

Exploring Coastal Potential Through Competency Development And Digital Based PPSDMBK Implementation

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Abstract; A Digital-Based Competency-Based Human Resource Potential Development Model PPSDMBK is used in this study to emulate the model in Takalar Regency, Indonesia. The specific possibilities of improved coastal community development are assessed. Focus group discussions (FGDs) were used to collect data from government officials, community leaders, academics, fisheries business actors and training institutions, in accordance with an exploratory qualitative design. The results demonstrate that the competency-based approach can systematically identify local natural resources and traditional skills, such as aquaculture, seafood processing, and coastal tourism management. The PPSDMBK model, which incorporates e-learning platforms, mobile applications and offline-capable digital tools, has been shown to enhance digital literacy, market access, operational efficiency and social collaboration. Challenges included limited infrastructure, low initial digital skills and the affordability of devices; however, there was potential for market expansion and more efficient training and networking. The staged process of introducing and implementing the model, from mapping and team formation to co-creation, platform development and pilot testing at launch sites, and then scaling up and replicating, proved successful in marrying technological solutions to local needs. The paper concludes by suggesting that integrating digital solutions with skill-based approaches in coastal development projects could be a model for other researchers and NGOs to consider, as such an approach could have meaningful social outcomes as well as promoting economic resilience. These insights are valuable for policymakers, practitioners and researchers seeking to encourage blue economy strategies in similar coastal areas.

Keywords: Coastal development, Digital literacy, Human resource competency, Blue economy, Community empowerment.

1. INTRODUCTION

Firms today operate in an environment that is more challenging than ever, meaning they need to deliver sustainable value beyond the traditional financial metrics. Going forwards, the digital transformation acceleration has radically transformed stakeholder expectations and requires organizations to develop their robust financial health aligned with firm social concerns towards strong environmental commitment whilst fostering continuous innovation (Alkaraan et al., 2022; Buonocore et al., 2024). This is not just a nice to have or a bolt on increasingly it will be table stakes for ongoing viability and complexity in the competition. Investors and consumers consider corporate social responsibility (CSR) disclosures as a solid substitute of trustworthy governance and efficient risk management, significantly impacting investment choices and brand power (Adel et al., 2019; Kim et al., 2021). At the same time, the ability to innovate is still a powerful driver for market dominance and future growth (Lisboa et al., 2011; Utterback & Suárez, 1993). This high level of operational integration requires to be provided with appropriate systems support in the form of enterprise-wide information systems, offering a broad array of system functionality (Gupta & Kohli, 2006; Irani et al., 2003). This study argues that this inclusion is critical because strategic digital initiatives are central to capturing the full value a firm could potentially draw upon (Pancote et al., 2025).

Nevertheless, significant issues remain. The poor quality of infrastructure means that digital participation in developing coastal communities will remain out of reach for most people. The cost of devices and a lack of knowledge about how to use them could make this impossible for everyone (Torous et al., 2025). Directly linking these issues to the limited readiness of local institutions to adopt and sustain digital platforms, which are occurring because of such competition from various actors helps us model how more promising initiatives are often left unsustainable (Bishop et al., 2025). Moreover, Li, (2025) argue that the majority of digital literacy research is based in urban or educational settings and rarely addresses the specific characteristics i.e. transformative digital learning ecosystems of coastal communities experiencing particular competencies gaps related to participatory application of technology as well as marine focused education (Netto et al., 2025). It has left out a big research void to understand how the coastal communities can adoption of digital tools to improve their resilience and

traditional functions which help for sustainable livelihoods, environment and socio economic growth (Mulligan et al., 2025; Rahman & Hossain, 2025).

Conceptual Framework The theoretical lens underpinning this paper is formed by the triangulation of three main elements namely Digital Literacy, Competency-Based Human Resource Development and Community Empowerment. Digital Literacy in this sense does not only the use of devices, but works effectively for using digital information (Ng, 2012; Park & Nam, 2022). Capacity-building activities are contextually specific and learning outcomes-focused, which create an autonomous environment promoting adaptability (Rathore & Mahesh, 2025; Simon & Muñoz, 2025), in a competency-based human resource development perspective. Community empowerment theory reinforces participatory, bottom-up interventions as imperative to engendering sustainable change (Shrestha et al., 2025; Villac et al., 2025). These theories collectively suggest that a rights-based approach to digital literacy, customized with input from regional communities can lead to the creation of sustainable economic and environmental value in coastal areas.

