DIGITAL MARKETPLACE FOR RURAL CREATIVE ECONOMY AND SUSTAINABLE DEVELOPMENT GOALS: AN INDONESIAN PROTOTYPE STUDY

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ABSTRACT

Indonesia's creative economy contributes 7.28 percent of national gross domestic product, yet rural producers who hold the country's living cultural knowledge capture only a small share of that value. General-purpose marketplaces reduce village creative products into anonymous commodities and provide no structured space for cultural provenance. This study designs, implements, and evaluates a village digital marketplace prototype that treats local wisdom as machine-readable metadata and links platform outcomes explicitly to the Sustainable Development Goals. A six-stage design science research methodology with evolutionary prototyping was applied in four craft villages in the Solo Raya Region, Central Java. Data were collected through observation, interviews with eighteen key informants, four focus group discussions, and questionnaires completed by eighty respondents, then analysed qualitatively and with descriptive statistics. The study produced a five-pillar conceptual model, a twelve-element Local Wisdom Metadata Schema, and a modular progressive web application. Evaluation showed a 96.61 percent functional test pass rate, a 95th percentile response time of 452 milliseconds under five hundred concurrent users, and a mean System Usability Scale score of 80.7. The findings indicate that culturally embedded platform design can operationalise Sustainable Development Goals 8, 9, 10, 11 and 12 at village scale.

KEYWORDS

creative economy; design science research; local wisdom; rural marketplace; sustainable development goals

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INTRODUCTION

The creative economy has become one of the fastest growing engines of the Indonesian economy. Statistics Indonesia recorded that the gross domestic product of the creative economy at current prices reached IDR 1,611.2 trillion in 2024, equivalent to 7.28 percent of national gross domestic product, and grew by 6.57 percent, outpacing national economic growth of 5.03 percent (Statistics Indonesia, 2025). In 2025 the sector absorbed 27.4 million workers or 18.70 percent of the working population, more than half of whom are under forty years old (Ministry of Creative Economy & Statistics Indonesia, 2025). Exports of creative products between January and October 2025 reached USD 26.68 billion or 11.96 percent of total non-oil and gas exports, dominated by the fashion and craft subsectors. At the global level, UNCTAD (2024) positions the creative economy as an explicit instrument for sustainable development, linking creative trade to decent work, innovation and cultural safeguarding.

These aggregate figures, however, conceal a persistent spatial imbalance. Culinary, fashion and craft subsectors together contribute roughly three quarters of creative economy output, and most of their production nodes are located in villages, yet branding, distribution channels and margin capture remain concentrated in urban areas. Villages therefore operate as suppliers of raw material and skilled labour while remaining price takers in the value chain. This pattern reproduces the rural-urban inequality that Sustainable Development Goal 10 seeks to reduce, and it constrains the contribution of rural producers to Goal 8 on decent work and inclusive economic growth.

The structural conditions of Indonesian villages reinforce that constraint. Of 75,265 villages nationwide, the Ministry of Villages and Development of Disadvantaged Regions (2026) recorded 20,503 villages with independent status and 23,579 with advanced status, while 21,813 remain developing, 4,672 underdeveloped and 4,694 severely underdeveloped. Rural poverty stood at 10.72 percent in September 2025 and 5,758 villages were still not connected to the national electricity grid. Rural development policy therefore cannot stop at physical infrastructure; it must strengthen productive economic capacity that is anchored in assets villages already own, namely cultural knowledge and craftsmanship.

At the same time, the national digital economy offers an opportunity that villages have not yet captured. The e-Conomy SEA report projects Indonesian digital economy gross merchandise value of approximately USD 99 billion in 2025, growing 14 percent year on year, with e-commerce contributing USD 71 billion; video commerce alone recorded 2.6 billion transactions, a 90 percent annual increase, while the number of online sellers rose 75 percent to 800 thousand (Google, Temasek & Bain, 2025). National internet penetration reached 80.66 percent or 229.43 million people, but rural penetration of 76.96 percent still trails urban penetration of 85.53 percent, and the main barriers reported by non-users are the absence of a device (43.62 percent) and not knowing how to use one (40.77 percent) (Indonesian Internet Service Providers Association, 2025). The remaining divide is thus a capability divide rather than a pure infrastructure divide, a distinction that Cowie et al. (2020) identified as the central risk of rural digitalisation.

