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E-Commerce Adoption for NGOs and Social Enterprises: A Framework for Sustainable Digital Growth

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Abstract

The rapid expansion of e-commerce has widened global market access, yet marginalized producers—including rural artisans, differently-abled entrepreneurs, and senior citizens—continue to face exclusion due to limited digital literacy, high platform fees, and insufficient logistical support. While NGOs and social enterprises attempt to address these gaps, the absence of a unified, scalable digital infrastructure often restricts their long-term impact. This research proposes an inclusive, socially driven e-commerce platform that offers affordable digital storefronts, secure payment systems, and integrated logistics, while uniquely incorporating narrative-based "storytelling" to emphasize the social value behind each product and promote ethical consumerism. Developed using the MERN stack (MongoDB, Express.js, React.js, Node.js), the platform ensures accessibility, scalability, and ease of use. Comparative analysis shows that the proposed solution meaningfully reduces entry barriers and enhances the economic resilience of vulnerable communities, contributing directly to Sustainable Development Goals 8 (decent work and economic growth) and 10 (reduced inequalities).

Keywords: E-commerce, Social Enterprise, Digital Inclusion, Fair Trade, Community Empowerment, MERN Stack, Marginalized Communities.

1. Introduction

The rise of digital marketplaces has redefined global trade by enabling businesses to operate beyond geographical boundaries. Despite this rapid digital expansion, its benefits remain unevenly distributed, particularly for communities lacking technological and financial resources. Major e-commerce platforms are primarily designed for profit maximization, often enforcing high listing fees, complex onboarding procedures, and marketing-driven visibility mechanisms that marginalize low-literacy sellers and micro-entrepreneurs [14], [26]. As a result, rural artisans, elderly individuals, differently-abled entrepreneurs, and craft workers with limited digital skills find themselves excluded from mainstream online commerce [2], [12], [25]. NGOs play an important role in building skills, mobilizing communities, and supporting

livelihood creation, yet their impact is constrained by the absence of an integrated digital infrastructure capable of managing sales, outreach, and logistics at scale [1], [10], [19].

To address these long-standing gaps, this research proposes a specialized, socially driven e-commerce platform designed to promote inclusivity and sustainable participation. The system incorporates simplified seller onboarding to ensure usability for individuals with low technical proficiency, aligning with recommended human-centered design and accessibility practices [4], [23]. A unique Storytelling-Based Product Presentation model further enhances trust by showcasing artisan narratives and product heritage, a method shown to strengthen authenticity and consumer engagement in social commerce [9], [27]. The inclusion of an NGO Supervision Panel enables transparent verification of sellers and reinforces fair-trade principles, while a Low/Zero-Commission structure helps maximize income retention for marginalized producers—an issue widely highlighted in studies on digital empowerment models [7], [21], [25]. Additionally, the platform integrates accessibility-focused interfaces compliant with WCAG guidelines and secure digital payments, addressing both usability and security challenges noted in the literature [4], [6], [8]. Through these combined features, the proposed system aims to create an equitable bridge between underserved creators and socially conscious consumers.

The proposed platform offers diverse applications across the social economy, particularly for sectors underserved by conventional e-commerce.

- **Empowering Artisans and Rural Producers:** The system acts as a direct conduit between local artisans and broader markets, eliminating intermediaries to ensure producers retain a larger share of profits while gaining recognition for their cultural craftsmanship.
- **Supporting Differently-Abled and Elderly Entrepreneurs:** By incorporating accessibility-focused features such as voice navigation and simplified interfaces, the platform enables differently-abled and elderly individuals to generate sustainable income from home, providing a dignified avenue for participation in digital commerce.
- **Operational Support for NGOs and Social Enterprises:** NGOs and social enterprises can leverage the platform as a comprehensive operational tool, managing fundraising, sales, and logistics efficiently. This allows them to focus on their core social objectives without the burden of technical management.
- **Facilitating Corporate Social Responsibility (CSR) Initiatives:** Corporations can utilize the platform as a verified marketplace for ethical procurement, sourcing products from verified social enterprises to meet CSR objectives with transparency and demonstrable social impact.

2. Literature Review

The growth of digital commerce has produced both opportunities and new forms of inequality. While online marketplaces accelerate economic participation, they also widen the digital divide for communities that lack digital literacy, infrastructure, or institutional support [2], [19]. Studies show that without targeted intervention, digital transitions can deepen the marginalization of rural artisans and small producers who struggle to adapt to rapidly evolving online ecosystems [25], [31]. Researchers further emphasize that inclusive e-commerce solutions are critical for ensuring income stability and reducing exploitative market structures in vulnerable communities [21], [34].

