

Design and Development of Web-Based Digital Product Marketplace Using Seller-Based Approach

[Rancang Bangun Marketplace Produk Digital Berbasis Web dengan Pendekatan Seller-Based]

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Abstract. *Most Indonesian commerce platforms focus on physical product supply chains, marginalizing digital creators and hindering brand reputation building. This research develops a web-based digital product marketplace using a seller-based approach that explicitly prioritizes creator identity, profile autonomy, and seller visibility. Developed using the Waterfall Model, the system integrates the Cause-Effect-Solution (CES) framework, UML design, Laravel/React, and Midtrans for secure implementation. System validation yielded a 100% success rate in Black-Box Testing and an 86.5% "highly feasible" rating in User Acceptance Testing (UAT). Load testing demonstrated server robustness with a 0% error rate under 300 concurrent virtual users. In conclusion, these results demonstrate solid prototype feasibility and technical stability under simulated conditions, providing a reliable web architecture that structurally supports creator identity autonomy in the creative economy.*

Keywords - Digital Product; Marketplace; Payment Gateway; Seller-Based; Web

Abstrak. *Sebagian besar platform e-commerce di Indonesia berfokus pada rantai pasokan produk fisik, sehingga meminggirkan kreator digital dan menghambat pembangunan reputasi merek. Penelitian ini mengembangkan marketplace produk digital berbasis web menggunakan pendekatan berbasis penjual (seller-based) yang secara eksplisit memprioritaskan identitas kreator, otonomi profil, dan visibilitas penjual. Dikembangkan menggunakan Model Waterfall, sistem ini mengintegrasikan kerangka kerja Cause-Effect-Solution (CES), desain UML, Laravel/React, dan Midtrans untuk implementasi yang aman. Validasi sistem menghasilkan tingkat keberhasilan 100% pada Black-Box Testing dan peringkat 86,5% ("sangat layak") pada User Acceptance Testing (UAT). Load testing menunjukkan ketangguhan server dengan tingkat kesalahan 0% pada 300 pengguna virtual secara bersamaan. Kesimpulannya, hasil ini menunjukkan kelayakan prototipe dan stabilitas teknis yang solid di bawah kondisi simulasi, menyediakan arsitektur web andal yang mendukung otonomi identitas kreator secara struktural dalam ekonomi kreatif.*

Kata Kunci - Marketplace; Payment Gateway; Produk Digital; Seller-Based; Web

I. INTRODUCTION

Digital transformation has significantly altered the modern global commerce landscape. The continuous evolution of communication networks has redefined how modern societies interact, exchange value, and conduct daily business operations on an unprecedented scale. The massive adoption of digital technology has empirically proven to be a primary catalyst in accelerating digital economy growth, particularly by enhancing financial inclusion and cross-border trade across various macro-scale industrial sectors [1]. This phenomenon is further amplified by the increasing accessibility of smart devices, which seamlessly connect millions of previously isolated individuals into a unified global digital market. As the primary epicenter of this massive economic activity transformation, online marketplace platforms are meticulously designed with integrated architectures to efficiently orchestrate complex Business-to-Business (B2B) and Business-to-Consumer (B2C) interactions without geographical barriers [2]. These highly sophisticated digital environments have successfully replaced traditional physical markets by offering unparalleled convenience, extensive product varieties, and seamless payment integrations for a global audience. Consequently, this modern commerce ecosystem is technically required to continuously adapt to emerging trends, actively mitigate cybersecurity vulnerabilities, and enhance transaction transparency to establish robust user trust in interconnected cyberspace [3].

As technology continues to advance, the evolution of electronic commerce is no longer exclusively driven by traditional logistics for physical goods. The electronic business model has steadily expanded its reach into the lucrative realm of intangible commodities, as digital counterparts to physical goods become increasingly ubiquitous in the consumer landscape [4]. These electronic assets, encompassing commercial software, interactive video tutorials, sophisticated graphic designs, and comprehensive electronic books, offer various economic benefits with a far superior

level of operational efficiency. Aided by the widespread availability of these technological platforms, this digital shift subsequently drives the growth and acceleration of the Creator Economy across the interconnected world [5]. Fueled by the democratization of digital creation tools, individuals can now effortlessly produce and distribute high-quality content to a global audience with minimal initial capital investment. The high market demand for these digital assets directly empowers independent creator groups globally by enabling self-employment and sustainable monetization within the freelance economy [6].