When rural creative producers enter general-purpose marketplaces, four problems recur. First, cultural reduction: generic product description fields cannot accommodate provenance, the philosophy of a motif, the technique of manufacture, or ritual context, which are precisely the sources of value in wisdom-based products. Second, asymmetric bargaining power: ranking and promotion mechanisms driven by transaction volume marginalise small rural sellers and push them into price competition. Third, logistical inefficiency: single-parcel shipping from locations distant from courier consolidation hubs

makes delivery costs high relative to product value. Fourth, individual operational burden: managing a storefront, photographing products, answering messages and handling returns demands time and digital literacy that most artisans do not possess. Consequently, digital participation of rural creative actors often stops at the experimentation stage.

Policy instruments are already in place. Law Number 6 of 2014 on Villages grants recognition and subsidiarity authority to villages, while village fiscal capacity has grown substantially, with aggregate village budgets exceeding IDR 126 trillion (Ministry of Villages and Development of Disadvantaged Regions, 2024). The Smart Village programme has established Village Digital Community Rooms and digital cadres in thousands of assisted villages, and the Ministry of Trade recorded 6,115 traditional markets and 317,429 traders digitalised by July 2025 (Ministry of Trade, 2025). Most recently, Presidential Instruction Number 9 of 2025 accelerated the establishment of Red and White Village Cooperatives as village-level economic aggregators; by 9 July 2026, 35,870 construction sites had been verified, around 15,500 units completed, and 40,000 units were targeted to be operational by the end of 2026 (Ministry of Cooperatives, 2026). Institutional aggregators and fiscal support exist, but a digital trading channel designed specifically to represent local wisdom does not.

Academic literature on smart villages has grown rapidly. Zavratnik et al. (2018) framed smart villages as community-driven initiatives, while Gerli et al. (2022) demonstrated that village smartness depends on social and institutional capacity rather than technological sophistication. Mukti et al. (2022) proposed a collaborative platform architecture for rural digital business ecosystems, and Utami et al. (2024) applied enterprise architecture to design a smart village reference model in Indonesia. Recent systematic reviews report that smart village models are highly context dependent (Anwar et al., 2025) and that documented applications of information and communication technology in rural areas remain dominated by public service domains (Ivanovic et al., 2025). Empirical evidence from China shows that rural e-commerce adoption raises household income (Han et al., 2023), stimulates farmer entrepreneurship (Qing & Chen, 2024), strengthens urban-rural common prosperity (Wei et al., 2024) and depends on ecosystem configurations rather than single factors (Huang et al., 2024; Sun & Shu, 2025). Studies in the Mediterranean context further show that digital and creative tools can safeguard food cultural heritage while supporting rural sustainability (Del Soldato & Massari, 2024).

Four research gaps emerge from this body of work. First, the smart village literature is dominated by governance and public service dimensions, whereas culturally grounded commerce is rarely treated as an object of systems design. Second, no metadata schema exists that renders local wisdom machine readable and integrates it directly into product catalogues, so cultural narrative remains free text that cannot be queried, verified or exchanged. Third, community-based curation and formal integration with village enterprises or cooperatives have not been embedded into software design. Fourth, prototype evaluations of rural marketplaces in Indonesia usually stop at functional testing without standardised performance and usability measurement. In addition, few studies map platform mechanisms explicitly onto Sustainable Development Goal targets, leaving the sustainability claim of rural digital platforms largely rhetorical.

This study therefore aims to: (1) formulate user requirements and a conceptual model for a village digital marketplace rooted in local wisdom; (2) design a local wisdom metadata schema that can be operationalised in a digital product catalogue; (3) implement a prototype with community curation and village institutional integration; and (4) evaluate the prototype in terms of functionality, performance and usability, while mapping its mechanisms onto Sustainable Development Goal targets. The novelty of this study lies in

treating local wisdom not as an interface ornament but as governed data that underpins retrieval, authenticity verification and value proposition formation.

RESEARCH METHOD

This study applied the Design Science Research Methodology (DSRM) proposed by Peffers et al. (2007), which is oriented toward building and evaluating information technology artefacts that solve real organisational problems. DSRM was selected because the outputs of this study are artefacts, namely a conceptual model, a metadata schema and a software prototype, for which conventional verificative designs are inadequate. The six stages were executed sequentially with iterative feedback and combined with evolutionary prototyping across two development iterations, as presented in Figure 1.

