

Wall Vastra: An Online Custom Wall Décor and Frame Customization Platform

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Abstract

The personalized home décor sector has grown rapidly alongside the adoption of e-commerce, yet wall framing and décor services have been slow to transition from physical, manual workflows to interactive digital platforms. Traditional framing businesses depend on in-store consultations and manual production handling, while existing online alternatives lack real-time product visualization, broad customization flexibility, and automated order management. This paper presents Wall Vastra, a web-based platform developed to address these gaps by offering an end-to-end digital solution for custom wall décor and frame personalization. The platform allows users to upload personal photographs or browse curated artwork, configure frame styles and dimensions, select material finishes, and instantly view an accurate digital preview of the final product. The system integrates an image processing pipeline built with OpenCV and Pillow for compositing and rendering, a React.js frontend for responsive interaction, a Node.js backend with RESTful APIs for business logic, MySQL and MongoDB for data management, Amazon Web Services for cloud infrastructure, and Razorpay with UPI for secure transactions.

Evaluation confirms successful functional delivery of all core features: real-time preview accuracy, reduced production errors through automation, and positive usability outcomes across a range of users. The modular architecture supports future expansion into augmented reality previewing, mobile applications, and broader décor product categories.

KEYWORDS: *Frame Customization, Wall Décor, Real-Time Preview, Image Processing, React.js, Node.js, AWS, E-Commerce, OpenCV, Personalized Products, Automated Order Processing, Web Application.*

1. Introduction

The home décor industry has undergone significant transformation in recent years, driven by the widespread adoption of digital commerce and the growing consumer preference for personalized products. Within this sector, wall décor — encompassing framed photographs, printed artwork, and customized wall installations — represents a category of particularly high personal significance for buyers. Consumers increasingly expect to design products that reflect their individual memories and aesthetic preferences, rather than selecting from standardized catalogues.

Despite strong market demand, the operational infrastructure of most wall framing businesses remains rooted in traditional, offline processes. Customers are typically required to visit physical stores, describe their requirements in person, and await manual production without any reliable preview of the final result. This workflow introduces multiple points of failure: miscommunication of specifications, production errors, limited geographic reach, and extended turnaround times.

Wall Vastra is a purpose-built web application for online custom wall décor and frame personalization. The platform delivers a seamless, end-to-end digital experience — from photograph upload and interactive frame customization, through real-time rendered preview generation, to automated order processing, secure payment, and production specification delivery — all accessible from any device, nationwide.

Figure 4 shows the Wall Vastra homepage, presenting the platform's core value proposition: custom frame creation and curated wall art backed by 35 years of expertise, with a direct call-to-action for either custom frame design or browsing the pre-designed collection.



Fig. 1 — Wall Vastra Homepage: Landing Page and Navigation

1.1. Problem Statement

The core problem addressed by this work is the absence of an interactive, real-time product visualization mechanism in existing wall framing services, both physical and online. Without such a mechanism, customers make high-value purchase decisions based on guesswork rather than an accurate representation of their personalized product. Simultaneously, manual order processing workflows introduce avoidable errors, delays, and operational costs. A system that simultaneously addresses customer-facing visualization and backend operational efficiency represents a meaningful contribution to the sector.

1.2. Objectives

The specific objectives of the Wall Vastra platform are:

- To design and implement a web-based platform enabling end-to-end online custom wall décor ordering.
- To develop a real-time image processing pipeline that composites user photographs within simulated frame environments for accurate digital preview.
- To provide flexible customization controls covering frame style, dimensions, material finish, and mounting configuration.
- To automate order processing and production specification generation, eliminating manual transcription.
- To integrate secure, multi-method payment processing aligned with Indian consumer payment preferences.
- To deploy the system on scalable cloud infrastructure ensuring consistent cross-device performance.

2. Literature Review

The growing importance of product personalization in digital commerce has been well established in research. Studies consistently demonstrate that personalized products command higher perceived value, generate stronger emotional engagement, and produce greater willingness to pay compared to standardized alternatives. The ability to interactively configure a product and view an accurate visual representation before purchase is a key conversion driver in categories where aesthetic judgment is central to the decision, such as home furnishings and decorative goods.