Despite the promising economic potential of this thriving creative industry sector, the domestic marketplace ecosystem, particularly in Indonesia, still exhibits significant disparities in architectural interface support. Current popular local platforms in Indonesia are predominantly utilized to digitalize conventional Micro, Small, and Medium Enterprises (MSMEs), focusing primarily on the marketing and distribution of physical commodities [7]. This physical-centric orientation creates a structural incompatibility for digital products. For instance, dominant domestic e-commerce platforms are structurally optimized for physical logistics, requiring inputs for inventory tracking, package weight, and shipping couriers. When independent digital artists or software developers attempt to showcase their unique portfolios on these platforms, they are frequently forced into generic product categories that diminish their personal value and obscure their brand identity in an overcrowded search interface. Consequently, creators face considerable difficulties in building a distinctive reputation, as the platform prioritizes the product's price and search ranking over the creator's portfolio. This phenomenon is detrimental because the primary characteristic of selling digital works is deeply rooted in loyalty to a specific niche market, which inherently demands a high level of marketing differentiation from the seller's perspective [8]. Buyers of digital art, software, or specialized educational materials typically seek specific creators whose previous work resonates with their personal or professional needs. The decision to transact with products without a physical form relies heavily on the creator's credibility and long-term reputation [9]. Numerous academic studies assert that consumer trust, formed through seller reputation and customer feedback, is the most crucial psychological variable determining the success or failure of sales conversions within the digital commerce ecosystem [10]. Without an autonomous interface approach specifically designed to reduce technical complexity and provide profile customization for the seller, the platform fails to deliver a user-centered storefront experience, leaving creators struggling to manage their digital presence effectively [11].

Furthermore, relying heavily on platforms initially engineered for physical goods introduces functional friction in product lifecycle management. Physical marketplaces prioritize shipping logistics and geo-location metrics, none of which are relevant to intangible commodities. When digital creators are forced to navigate these redundant features, it substantially decreases their operational efficiency and increases cognitive load. A dedicated digital architecture eliminates these unnecessary logistical parameters, allowing the platform to streamline operational workflows and focus entirely on optimizing the creator's digital asset management experience.

Addressing these interconnected functional gaps necessitates a fundamental architectural adjustment in how digital commerce platforms present intangible commodities to end-users. Redirecting the platform's primary focus from generic product catalogs to the empowerment of the seller entity represents a critical academic and practical objective. Consequently, this applied research aims to design, implement, and rigorously evaluate a seller-profile-oriented digital product marketplace prototype explicitly tailored for the Indonesian domestic market. By providing infrastructure specifically structured for digital creators, this initiative seeks to dismantle the barriers imposed by conventional, physical-product-centric marketplace designs. Rather than merely asserting that the platform protects creator identity, this study systematically validates the proposed seller-based architecture—which prioritizes creator storefront identity, profile autonomy, and independent product management. The system's effectiveness is comprehensively evaluated through functional Black-Box testing, User Acceptance Testing (UAT) to measure interaction satisfaction, and Locust-based Load Testing to precisely measure server performance stability under simulated stress conditions. These measurements are conducted to objectively assess the viability of implementing the seller-based approach as an innovative alternative solution in the commercial realm.

II. LITERATURE REVIEW

Reviewing past electronic commerce literature is vital to meticulously map the urgency of designing a modern marketplace architecture tailored specifically for digital commodities. A critical synthesis of existing studies reveals a distinct dichotomy in how marketplace solutions are developed based on platform type and product scope. Regionally, applied software-development literature has focused heavily on the digitalization of physical commodity transactions, such as localized marketplace systems for daily physical goods [12]. In contrast, global multi-vendor digital commerce studies emphasize the increasing digitization of assets, which drives demand for secure platforms dedicated to digital exchange [13]. Because intangible assets require no warehousing, this multi-vendor environment necessitates a fundamentally different structural approach to vendor representation. Global benchmarks, such as Gumroad-like creator storefronts and creator monetization tools, offer specialized interfaces that empower independent artists to autonomously monetize their digital talents. However, domestic micro-transaction alternatives

often lack this specialized digital trading interface, forcing creators into generic templates that amalgamate their works into a highly saturated, physical-product-centric marketplace, thereby marginalizing their individual identities.