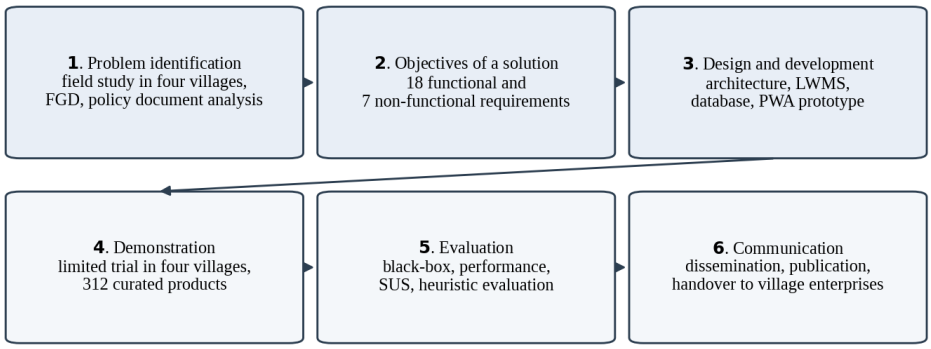


Figure 1. Research stages based on design science research methodology

The research sites were selected purposively: four creative economy villages in the Solo Raya Region, Central Java Province, representing four different craft subsectors in which local wisdom remains alive in daily production practice. Selection criteria were an active production centre with at least thirty business actors, a functioning village economic institution, at least fourth generation mobile internet coverage, and the willingness of the village government to act as a research partner. Fieldwork ran for ten months, from February to November 2025, covering requirements elicitation, development, demonstration and evaluation.

The target population comprised 187 creative economy business units recorded through joint enumeration with village officials. Purposive sampling was used, with the criteria of active production for at least two years and ownership of a smartphone. Eighty respondents participated in the evaluation, consisting of 32 artisans, 8 managers of village-owned enterprises and cooperatives, 6 village officials, and 34 prospective buyers recruited through community channels. In addition, in-depth interviews were conducted with 18 key informants and four focus group discussions were held with 12 to 15 participants in each village.

Data collection combined five instruments: participant observation of production and selling routines; semi-structured interviews using a 24-item guide to explore trading practices and the cultural meaning of products; focus group discussions to validate requirements and interface mock-ups; closed questionnaires to measure usability; and system telemetry to record performance and interaction patterns during the demonstration period. Village policy documents and village profile data served as secondary data.

Usability was measured using the System Usability Scale (SUS), a ten-item instrument with a five-point Likert scale (Brooke, 1996). The Indonesian version was

prepared through translation and back translation and validated by five human-computer interaction experts using Aiken's coefficient, yielding V values between 0.82 and 0.93 with a mean of 0.86, so all items were declared valid. A pilot test with 30 respondents produced a Cronbach's alpha of 0.872, indicating good reliability. SUS scores were interpreted using the adjective rating and acceptability categories of Bangor et al. (2009), with 68 as the industry mean.

Development hardware consisted of two laptops with eight-core processors, 16 GB of memory and 512 GB solid state storage. The prototype was deployed on a virtual private server with four virtual CPUs, 8 GB of memory, 160 GB NVMe storage and Ubuntu Server 24.04 LTS, hosted in a domestic data centre to minimise latency. Client-side testing used three classes of smartphone, with 3 GB, 6 GB and 12 GB of memory, to verify affordability for rural users. The software stack is detailed in Table 5.

Qualitative data were analysed using the interactive model of data condensation, data display, and conclusion drawing and verification. Validity was maintained through source triangulation among artisans, institutional managers and village officials, method triangulation among observation, interviews and focus group discussions, and member checking of summarised findings in each village. Quantitative analysis was descriptive, comprising means, standard deviations and percentages, supplemented by percentile analysis for performance data. Functional testing used black-box techniques with equivalence partitioning and boundary value analysis; performance testing used the k6 tool with staged load scenarios; and expert evaluation applied Nielsen's ten usability heuristics (Nielsen, 1994) rated by five evaluators on a severity scale of zero to four.

RESULT AND DISCUSSION

Site Characteristics and User Requirements

The problem identification stage produced a mapping of the four research sites, presented in Table 1. All four hold flagship products with deep roots in local wisdom, yet face comparable marketing problems, namely dependence on orders from local collectors and the absence of direct channels to end consumers.

