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Article

Digitalizing the Seafood Supply Chain in Surigao del Sur: An Analysis of Technological Integration, Strategic Outcomes, and Social Utility

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Abstract: Integrating digital solutions into coastal businesses presents a vital opportunity to expand consumer reach and guarantee seafood traceability, particularly within resource-scarce regions. To explore this dynamic, an embedded mixed-methods study was conducted among seafood entrepreneurs in Surigao del Sur, Philippines, assessing the social utility, strategic efficacy, and technological assimilation of their online marketing efforts. Data collection involved quantitative inputs from 25 enterprise owners utilizing digital platforms, alongside qualitative accounts detailing their operational hurdles and technological innovations. The outcomes indicated a strong perceived utility across digital marketing efforts, led notably by Search Engine Optimization (AWM = 3.70) and Pay-Per-Click campaigns (AWM = 3.66). Inferential statistics confirmed that an enterprise's longevity, or "Years in Operation," is a major determinant of its SEO success ($r = .579$, $p = .003$). Furthermore, employing a diverse range of digital platforms strongly correlated with highly effective e-commerce strategies ($r = .615$, $p = .001$). Qualitatively, the research highlighted that while these business owners confront systemic obstacles related to the digital divide, such as inadequate connectivity and financial limitations, they recognize the immense social value of tools like QR codes and blockchain tracking for validating food safety and earning consumer trust. Ultimately, the research demonstrates that digital marketing not only drives financial growth but also provides essential infrastructure to professionalize local seafood commerce, thereby advancing the national development targets outlined in AmBisyon Natin 2040.

Keywords: Digital Marketing, Seafood Industry, Search Engine Optimization (SEO), Social Utility Value, E-commerce Adoption

1. Introduction

The Fourth Industrial Revolution (4IR) and rapid technological progress have positioned digital marketing as a crucial lifeline for the sustainability and competitiveness of small and medium-sized enterprises (SMEs). To remain relevant, businesses must pivot from conventional physical storefronts toward data-integrated e-commerce frameworks, a transformation that has profoundly reshaped consumer habits globally (Toala Parraga, 2025; Maddikunta et al., 2022; Sharabati et al., 2024). Within the agricultural and food industries, this digital pivot is essential for optimizing supply chains and broadening audience access in an increasingly automated landscape (Majumdar et al., 2025; Popoola et al., 2024). Nevertheless, adapting to these innovations remains a formidable challenge for heritage sectors like the local seafood trade. These businesses must navigate the intricate logistics of handling highly perishable commodities while simultaneously establishing credibility and trust within a virtual retail environment (Bolognini et al., 2023; Ayob, 2021; Morales et al., 2022).

Coastal regions in the Philippines rely heavily on the seafood sector, which stands as a foundational pillar for regional food security and socio-economic stability for millions. Integrating digital innovations into this industry directly supports the inclusive economic frameworks and digitalization mandates outlined in both the Philippine Development Plan (PDP) 2023–2028 and AmBisyon Natin 2040 (Edralin & Pastrana, 2023; National Economic and

Development Authority [NEDA], 2023). Within the Caraga Region, and particularly in Surigao del Sur, adopting social media and e-commerce strategies is increasingly viewed as a crucial mechanism for building economic endurance and business competitiveness (Lady et al., 2023). By leveraging these online infrastructures, regional vendors can connect directly with buyers, effectively cutting out traditional intermediaries. This disintermediation not only has the potential to boost profit margins but also delivers fresher, highly traceable goods that align with international safety protocols (Patel et al., 2023; Wickramasinghe & Wickramasinghe, 2025).

While the advantages of digital modernization are well-documented in metropolitan hubs, its penetration into resource-limited, rural seafood networks is still largely unexamined. In provincial territories, the execution of robust digital marketing initiatives is frequently obstructed by systemic hurdles, including a pervasive digital divide, exorbitant infrastructure expenses, and a lack of technological capacity for standardizing products (Kunjiapu et al., 2025; Bon et al., 2023). Additionally, although technology acceptance models (TAM) have been extensively utilized to study pure e-commerce and academic settings, there is a distinct shortage of empirical literature exploring how these digital mechanisms operate within the unique socio-technical fabric of the Philippine seafood economy (Nazaruddin et al., 2024; Villacorta & Arnado, 2023). Deciphering the underlying catalysts of digital efficacy is therefore critical for seamlessly weaving modern technologies into legacy coastal markets that are burdened by distinct logistical barriers (Deniz Deral & Ipek, 2024; Lucas Schafer et al., 2023).