The scientific literature emphasizes that personalization and reputation systems in e-commerce are critical factors that significantly enhance consumer trust and directly influence purchase intentions [14]. In the digital product space, where buyers cannot physically inspect the commodity, consumer trust is heavily anchored in the perceived credibility and professional presentation of the creator [10]. To bridge the inherent trust gap found in anonymous online transactions, this study explicitly connects these theoretical trust constructs to specific implemented system features. For instance, platform personalization is tangibly implemented through the provision of customizable seller banners, bespoke avatars, and integrated social media links within the autonomous public storefront. These features systematically validate the creator's authenticity and build a unique brand identity [15]. Furthermore, reputation and transactional security are explicitly operationalized through transparent product review displays and reliable payment-gateway integrations, addressing the technical necessity for payment-gateway trust to secure financial exchanges in modern digital commerce [3].

In the field of human-computer interaction (HCI), the architectural design of a marketplace plays a pivotal role in shaping both consumer behavior and creator empowerment. Empirical evidence demonstrates that optimizing fundamental UI and UX elements—evaluated through structured UX evaluation methods and system-validation approaches—substantially increases user satisfaction and long-term retention [16], [17]. Psychological models rooted in Self-Determination Theory indicate that allowing individuals to play an active, autonomous role in personalizing their digital environments satisfies fundamental psychological needs, fostering deeper intrinsic engagement [18]. This theoretical construct of user autonomy is directly translated into the proposed system's architecture by providing an isolated, independent seller dashboard. This dedicated workspace grants creators full autonomy over digital asset management, pricing strategies, and promotional discounts without intermediary platform interference, effectively serving as a highly usable seller-dashboard specifically designed to minimize cognitive friction and support continuous creator growth.

While existing research provides robust frameworks for consumer preferences and physical-product e-commerce models [19], a critical gap remains in the intersection of creator autonomy and regional platform architecture. The current literature indicates that limited applied software-development studies have comprehensively examined how a seller-profile-oriented interface architecture can effectively support digital-product creator autonomy specifically within domestic marketplace contexts. Therefore, this study positions the proposed seller-based approach precisely within this technological gap. By engineering a system that prioritizes creator storefront identity, profile autonomy, and seller visibility, and subsequently subjecting it to rigorous functional testing, user acceptance evaluations, and simulated load testing, this research aims to provide a reliable technological blueprint that structurally elevates the creator economy in the regional landscape.

III. METHODS

This software engineering research was strategically initiated using an applied research framework to prototype a fully functional computational system. The engineering method adopted as the primary backbone of the application development is the classic Waterfall Model [20]. While iterative frameworks such as Agile, Scrum, or Design Thinking are frequently utilized for UX-centric platforms requiring repeated user feedback, the Waterfall paradigm was specifically selected for this marketplace architecture. The strict, sequential nature of Waterfall ensures that complex financial logic—particularly the payment gateway integration and database relational constraints—are rigidly defined, mathematically mapped, and documented upfront. This sequential rigidity effectively mitigates the severe security risks and data anomalies associated with rapid, undocumented iterative changes in digital transaction environments [21]. This sequential engineering paradigm is systematically implemented through a logical sequence of stages, visually illustrated in Figure 1.

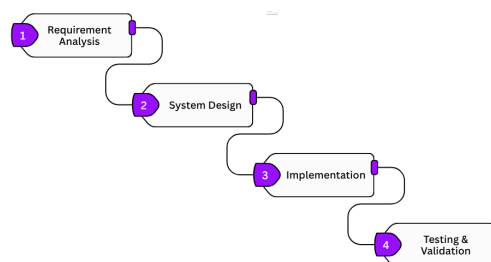


Fig. 1 Research Methodology Stages

To provide a comprehensive overview of the application development lifecycle, the chronological flow of the research methodology is visually illustrated in Figure 1. The implementation of the Waterfall Model in this study is systematically divided into four primary stages to ensure structural integrity. These stages are executed sequentially to maintain disciplined documentation and prevent architectural flaws during the entire development process.

A. Requirement Analysis

This initial stage focuses on dissecting the fundamental problems using the Cause-Effect-Solution (CES) framework. In software development, the CES framework serves as a structured analytical instrument to identify root problems and their operational impacts, systematically translating them into concrete information technology solutions [22]. Subsequently, it formulates the comprehensive Functional and Non-Functional (FNF) requirements to meticulously define the system's core actions and architectural quality characteristics [23], which are integral to building a reliable seller-based ecosystem. This thorough identification process guarantees that the subsequent engineering phases align flawlessly with the specific demands of the creators.