Table 1. Profile of the research villages

Village (Regency)	Flagship product and local wisdom	Business actors	Village status
Tumang, Cepogo (Boyolali)	Copper and brass handicraft; hereditary hand-forging technique	63	Independent
Wirun, Mojolaban (Sukoharjo)	Gamelan and karawitan instruments; pelog and slendro tuning	38	Advanced
Melikan, Wedi (Klaten)	Pottery using the rare inclined-wheel technique	44	Advanced
Kliwonan, Masaran (Sragen)	Girli batik with motifs of the Bengawan Solo riverbanks	42	Developing

Source: field enumeration by the authors (2025)

Requirements analysis produced 18 functional and 7 non-functional requirements, prioritised using the MoSCoW technique and revalidated in the second round of focus group discussions. The eight highest priority functional requirements are shown in Table 2. A key finding is that artisans did not request sophisticated features; they emphasised three conditions: uploading products using only a smartphone, the presence of an institution that verifies and markets on their behalf, and certainty of payment. This is consistent with the argument that village smartness rests on social and institutional capacity rather than technological sophistication (Gerli et al., 2022).

Table 2. Highest priority functional requirements

Code	Functional requirement	Priority
FR-01	Artisan registration verified by the village economic institution	Must
FR-02	Multimodal product upload from a smartphone	Must
FR-03	Structured entry of local wisdom metadata	Must
FR-04	Tiered curation by village and regional curators	Must
FR-05	Cultural narrative in text, photograph and short video	Must
FR-06	Transaction with escrow held by the village institution	Must
FR-07	Aggregated and consolidated shipment	Should
FR-08	Product retrieval by local wisdom attributes	Should

Source: processed by the authors (2025)

Conceptual Model of the Village Digital Marketplace

Synthesis of the requirements produced a conceptual model resting on five pillars, shown in Figure 2: community curation, local wisdom metadata, digital cultural narrative, logistics aggregation and village institutional governance. The pillars are mutually reinforcing. Community curation guarantees authenticity; metadata makes that authenticity machine traceable; cultural narrative converts it into a communicable value proposition; logistics aggregation lowers the cost barrier; and institutional governance provides a trust guarantee while retaining economic value inside the village.

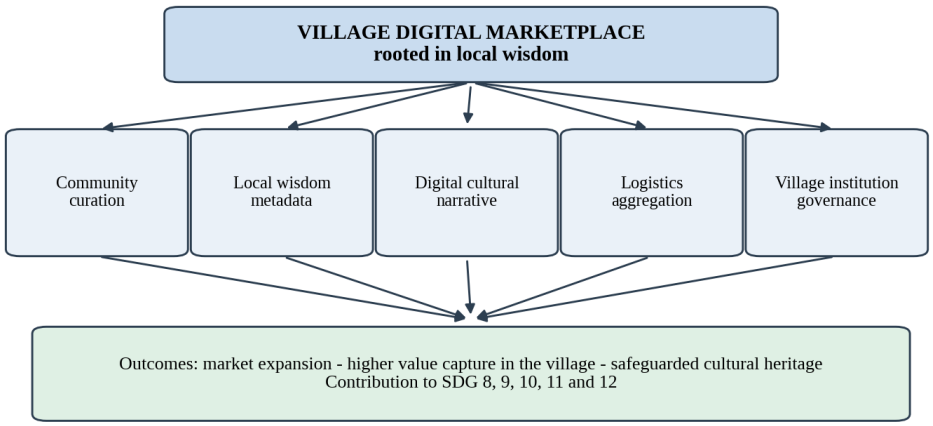


Figure 2. Five-pillar conceptual model of the village digital marketplace

The model departs from general-purpose marketplaces at three points. First, the selling entity is not an isolated individual but an artisan affiliated with a village economic institution, so accountability is institutional. Second, products cannot be published before passing curation, so competition is directed toward quality and authenticity rather than price erosion. Third, the cultural dimension is treated as a first-class attribute in the database. This extends the collaborative platform concept for rural digital business ecosystems (Mukti et al., 2022) by adding a cultural representation layer that existing smart village reference models do not accommodate (Anwar et al., 2025; Utami et al., 2024).