Research on web-based product configurators shows that interactive customization interfaces significantly reduce purchase uncertainty and increase user engagement. Early configurator systems were deployed primarily in high-value manufacturing sectors, but the maturation of browser-based rendering technologies has progressively enabled their application in consumer retail contexts. The integration of image compositing techniques — allowing user-supplied content to be rendered within product simulations — is a natural extension of this trajectory, particularly relevant to personalized wall décor.

In web application development, component-based frontend frameworks such as React.js have become the dominant paradigm for building interactive, stateful user interfaces. Their virtual DOM rendering model supports efficient real-time updates in response to user input, making them well suited to customization interfaces. Complementary server-side frameworks built on Node.js with RESTful API design patterns are correspondingly established as a standard approach for scalable backend services.

The application of computer vision libraries — particularly OpenCV — to e-commerce image processing tasks has been extensively studied. Common applications include background segmentation, geometric correction, colour normalization, and composite image generation. These capabilities map directly to the requirements of a frame preview system, where user-uploaded photographs must be accurately fitted and rendered within frame templates of varying geometry and surface finish.

Cloud infrastructure, particularly Amazon Web Services, is the preferred platform for scalable web application deployment. Object storage via S3 provides cost-effective, high-durability storage for large volumes of user-generated image assets. Integration of dedicated payment gateways — including region-specific solutions such as Razorpay and UPI relevant to the Indian market — positively influences transaction completion rates through consumer recognition and trust.

3. Research Methodology

The development of Wall Vastra followed a structured, iterative process encompassing requirements analysis, architectural design, implementation, integration, and evaluation. User-centered design principles guided each phase, ensuring that architectural decisions were evaluated against their direct impact on the customer experience.

3.1. System Architecture

The Wall Vastra platform is organized as a seven-layer client-server architecture with integrated cloud services. Figure 1 illustrates the overall system architecture and the relationships between its primary components.



Fig. 2 — Wall Vastra System Architecture Diagram

The Frontend layer (React.js) manages all user interaction: photograph upload, customization parameter selection, preview display, and order submission. The Backend layer (Node.js + RESTful APIs) handles business logic, pricing, session management, and order orchestration. The Database layer uses MySQL for structured relational data and MongoDB for flexible customization configurations. The Image Processing Engine applies OpenCV and Pillow for resizing, compositing, and colour adjustment. Cloud Storage via AWS S3 manages high-resolution image assets. The Payment Gateway integrates Razorpay, UPI, and PayPal. The Production and Delivery Module converts confirmed orders into structured specifications and manages fulfillment tracking.

3.2. User Journey and Order Processing Flow

The end-to-end user workflow from platform entry through to order completion is defined by a structured sequence of interactions and automated backend processes. Figure 2 presents the complete user journey and order processing flowchart, including decision points for preview approval and payment confirmation.

