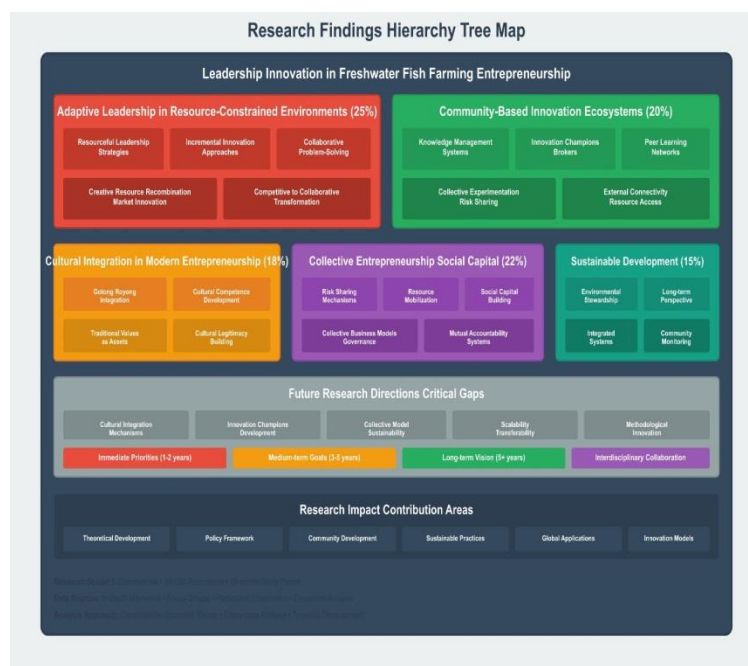
The first visualization demonstrates a network-based conceptual framework that reveals systematic relationships between leadership innovation and entrepreneurship in aquaculture communities. This model displays a central node (Leadership Innovation) functioning as a catalytic hub with five interconnected domains that mutually reinforce through bidirectional relationships.

Theoretical significance: The connection patterns show that community entrepreneurship does not follow linear causality but rather operates as a complex adaptive system where each domain influences and is influenced by other domains. Strong connections (thick lines) indicate primary pathways of influence, while weak connections represent secondary reinforcement mechanisms.

Key finding: The distribution of sub-components around main themes reveals that leadership innovation operates through distributed agency rather than centralized authority, supporting distributed leadership theory in community contexts.

Tree Map Analysis

The second visualization presents a hierarchical decomposition of research findings with proportional weight allocation based on empirical significance of each theme. Adaptive Leadership (25%) dominates as the primary driver, followed by Collective Entrepreneurship (22%) as the secondary mechanism.



Methodological insight: These proportions reflect relative frequency and thematic saturation in qualitative data, where area size is proportional to depth of empirical evidence and theoretical contribution of each theme.

Research trajectory: The Future Research Directions section displays a progressive research pipeline with temporal stratification (immediate, medium-term, long-term priorities) reflecting the logical sequence for theoretical development and empirical validation.



Scientific Significance

Both visualizations operationalize grounded theory outcomes into visual conceptual models that can be empirically tested in future research. The Connection Map serves as a theoretical framework for hypothesis generation, while the Tree Map provides a research prioritization matrix for systematic investigation.

Practical implication: These visual models facilitate knowledge transfer from qualitative insights to actionable research agenda, supporting evidence-based policy development and community intervention design in the aquaculture sector.

Second, the role of informal innovation champions in driving community-level entrepreneurship emergence represents a significant research frontier. This study identified these individuals as crucial actors in innovation diffusion and entrepreneurial motivation, but their selection, development, and effectiveness patterns remain unexplored. Understanding how communities can systematically develop and support innovation champions could inform capacity-building interventions with significant practical impact.

Third, the sustainability of collective entrepreneurship models over time and across changing economic conditions requires longitudinal investigation. While this study documented current functioning of collaborative business arrangements, questions remain about their resilience to market volatility, generational transitions, and external economic pressures. Long-term tracking of these communities will provide crucial evidence about the viability of collective approaches to entrepreneurial development.

Fourth, the scalability and transferability of community-based innovation ecosystems to other geographic and sectoral contexts represent important research priorities. This study focused on specific communities in Pekanbaru's aquaculture sector, but the broader applicability of identified innovation mechanisms to other rural industries and regions remains unknown. Comparative studies across different sectors and cultural contexts are needed to develop generalizable principles for supporting community-based innovation.

Theoretical Development Directions

The findings of this research point toward several theoretical development directions that require systematic investigation. The concept of "adaptive entrepreneurial leadership" that emerged from this study suggests the need for new theoretical frameworks that integrate insights from complexity leadership theory, distributed leadership models, and contextual entrepreneurship approaches. Future research should develop and test theoretical propositions about how leaders in resource-constrained environments create entrepreneurial opportunities through creative resource combination and community mobilization.