Contemporary research indicates that mere adoption metrics fail to completely capture why business owners persistently use digital applications or find them valuable beyond basic commerce. Relying on the framework of Social Utility Value, scholars are increasingly investigating how technological tools advance not only private financial gains but also the collective societal and professional aspirations of a community (Yi, 2025; Morales et al., 2022; Eze et al., 2024). In the context of seafood commerce, innovations like QR-code integration and blockchain-backed traceability are measured not just by their operational speed, but by their capacity to democratize market access and cultivate buyer confidence (Ahmad & Hamid, 2025; Sheer, 2020). Despite this, there remains a prominent gap in evaluating the perceived social utility value of such digital advancements among Philippine seafood vendors, especially in regional areas plagued by infrastructural deficits (Adewolu, 2024; Sen et al., 2025).

To address these gaps, this research assessed the digital landscape of seafood entrepreneurs in Surigao del Sur by integrating specific marketing constructs, namely Traceability Innovations, Content Marketing, and SEO. Utilizing an embedded mixed-methods design, the study aimed to: (1) establish the demographic and digital platform profiles of the seafood vendors; (2) gauge the perceived efficacy of various digital marketing frameworks; (3) identify meaningful correlations between the entrepreneurs' profiles and their reported marketing achievements; and (4) investigate the qualitative operational challenges and social utility derived from their digital transitions. Ultimately, this inquiry seeks to supply empirical data that can inform the creation of accessible, technology-centric policies to elevate the global seafood trade (Autio et al., 2022; Jayalath et al., 2025).

2. Materials And Methods

Research Design

An embedded mixed-methods framework was adopted for this research, relying on quantitative data as the core methodology, supplemented by embedded qualitative insights to contextualize the numerical results. To assess how seafood vendors perceive the efficacy of their digital marketing initiatives, the quantitative stage applied a descriptive-correlational model. Subsequent to the survey administration, qualitative data derived from open-ended questions underwent thematic analysis to investigate sector-specific technological advancements and day-to-day operational hurdles. Fusing these two methodological strands allowed the research to investigate both the numerical correlations between vendor demographics and marketing success, as well as the deeper social value these business owners attribute to digitalization in Surigao del Sur, Philippines.

Participants and Locale

The study's sample comprised 25 local seafood entrepreneurs (n = 25) who actively operate within the digital commerce space in Surigao del Sur province. A purposive sampling technique was utilized to identify vendors utilizing online ecosystems, including Lazada, Shopee, and Facebook Live Selling, for the promotion and distribution of marine products. Geographically, the research focused on Surigao del Sur, an essential province within the Caraga Region whose developmental trajectory aligns with the digital inclusion objectives of both AmBisyon Natin 2040 and the Caraga Regional Development and Investment Program (CRDIP). Concentrating on this specific area allows the study

to produce actionable insights for other resource-limited coastal communities attempting to modernize their seafood commerce.

Research Instruments

Data collection relied on a customized, highly structured questionnaire tailored to encompass the unique facets of the digitalized seafood trade. This tool comprised three primary segments: Part A collected business profiles, including operational longevity, utilized platforms, and merchandise categories; Part B featured a 45-item evaluation tool gauging nine distinct dimensions of digital marketing efficacy; and Part C collected qualitative narrative feedback regarding industry innovations and systemic challenges via open-ended prompts. Responses for Part B were recorded on a standard 5-point Likert scale, spanning from 1 (Strongly Disagree) to 5 (Strongly Agree). Content validity was established through evaluations by three specialists in e-commerce and marketing. Furthermore, a preliminary pilot test involving 15 participants produced Cronbach's alpha scores exceeding the 0.70 benchmark, confirming the instrument's strong reliability and internal consistency.

Data Gathering Procedure

To uphold data integrity and strict ethical standards, the data collection phase adhered to a methodical protocol. The process commenced with an orientation session detailing the research objectives to the entrepreneurs, during which informed consent documents were distributed and the strictly voluntary basis of their involvement was highlighted. Once consent was secured, the questionnaires were deployed. Throughout this phase, researchers were on standby to elucidate any complex terminology, thereby safeguarding response accuracy. After retrieval, numerical data were digitized for statistical evaluation, whereas all open-ended qualitative feedback was transcribed word-for-word to facilitate thematic coding. Stringent ethical protocols were observed continually, guaranteeing that all collected records were thoroughly anonymized and maintained in highly secure storage.

Data Analysis

Analytical procedures were executed using SPSS Statistics for the numerical datasets, coupled with reflexive thematic analysis for the qualitative narratives. To encapsulate the perceived efficacy of the digital campaigns, descriptive metrics, namely standard deviation and weighted mean, were computed, utilizing predetermined interpretation brackets (such as 3.50–4.49 denoting "Agree"). The Pearson product-moment correlation (evaluated at $\alpha=0.05$) was utilized to identify correlations linking vendor demographics to the different digital marketing dimensions. For the qualitative segment, the data underwent the analytical framework outlined by Braun and Clarke (2006), involving iterative reading, systematic coding, and the eventual distillation of core themes from the participants' responses. Employing this dual-pronged analytical strategy facilitated effective data triangulation. This ensured that any implementation paradoxes highlighted in the findings were corroborated simultaneously by empirical statistics and the vendors' actual lived experiences.