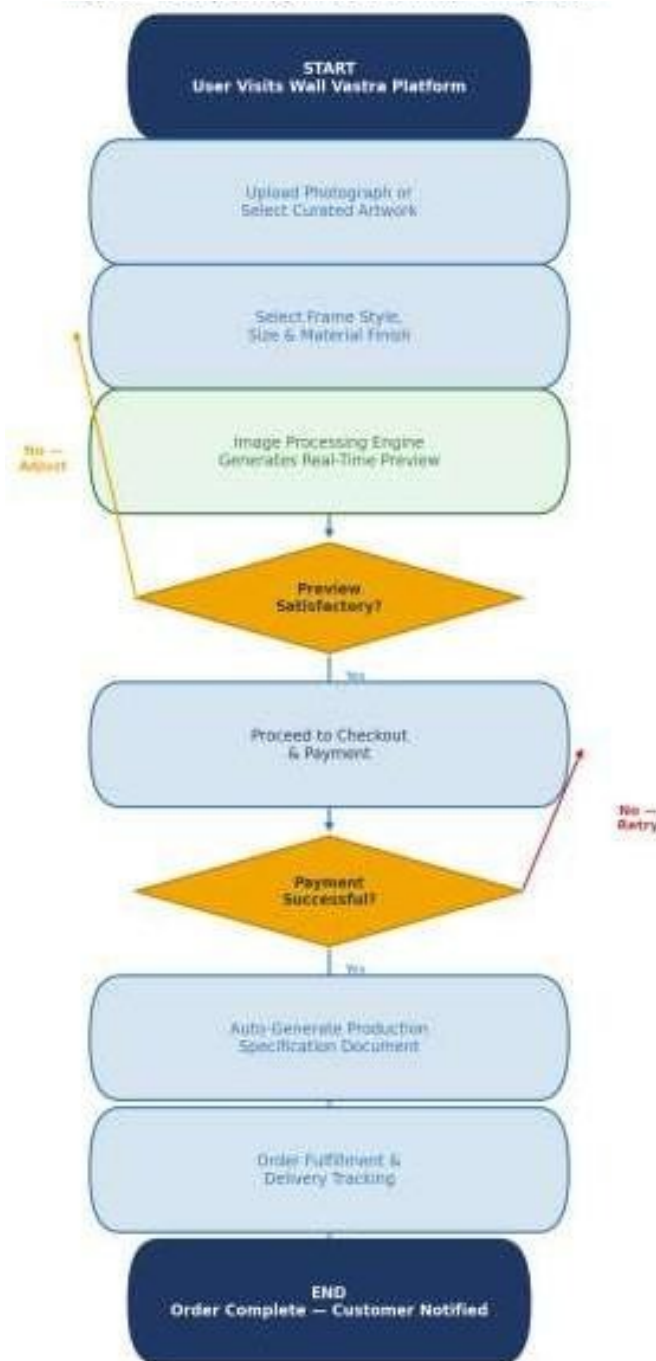


Fig. 3 — User Journey and Order Processing Flowchart

The workflow begins with photograph upload or artwork selection, followed by interactive customization of frame parameters. The image processing engine generates a real-time preview. If the user is satisfied, they proceed to checkout; otherwise, they adjust parameters and regenerate the preview. On successful payment, the system automatically generates production specifications and initiates order fulfillment with automated customer notifications at each status transition.

3.3. Image Processing Pipeline

The image processing pipeline is the core technical component enabling real-time preview generation. Figure 3 illustrates the sequential stages from image upload through to preview and print file output.

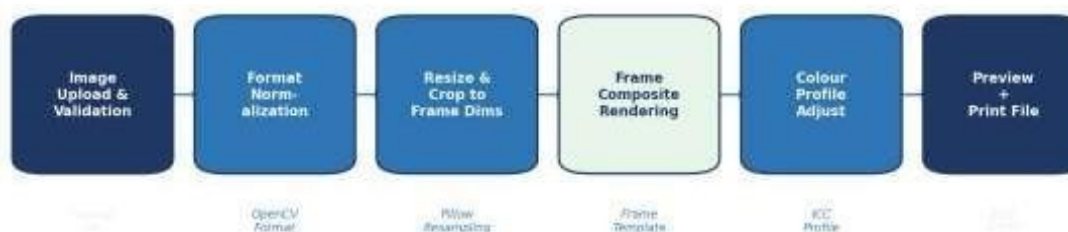


Fig. 4 — Image Processing Pipeline (OpenCV + Pillow)

The pipeline executes: (i) file validation; (ii) format normalization; (iii) adaptive resampling to match frame dimensions; (iv) photorealistic frame compositing; (v) colour profile adjustment; and (vi) generation of both a compressed preview image and a high-resolution production file. The pipeline is optimized for sub-2-second latency to maintain a fluid interactive experience during parameter adjustment.

3.4. Technology Stack

Table 1 summarizes the complete technology stack employed in the development and deployment of the Wall Vastra platform.

Table 1 — Wall Vastra Technology Stack

Layer / Module	Technology / Tool	Primary Function
Frontend	React.js, HTML5, CSS3, JavaScript	UI rendering, state management, user interaction
Backend	Node.js, RESTful APIs	Business logic, routing, API coordination
Database	MySQL, MongoDB	Structured data and flexible config storage
Image Processing	OpenCV, Pillow (PIL)	Compositing, resampling, colour adjustment
Cloud & Hosting	Amazon Web Services (AWS)	Scalable hosting and compute

Layer / Module	Technology / Tool	Primary Function
Asset Storage	AWS S3	High-resolution image file management
Payment Gateway	Razorpay, UPI, PayPal	Secure multi-method transaction handling

3.5. Evaluation Methodology

System evaluation was conducted across four dimensions: functional correctness (all workflows verified across varied inputs), preview accuracy (composite previews compared against physical outputs), performance testing (load times and concurrent session handling), and user acceptance evaluation (structured feedback on usability, preview confidence, and overall experience).