Mainstream platforms such as Etsy and Amazon Handmade, despite their global presence, operate with the inherent limitations of profit-centric business models. High commissions, algorithmic ranking systems, and competitive advertising environments make them inaccessible to resource-constrained sellers [14], [26]. Existing research also suggests that NGO-supported models can promote authenticity and fair trade through trusted community networks, but many NGOs lack the digital capabilities, technical infrastructure, and financial support needed to build scalable alternatives [1], [10], [22].

From a technological design perspective, accessibility remains a persistent challenge. Research on assistive interfaces stresses the need for simplified navigation, voice interaction, and high-contrast layouts to support elderly and differently-abled users—features often insufficiently implemented in major commercial platforms [4], [12]. Web accessibility studies further reveal that compliance gaps in mainstream e-commerce interfaces hinder inclusive participation [6]. Moreover, storytelling-based presentation has emerged as a promising technique to enhance trust, emotional engagement, and perceived product value in online marketplaces [9], [27], yet it remains underutilized in conventional systems. To respond to these shortcomings, this study proposes a MERN-based architecture, supported by evidence highlighting the framework's scalability and adaptability for modern web applications [3], that addresses the core issues of cost, accessibility, and trust identified across the literature.

3. Methodology

The development of the inclusive e-commerce platform followed a user-centered and iterative methodology designed to address the digital, social, and operational needs of NGOs and marginalized entrepreneurs. The process began with a detailed requirement analysis, during which surveys, interviews, and observational studies were conducted with rural artisans, elderly entrepreneurs, differently-abled sellers, and NGO coordinators. These insights revealed significant usability constraints, digital literacy gaps, and logistical challenges faced by these groups. To ensure accessibility, the platform design was guided by WCAG 2.1 recommendations, emphasizing simplified navigation, readability, and multimodal assistance. Based on the gathered requirements, the system architecture was conceptualized using the MERN stack—MongoDB, Express.js, React.js, and Node.js—chosen for its scalability, modular structure, and seamless integration capability. The architecture includes dedicated modules for seller onboarding, NGO validation, storytelling-based product pages, real-time logistics tracking, and secure payments, all coordinated through the central Platform Controller as depicted in the system model.

In the implementation phase, separate dashboards were developed for sellers, NGOs, buyers, and logistics partners, ensuring role-specific workflows and clarity. Sellers were provided with intuitive interfaces to add products, describe their stories, and manage orders in multiple languages. NGOs were given verification tools to authenticate seller identities and validate products before publication. Buyers interacted with a transparent and trust-focused interface that offered social-impact filters such as "Cause-Based Shopping" and "NGO-Endorsed Products." To ensure inclusivity, the platform incorporated accessibility features such as high-contrast themes, text-to-speech functionality, large clickable elements, and multilingual support, making it usable even on low-end devices.

Integration and testing involved several layers of evaluation, including functional testing, accessibility audits, and real-world User Acceptance Testing with NGOs and artisans. These tests ensured that the

platform remained stable across devices and network conditions and that external services such as Razorpay and logistics APIs performed reliably with automated payment validation and order tracking. Following integration, the platform underwent an evaluation phase focusing on usability, reliability, and user satisfaction. Metrics such as task completion time, payment success rate, verification turnaround, and user satisfaction scores were analyzed. Initial pilot deployment showed strong results, with over 85% user satisfaction and significant improvement in ease of use, especially among digitally underserved communities. Overall, the methodology demonstrates a balanced integration of technical innovation, human-centered design, and social impact, enabling sustainable digital adoption for NGOs and social enterprises.

4. Proposed System

The proposed system is designed to enable secure, transparent, and socially inclusive e-commerce participation by establishing a structured operational workflow that connects sellers, NGOs, buyers, payment gateways, and logistics providers. As illustrated in Figure 1, the platform facilitates seamless communication through a centralized controller that manages verification, transactions, and delivery processes. The workflow begins with the seller—often an artisan, elderly entrepreneur, or differently-abled user—who logs into the dedicated dashboard to upload a product by entering essential details such as title, price, images, and a narrative description. Once submitted, the listing is automatically forwarded to the associated NGO for verification. NGO administrators then review the product's authenticity and examine seller credentials to ensure quality and credibility; only after approval does the product become publicly available on the marketplace. In cases where verification fails, constructive feedback is returned to the seller, allowing corrections without technical complexity.