Local Wisdom Metadata Schema

The second artefact is the Local Wisdom Metadata Schema (LWMS), a twelve-element schema developed as an application profile extending DCMI Metadata Terms (Dublin Core Metadata Initiative, 2020) and aligned with the intangible cultural heritage domains defined by UNESCO (2003). Each element is mapped to a schema.org property so that it can be

read by search engines and exchanged between systems. The elements are listed in Table 3.

Table 3. Elements of the Local Wisdom Metadata Schema

Code	Element	Description
LW-01	origin	Village, district and coordinates of the production centre
LW-02	heritageDomain	Link to an intangible cultural heritage domain
LW-03	motifPhilosophy	Symbolic meaning of the motif, form or tuning
LW-04	craftTechnique	Distinctive technique and stages of making
LW-05	localMaterial	Type and origin of the principal raw material
LW-06	creator	Identity of the artisan and craft generation
LW-07	productionTime	Duration of production per unit of work
LW-08	useContext	Customary, ritual or everyday function
LW-09	curationStatus	Verification level and curator identity
LW-10	sustainability	Environmental and material circularity aspects
LW-11	narrativeMedia	Links to photographs, short video and audio
LW-12	culturalLicence	Terms of use for imagery and motifs

Source: designed by the authors (2025)

As an illustration of instantiation, a copper work from Tumang Village is recorded with origin holding the coordinates of the forging centre, craftTechnique holding staged cold forging, motifPhilosophy holding the meaning of the tendril motif as continuity, and culturalLicence stating that the motif may not be mass reproduced outside the village. Such a structure enables cross-attribute retrieval, for example displaying every product tuned to the slendro scale or every product made from local clay. Local wisdom thereby shifts from passive descriptive text into data that can be queried, verified and compared, which is the principal difference between this study and earlier work on rural marketplaces.

Alignment with the Sustainable Development Goals

Because the platform is intended as a sustainability instrument rather than a commercial channel alone, each design mechanism was mapped onto specific Sustainable Development Goal targets (United Nations, 2015), as presented in Table 4. The mapping was used both as a design constraint during development and as an evaluation lens during the demonstration stage, following the recommendation of UNCTAD (2024) that creative economy interventions be assessed against measurable development outcomes.

Table 4. Alignment of platform mechanisms with Sustainable Development Goal targets

SDG target	Platform mechanism	Observed indicator
8.3 decent job creation and growth of micro and small enterprises	Direct market access with institutional escrow	268 transactions in six weeks
8.9 policies promoting sustainable tourism and local culture	Village tourism content module and cultural narrative	4 village tourism profiles published
9.3 access of small-scale enterprises to markets and value chains	Verified onboarding through village institutions	84 active artisans onboarded
10.2 inclusion irrespective of location and status	Low-bandwidth progressive web application and deferred upload queue	Operational on entry-level devices
11.4 safeguarding cultural and natural heritage	Local wisdom metadata schema and cultural licence element	312 products with complete metadata

SDG target	Platform mechanism	Observed indicator
12.8 information and awareness for sustainable lifestyles	Sustainability element and provenance narrative	Provenance shown on every listing
17.17 effective public, public-private and civil society partnerships	Governance by village-owned enterprises and cooperatives	4 institutional partnerships formed

Source: processed by the authors (2025)

System Architecture and Implementation

The prototype architecture is organised into five layers as shown in Figure 3, using a modular monolithic approach so that it remains maintainable by village technical resources while staying open to decomposition into independent services during scaling. The relational database comprises 27 core tables, and the application programming interface exposes 46 REST endpoints with token-based authentication and role-based access control for five roles: artisan, village curator, institutional manager, regional administrator and buyer.

