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BookPlace: A Modular & Scalable Multi-Vendor eCommerce System with Advanced Order, Inventory & Analytics Managem

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BookPlace: A Modular & Scalable Multi-Vendor eCommerce System with Advanced Order, Inventory & Analytics Management

June 2026

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This is to declare that the composition of the project work on the entitled BookPlace: A Modular & Scalable Multi-Vendor eCommerce System with Advanced Order, Inventory & Analytics Management, is the original academic work submitted by Muntakim Kadir Sayam (ID: 2521458) as part of a graduate project submission. There is no existing system on which the project has been based. The references section lists existing software frameworks, libraries, documentation, market reports and competitor platforms.

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Abstract

On contemporary e-commerce platforms, the discovery of products, management of the cart, payment, and delivery are usually handled, whereas on professional home-service platforms, the focus is on technician booking, scheduling, and job completion. Customers who purchase appliances or products that consume services extensively typically require simultaneous workflows. A customer can buy an air conditioner, washing machine, smart gadget, or home appliance online, but must call a separate service provider, make a phone call, or use a third-party platform to book an installation, repair, or maintenance. This break creates conflicts with clients, ambiguity among suppliers, reduced visibility among technicians and issues with after-sales responsibility.

This paper presents BookPlace, a service-commerce-based multi-vendor platform that offers a single modular web-based platform for online product and professional service booking. It includes product catalogs, technician schedules, receivables, loyalty services, reviews, refunds, support credentials, vendor processes, human resource operations, and administrative analysis to enable customers, vendors, technicians, and administrators to run the entire service-commerce life cycle more efficiently, safely, and collaboratively. This platform has been built with Laravel 12, Vue 3, InertiaJS, Tailwind CSS, MySQL, Spatie permissions, Laravel Fortify, Stripe, PayPal and SSLCommerz. It takes advantage of a modular monolith design, in which large business areas are subdivided into feature-oriented modules that remain part of a single deployable application.

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1. Introduction

1.1 Project Overview

BookPlace is a full-stack service commerce platform that is a Multi-Vendor system, designed to offer a unique way to book services and make personal purchases online as a single solution. It's designed for companies that offer service-rich products, like appliances, electronics or equipment, when their customers require installation, setup, repair, inspection or maintenance after they've bought them. At BookPlace, we consider service to be a first-class purchase.

The system supports four key functions for customers, vendors, technicians, and administrators.

It enables customers to browse products and categories in the shop, add items to the purchase cart, select services, book technicians, pay, monitor orders, request a refund, post reviews, earn loyalty points, and contact customer care.

The products, variants, service features, shopping, orders, technicians, available features, service spots, coupons, storefronts, human resources, payroll, and leave requests are handled by vendors.

Another portal is where technicians will look at assigned jobs, schedules, and reviews, review-point balances, withdrawal requests, and leave workflows.

The administrators can manage platform-wide vendors, categories, products, refunds, coupons, service areas, themes, loyalty settings, technician withdrawals, reports, and permissions.

The BookPlace is a modular monolith application, with a Laravel backend and an Inertia.js/Vue frontend. This means it's just one web app on the platform, reducing the number of apps to host, maintain and update. At the same time, its business logic is broken up into separate business modules such as catalog, commerce, payment, service operations, geomanagement, CMS, loyalty, review, support, notification, authorization, customer, admin, and vendor. The modules are dedicated to particular parts of the system like products, checkout, technician booking, payments, reviews, or vendor operations. This framework maintains the codebase in order and allows the extensive feature selection needed by BookPlace.

1.2 Problem Statement

The main issue this work addresses is the disjuncture between product trade and professional service activities. The issue with most e-commerce platforms is that shoppers can order

appliances or products that require a lot of service, but they cannot depend on being able to order an installation, repair, inspection, or maintenance as part of the same order. Similarly, there are many home service apps that let you book technicians but don't offer the flexibility to buy products, access a variety of products, use coupons, create an invoice, schedule delivery, or coordinate service all in one move. This disjointedness leads to customer diversion, such as having to go to different websites, call, use messaging apps and book manually.

Such fragmentation leads to four major issues. Firstly, customer experience was disjointed, with the ability to buy products and book services separately, resulting in tedious transactions and limited accountability when issues occurred. Second, it is not always obvious to book a service, because the customer might not know the technician's skills, availability, arrival time or performance history. Thirdly, with multiple tools managing inventory, orders, technician assignment, service areas, coupons, refunds, payroll and availability, vendors experience operational chaos. Fourthly, workers, schedules, wages, performance, benefits, clearances and leave applications are not digitized for technicians.