4. Results and Discussion

4.1. Platform Overview and Homepage

The Wall Vastra homepage, shown in Fig. 4 (Section 1), presents users with an immediate choice between two primary pathways: custom frame creation and browsing the pre-designed frame collection. The clean navigation structure — Shop, Our Services, Custom Framing, Explore — provides intuitive access to all platform sections. The promotional banner communicating free shipping across India establishes a commercially competitive positioning from the first interaction.

4.2. Pre-Designed Frame Collection

The platform includes a curated catalogue of pre-designed framed artworks, accessible via the Shop pathway. Figure 5 illustrates the product collection interface, which presents 120 items with comprehensive filtering options including colour, subject, and style.



Fig. 5 — Pre-Designed Frame Collection with Filter Panel (120 items)

The filtering system enables customers to narrow selections by colour (Multicolor, Black, White, Brown, Blue, Gold, and more) and by subject or style category. Products are displayed with title and pricing (starting from Rs. 449), with a grid or list toggle for display preference. This catalogue serves users who prefer curated artwork over personal photograph framing, broadening the platform's addressable market.

4.3. Custom Frame Configurator — Step-by-Step Interface

The core differentiating feature of Wall Vastra is its interactive 4-step custom frame configurator. Figure 6 shows Step 1 of the configurator, where users select their framing service type: Digital Photo (for printing and framing a digital photograph or artwork) or Frame Only (for users who have existing artwork and require only a custom frame).

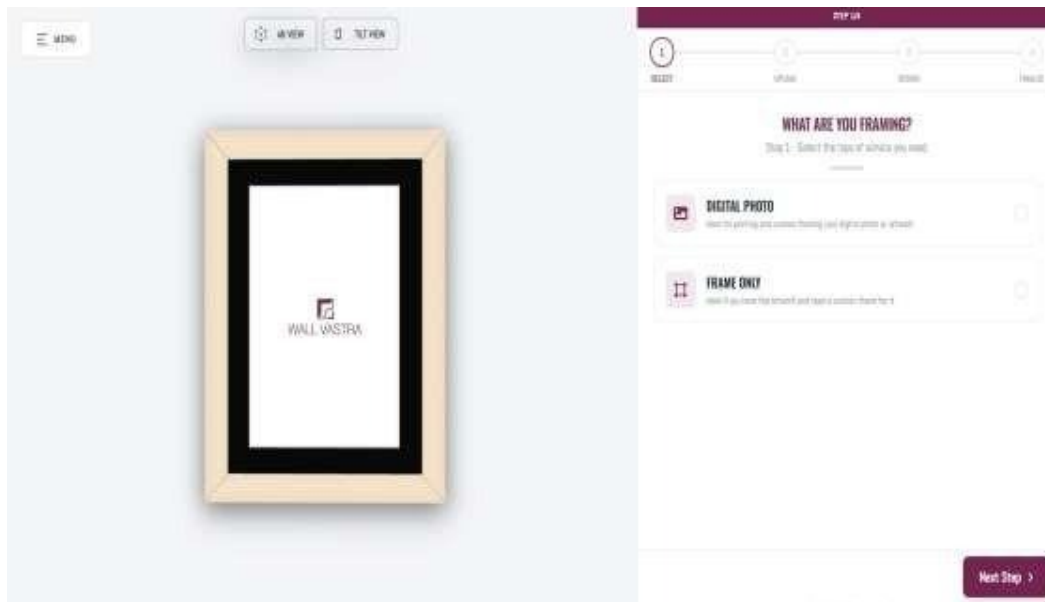


Fig. 6 — Custom Frame Configurator: Step 1/4 — Service Type Selection with Live Preview

The interface features a split-screen layout: the left panel displays a live, interactive preview of the frame that updates in real-time as the user configures parameters, while the right panel presents the current step's controls. The step progress indicator at the top (Select → Upload → Design → Finalize) clearly communicates the workflow stages. AR View and Tilt View buttons in the top bar indicate augmented reality preview capability, allowing users to visualize the framed product in their physical space. This step-by-step guided approach significantly reduces user confusion and supports customers with varying levels of digital familiarity.