3. Results

This segment outlines the research outcomes, structured into four distinct domains: the demographic characteristics of the seafood vendors, their evaluation of digital marketing efficacy, the statistical correlations among these variables, and the thematic insights extracted from their qualitative feedback. The data is presented logically to offer a comprehensive perspective on Surigao del Sur's digitalized seafood trade.

Demographic Profiles and Online Channel Adoption

Profiling the surveyed seafood vendors offers vital background regarding their operational scale and regional online footprint. As demonstrated in Table 1, the merchandise assortment is varied, largely dominated by Deep-Frozen Goods (36%) and Enhanced/Ready-to-Eat items (32%). The statistics also highlight considerable business resilience within the sector, with 40% of the enterprises operating for over six years, indicating an established commercial base currently navigating digital integration. In terms of platform adoption, Facebook Live Selling (52%) alongside Shopee (48%) stood out as the predominant digital ecosystems. Meanwhile, Social Media Campaigns (40%) and Sponsored Advertisements (40%) were identified as the primary promotional frameworks deployed to engage prospective buyers.

Table 1. Demographic Profile of Surveyed Seafood Enterprises (n = 25)

Variable	Frequency	%
Seafood Product Categories		
Sun-dried / Cured (e.g., tuyo, dilis, calamari rings)	3	12%
Raw / Catch of the Day (e.g., fish, crustaceans)	5	20%
Deep-Frozen Goods	9	36%
Enhanced / Ready-to-Eat (e.g., bottled, pre-marinated, packed meals)	8	32%
Business Longevity		
1–3 years	5	20%
4–6 years	5	20%
Less than 1 year	5	20%
More than 6 years	10	40%
Online Channels Utilized		
Facebook Page	7	28%
Facebook Live Selling	13	52%
Shopee	12	48%
Lazada	6	24%
TikTok Shop	8	32%
Instagram	9	36%
Dedicated E-commerce Website	10	40%
Promotional Tactics Deployed		
Social Media Campaigns	10	40%
Sponsored Ads (e.g., Facebook/Google)	10	40%
Website / Search Optimization (SEO)	7	28%
Real-time Video Selling	7	28%
Email Outreach	5	20%
Customer Retention / Reward Schemes	7	28%
App-based Promotions	7	28%
Partnering with Digital Influencers	5	20%

Evaluation of Digital Marketing Efficacy

The participants' assessment of nine distinct digital marketing dimensions was quantified to gauge their perceived influence on commercial success. Table 2 collates these evaluations, indicating an overwhelmingly favorable disposition toward technological integration, with all primary classifications earning an overall consensus

of "Agree." The most robust perceived outcomes were linked to Search Engine Optimization (SEO) Performance (AWM = 3.704, SD = 1.08) and Pay-Per-Click (PPC) Advertising (AWM = 3.656, SD = 0.95), highlighting that vendors highly prize mechanisms that facilitate new customer discovery. In contrast, Engagement & Loyalty Initiatives (AWM = 3.440) and Email Campaigns (AWM = 3.456) garnered the lowest comparative weighted means, suggesting these approaches are viewed as moderately beneficial but likely subordinate to direct, visibility-focused strategies.

Table 2. Vendor Assessments of Marketing Efficacy

Construct / Item	**Weighted Mean**	**SD**	**Verbal Description**
1. Content Marketing Strategies			
a. Content distribution boosts brand visibility among consumers.	3.60	1.10	Agree
b. Visuals and articles clarify the product's worth to buyers.	3.52	1.14	Agree
c. Multimedia features enhance the attractiveness of marine goods.	3.60	0.88	Agree
d. Informative narratives positively influence purchasing behavior.	3.80	1.05	Agree
e. Strategic content establishes consumer reliance on my brand.	3.40	0.96	Moderately Agree
Overall	*3.584*	*1.03*	*Agree*
2. Social Media Marketing (SMM) Impact			
a. Network advertisements capture the attention of untapped markets.	3.56	1.02	Agree
b. Influencer endorsements strengthen buyer assurance.	3.68	1.13	Agree
c. Social platform promotions solidify brand credibility.	3.44	1.06	Moderately Agree
d. Consistent updates stimulate audience interaction.	3.40	1.17	Moderately Agree
e. SMM directly elevates conversion rates.	3.60	1.05	Agree
Overall	*3.536*	*1.09*	*Agree*
3. Search Engine Optimization (SEO) Performance			
a. Securing top search placements facilitates seamless customer discovery.	3.56	1.25	Agree
b. Dominating search rankings bolsters enterprise legitimacy.	3.56	1.18	Agree
c. Shoppers frequently select my highly-ranked web links.	3.96	0.98	Agree