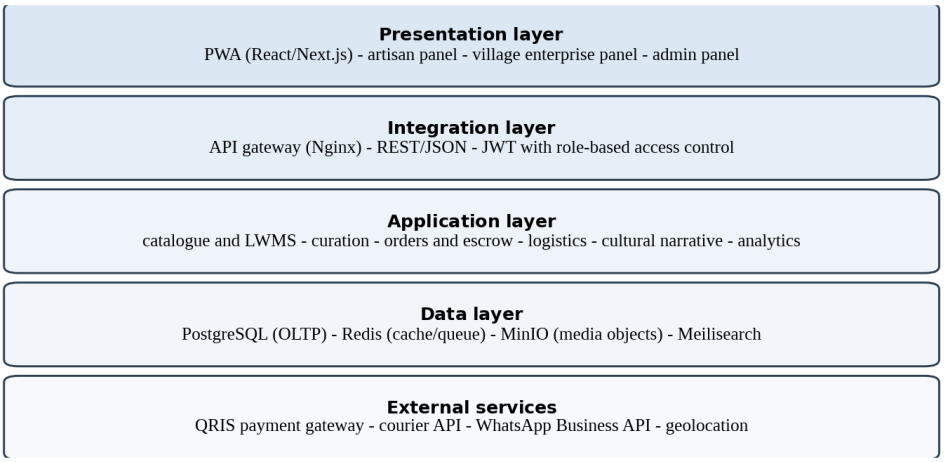


Figure 3. Architecture of the village digital marketplace prototype

Table 5. Technology specification of the prototype

Component	Technology and version	Component	Technology and version
Client interface	Next.js 14, React 18, PWA	Object storage	MinIO
Application service	Laravel 11 on PHP 8.3	Web server	Nginx 1.26
Database	PostgreSQL 16	Containerisation	Docker Compose
Cache and queue	Redis 7	Functional testing	Postman and Newman
Search engine	Meilisearch 1.8	Performance testing	k6 and Lighthouse 12

Source: designed by the authors (2025)

Two design decisions deserve emphasis. First, the application was built as a progressive web application rather than a native application in order to lower the installation barrier on entry-level smartphones, given that 83.39 percent of Indonesian internet users access the internet through smartphones and device limitation remains the largest barrier for non-users (Indonesian Internet Service Providers Association, 2025). Second, the system provides a data-saving mode that loads low-resolution imagery first and a deferred upload queue that stores data locally when connectivity is lost and transmits

it once the connection is restored. Both decisions respond directly to the capability character of the rural digital divide.

The prototype was implemented in eight modules: identity and roles, product catalogue with LWMS, tiered curation, cultural narrative, transaction and escrow, consolidated logistics, village analytics, and village tourism content. Curation is tiered: the artisan uploads, the village curator verifies metadata consistency and technique authenticity, and the regional curator assesses commercial readiness such as photograph quality and price reasonableness. The mean curation time during the demonstration was 1.4 working days per product. Buyer funds are held until goods are received and then released to the artisan, less a three percent institutional contribution agreed in a village assembly.

Functional Testing Results

Black-box testing covered 118 test cases derived from the 18 functional requirements. Results for the second iteration are presented in Table 6, with 114 valid cases, a pass rate of 96.61 percent. The four invalid cases all occurred in the logistics module and concerned shipping cost calculation when the destination district was not registered in the partner courier database; this was mitigated by adding a fallback mechanism of manual calculation by the institutional manager.

Table 6. Black-box functional testing results

Module	Test cases	Valid	Pass rate
Identity and roles	16	16	100.00%
Catalogue and LWMS	24	24	100.00%
Tiered curation	18	18	100.00%
Cultural narrative	12	12	100.00%
Transaction and escrow	20	19	95.00%
Logistics	14	11	78.57%
Village analytics	8	8	100.00%
Village tourism content	6	6	100.00%
Total	118	114	96.61%

Source: testing results by the authors (2025)

Performance Testing Results

Performance testing applied staged loads from 50 to 1,000 concurrent virtual users for ten minutes per stage against the three most critical endpoints: catalogue search, product page retrieval and order creation. The summary is presented in Table 7 and the response time trend in Figure 4.

Table 7. Summary of performance testing

Concurrent users	95th percentile response time (ms)	Throughput (req/s)	Error rate
50	181	42	0.0%
100	214	78	0.0%
200	268	121	0.0%
300	331	139	0.1%
500	452	148	0.3%
750	688	151	1.2%
1,000	1,043	149	3.4%

Source: testing results by the authors (2025)