Though preliminary evidence exists, four substantial discrepancies existed among prior research that necessitated the present study. One, while place-based digital interventions have worked to create marine citizenship in the UK (Koss et al., 2024), their relevance and effectiveness to developing world coastal areas is unknown (Cian & Brasili, 2025; Willis & Gupta, 2025). The second is that, although intensive digital ecosystem assessments identify components of needed digital infrastructure and policy support missing Alsagr (2025), Q. Li et al. (2025), in practice the empirical move for capacity building has been slow. Second, we know that ocean literacy and marine education interventions can effect an impact on behaviors and health, although often these are first focused on awareness rather than economic empowerment (Kao et al., n.d.; Purnomo et al., 2025). First, less than optimal digital literacy amongst educators is not uncommon in coastal Indonesia; however, insufficient expansion of competencies toward a broader community particularly with regard to aquaculture and marketing & local entrepreneurship (Haque & Mahmud, 2025; Kurniawan & Do, 2024). The sum of these inconsistencies emphasizes a critical gap that no unified digital Based Competency Base Human Resource Development Model (PPSDMBK) for coastal communities in which marine knowledge, digital based-tools, entrepreneurship, and social inclusiveness have been holistically integrated yet. The innovation in this study is to co-develop and empirically test such a model for both individual capacity and collective economic and social resilience through the process of Focus Group Discussions focused on coastal conditions. This approach aims to address both the theoretical and practical gaps in coastal digital empowerment by focusing specifically on infrastructure, literacy, market access and traditional competences.

This study has been carried out to explore how a digital-based PPSDMBK model was actualized and its contribution to improve digital literacy skills, entrepreneurship capability and social-economic welfare of fisherman communities. We speculate that: 1) personalized digital learning platforms enhance competency in sustainable aquaculture, processing and marketing; 2) participatory design increases user engagement and model resilience; and 3) local institutional linkages ensure scalability and sustainability. These results may have global theoretical implications on digital literacy and empowerment, serve to design adaptive capacity building platforms, advise policy makers about digital infrastructure investment, as well as aid NGOs and governments in the replication of those digitally enabled community development strategies to other similar coastal regions around the world.

2. LITERATURE REVIEW

2.1 Concept and potential of sustainable coastal areas

The coast is a vital ecological, economic and social service provider (Kay and Alder 2005). It has the potential which lie in the richness of biodiversity and it is also supported by critical ecosystems like mangroves, coral reefs, seagrass beds providing interruption to shore line protection, carbon sequestration and contribution ton fisheries productivity (Barbier 2017; Setiawan et al. 2025). The coastal areas provide an economic value in the form of capture and culture fisheries, marinetourism, renewable energy and non living resource extraction (Kabil et al., 2021). The ICZM conceptual framework suggests integrating ecological, economic and social objectives to use these resources in a sustainable manner (Cicin-Sain & Knecht, 1998). In

addition, the Blue Economy approach encourages sustainable innovation and efficient resource use to stimulate economic growth while ensuring ocean health (World Bank, 2017). As multifaceted issues by their nature require a means of governance that is integrated and the involvement of all relevant stakeholders in decision-making processes, the importance of sustainable coastal development poses questions about long-term socio-ecological resilience through adaptive management.

2.2 Competency development for coastal human resources

Formative component in the coastal communities is an essential driver for vibrant and successful coast economies. So not only the fishermen skills such as artisanal fishing (or basic level of aquaculture), and they must have digital literacy, entrepreneurial attitudes, a sense of environmental stewardship and collaboration in problem-solving given that today we are living in 21st-century competencies (Trottet et al., 2022; Prihatin et al., 2025). The Human Capital Theory posits that targeted training and skill enhancement results in increased productivity and economic returns to society (Becker, 1993). But for various reasons, including access to training that is relevant to coastal dynamics and the types of infrastructure developments that are either appropriate or inappropriate in these regions (Sumter et al., 2020), skill gaps remain persistent. Such capacity building needs to be underpinned by andragogical principles which focus on practical learning, local context fitting and participatory involvement in the health system (Knowles et al., 2015). In doing so, coastal communities can increase the livelihood resilience and adaptive capacity in the face of socio-economic and ecological changes through competency development that is aligned with market demands to promote environmentally sustainable and culturally appropriate aims.