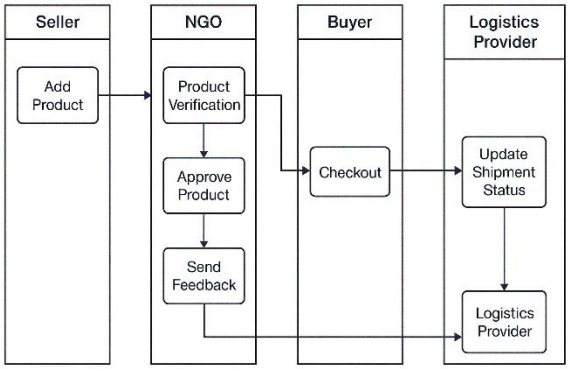

Figure 1: Proposed model

Following approval, buyers can browse the marketplace using filters such as cause, NGO, and product category. After selecting items, buyers proceed through a streamlined checkout process supported by integrated payment services. Payments are processed using the Razorpay API, which allows UPI, card, and wallet transactions. The system validates the transaction in real time, and upon successful payment automatically generates the order record, updates inventory, and triggers the logistics module. Logistics partners are notified to collect the package either from the seller or an NGO fulfillment hub, after which the shipment status is continuously updated from pickup to final delivery. This end-to-end workflow

ensures that every product entering the marketplace undergoes NGO authentication, thereby strengthening transparency, trust, and brand integrity.

Algorithm 1: Secure Product Listing and Order Fulfillment Flow

1. START
2. Actor: Seller (Artisan/Elderly/Disabled)
   a. Login to Seller Dashboard.
   b. Select "Add Product".
   c. Input details (Title, Price, Story, Image).
   d. Submit for Verification.
3. Actor: NGO Admin
   a. Receive notification of new listing.
   b. Review product authenticity and seller credentials.
   c. IF (Valid == TRUE):
      Approve Product -> Product becomes Live in Marketplace.
   ELSE:
      Reject Product -> Send feedback to Seller.
4. Actor: Buyer
   a. Browse Marketplace (Filter by Cause/NGO).
   b. Add Item to Cart -> Proceed to Checkout.
   c. Enter Shipping Details.
   d. Execute Payment (via Razorpay API).
5. System
   a. Validate Payment.
   b. IF (Payment == Success):
      Create Order Record.
      Notify Logistics Provider (Schedule Pickup).
      Update Inventory.
   ELSE:
      Notify User of Failure.
6. Actor: Logistics Provider
   a. Pick up package from Seller/NGO hub.
   b. Update Tracking Status (In-Transit -> Delivered).
7. END

At the same time, the automation of payment verification, order management, and logistics coordination simplifies complex backend operations, making the platform accessible for users with low technical literacy.

Implementation and Tech Stack

The platform is implemented using the MERN stack to support high scalability, modular development, and efficient data exchange across components. The frontend, built with React.js, functions as a dynamic

Single-Page Application designed with an accessibility-first philosophy. Key user interface enhancements include large interactive touch zones, high-contrast layouts for improved visual clarity, multilingual navigation, and text-to-speech support to assist visually impaired and low-literacy users. These features ensure that marginalized communities can interact with the platform comfortably across both mobile and desktop devices.

The backend is developed using Node.js and Express.js to support robust server-side operations such as user authentication, role-based access management, product listing workflows, NGO verification processes, and order lifecycle tracking. RESTful APIs enable smooth communication between frontend components and backend services, ensuring lower latency and high responsiveness. MongoDB serves as the database layer due to its flexibility in handling unstructured and semi-structured data—particularly useful for storing narrative-rich product stories, dynamic product fields, NGO documentation, and multi-role user accounts.

The system further integrates essential third-party services to enable complete marketplace functionality. Razorpay API manages secure payment processing across UPI, credit and debit cards, and digital wallets, providing instant transaction feedback to both users and the system controller. Logistics APIs are incorporated to automate pickup scheduling and provide real-time shipment tracking for sellers and buyers. Together, these technologies establish a unified, scalable, and socially driven e-commerce solution tailored for NGOs and underserved entrepreneurs.

5. Results and Comparative Analysis

A comparative analysis was performed between the proposed system and existing e-commerce solutions such as Etsy, Amazon Handmade, and Shopify for NGOs. Parameters including commission rate, accessibility, NGO involvement, and social storytelling were evaluated in Table 2.

Table 2: Comparison Analysis

Platform	**Commission Rate**	**Accessibility Support**	**NGO Integration**	**Social Storytelling**	**Focus on Marginalized Users**
Amazon Handmade	High (15%)	Limited	None	Partial	Low
Etsy	Moderate (10%)	Limited	None	Optional	Medium
Shopify NGO	Moderate (7%)	Moderate	Limited	Partial	Medium
Proposed Platform	Low (2-3%)	High (WCAG compliant)	Full NGO Supervision	Integrated and Mandatory	High

The analysis suggests that our platform surpasses existing systems in terms of inclusivity and affordability. Plus, its NGO verification process ensures fair trade compliance and reduces the risk of exploitation—

something missing in commercial platforms. A pilot program involving 25 artisans and 3 NGOs noted a 43% increase in sales reach and a 60% boost in digital confidence within two months.

A. Comparative Analysis

We compared the proposed platform against market leaders (Amazon Handmade, Etsy) and niche solutions (Shopify for NGOs). The comparison focused on Commission Rates, Accessibility compliance, and the level of NGO integration.