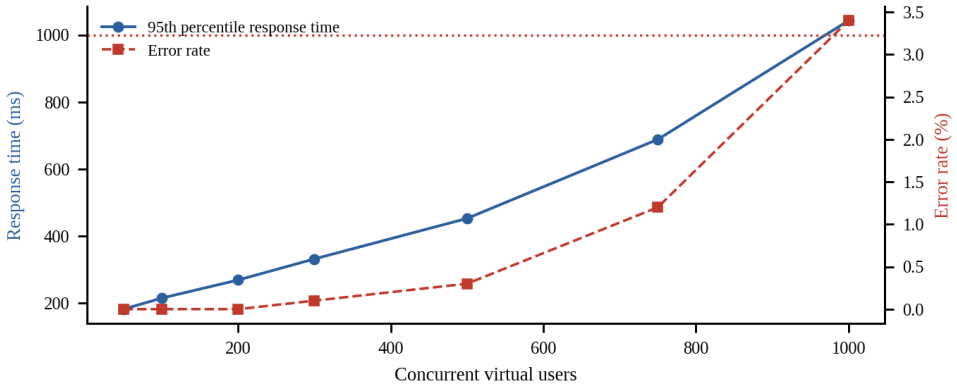


Figure 4. Response time and error rate against concurrent load

The system maintained a 95th percentile response time below 500 milliseconds up to 500 concurrent users with an error rate of 0.3 percent, and throughput saturated at around 150 requests per second. At 1,000 concurrent users the response time exceeded one second and the error rate rose to 3.4 percent, originating from the database connection pool limit. Because the estimated daily active user population across the four villages does not exceed 400, this capacity is adequate at regional scale, whereas further scaling requires separating the search service and adding read replicas. A Lighthouse audit on an entry-level device under network throttling produced a performance score of 91, accessibility 95 and best practices 96, with installability confirmed; the initial payload was compressed to 412 KB with a time to interactive of 2.8 seconds.

Usability Evaluation Results

Usability evaluation involved 80 respondents, with results by group presented in Table 8 and Figure 5. The overall mean SUS score was 80.7 with a standard deviation of 8.9. Following the adjective categories of Bangor et al. (2009), this score falls within the excellent range and the acceptable category, above the industry mean of 68.

Table 8. System Usability Scale results

Respondent group	n	Mean	SD	Category
Artisans	32	78.4	9.6	Good
Village enterprise managers	8	81.6	7.2	Excellent
Village officials	6	79.8	8.1	Good
Prospective buyers	34	83.1	8.8	Excellent
Overall	80	80.7	8.9	Excellent

Source: processed by the authors (2025)

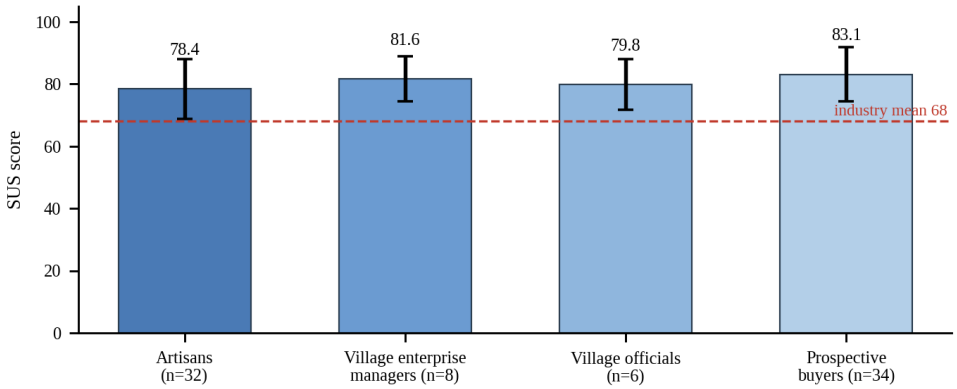


Figure 5. Comparison of System Usability Scale scores across respondent groups

The artisan group recorded the lowest score and the widest standard deviation, indicating the greatest heterogeneity of digital experience. Item analysis showed the lowest scores on statements concerning the need for technical support and confidence in using the system, and the highest on interface consistency. This confirms that technology acceptance in rural contexts cannot be separated from continuous facilitation, echoing findings that rural e-commerce ecosystems succeed through configurations of supporting conditions rather than any single technological factor (Huang et al., 2024; Sun & Shu, 2025). The village digital cadres already established through the national Smart Village programme are therefore a prerequisite for sustainability rather than an optional complement.

Heuristic Evaluation and Iterative Improvement

Evaluation by five experts produced 23 findings distributed across eight heuristic principles, as shown in Table 9. No catastrophic problems were identified. Four major findings concerned the absence of upload status feedback on slow connections, technical terminology unfamiliar to artisans, the lack of a cancellation mechanism in the curation flow, and error messages that did not explain recovery steps. Fifteen findings were resolved in the second iteration and eight cosmetic findings were recorded in the development backlog.