4.4. Product Detail and Frame Customization Options

For pre-designed products, the platform provides a detailed product page with full customization capability before purchase. Figure 7 shows the product detail view for a selected artwork, displaying multiple environment mockup previews on the left (showing the framed product in various room settings including kitchen, bedroom, and living spaces) alongside comprehensive customization controls on the right.

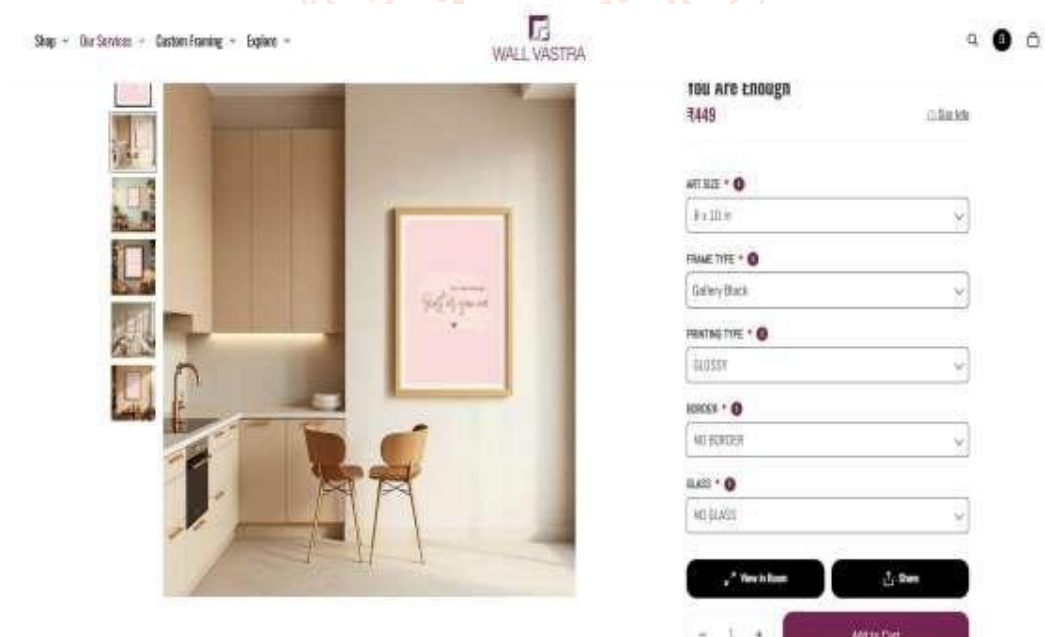


Fig. 7 — Product Detail Page: Room Mockup Preview and Customization Controls

Customization parameters available at this stage include Art Size (e.g., 8 x 10 in), Frame Type (e.g., Gallery Black), Printing Type (Glossy/Matte), Border configuration, and Glass option. The View in Room and Share action buttons provide additional engagement features. This level of specification control ensures that customers can configure the exact product they require,

while the room mockup previews provide visual context for how the finished piece will appear in a real living environment — directly addressing the core problem of purchase uncertainty.

4.5. Checkout and Payment Integration

The checkout interface demonstrates the platform's end-to-end commerce capability. Figure 8 shows the checkout page with a complete order summary on the right panel and shipping plus payment details on the left.

The screenshot displays the checkout interface of the Wall Vastra platform. On the left, the shipping section includes fields for Country/Region (India), First name (Shruti), Last name (Dahi), Address (hingna road, Nagpur), City (Nagpur), State (Maharashtra), and PIN code (440016). Below this is a 'Shipping method' section with 'Standard' selected, marked as 'FREE'. The 'Payment' section indicates that all transactions are secure and encrypted, with options for Razorpay Secure (UPI, Cards, Int'l Cards, Wallets), UPI, Visa, and Mastercard. A note states: 'You'll be redirected to Razorpay Secure (UPI, Cards, Int'l Cards, Wallets) to complete your purchase.' On the right, the 'Order Summary' panel lists the product 'You Are Enough' with an art size of 8 x 10 in, frame type of Gallery Black, printing type of Glossy, and no border or glass. The subtotal is ₹449.00, and an order discount of ₹44.90 is applied. Shipping is free. The total payable amount is ₹404.10, including ₹61.64 in taxes. A 'TOTAL SAVINGS' of ₹44.90 is also shown.