2.3 Digital transformation in coastal development

Today, in negative line with the above scenario, digital transformation is identified as one of the fundamental gateways to advance socio-economic and environmental conditions in coastal areas through the incorporation of information and communication technologies (ICT) within fisheries, marine tourism and resource management systems (Feroz et al., 2023). As for the individual factors, Tornatzky and Fleischer (1990) suggest that technological readiness, organizational capacity, and environmental forces interact to shape how digital innovations are implemented in community development. The introduction of ICT allows real-time weather, oceanographic data access and e-commerce for seafood such as in coastal cases and provides the possibility of sharing knowledge via digital platforms (Vaska et al., 2021). There is empirical evidence that ICT helps in market facilitation, operational efficiency and coordination of stakeholders that ultimately influence the climate signal or market fluctuations (Hamsiah et al., 2024). Despite these issues, challenges remain including infrastructure divides, financial constraints to access and variations in digital-competency (Ismail et al., 2024). Now, sustainable coastal development senses the opportunities that digital transformation can make possible – from strategic investments in ICT infrastructure and training to locally-tailored digital solutions.

2.4 Digital literacy as a catalyst for empowerment

Utilization of the PPSDMBK optimization model Digital-Based Development of Human Resources Competency (PPSDMBK) becomes a model that integrates developing skills, knowledge and socio-economic empowerment in coastal communities. Based on the Community-Based Development Theory, these might be called models of participatory planning, local ownership and so forth (Mansuri & Rao, 2013). The digital sphere makes use of e-learning platforms, mobile applications, and social media networks to provide convenient access to training in aquaculture, marine product processing, and business management (Hasan & Habib 2022). Indeed, studies from evidence show that digitalised capacity building models enhance learning retention, market access and innovation adoption in resource-poor settings such as rural and coastal locations (Shen & Zhang, 2024). In conclusion, the success of PPSDMBK model is boosted through digital tools matching with local needs, infrastructural readiness and conducting a starting new project i.e "yes but" literacy for both trainers and participants (Hamsiah et al., 2024). Implemented systemically, this model can hasten a sustainable future for coastal development that combines indigenous practices and modern, data-driven technology.

2.5 Implementation of digital-based PPSDMBK model

Capacity building principles are integrated with technology-enabled delivery to address the specific needs of coastal communities through a Digital-Based Competency-Based Human Resource Potential Development Model (PPSDMBK).

Community-Based Development Theory is the basis of it, involving participatory engagement, individual capacity building on a local level and culturally relevant channels for learning (Disaster Insight 2015). Its digital part includes e-learning platforms, mobile applications and social media channels for flexible, problem-specific training in sustainable aquaculture, marine product innovation and entrepreneurial management (Hasan & Habib 2022; Shen & Zhang 2024). Technology-assisted models improve knowledge retention and increase the technology, market access and innovation adoption in rural and maritime sectors (Hamsiah et al. 2024). But it needs infrastructure; digital access at low cost and continued mentoring via trained facilitators (Ismail et al., 2024). The implementation of PPSDMBK in a systematic manner will be able to change the term traditional economy into a resilient innovative economy and digital connectivity in the middle of the ocean.

3. METHOD

3.1 Research design

This research takes an exploratory qualitative design through the Focus Group Discussion (FGD) method to understand influence stakeholder viewpoints in the implementation of a Digital-Based Competency-Based Human Resource Potential Development Model (PPSDMBK). They note that for such systems a more reflexive qualitative approach is desirable as "Qualitative methods are notorious as the most suitable choice in capturing complex social dynamics, contextual realities and nuanced social experiences [amongst others in the case of community development research]" (Cresswell and Poth 2018). The focus group discussion (FGD) technique supports interactive dialogue which may enable the respondents to co-construct information that is, to together make manifestations clearer with regard to common problems and provide proposals appropriate in a certain context (Nyumba et al. 2018). It is well suited to studying capacity, infrastructure and strengthening costs in specific coastal settings, given that institutional and environmental characteristics also govern the feasibility of programs. This approach allows the opportunity to triangulate stakeholder perspectives to improve trustworthiness of findings and ensure that the proposed model is based on knowledge that is locally appropriate.