B. System Design

Based on the gathered functional requirements, this stage translates the conceptual solutions into a detailed technical blueprint. It utilizes the Unified Modeling Language (UML)—recognized as a comprehensive and universally applicable description language for encapsulating both static structures and dynamic interactions in object-oriented software [24]—to define the entity interaction logic and visualize the architectural workflow prior to the coding phase. This systematic visualization ensures that all actor boundaries and system responses are validated before the physical implementation begins.

C. Implementation

In this construction phase, the finalized architectural blueprints are directly transformed into physical software code. The backend is robustly engineered using the Laravel MVC framework to manage relational data [25], while the frontend is built using React to create a highly responsive Single Page Application (SPA) [26]. Concurrently, this application interface is securely integrated with the Midtrans payment gateway API to handle financial transaction processing safely, ensuring robust transactional trust [3].

D. Testing and Validation

The final development stage rigorously evaluates the system's operational performance through a multi-layered validation strategy, guided by clear acceptance criteria defined prior to execution. The assessment commenced with functional code validation via Black-Box Testing, an established software testing method that evaluates functional output without examining the internal code structure [27]. This protocol comprised ten predefined core scenarios targeting critical marketplace operations, such as secure authentication, digital source file uploading, and checkout processing. To establish a reliable backend foundation, the absolute acceptance criterion for this initial phase was strictly set to a 100% execution success rate without any fatal blocking errors.

Following successful functional verification, User Acceptance Testing (UAT) was deployed to objectively measure subjective interface satisfaction and usability. To ensure rigorous methodological grounding, purposive sampling was utilized to recruit 20 participants. Each participant was instructed to systematically evaluate the system from dual perspectives by performing both the active digital product creator and prospective buyer roles. The UAT instrument was developed using standard human-computer interaction (HCI) evaluation constructs [17], utilizing a 5-point Likert scale to measure perceived autonomy and transaction ease across these two interconnected workflows. To rigorously interpret the accumulated responses, this study adopted a standard psychometric percentage scale divided into five categorization tiers: Highly Unfeasible (0%-20%), Unfeasible (21%-40%), Moderately Feasible (41%-60%), Feasible (61%-80%), and Highly Feasible (81%-100%) [28]. Based on this established framework, the minimum acceptance criterion for the system was set at achieving at least the 'Feasible' category (above 60%), ensuring a reliable baseline for user satisfaction.

Finally, to determine the system's structural endurance limits, Load Testing was executed using the Locust tool [29] from a local workstation equipped with an Apple MacBook M1 (8GB RAM, 256GB SSD). The stress-test scenario was deliberately capped at 300 concurrent virtual users. Previous performance benchmarks for academic information systems have demonstrated that evaluating API scalability through concurrency simulations ranging from 100 to 500 users provides essential insights into performance degradation patterns. In software capacity planning, simulating 300 concurrent read-and-write requests accurately represents the peak traffic saturation point for a single-node prototype architecture before horizontal scaling is fundamentally required [30]. By emphasizing simultaneous access to critical API endpoints—specifically the homepage (/), the product detail page (/products/{slug}), the creator directory page (/creators), and the creator store profile page (/creators/{username})—this test rigorously verified that the backend routing and database management remain highly stable under intense, real-world domestic production conditions.

IV. RESULT

A. Requirement Analysis and System Design Artefacts

This section outlines the foundational requirement analysis and system design artifacts necessary for the successful development of the digital product marketplace. By utilizing systematic modeling techniques, we ensure that every functional and non-functional requirement is clearly defined and aligned with the project's core objectives. These design artifacts serve as the essential technical roadmap, bridging the gap between identified user needs and the final system architecture.

The requirement analysis phase deconstructed the core marketplace challenges using the Cause-Effect-Solution (CES) framework. As shown in Table 1, this qualitative analysis identified critical gaps in traditional commerce architectures, which directly informed the functional and non-functional requirements detailed in Table 2. These refined specifications constitute the essential foundation for the system design, which was formally modeled using Unified Modeling Language (UML) standards to maintain architectural integrity.

TABLE 1
CAUSE EFFECT SOLUTION (CES) CANVAS

No	Cause	Effect	Solution
1	Difficulty in selling digital products.	Products remain unsold.	Create a platform for trading digital products.
2	Absence of reviews from buyers who have purchased a digital product.	Prospective buyers hesitate to proceed with a purchase.	Provide a product review feature within the system.
3	Difficulty in finding specific digital products.	Failure to find the desired product.	Design the system with a categorized menu.