d. Optimized searches deliver appropriate goods to interested buyers.	3.64	1.12	Agree
e. Robust SEO magnifies overall market curiosity about my goods.	3.80	0.94	Agree
Overall	*3.704*	*1.08*	*Agree*
4. Email Marketing Effectiveness			
a. Digital coupons sent via email sway buyer choices.	3.80	1.05	Agree
b. Follow-up emails successfully reclaim hesitant shoppers.	3.36	0.92	Moderately Agree
c. Digital bulletins provide compelling and useful insights.	3.16	1.14	Moderately Agree
d. Inbox announcements convince patrons to test different products.	3.48	1.07	Moderately Agree
e. Customized email pitches elevate transaction probabilities.	3.48	1.10	Moderately Agree
Overall	*3.456*	*1.06*	*Moderately Agree*
5. Pay-Per-Click (PPC) Advertising Results			
a. Paid clicks expose buyers to items they were not actively seeking.	3.40	0.88	Moderately Agree
b. Consumers actively observe my sponsored content while surfing.	3.52	1.02	Agree
c. Funded promotions channel substantial visitor volume to my shop.	3.80	1.05	Agree
d. Precision-targeted campaigns elevate brand prestige.	3.80	0.85	Agree
e. PPC initiatives prompt instantaneous buying actions.	3.76	1.03	Agree
Overall	*3.656*	*0.95*	*Agree*
6. E-commerce Strategy Success			
a. Digital marketplaces are the favored avenues for procurement.	3.48	1.20	Moderately Agree
b. Automated chats efficiently dispense item details.	3.52	1.14	Agree
c. Real-time broadcast selling profoundly anchors consumer trust.	3.84	0.95	Agree
d. Virtual inventories offer a streamlined browsing mechanism.	3.64	1.32	Agree

e. Digital storefronts accelerate the checkout journey.	3.48	1.02	Moderately Agree
Overall	*3.592*	*1.13*	*Agree*
7. Mobile Marketing Reach			
a. Audiences react favorably to text-based alerts.	3.56	1.14	Agree
b. Application-exclusive markdowns trigger immediate sales.	3.80	1.16	Agree
c. System notifications successfully prompt user return visits.	3.28	1.03	Moderately Agree
d. Patrons value receiving localized mobile discounts.	3.60	0.97	Agree
e. Mobile outreach streamlines the consumer's shopping endeavor.	3.16	1.28	Moderately Agree
Overall	*3.480*	*1.12*	*Moderately Agree*
8. Engagement & Loyalty Program Impact			
a. Peer reviews heavily dictate final purchasing moves.	3.24	0.98	Moderately Agree
b. Reward systems tangibly amplify returning customer volume.	3.12	1.34	Moderately Agree
c. Incentivizing return trips forges profound merchant reliability.	3.60	1.15	Agree
d. Recommendation incentives effectively trigger organic endorsements.	3.64	1.21	Agree
e. Consumers relish interactive and game-like promotional events.	3.60	1.12	Agree
Overall	*3.440*	*1.16*	*Moderately Agree*
9. Perceived Value of Emerging Trends			
a. Algorithmic customization heightens merchandise appeal.	3.48	1.02	Moderately Agree
b. Ledger-based (blockchain) tracing reassures buyers regarding sourcing.	3.60	1.09	Agree
c. Virtual overlays (AR/VR) inject interactivity into remote shopping.	3.64	1.14	Agree
d. Next-generation tools solidify faith in seafood freshness.	3.24	0.98	Moderately Agree
e. Buyers favor merchants deploying contemporary digital enhancements.	3.76	1.05	Agree

Overall	*3.544*	*1.06*	*Agree*

Inferential Statistics on Vendor Profiles and Marketing Efficacy

To investigate the links between the enterprises' characteristics and their marketing evaluations, a Pearson product-moment correlation analysis was executed using a 0.05 significance threshold. As detailed in Table 3, the Seafood Product Categories did not demonstrate any statistically significant correlation with the marketing dimensions, given that all *p*-values surpassed the alpha limit. Conversely, Business Longevity (Years in Operation) exhibited a meaningful positive association with SEO Performance ($r = 0.579$, $p = 0.003$) as well as Content Marketing Strategies ($r = 0.418$, $p = 0.038$). This implies that veteran vendors place a premium on sustainable digital authority and informative brand narratives. Moreover, the Diversity of Online Channels Utilized proved to be a highly significant indicator of E-commerce Strategy Success ($r = 0.615$, $p = 0.001$), corroborating the notion that deploying a multi-platform approach fundamentally enhances perceived transactional efficiency and market penetration.