3.2 Research location and participants

The research was conducted in Takalar Regency, South Sulawesi, Indonesia—a region with rich coastal resources and a strong reliance on fisheries, aquaculture, and marine-based livelihoods. The location was selected purposively based on its economic potential, existing community structures, and readiness for digital intervention (Patton, 2015). Participants included representatives from local government agencies, coastal community leaders, academic experts, fisheries business owners, and vocational training providers, ensuring a multi-stakeholder perspective. Purposive sampling was applied to select individuals with relevant expertise or direct involvement in coastal resource management and community empowerment. This selection strategy ensured that discussions reflected a combination of policy-level insights, practical field experience, and local cultural understanding, which is essential for designing an inclusive and sustainable PPSDMBK model in a maritime setting (Etikan et al., 2016).

3.3 Data collection and analysis

Qualitative methods included semi-structured focus group discussions (FGDs), using open-ended questions that facilitated dialogue and the sharing of knowledge. Sessions took place in neutral community settings to ease comfort and foster participation. All conversations were audio-recorded with the participants' permission and augmented by extensive field notes to capture non-verbal cues. Thematic analysis was used to detect repetitive occurrence of themes, challenges and opportunities in the data (Braun & Clarke 2006). We then identified the most frequently cited themes and data were coded into these categories, using an inductive approach that was applied to our entire study sample with iterative cycles of coding accordingly (26). These steps not only ensured theoretical coherence but also provided context-specific understandings. and made reachable recommendations applicable for sustainable adoption of the digital-based PPSDMBK model.

4. Result

4.1 Recognition and development of coastal potential through competency-based approach

Takalar Regency the coastal areas which offer rich natural resources, as high value commodities of raw materials such as seaweeds, milkfishes, shimps, or other marine biodiversity; also having suitable conditions for aquaculture together with the potential of coastal tourism panorama. The competences approach allows a systematic mapping of these resources next to human capacities that are local traditional fishing methods, seafood processing skills and ecological stewardship knowledge build for generations (Schutter et al., 2021). Developing programs in these competencies - as varied as supported modernization of fishing gear, production of value-added processed seafood and community-based eco-tourism - advance both economic well-being and environmental sustainability. Collectively, they represent a blueprint for sustainable coastal development (Okafor-Yarwood et al., 2020) informing market access, technology transfer and capacity-building initiatives to achieve these transformational goals.

4.2 Implementation Flow of the Digital-Based PPSDMBK Model

This staged approach provides for a collaborative and locally relevant implementation of the PPSDMBK model, marrying technology tools with community requirements and institutional capabilities. Through a combination of piloting, process improvements and linkage with cooperatives, the project is both scalable and sustainable (Mansuri & Rao, 2013).

Table 1. Implementation Flow of the Digital-Based PPSDMBK Model

Stage	Main Activities	Actors Involved	Output	Success Indicators
Mapping Potential & Issues	Identify locations, map resources, analyze obstacles	Local gov., researchers, leaders	Potential & issues profile	Complete profiling per area
Team Formation & Institutions	Form collaborative team, appoint champions	Local gov., fishermen, KUB	Implementation team	Clear roles, active champions
Co-Creation	Platform design, integrate local wisdom	Community, IT devs, academics	Platform prototype	≥80% community needs met
Platform Development	Marketplace, training, offline mode	Academics, gov., pilot users	Functional platform	Passed testing
Pilot Project	Location selection, training, mentoring	Team, community, researchers	Active pilot use	≥70% adoption in 3 months
Full Implementation	Expansion, cooperative integration, certification	Gov., marketplace, fintech	Broad adoption, certified products	≥50% user growth/year
Monitoring & Evaluation	Data collection, feedback, feature updates	Academics, community	Reports & recommendations	≥80% recs implemented
Sustainability & Replication	Local business model, coop mgmt., expansion	Gov., coop, community	Long-term platform	≥3 years active, 2+ new regions

Source; Author 2025

4.3 Challenges and opportunities in digitalizing social Empowerment programs

As a result, digital transformation in the coastal empowerment programs become technology, financial and educational barriers that can be converted into opportunities for innovation through strategic interventions. Some examples include deploying offline-capable learning modules and community-based digital literacy workshops to address infrastructure and skills gaps, partnering with fintech and logistics companies to increase market integration (Burgess et al., 2023).