Table 1 provides a clear link between identified problems and their respective technical solutions, ensuring that every feature implemented in the system is derived from a specific need identified during the analysis phase. Building upon these conceptual solutions, Table 2 delineates the technical specifications, distinguishing between core functional operations and critical non-functional attributes such as security protocols and usability standards. These tables collectively serve as the foundational benchmarks for the subsequent system architecture design and performance testing.

TABLE 2
FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENT

No	Functional	Non Functional
1	Users can perform registration.	Sends a verification code via email when users register.
2	Users can perform login and logout.	Includes a forgot password feature.
3	Users can sell digital products.	Sellers can offer limited discounts on digital products.
4	Users can buy digital products.	Includes a shopping cart menu that lets buyers purchase multiple digital products at once.
5	Users can search for digital products by category.	Includes a feature to sort products by price, rating, and newest.
6	Includes a review feature after product purchase.	Product reviews will always be displayed to both sellers and prospective buyers.
7	Can view digital product purchase history.	Purchased digital products can be viewed or downloaded again.
8	Includes a digital product management feature for sellers.	Includes a feature to sort sold products based on best-selling items.

To translate these comprehensive requirements into a visual design realm, this research adopts the Unified Modeling Language (UML) modeling standardization to design entity interaction logic. This structural mapping is essential to establish a clear architectural blueprint before the actual coding phase begins. Consequently, the initial representation is embodied in a Use Case Diagram and a Sequence Diagram, which serve to visualize the operational workflow and architectural boundaries.



Fig. 2 Use Case Diagram

As illustrated in Figure 2, the Use Case Diagram clearly delineates the access boundaries for buyers, sellers, and administrators within the system. This diagram ensures that the architectural design supports role-based functionality, effectively isolating the seller's workspace to maintain autonomy. Furthermore, it validates that each actor's requirements are met without overlapping access privileges.

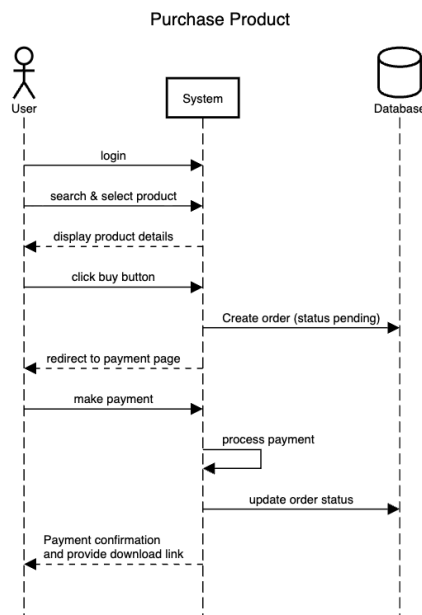


Fig. 3 Product Purchase Sequence Diagram

Complementing the structural design, the Product Purchase Sequence Diagram in Figure 3 outlines the chronological interaction flow between the user, system, and database. This diagram empirically confirms the integrity of the transactional lifecycle, demonstrating how the system validates payment and provides secure access to digital assets after a successful transaction. By mapping these interactions, we provide a transparent view of the backend process during the critical purchase phase.

B. System Validation and Empirical Testing Outcomes

Following the architectural design, the system underwent multi-layered empirical validation to confirm its technical and operational robustness. This section provides quantitative evidence of the system's performance, ensuring that the implemented logic functions as intended before presenting the user interface. By rigorously testing these layers, we demonstrate that the application is not only functional but also scalable for real-world production environments.

1) Functional Testing (Black Box)

Validating the technical integrity of the system commenced with functional evaluation using the Black-Box Testing methodology to confirm input-output accuracy. This validation process focused on ten critical application modules, including secure account authentication, source file management, and transaction processing, to ensure that system behavior conforms strictly to defined specifications. The empirical data summarized in Table 3 demonstrates that all operational parameters were executed with a 100% success rate, without the occurrence of any blocking errors. These results verify that the backend logic is structurally sound, providing a reliable foundation for the marketplace's operational ecosystem.