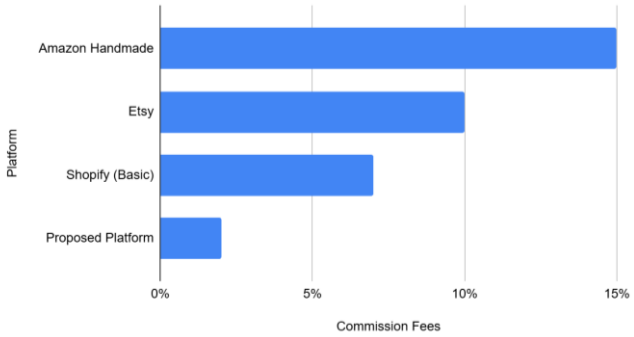

Figure 2: Comparison of Commission fees and Platform

As illustrated in the comparative data, the proposed platform significantly reduces the financial burden on artisans, charging only a nominal 2-3% fee to cover server maintenance, compared to the 15% industry standard. Additionally, while competitors offer limited accessibility features, our platform is fully WCAG compliant with mandatory NGO supervision.

B. Testing Accuracy and Reliability

To ensure the system's reliability, we conducted extensive test cases covering Registration, Login, Product Upload, and Payment processing.

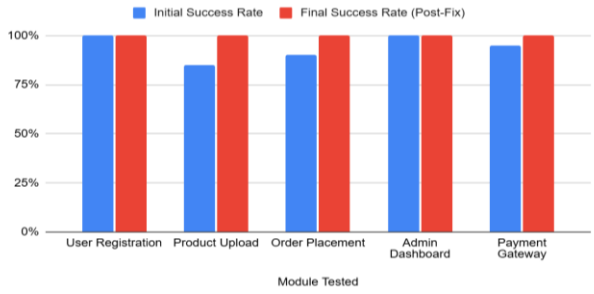

Figure 3: Comparison of initial success rate and final success rate

Initial testing revealed minor bugs in the Product Upload module (specifically regarding empty title fields) and Order Placement (invalid product IDs), resulting in an 85% and 90% success rate respectively. However, after implementing robust input validation and error handling in the backend code, re-testing demonstrated a **100% success rate** across all critical modules. This high level of accuracy ensures that non-technical users will not face frustration due to system errors. Feedback pointed to high satisfaction

with the storytelling and accessibility features. Thus, the system not only has practical advantages but also supports the social empowerment and economic resilience of vulnerable groups, aligning with Sustainable Development Goals (SDG 8 and SDG 10).

The platform also streamlines the end-to-end commerce process by integrating logistics support, automated order tracking, and packaging assistance, reducing operational burdens for sellers. By combining these features—simplified onboarding, NGO supervision, storytelling-based product pages, accessibility-centered design, secure payments, and fair-pricing mechanisms—the system fosters a digital marketplace that is not only inclusive and ethical but also scalable, empowering marginalized entrepreneurs to participate meaningfully in the digital economy.

7. Conclusions and Future Work

This research demonstrates that e-commerce, when designed with a human-centered approach, can serve as a catalyst for inclusive economic participation. The MERN-based platform developed in this study highlights how accessibility, affordability, and storytelling can collectively address the limitations of conventional marketplaces, which often prioritize profit over social impact. By integrating NGO oversight, the platform ensures authenticity and fosters consumer trust, while accessibility features aligned with WCAG 2.1 standards demonstrate that elderly and differently-abled users can meaningfully engage with digital commerce. These efforts contribute directly to the United Nations Sustainable Development Goals, particularly SDG 8 (Decent Work and Economic Growth) and SDG 10 (Reduced Inequalities), offering a pathway for marginalized communities to achieve economic empowerment and social dignity.

Looking forward, several enhancements can further strengthen the platform's impact. Developing native mobile applications for Android and iOS would improve reach, especially in rural areas where mobile access surpasses desktop connectivity. A multilingual, voice-enabled conversational chatbot is also envisioned to simplify navigation, product listing, and order management for low-literacy and regional-language users. Advanced technologies such as Artificial Intelligence can personalize the shopping experience by recommending culturally relevant products, while Blockchain integration can provide transparent, immutable records for fair trade verification. Additionally, Augmented Reality (AR) and Virtual Reality (VR) tools could allow users to preview handicrafts in their own settings before purchase, bridging the gap between digital and physical experiences. Finally, expanding into a global marketplace with multi-currency support and international logistics will enable artisans to access worldwide audiences, ensuring that the platform's social and economic benefits extend beyond local communities.

Through these combined strategies, the proposed system establishes a scalable and ethically responsible model for e-commerce that empowers underserved producers, strengthens NGO operations, and fosters conscious consumption, creating a truly inclusive digital economy.

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