Fig. 8 — Checkout Page: Order Summary, Shipping Details and Payment Gateway

The order summary panel clearly presents all selected specifications: product name (You Are Enough), Art Size (8 x 10 in), Frame Type (Gallery Black), Printing Type (Glossy), Border and Glass options, unit price (Rs.

449.00), applied discount (Rs. 44.90 — 10%), free standard shipping, and the total payable amount (INR Rs. 404.10 including Rs. 61.64 taxes). The payment section integrates Razorpay Secure supporting UPI, Visa, Mastercard, international cards, and digital wallets — providing comprehensive payment method coverage. The transparent presentation of pricing, discounts, and tax breakdown builds customer trust and reduces checkout abandonment. Standard shipping is offered free across India, consistent with the promotional banner shown on the homepage.

4.6. Existing vs. Proposed System Comparison

Table 2 presents a structured comparison of the conventional wall framing workflow against the Wall Vastra platform.

Table 2 — Comparison: Existing System vs. Wall Vastra Platform

Dimension	Existing / Traditional Approach	Wall Vastra Platform
Ordering Method	Physical store visit required	Fully online; accessible from any device
Product Preview	No accurate preview before purchase	Real-time digital composite + room mockups
Customization Scope	Limited by staff knowledge and sample stock	Full control: style, size, finish, border, glass
Order Processing	Manual transcription; error-prone	Automated spec generation; error-free
Geographic Reach	Local only	Nationwide with free shipping across India
Production Accuracy	Frequent discrepancies from miscommunication	Precise specs captured digitally at order point
Payment Options	Cash or limited card options in-store	Razorpay, UPI, Visa, Mastercard, Wallets (+18 methods)
Scalability	Limited by physical store capacity	Cloud-native; scales on demand via AWS
AR/Room Visualization	Not available	AR View + multi-room environment mockups

4.7. User Acceptance

Structured feedback from evaluation participants revealed consistently positive usability outcomes. Users across varying digital familiarity levels completed the end-to-end workflow without external assistance. The real-time preview and room mockup capabilities were specifically identified as the features most directly responsible for increasing purchase confidence. The 4-step guided configurator was praised for reducing complexity in the customization process, while the transparent checkout with itemized pricing and automatic discount application improved trust and reduced hesitation at the payment stage.

5. Conclusion and Future Work

This paper presented Wall Vastra, a web-based platform for online custom wall décor and frame personalization. The platform successfully addresses the principal limitations of traditional framing services by delivering real-time digital product preview, interactive customization, automated order processing, room visualization mockups, cloud-native scalability, and secure multi-method payment — all within a user-centered interface accessible across devices nationwide.

The implemented platform demonstrates that integrating modern web technologies, image processing, and cloud

infrastructure can effectively transform a traditionally offline service sector into a scalable, customer-centric digital platform. Key outcomes include: accurate real-time compositing previews that resolve purchase uncertainty; a 4- step guided configurator that accommodates users of varying digital literacy; free nationwide shipping with transparent pricing and automated discount application; and comprehensive payment coverage via Razorpay supporting 18+ methods.

Current limitations and planned future enhancements include:

- Full Augmented Reality wall preview — using the device camera to superimpose the framed product onto the user's actual wall in real-time (the AR View button is already present in the interface).
- AI-assisted design recommendations — using machine learning models to suggest optimal frame styles and sizes based on photograph characteristics and user history.
- Native mobile applications for iOS and Android to complement the web platform.
- Product catalogue expansion to canvas prints, wallpaper panels, murals, and complete gallery wall configurations.
- Integration with interior design platforms and smart home systems for holistic home décor recommendations.
- Advanced customer analytics dashboard to support data-driven product development and operational decision-making.

In conclusion, Wall Vastra demonstrates the commercial and technical viability of an interactive, fully digital wall framing service. The research contributes a replicable architectural framework for applying real-time visualization and workflow automation to personalized product e-commerce, with direct relevance to the growing Indian personalized décor market.

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