TABLE 3
BLACK BOX TESTING RESULTS

Test Scenario	Input Data	Expected Output	Status
Valid OTP code input during new account registration.	6-digit number matching the received email.	System verifies the code, redirects the user to the Dashboard, and sets the account status to verified.	Valid
Invalid input other than numbers or code less than 6 digits on the OTP form.	Alphabet input "A-B-C" or code "1234".	Form rejects alphabet input; "Verify Account" button remains disabled until 6 digits are met.	Valid
Updating store username with a name already used by another seller.	Text: "johndoe" (already exists in the database).	System displays a loading indicator, then shows a red cross validation message: "Username is already taken".	Valid
Uploading a digital product source file with a size below the maximum limit.	.zip file with a size of 45 MB.	System processes the upload, saves the file to storage, and shows a success toast message.	Valid
Uploading a digital product source file with a size exceeding the maximum limit.	.zip file with a size of 55 MB.	The system aborts the upload process and displays an error notification: "Source file must be under 50MB."	Valid
Uploading product presentation gallery media exceeding the maximum quantity limit.	Selecting 12 image/video files at once.	The system rejects the upload and displays a notification: "You can only have up to 10 media files."	Valid
Buyer completes checkout for a digital product.	Clicking the "Continue to Payment" button.	System calls the API gateway (Midtrans Snap), displays the payment popup, and sets the order status to Pending.	Valid
Buyer cancels a pending payment order to change the method.	Clicking the "Cancel / Change Payment" button.	Confirmation modal appears; once approved, the Virtual Account is released, and the order status becomes Canceled.	Valid
Attempting to download a product from an unpaid/unverified order.	Product download endpoint URL.	System denies access and displays an Unauthorized (403) warning page.	Valid
User requests permanent account deletion and inputs valid OTP.	Clicking "Request Deletion", inputting 6-digit OTP.	System deletes session data, performs soft delete/cascade, and redirects back to the main page (Welcome).	Valid

2) User Acceptance Test (UAT)

Following successful functional validation, User Acceptance Testing (UAT) was conducted to measure the system's usability and interface satisfaction. Using a 5-point Likert scale, twenty participants—evenly distributed between digital product creators and prospective buyers—evaluated the interface layout and transactional autonomy. The quantitative analysis of the collected data, as presented in Table 4, yielded an accumulated score of 865 out of 1,000, representing a feasibility level of 86.5%. Based on established psychometric evaluation standards for system feasibility, this result statistically classifies the system as "Highly Feasible" for deployment, confirming that the interface effectively supports intended user tasks.

TABLE 4
UAT QUESTIONNAIRE RESULTS

No	Statement	Number of Respondents per Scale					Total Score	Average
		1	2	3	4	5		
A	Buyer Experience Aspect							
1	The user interface (UI) on the homepage and search is easy to understand and use.	0	0	0	9	11	91	4.55
2	The search and filter features make it easy for me to find specific digital products.	0	0	1	8	11	90	4.5

3	The checkout and payment process using the provided system runs smoothly and clearly.	0	0	0	8	12	92	4.6
4	I can directly access and download the digital product easily after successful payment.	0	0	0	5	15	95	4.75
B Seller-Based Experience Aspect								
5	The store profile feature (banner, avatar, and social media settings) makes it easy for me to build a brand identity independently.	0	1	5	6	8	81	4.05
6	The process of publishing a new product (uploading source files, setting prices, and media gallery) is very easy to do.	0	1	5	3	11	84	4.2
7	The dashboard or product display that I created represents my work well to prospective buyers.	0	0	5	9	6	81	4.05
C Security & System Aspect								
8	The OTP verification system via email during registration and account deletion provides a sense of security for my data.	0	2	4	5	9	81	4.05
9	Error messages or notifications that appear are very helpful when I make a mistake (e.g., incorrect OTP code input).	0	1	3	5	11	86	4.3
10	Overall, this system highly supports and facilitates the buying and selling transactions of digital products autonomously.	0	2	2	6	10	84	4.2
Overall Total		0	7	25	64	104	865	4.32

3) Load Testing (Locust)

To determine the system's endurance limits under high-traffic conditions, load testing was performed using the Locust tool to monitor database and memory stability. The empirical metrics obtained from the 300-user stress test, as detailed in Table 5, demonstrate that the architecture maintained high stability without experiencing structural bottlenecks or performance degradation. At the peak load simulation, the server sustained a throughput of 140.87 requests per second (RPS) with a highly efficient average response time of 29.03 milliseconds. The observed 0% error rate across all phases serves as empirical evidence that the backend routing and database integration are optimized for production-scale traffic.