Table 3. Correlation Between Vendor Demographics and Marketing Efficacy

Profile Variable	**Evaluated Marketing Dimension**	**r-value**	**p-value**	**Interpretation**
Seafood Product Categories	Content Marketing Strategies	0.231	0.275	Not Significant
	Social Media Marketing (SMM) Impact	0.192	0.360	Not Significant
	Search Engine Optimization (SEO) Performance	0.285	0.155	Not Significant
	Email Marketing Effectiveness	0.305	0.135	Not Significant
	Pay-Per-Click (PPC) Advertising Results	0.252	0.229	Not Significant
	E-commerce Strategy Success	0.335	0.098	Not Significant
	Mobile Marketing Reach	0.218	0.302	Not Significant
	Engagement & Loyalty Program Impact	0.261	0.210	Not Significant
	Perceived Value of Emerging Trends	0.189	0.355	Not Significant
Business Longevity	Content Marketing Strategies	0.418	0.038	Significant
	Social Media Marketing (SMM) Impact	0.349	0.088	Not Significant
	Search Engine Optimization (SEO) Performance	0.579	0.003	Highly Significant
	Email Marketing Effectiveness	0.495	0.011	Significant
	Pay-Per-Click (PPC) Advertising Results	0.385	0.057	Not Significant

	E-commerce Strategy Success	0.292	0.158	Not Significant
	Mobile Marketing Reach	0.308	0.133	Not Significant
	Engagement & Loyalty Program Impact	0.410	0.042	Significant
	Perceived Value of Emerging Trends	0.372	0.066	Not Significant
Online Channels Utilized	Content Marketing Strategies	0.461	0.020	Significant
	Social Media Marketing (SMM) Impact	0.505	0.011	Significant
	Search Engine Optimization (SEO) Performance	0.382	0.060	Not Significant
	Email Marketing Effectiveness	0.299	0.149	Not Significant
	Pay-Per-Click (PPC) Advertising Results	0.482	0.014	Significant
	E-commerce Strategy Success	0.615	0.001	Highly Significant
	Mobile Marketing Reach	0.538	0.006	Significant
	Engagement & Loyalty Program Impact	0.318	0.122	Not Significant
	Perceived Value of Emerging Trends	0.408	0.043	Significant
Promotional Tactics Deployed	Content Marketing Strategies	0.498	0.012	Significant
	Social Media Marketing (SMM) Impact	0.650	<0.001	Highly Significant
	Search Engine Optimization (SEO) Performance	0.428	0.031	Significant
	Email Marketing Effectiveness	0.380	0.061	Not Significant
	Pay-Per-Click (PPC) Advertising Results	0.515	0.009	Significant
	E-commerce Strategy Success	0.493	0.012	Significant
	Mobile Marketing Reach	0.472	0.017	Significant
	Engagement & Loyalty Program Impact	0.548	0.005	Significant

	Perceived Value of Emerging Trends	0.419	0.038	Significant

Qualitative Findings: Daily Hurdles and Digital Innovations

To back up the statistical data, we also analyzed the written feedback from the 25 seafood business owners to better understand the practical side of their online operations. By grouping their responses, we identified four main themes covering their daily obstacles, technology upgrades, and training needs. These narratives reveal that local vendors view digital tools not just as ways to advertise, but as essential lifelines to keep their businesses running and growing.

Theme 1: Internet and Financial Roadblocks

Most of the group (18 out of 25) pointed to basic, systemic issues, specifically bad internet connections and tight budgets, as their main hurdles. Many respondents noted that these gaps make it incredibly difficult to stay active online and fight for customers against larger, well-funded competitors. Participant 09 summed up this frustration simply:

"The hardest parts for me are the slow internet connection and my own lack of computer skills." (Participant 09)

Participant 04 also explained how having a small budget puts them at a disadvantage:

"It is really tough fighting for customers against huge online shops, especially since we don't have a lot of money to spend." (Participant 04)

These comments show that even though local sellers are eager to use digital tools, poor regional infrastructure and a lack of funding prevent them from fully transitioning online.

Theme 2: Building Trust with Tracking Technology

More than half of the vendors (14 out of 25) felt that using newer tools, like QR codes and digital tracking (blockchain), was a game-changer for winning over cautious buyers. Because seafood freshness is so critical, being able to prove the origin and safety of a product makes customers feel secure. Participant 01 shared:

"We started putting QR codes on our items so people can easily track exactly where their seafood comes from." (Participant 01)

Participant 19 agreed, pointing out that going the extra mile to prove quality directly impacts their income:

"Showing customers the exact journey of our fish using digital tracking has actually made our sales go way up." (Participant 19)

For these business owners, these technological upgrades are essential for building a trustworthy brand, allowing small local sellers to prove their food is just as safe as items from major supermarkets.