These issues are gaining significance in the Bangladesh market, particularly as digital commerce becomes increasingly popular, although the market is still plagued by trust issues, cash-on-delivery, inconsistent service quality, and split fulfillment, which affect customer trust. Trust, coordination, and accountability can be enhanced through a single service-commerce platform, as the sale of products, booking of services, scheduling of technicians, payments, reviews,

1.3 Specific Objectives

Its targeted goals are:

- To develop a platform with multiple roles for administrators, vendors, technicians, and customers.
- To put product purchase and the booking of services into a single coordinated order.
- To offer a vendor dashboard about product, variant, service option, order, coupon, technician, availability, area, theme, HR, payroll, and leave management.
- To provide the technician portal to book schedules, reviews, review points, withdrawal and leave.

- We will implement payment flows using SSLCommerz, Stripe, PayPal, and cash-on-delivery-style confirmation routes.
- To facilitate loyalty rewards, guest loyalty claims, tokenized submissions of reviews, refunds, invoices, support tickets, and tracking orders.
- In order to compare BookPlace with the local and international platforms and determine its differentiation in the market.
- To record the architecture, requirements, implementation processes, strengths, weaknesses, opportunities, threats, and future work.

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1.4 Scope of the Work

The scope of BookPlace includes a full-service commerce system that should be designed and implemented, not just a mere product catalog or technician booking prototype. The system encompasses the entire product discovery to support after-sales. It consists of product and category management, variant stock, an option of services, placing orders and checkout, customer coupons, remittance and confirmation of payments, tracking of the status of the orders, invoice generation, refund, service booking, technician scheduling, polygon-based service locality checking, vendor and customer dashboards, technician dashboards, requesting reviews, technician rewarding based on reviews, loyalty points, claimed loyalty using guest loyalty, support tickets, custom theme-based sections of storefront, and administrative reporting.

There's also a layer of a REST-like API under /api/v1 which could be fleshed out to support eventual third-party integrations or mobile apps as well. All of these endpoints include search/product, cart, checkout, technician availability, booking holds, location resolution, payment configuration and payment completion, order tracking, invoices, technician booking intent and administrative reports. This is therefore not limited to Inertia pages in the browser, but is intended to enable the development of mobile and external systems in the future.

1.5 Research Questions

BookPlace is analyzed using the following research questions:

RQ1: How could we bring the product purchase process and professional service booking process together in a single process?

RQ2: What are the approaches to mitigate the uncertainty in the scheduling of technicians in a service-commerce platform?

RQ3: What security and access-control measures are needed for the customers, vendors, technicians, and administrators?

RQ4: What are the ways through which a service-commerce platform can enhance the operations management of the vendors?

RQ5: What are the platform features that can enhance customer trust post-checkout?

RQ6: What are the differences between BookPlace and current e-commerce and services to home businesses?

Subsequent chapters, involving literature review, system design, evidence of implementation, and result analysis, address these questions.

2. Literature Review

2.1 Bangladesh Digital and E-Commerce Context

Bangladesh has an excellent practical environment for systems of service commerce, with increasing digital access, mobile connectivity and the availability of various services on platforms. DataReportal (Kemp, 22026, #) reported 82.8 million internet users and an internet penetration rate of 47.0 percent in Bangladesh as of December 2025, 186 million cellular mobile connections, and 64.0 million internet social media user identities in October 2025. These statistics confirm that there is a significant population to survey, ready to participate in digital commerce and service platforms, and that more than half of the population is still offline; there is still potential for growth.

3 A similar factor is the relevance of BookPlace, thanks to the development of e-commerce. In 2025, the e-commerce market in Bangladesh generated approximately US$6.039 billion in revenue and is estimated to increase by 15-20% in 2025/26 (ECDB, 2026), according to ECDB. It reveals that it is no longer a fandom, at least when it comes to buying online. However, according to ITPs, cash is the most preferred payment method in Bangladesh, and more than 8 90% of e-commerce users have always preferred cash on delivery (International Trade Administration, 2022) It enables BookPlace to implement the multi-provider payment design

and cash-on-delivery-style payment flows with local SSLCommerz integration for offline payments.

In the Bangladeshi market, they are facing a trust issue with the platform. Users might have doubts about the quality of the products, delivery, refunds and after-sales services. The problems are heightened with service-based products because the end user may not have confidence in the selling platform or the seller if the installation process was inadequate or the installation technician had a poor experience. Thus, not only can products be listed in a single application for services and commerce, but it must also possess features for service areas, tech credentials, appointments, status tracking, payment confirmation, reviews, refunds, support, and accountability.

2.2 Adopting E-Commerce, Trust, Payment, and Delivery Obstacles.

A literature review on the adoption of e-commerce in Bangladesh indicates that internet penetration rate is not the only determinant of e-commerce development, but rather usefulness, cost, personal awareness, facilitating conditions, perceived risk and trust. Based on the Bangladesh ecommerce and mobile commerce adoption literature, perceived usefulness, perceived risk and facilitating condition are found to influence user intention and the actual adoption of the user. (Shah Azam et al., 2023, #) (Rahman & Sloan, 2013, #).