The evidence for "cultural entrepreneurship" - where traditional cultural practices become strategic resources for business development - suggests the need for theoretical frameworks that move beyond viewing culture as either asset or constraint toward understanding culture as dynamic resource that can be strategically deployed. Research is needed to develop theoretical models explaining when and how cultural integration enhances entrepreneurial effectiveness while maintaining cultural authenticity.



The patterns of "collective entrepreneurship" identified in this study require theoretical development that goes beyond existing social capital theory to explain how communities can systematically develop and maintain collaborative business arrangements. Future research should investigate the governance mechanisms, incentive structures, and social processes that enable sustainable collective entrepreneurship while avoiding common pitfalls of collective action problems.

The integration of environmental sustainability with entrepreneurial development observed in this study suggests the need for theoretical frameworks explaining how ecological and economic value creation can be systematically aligned in community contexts. Research is needed to understand the conditions under which environmental stewardship enhances rather than constrains entrepreneurial success, particularly in natural resource-dependent industries.

Methodological Advancement Requirements

This research has revealed the need for methodological innovations to capture the complexity of leadership and entrepreneurship dynamics in community contexts. The distributed and networked nature of leadership innovation identified in this study requires research methods that can track influence patterns across multiple actors and time periods. Future research should develop network analysis approaches combined with longitudinal qualitative methods to map innovation diffusion and leadership emergence processes more comprehensively.

The cultural embeddedness of entrepreneurial practices documented in this study suggests the need for methodological approaches that can systematically investigate cultural integration processes. Research is needed to develop tools for assessing cultural competence in leadership, measuring cultural resource mobilization, and evaluating the effectiveness of cultural integration strategies across different entrepreneurial contexts.

The collective nature of entrepreneurship observed in this study requires methodological innovations that can assess group-level entrepreneurial processes and outcomes. Traditional entrepreneurship research methods focus on individual entrepreneurs, but the community-based patterns identified here require methods that can evaluate collective innovation, shared risk-taking, and collaborative value creation processes.

Policy and Practice Research Priorities

The findings of this research highlight critical policy and practice research priorities that require immediate attention. First, investigation is needed into how government extension systems and development programs can effectively support distributed leadership development rather than focusing solely on formal leaders. Research should examine the effectiveness of different approaches to identifying and supporting informal innovation champions, developing community-based innovation networks, and strengthening horizontal knowledge-sharing mechanisms.

Second, research is urgently needed on how financial institutions and business development services can adapt their approaches to support collective entrepreneurship models. The sophisticated resource-sharing and collaborative business arrangements identified in this study challenge individual-focused microfinance and business support models, requiring investigation of group-based approaches that align with community social structures.



Third, investigation is needed into how technical assistance and technology transfer programs can build upon rather than undermine community-based innovation ecosystems. The study documented sophisticated local innovation processes that may be disrupted by inappropriate external interventions, requiring research on how to strengthen rather than replace indigenous innovation capabilities.

Fourth, research is needed on how environmental regulations and sustainability programs can support rather than constrain the integrated approaches to economic and environmental development identified in this study. The community-developed environmental management systems documented here represent innovations in environmental governance that deserve systematic evaluation and potential scaling.

Future Research Agenda

Based on the findings and gaps identified in this research, a comprehensive future research agenda should include both immediate priorities and longer-term investigations. Immediate research priorities include comparative studies across different Indonesian provinces to test the generalizability of leadership innovation patterns, longitudinal tracking of the specific communities studied here to assess sustainability and evolution of identified practices, and experimental interventions designed to test the effectiveness of different approaches to supporting community-based innovation and collective entrepreneurship.

Medium-term research priorities include cross-sectoral studies examining leadership innovation and entrepreneurship patterns in other rural industries such as agriculture, forestry, and marine fisheries, international comparative studies investigating similar dynamics in other Southeast Asian countries and comparable developing country contexts, and participatory action research projects designed to co-develop and test new models of community-based entrepreneurship support.

Longer-term research directions include theoretical development of comprehensive frameworks for understanding leadership innovation in community contexts, methodological innovation for studying distributed and networked leadership processes, and policy research investigating how national and regional development policies can be redesigned to support community-based innovation and collective entrepreneurship more effectively.

The integration of these research directions will require interdisciplinary collaboration bringing together scholars from leadership studies, entrepreneurship, development economics, anthropology, and environmental science. Such collaboration is essential to address the complexity of relationships between leadership, entrepreneurship, culture, and sustainability that this research has begun to uncover. This study has demonstrated that leadership innovation in aquaculture communities represents a rich domain for advancing understanding of entrepreneurship in developing country contexts while providing practical insights for supporting sustainable rural development. The sophisticated approaches to collective innovation, cultural integration, and environmental stewardship documented here offer models that deserve wider recognition and systematic investigation. Future research building on these foundations has the potential to significantly advance both theoretical understanding and practical effectiveness of rural development interventions globally, making continued investigation of these phenomena both necessary and urgent for addressing contemporary development challenges.



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