Table 9. Distribution of heuristic evaluation findings

Heuristic principle	Findings	Mean severity
Visibility of system status	5	2.6
Match between system and the real world	4	2.8
User control and freedom	3	2.3
Consistency and standards	2	1.5
Error prevention	3	2.0
Recognition rather than recall	2	1.5
Help users recover from errors	3	2.7
Help and documentation	1	1.0
Total	23	2.2

Source: evaluation results by the authors (2025)

Demonstration Outcomes and Discussion

The prototype was demonstrated for six weeks with 312 curated products from 84 active artisans. During that period 268 transactions were recorded with a total value of IDR 83.4 million and a mean order value of IDR 311 thousand. Sixty-one percent of buyers came from outside the regency and 23 percent from outside the province, whereas before the trial

the majority of sales relied on orders from local collectors. Mean order fulfilment time fell from 3.4 days to 1.9 days, and twice-weekly shipment consolidation lowered the average delivery cost per parcel by 18 percent. These outcomes are consistent with evidence that rural e-commerce adoption is positively associated with household income (Han et al., 2023), entrepreneurship (Qing & Chen, 2024) and urban-rural convergence (Wei et al., 2024). It must be emphasised that these figures come from a limited trial without a control group and therefore cannot be interpreted causally.

Table 10. Positioning of this study relative to prior work

Aspect	Prior studies	This study
Domain focus	Village governance and public services	Culturally grounded creative commerce
Cultural representation	Free descriptive text	Twelve-element structured metadata
Seller model	Independent individual sellers	Artisans affiliated with village institutions
Trust mechanism	Buyer reviews	Tiered curation and institutional escrow
Sustainability claim	Stated in general terms	Mapped to specific SDG targets
Evaluation scope	Predominantly functional testing	Functional, performance and usability

Source: processed by the authors (2025)

The theoretical implication of this study is an extension of the smart village framework into the creative economy dimension. Where earlier literature emphasises village smartness as service and governance capacity (Gerli et al., 2022; Zavratnik et al., 2018), these findings show that smartness can also be realised as the capacity of a village to represent and monetise its own cultural knowledge in structured form. Practically, the artefacts are replicable by other villages through re-instantiation of LWMS according to the typology of their flagship products. For policy, the results suggest that village fiscal capacity and the national network of village cooperatives can be leveraged as the delivery vehicle for culturally embedded digital commerce, converting a general sustainability ambition into measurable target-level contributions.

Several limitations apply. The study covers four villages dominated by craft subsectors within a single region, so generalisation to culinary or fashion subsectors and to different geographical typologies requires further testing. A six-week demonstration is insufficient to assess adoption sustainability and user retention. Economic impact assessment remains descriptive without a control group. Security was tested only at a basic level covering authentication and access control, without comprehensive penetration testing

CONCLUSION

This study produced three interrelated artefacts: a five-pillar conceptual model of a village digital marketplace, a twelve-element Local Wisdom Metadata Schema, and a modular progressive web application prototype integrated with village economic institutions. Evaluation demonstrated functional adequacy with a black-box pass rate of 96.61 percent, performance adequacy with a 95th percentile response time of 452 milliseconds and an error rate of 0.3 percent under 500 concurrent users, and user acceptance with a mean System Usability Scale score of 80.7, categorised as excellent and acceptable. A six-week demonstration across four villages recorded 268 transactions worth IDR 83.4 million, with 61 percent of buyers located outside the regency and an 18 percent reduction in average delivery cost through shipment consolidation.

The principal finding is that treating local wisdom as structured metadata rather than descriptive text is technically operable and comprehensible to rural users. The combination of machine-readable cultural representation, community-based curation and governance by village economic institutions constitutes a trust mechanism that differs from general-purpose marketplaces relying solely on buyer reviews, and it allows platform mechanisms to be mapped onto specific Sustainable Development Goal targets rather than to sustainability in the abstract. Strengthening the rural creative economy therefore requires not only access to digital markets but also an information architecture that favours local cultural value.

Future work should test the artefacts across more diverse village typologies and creative subsectors, extend the observation period to assess adoption retention, apply a quasi-experimental design with a control group to estimate economic impact causally, develop a recommendation module that exploits LWMS attributes, and complete the evaluation with comprehensive security penetration testing.

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