TABLE 5
LOAD TESTING RESULTS

Virtual Users (VU)	Spawn Rate	Total Request	Throughput (RPS)	Average Response Time (ms)	Error Rate (%)
50	5	3,067	23.75	35.75	0
100	10	5,933	47.65	30.03	0
300	20	17,874	140.87	29.03	0

C. System Architecture and Implementation Evidence

The physical embodiment of the proposed architecture is realized through a Model-View-Controller (MVC) structure leveraging the Laravel framework for the backend. This server-side foundation is seamlessly integrated with a React-based Single Page Application (SPA) frontend to provide a responsive user experience. This technology stack was carefully selected to ensure the system remains robust and scalable for managing complex relational databases and dynamic content.

The user interface is strategically segmented into two primary domains: a public-facing storefront and a private, autonomous work panel for sellers. As depicted in Figure 4, the homepage utilizes a minimalist card-based design engineered to reduce cognitive load for new visitors while maintaining system performance. This interface layout is specifically structured to guide users through the catalog efficiently, ensuring that each digital product is clearly associated with its respective seller entity, thereby operationalizing the seller-based principle without visual clutter.

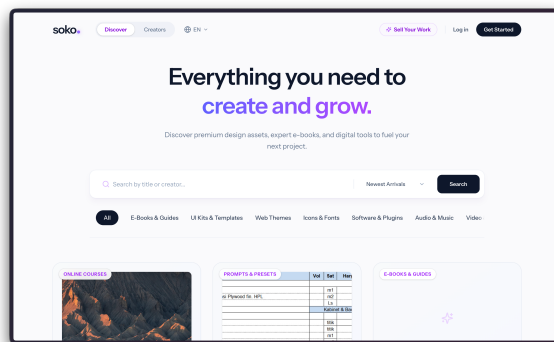


Fig. 4 Main Page User Interface View

The platform prioritizes creator identity through the 'Discover Creators' directory (Figure 5a) and independent storefront profiles (Figure 5b). These interface components translate the theoretical seller-based requirements into tangible features, allowing creators to display custom banners, avatars, and social media links. This visual customization serves as a functional mechanism to build brand credibility and foster buyer trust, which is essential for transactions involving intangible digital assets.

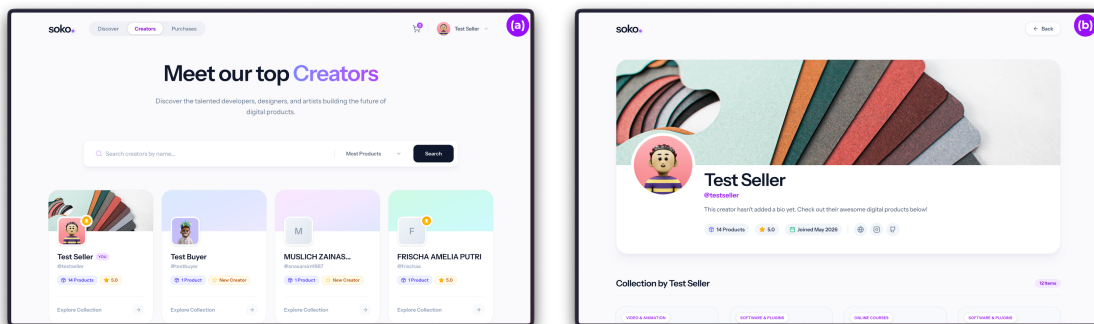


Fig. 5 Creator Discovery and Identity: (a) Creator List Interface View, and (b) Creator Public Storefront and Profile Interface.

Finally, the private 'Creator Hub' (Figure 6) functions as a dedicated management environment that isolates the seller from unnecessary platform bureaucracy. This interface provides creators with full spatial autonomy to manage the lifecycle of their digital product portfolio, including updating prices and monitoring sales metrics. By concentrating these operational controls into a single, distraction-free environment, the system effectively maximizes the seller's operational efficiency and independence.

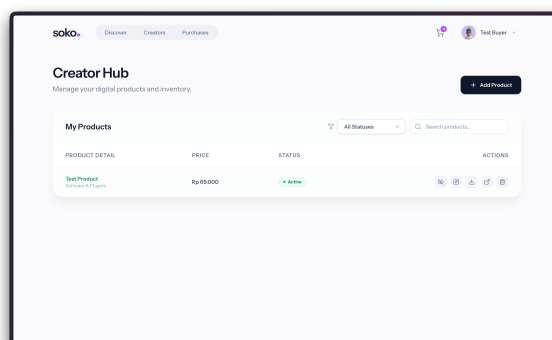


Fig. 6 Product Management Interface Display

V. DISCUSSION

The holistic evaluation of this seller-based marketplace architecture reveals significant insights into its technical feasibility and structural resilience. While recent literature, such as the study by Di Meglio et al. [29], highlights that many modern web projects struggle with high concurrency and often lack rigorous load maintenance, our system demonstrated exceptional stability under simulated stress conditions. Specifically, the load testing results—achieving a throughput of 140.87 RPS and an average response time of 29.03 milliseconds at 300 concurrent users with a 0% error rate—empirically confirm the robustness of the backend design. This seamless structural synchronization ensures that the transaction lifecycle remains uninterrupted, successfully addressing the performance gaps often observed in early-stage platform deployments.