Theme 3: Faster Service Through Auto-Replies and Live Video

Another major trend (noted by 15 out of 25 people) was the push toward instant customer service using automated tools and live streaming. Vendors realized that using auto-reply chats and going live on camera helped them answer questions quickly without losing their friendly, personal touch. Participant 06 explained:

"We depend a lot on auto-replies to help us answer customer messages right away." (Participant 06)

For many, adopting these tools is a necessary step up from traditional vending to a faster, more convenient online model. Showing how they are actively trying to catch the modern shopper's eye, Participant 16 mentioned that their biggest upgrade was simply *"going live on video to sell directly to viewers."*

Theme 4: The Need for Expert Training and Advice

The final theme highlighted that a vast majority of the sellers (20 out of 25) recognize their own skill gaps and are actively asking for expert help to survive in the long run. Many admitted that while they know how to scroll and post on social media, they do not have the skills to take high-quality photos or build a real business strategy. Participant 01 stated:

"What I need most is a pro to help me make good posts, like taking much better pictures and videos." (Participant 01)

Participant 09 also expressed a strong desire for professional business coaching:

"I really need to sit down with an expert who can help me plan out how to grow my business online." (Participant 09)

Together, these thoughts prove that merely giving people access to the internet is not enough. To truly thrive in the digital seafood market, these vendors need ongoing training, professional advice, and dedicated support.

4. Discussion

The outcomes of this research offer concrete evidence supporting the revolutionary impact of e-commerce strategies on Surigao del Sur's marine trade. The strong positive relationship identified between utilizing a variety of digital channels and overall promotional triumph indicates that online tools successfully connect conventional coastal vending with contemporary digital market expectations.

A pivotal discovery in this investigation is the substantial value veteran merchants place on Search Engine Optimization (SEO). The exceptional score attributed to top-tier search results (M = 4.0) resonates with the Information Search Theory, suggesting that online shoppers highly value algorithmic trustworthiness and convenience when purchasing highly perishable items (Morales et al., 2022). This insight is significant; it indicates that for marine vendors, an online footprint has evolved past basic social network exposure into deliberate, tactical placement within the virtual retail space. Such an evolution reflects the conclusions of Sharabati et al. (2024), who noted that a brand reaches marketing maturity only when it advances from stagnant posting to dynamic, search-optimized discoverability.

Another essential finding is the stark contrast between the entrepreneurs' willingness to adopt technology and the actual infrastructural realities they face. Even though vendors consistently issued high "Agree" scores regarding the usefulness of digital campaigns, their written feedback uncovered a severe implementation gap" driven by financial shortages and unstable internet connections. Comparable contradictions are frequently noted in other under-resourced Philippine sectors, where systemic infrastructural roadblocks eclipse a population's digital literacy (Jayalath et al., 2025; Villacorta & Arnado, 2023). Consequently, for vendors operating in the Caraga Region, maximizing the utility of online frameworks relies far more on robust structural and institutional backing than on sheer individual ingenuity.

Furthermore, the qualitative insights concerning QR coding and blockchain systems offer a complex look at how technological adoption creates tangible social value. Because factors like sourcing and freshness remain paramount yet hidden to remote buyers, these advanced tracing methods act as a framework of trust that authenticates the caliber of the goods. This dynamic supports contemporary research emphasizing that e-commerce systems must surpass basic advertising to deliver a level of transparency unattainable through traditional, static promotions (Toala Parraga, 2025; Patel et al., 2023). Adopting such sophisticated verification tools also strongly supports the socioeconomic objectives of AmBisyon Natin 2040, essentially elevating grassroots commodities to align with stringent international quality metrics (NEDA, 2024; Eze et al., 2024).

From a statistical perspective, the correlational data underscores that the diversity of Digital Platforms Used (r = 0.621) acts as a major catalyst for overall online sales achievements. This reveals that simply maintaining a static social media profile falls short; genuine success relies on active behavioral interaction propelled by live streaming and a multi-channel presence (Lady et al., 2023). Such an approach perfectly aligns with the Media Richness Theory, which contends that immediate, reciprocal communication is vital when selling products burdened by high buyer uncertainty, such as fresh marine life (Ayob, 2021). The growing preference for real-time video broadcasting points toward the emergence of a digital wet market, effectively translating the vibrant, culturally ingrained haggling and interactions of traditional Philippine bazaars into a virtual setting.

Ultimately, the proven efficacy of these technological applications presents a practical remedy for the commercial isolation experienced by remote coastal municipalities in the Philippines. As previously outlined, geographic separation from metropolitan hubs and logistical deficits routinely cripple the local seafood economy; nevertheless, this research confirms that online infrastructures can function as highly effective, economical bridges (Autio et al., 2022; Sen et al., 2025). Concurrently, the massive request for expert strategic mentorship (80%) exposes a severe skills gap that urgently necessitates targeted support, potentially through university extension initiatives. These collective insights dictate that rather than merely processing sales, digital interventions must be leveraged to nurture a highly formalized, enduring framework for regional entrepreneurship in the marine sector.

5. Conclusion

This research effectively appraised how seafood enterprise owners in Surigao del Sur, Philippines, adopt and gauge the efficacy of digital promotional frameworks. The outcomes verify that online marketing substantially elevates e-commerce strategy outcomes and transactional fluidity (p = .001). Consequently, these technologies are validated as vital structural supports for provincial maritime trade operating under resource limitations. Ultimately, the data indicates that online ecosystems serve a dual purpose: they are potent commercial catalysts for revenue generation and crucial foundations for fostering market agility and professional endurance.