Table 2. challenges and opportunities in coastal digitalization

Challenges	Opportunities
Limited internet infrastructure (Lee et al., 2020)	Expanded program reach without location constraints
Low digital literacy (Ismail et al., 2024)	Improved program efficiency via data-driven monitoring
High device costs (Hamsiah et al., 2024)	Increased market access for fisheries & crafts
Content relevance for diverse audiences	Stronger collaboration via online platforms

4.4 Effectiveness of the Digital-Based PPSDMBK model

The PPSDMBK model had clear improvements in terms of economic and social. The economic benefits include increased revenues (e-commerce channels), and less operational risks resulting from the use of digital forecasting tools (Fauville et al., 2022). Strengthening the community: The model contributed to cohesive and adaptable social dynamics through continued involvement in co-learning and collaborative endeavours, highlighting the importance of digital properties in growing resilience (Haxton & Jenkins, 2023).

Table 3. Economic and Social Effectiveness Indicators

Dimension	Indicators	Observed Impact
Economic	Market access, product diversification	Expanded buyer networks; increased income
Economic	Operational efficiency	Safer fishing trips via real-time weather data
Social	Digital literacy level	Improved tech adoption for aquaculture & tourism
Social	Community collaboration	Active online forums & joint ventures

Source; Author 2025

4.5 Discussion

This is part of global trend which uses technology transfer into integrated use of the skills increase and resources utilization sustainable, energy to coastal community development context. This is a staged, locally relevant process of mapping, team formation, co-creation, platform development and scaling that ensures interventions are contextually adaptive and driven by multi-stakeholder collaboration. This confirms the Technology-Organization-Environment (TOE) framework, which suggests that technological solutions must fit with organizational readiness and environmental conditions (Tornatzky & Fleischer 1990).

The main hurdles identified, particularly infrastructural deficits, low digital literacy and affordability issues, have clear similarities with distinctive developing coastal contexts (Ismail et al., 2024; Hamsiah et al., 2024). Nevertheless, opportunities of improved market linkages, efficiency improvements and social capital enhancement show that when integrated with psychometric approaches to competency-based skills digitalisation can be a transformative tool (Burgess et al., 2023). The results from the field in Takalar is that focused training on aquaculture innovation, elaboration of fish-based products and increasing local tourism through open digital platform could actually have a measurable impact on income and resilience.

The model is theoretically rooted in Community-Based Development Theory, operationalizing the concepts of ownership, participation and localized learning designed to reduce property-level barriers (Mansuri & Rao 2013), as well as Human Capital Theory highlighting direct skill investments that earn long-term returns over time (Becker 1993). The PPSDMBK success further supported the findings from research carried on the link between ocean literacy and sustainable marine practices (Fauville et al., 2022). Crucially the platform is co-designed and allows local knowledge to be integrated ensuring cultural fit necessary for retained use of a technology.

The practical implications are that expanding successful case studies as the one experienced in two coastal areas (X and Y) requires three legs: (1) initial amount for ICT infrastructure to make devices accessible, (2) appropriate content creation which mixes traditional knowledge with market-oriented technologies targeting small wins, and (3) after-scale mentoring to cement the trainings while promoting ground innovation. Such initiatives could be scaled and built into national or regional policy making the use of digital competency frameworks part and parcel of blue economy strategies, infrastructure development as well as climate adaptation planning. The Takalar case shows that it is possible, and furthermore necessary to bridge the digital divide as well as fill a competency gap in order for coastal communities around the world to be able to grow and participate in a world where global competition has become tighter and demands higher.

5. CONCLUSION

Through this case study, we can prove that the Digital-Based Competency-Based Human Resource Potential Development Model (PPSDMBK) is a suitable framework to create local economic and social empowerment of coastal communities through integrating local competencies with technology enabled learning and market access. From resource mapping, through collaborative platform design and to scale-out delivery, the participatory stages are carefully staged so that implementation remains rooted in the needs of communities while building upon established ownership and potential sustainability. The experience of Takalar Regency indicates that it not only overcomes digital literacy barriers, entrepreneurial capacity, and efficiency; but also strengthens social cohesion and adaptive capacity in facing environmental dynamics and changes in competition structure. Through the closing of these gaps, the PPSDMBK model is a scalable approach to actualize blue economy strategies and drive sustainable coastal development. The results highlight the need for continued stakeholder engagement, local context relevance, and ongoing mentorship in leveraging the transformative potential of digital empowerment programs.

CONTRIBUTION

By incorporating digital transformation concepts with competency-based HRD for coastal communities, this research provides an empirically tested model (PPSDMBK) that contributes to the academic literature and can be replicated in similar maritime contexts. Operationally, it offers a structured participatory mechanism for technology-enabled skill development, market access and community empowerment towards enhanced livelihood prospects in coastal areas to the policy makers and practitioners.

CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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