Moving beyond technical endurance, the psychological interaction sentiment measured through the UAT provides nuanced insights into user acceptance and future design implications. Previous developments in local marketplace systems, such as the platform engineered by Afifah et al. [12], have predominantly focused on physical product transactions, whereas our seller-based approach fundamentally shifts this paradigm to prioritize digital asset management and creator visibility. However, a critical analysis of the UAT data reveals a distinct divergence: buyer-centric functionalities received the highest scores, while seller-based and security-related items—specifically store profile customization, dashboard representation, and OTP security perception—received lower average scores of approximately 4.05. These findings indicate that while the platform successfully detaches digital products from generic catalogs, the profile customization interfaces and seller dashboard clarity can still be further improved to truly maximize creator autonomy.

This strategic emphasis on creator identity naturally extends into a mechanism designed to bridge the trust gap in digital commodity transactions. Qalati et al. [10] asserted that perceived reputation is a crucial psychological variable determining online trust, which aligns with Madhuri et al.'s [14] empirical conclusions that customized personalization significantly enhances consumer trust. While this research successfully validates the architectural feasibility of providing personalized visual branding to address these theoretical constructs, the interpretation of our current findings must be carefully restrained. The current study does not directly measure longitudinal business metrics such as actual buyer trust, purchase intention, concrete seller revenue, or creator retention rates, necessitating future empirical studies to objectively measure the platform's comparative superiority against established conventional marketplaces.

Furthermore, as the system transitions toward practical deployment, it is imperative to address several operational and technical risks inherent in digital asset trading that fall beyond the scope of initial usability testing. A comprehensive digital marketplace requires highly secure file storage and robust download authorization frameworks to provide stringent protection against unauthorized redistribution and copyright infringement. Additionally, the operational ecosystem must be fortified with clear administrative mechanisms for rigorous seller verification, proactive fraud prevention, and efficient payment dispute handling. Establishing clear refund policies and robust legal compliance frameworks will be critical to mitigating these practical risks and ensuring a trustworthy, sustainable environment for all transacting parties.

Despite the demonstrated performance stability, the current web-based architecture inherits certain platform accessibility limitations. Because the application is accessed entirely via third-party web browsers, it restricts native hardware integration and limits the fluidity of mobile-first user interactions. This establishes a logical prerequisite for subsequent experimental research to expand the ecosystem into a cross-platform mobile application. Utilizing modern mobile development frameworks would efficiently resolve these multi-device accessibility constraints, thereby providing a more frictionless and integrated digital transaction environment to further solidify the creator economy infrastructure.

VI. CONCLUSIONS

This applied research has successfully developed a web-based digital product marketplace prototype utilizing a seller-oriented framework to facilitate the inclusive exchange of digital assets. By delegating management autonomy and explicitly emphasizing creator storefront identities, the system provides a practical architectural alternative to the brand visibility deficit often imposed by conventional physical-centric commerce platforms. Empirical validation confirms the prototype's technical integrity and initial user acceptance; specifically, functional testing achieved a 100% success rate, dual-role usability testing yielded an 86.5% feasibility score, and simulated load testing demonstrated server stability by efficiently processing 300 concurrent virtual users with a 0% error rate.

While these evaluation metrics confirm solid prototype feasibility and technical resilience under simulated conditions, transitioning this foundational architecture into a fully deployed ecosystem establishes a clear trajectory for subsequent empirical research. To build upon this prototype, future work will be directed toward broader real-user testing with larger creator-buyer samples and comparative UX testing against established marketplaces. Furthermore, executing real transaction pilots, conducting rigorous security audits, and assessing payment reliability under actual

operational volumes represent essential next steps. Ultimately, long-term evaluations of creator-brand autonomy and dispute resolution mechanisms will perfectly complement this system to ensure robust operational sustainability in a real-world digital commerce environment.

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Conflict of Interest Statement:

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.