The core scholarly contribution of this inquiry is its detailed contextualization of e-commerce theories within the regional marine trade, which exposed a significant implementation paradox. Even though entrepreneurs exhibited substantial enthusiasm and digital preparedness, such favorable psychological stances fail to yield concrete financial or operational benefits in the absence of robust local infrastructure. The analysis pinpoints Platform Diversification and Search Engine Optimization (SEO) as the chief catalysts for perceived commercial triumph, underscoring that enduring viability depends on continuous, active digital participation rather than inconsistent social media activity.

Looking past purely financial metrics, the thematic analysis uncovered that e-commerce frameworks create substantial social utility by enabling technological transparency. Vendors identified QR code applications and blockchain tracking as deeply impactful mechanisms that guarantee food security, cultivate buyer faith, and democratize entry into premium marketplaces. Such insights illustrate that digital advancements operate as tools of professional accountability. They empower regional sellers to push beyond the constraints of conventional wet market paradigms and harmonize their business practices with rigorous global quality benchmarks.

These conclusions carry profound weight for provincial advancement and the fulfillment of broader national economic blueprints, specifically the Philippine Development Plan (2023–2028) and AmBisyon Natin 2040. This investigation highlights an urgent need for institutional and educational measures designed to cultivate a digital mindset via comprehensive capacity building and expert strategic mentorship. By merging technological upgrades with targeted academic extension initiatives, governing bodies can successfully narrow the digital divide. This collaborative approach will nurture a highly competitive, sustainable, and inclusive marine sector, thereby driving the overarching socio-economic progress of the Philippines.

References

1. Adewolu Ogwo, A. (2024). Higher education, skills development, and students' preparedness for employability: A case study. Journal of Vocational and Technical Education, 15(2), 112-128.
2. Ahmad, A., Ghani, N. A., & Hamid, S. (2025). Examining the Predictors of Consumer Trust and Social Commerce Engagement: A Systematic Literature Review. Journal of Theoretical and Applied Electronic Commerce Research, 20(3), 247. https://doi.org/10.3390/jtaer20030247
3. Autio, E., Fu, K., Smit, W., Muftiadi, A., Chiyachantana, C., Prasarnphanich, P., Quyên, M., Habaradas, R., Petalcorin, C., Jinjarak, Y., & Park, D. (2022). Adoption of Digital Technologies, Business Model Innovation, and Financial and Sustainability Performance in Startup Firms. https://www.adb.org/sites/default/files/institutional-document/826606/adou2022bp-adoption-digital-technologies-business-model.pdf
4. Ayob, A. H. E-Commerce Adoption in ASEAN: Who and Where? Future Business Journal 2021, 7 (1). https://doi.org/10.1186/s43093-020-00051-8.
5. Bolognini, L., Frittelloni, C., Perretta, F., Scanu, M., & Grati, F. (2023). From Crisis to Opportunity: Developing a Virtual Marketplace to Enhance Sustainability and Resilience in Small-Scale Fisheries. Fishes, 8(5), 272. https://doi.org/10.3390/fishes8050272
6. Bon, A.; Saa-Dittoh, F.; Akkermans, H. Bridging the Digital Divide. Introduction to Digital Humanism 2023, 283–298. https://doi.org/10.1007/978-3-031-45304-5_19.
7. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa
8. Deniz Deral, Şirin Gizem Köse, & İpek Kazançoğlu. (2024). Barriers to Digital Supply Chain Management: A Qualitative Research. Yildiz Social Science Review, 10(1), 28–42. https://doi.org/10.51803/yssr.1480396
9. Edralin, D. M., & Pastrana, R. R. (2023). SME resilience and digital transition in the Philippines. Bedan Research Journal, 8(1), 138-172. https://doi.org/10.58870/berj.v8i1.50
10. Eze, V. H. U., Ugwu, C. N., & Fabian, O. C. (2024). Blockchain-enabled supply chain traceability in food safety. Research Output Journal of Biological and Applied Science, 3(1), 46–51.
11. Jayalath, M. M.; Ratnayake, R. M. C.; Perera, H. N.; Thibbotuwawa, A. Digitalizing Traditional Agri-Food Supply Chains in Developing Economies: A Pathway to Regulated Sustainable Governance. Sustainable Futures 2025, 10, 101356. https://doi.org/10.1016/j.sftr.2025.101356.

12. Kunjiapu, S., Sinnappan, P., Akmar, F., & Kunasegaran, M. (2025). Challenges and Dilemmas of Digitalization in Philippine Education: A Grassroots Perspective. Journal of Public Administration and Governance, 14(2), 232–232. https://doi.org/10.5296/jpag.v14i2.22325
13. Lady, L., Delfina, D., Ng, I., Quinn, F., Wijaya, A. J., & Lie, H. W. (2023). The effectiveness of digital marketing: A case study of One Bowl Soup MSMEs. Jurnal Business & Applied Management, 16(2), 101–114. https://doi.org/10.30813/jbam.v16i2.4589
14. Lalic, B., et al. (2025). Sustainability and digital transition in traditional food markets. Sustainability, 17(3), 456-478. https://doi.org/10.3390/su17030456
15. Lucas Schafer; Ludwig Bauer; Claudia Schafer. The Role of Digital Transformation in Enhancing SMEs' Competitiveness in Emerging Economies. Proceeding of The International Conference on Economics and Business 2023, 2 (1), 151–157. https://doi.org/10.55606/iceb.v2i1.482.
16. Maddikunta, P. K. R., et al. (2022). Industry 5.0: A survey on enabling technologies and potential applications. Journal of Industrial Information Integration, 26, 100257. https://doi.org/10.1016/j.jii.2021.100257
17. Majumdar, K., Verma, A.K., Kathpalia, K.V., Samajder, P., Prabhakar, P.K. (2025). Utilizing Industry 5.0 Technologies to Improve Food Production and Promote Sustainability in Agriculture. In: Dutta, P.K., Hamad, A., Haghi, A.K., Prabhakar, P.K. (eds) Food and Industry 5.0: Transforming the Food System for a Sustainable Future. Sustainable Development Goals Series. Springer, Cham. https://doi.org/10.1007/978-3-031-76758-6_10
18. Morales, Luis & Ehmke, Mariah & Sheridan, Alison. (2022). Consumer Trust and Purchase of Perishable Fresh Food Online Versus In-Store: The Case of beef. Journal of International Food & Agribusiness Marketing. 36. 1-23. 10.1080/08974438.2022.2072992.
19. National Economic and Development Authority. (2023). Philippine Development Plan 2023-2028. Government of the Philippines. https://pdp.neda.gov.ph/
20. National Economic and Development Authority. (2024). AmBisyon Natin 2040: A digitally inclusive economy report. Government of the Philippines. https://2040.neda.gov.ph/
21. Nazaruddin, I.; Utami, E. R.; Rahmawati, E. Digitalization Challenges for SMEs: A Systematic Literature Review Perspective and Future Research. JBTI : Jurnal Bisnis : Teori dan Implementasi 2024, 15 (1), 15–43. https://doi.org/10.18196/jbti.v15i1.20410.
22. Patel, A. S., Brahmbhatt, M. N., Bariya, A. R., Nayak, J. B., & Singh, V. K. (2023). "Blockchain technology in food safety and traceability concern to livestock products". Heliyon, 9(6), e16526. https://doi.org/10.1016/j.heliyon.2023.e16526
23. Popoola, O. A., et al. (2024). The impact of automation on coastal workforce management. International Journal of Management & Entrepreneurship Research, 6(5), 1467-1488. https://doi.org/10.51594/ijmer.v6i5.1095
24. Sen, L. T. H., Phuong, L. T. H., Chou, P., Dacuyan, F. B., Nyberg, Y., & Wetterlind, J. (2025). The Opportunities and Barriers in Developing Interactive Digital Extension Services for Smallholder Farmers as a Pathway to Sustainable Agriculture: A Systematic Review. Sustainability, 17(7), 3007. https://doi.org/10.3390/su17073007
25. Sharabati, A.-A. A., Ali, A. A. A., Allahham, M. I., Hussein, A. A., Alheet, A. F., & Mohammad, A. S. (2024). The Impact of Digital Marketing on the Performance of SMEs: An Analytical Study in Light of Modern Digital Transformations. Sustainability, 16(19), 8667. https://doi.org/10.3390/su16198667
26. Sheer, V. C. Media Richness Theory. The International Encyclopedia of Media Psychology 2020, 1–14. https://doi.org/10.1002/9781119011071.iemp0118.
27. Toala Parraga, S. D. Marketing Digital Y Comportamiento Del Consumidor En La Era Post-Covid. Visión Académica 2025, 3 (3), 23–33.https://doi.org/10.70577/2qpbkf46
28. Villacorta, F. C.; Arnado, A. A. Competencies, Instructional Skills, and Challenges of Teachers in Implementing the Technical-Vocational and Livelihood Senior High School Track. International journal of membrane science and technology 2023, 10 (2), 653–678. https://doi.org/10.15379/ijmst.v10i2.1304.
29. Wickramasinghe, G. L. D., & Wickramasinghe, V. (2025). Technical and vocational education and training in Asia and the Pacific–It's matter for economic performance with the 4th industrial revolution. Journal of Economic Analysis, 4(1), 170–191. https://doi.org/10.58567/jea04010009
30. Yi, H. (2025). Impact of Perceived Value and Social Media Usage on Purchase Intention and Brand Loyalty. Advances in Economics, Management and Political Sciences 2025, 214 (1), 216–224. https://doi.org/10.54254/2754-1169/2025.cau27057.