Delivery/Fulfillment is another significant factor in the online shopping scenario in Bangladesh. A detailed study of online shoppers in Bangladesh found that delivery performance has a significant impact on customer satisfaction, purchase intention, and willingness to pay more (Saha et al., 2020, #). For products that require a service touch, delivery is not enough; in addition to delivery, installation, schedule adherence, repair and after-sales is also important (ECDB, 2026).

Trust is also associated with e-commerce marketplace research. E-service quality, customer satisfaction and e-trust have been shown to affect the intention to continue using (Kim & Yum, 2024, #). Consumer protection concerns also reported in the marketplace research include undefined responsibilities, fake reviews, refund options, guarantees, scams, and service quality. Technician verification, service-area validation, booking tracking, payment confirmation, refunds, reviews, support tickets and vendor accountability are all explored through these findings, which inform BookPlace features.

2.3 The Product-Service Systems (PSS) concept

The idea of BookPlace is based on information about literature on a product service system. Product-service systems are business models where product and services are combined together in a single transaction and sold in a bundle. It means appliances, electronics, and equipment, where the customer wants a service after purchase of the item through installation, inspection, maintenance and repair services. (Beuren et al., 2013, #).

However, there are many applications in the E-commerce world where the product checkout process is still disconnected to the execution of the service. The product-service concept is put into practice with BookPlace as a fully functional software system that links Product Catalog, Service Options, Checkout, Technician Scheduling, Service Zones, Payments, Invoices, Refunds, Loyalty and even Reviews in one platform.

2.4 Home Service Market Context – On-Demand Service Market

Home-service platforms showcase the market's demand for verified professionals with scheduled appointments and convenient booking. According to Sheba.xyz, the Bangladeshi home and office service platform lists 150+ household services on its app and has over one million registered customers (*Sheba.xyz: Your Service Expert - Apps on Google Play*, n.d.). Looking beyond, Urban Company, TaskRabbit, Amazon Professional Services, or Best Buy—all present their own take on the market logic that customers expect service people to be findable, bookable, reviewed, and scheduled via a digital platform.

However, the majority of the service platforms are service-first. They are interested in only a piece of the work – book only (not the complete product commerce life cycle). In contrast, ecommerce platforms such as Daraz focus on the product discovery, the sellers who supply it, offers, logistics handling and payment. The product specific installation is usually facilitated by the vendor/brand.With this split comes the research opportunity of BookPlace, which conceptualizes product and service as fundamentally linked parts of one order.

2.5 Related Work & Competitor Platforms

17 Daraz is a key player in the e-commerce sector in Bangladesh and across South Asia. It provides Marketplace shopping, retailer involvement, digital logistics and a wide product assortment (*Bangladesh — Daraz*, n.d.) . Its powers are scale & commerce. However, the main purpose of a general marketplace is not to provide a vendor-centric, technically a service booking/payroll/installs coordination system, HR system for the vendors.

Sheba.xyz is powerful in booking local services. It allows users to find reliable professionals and a wide array of home and office services (Kemp, 22026, #). It is focused on service and local. But it is not so much a multi-vendor product marketplace where each vendor might sell service-heavy solutions for the same application, handle variants, theme portions, product-linked services, and payroll.

Urban Company is an international home services company. The public annual materials report lists thousands of active service partners and millions of users who transact annually in FY25 (Urban Company, n.d.). Urban Company is a proof point that a market for professional services can be successfully scaled and not just a ‘commerce plus a vendor operation platform’, a la Groupon.

TaskRabbit is a service that matches customers with independent contractors who can move, repair, clean, mount furniture and perform any other task customers need (Taskrabbit, 2026). The marketplace is adaptive but differs from features such as BookPlace's inventory, product variants, payroll, loyalty, and theme builder.

Examples of product markets are Amazon Professional Services and Amazon Home Services, both of which provide assembly, home theater and appliance installation services that can be purchased along with the product. This is an indication of product-plus-service opportunity. However, Amazon is not a “self-hostable service commerce platform” for local businesses, it's a closed marketplace ecosystem. (guide, n.d.).

Best Buy appliance services offer delivery, installation, protection, repair, haul-away and service partner models (BestBuy, n.d.). It's all very pertinent, as it demonstrates the need for after-sales support in the appliance sector. Best Buy is a retailer/service provider model rather than a multi-vendor platform that independent vendors can set up and run.

Table 2.1 Comparative Review of Related Platforms

Platform	Primary Focus	Observed Gap Relative to BookPlace
Daraz	Product marketplace, seller ecosystem, logistics and digital commerce.	The platform is not actually one of product commerce as product commerce is strong and broad. Instead, the model is based on product purchase and also its installation, which also applies to bookings, HR for techs, and payroll for vendors.
Sheba.xyz	In Bangladesh, the NGSSP corporation is working to make home and office service booking processes easier.	Product stock and variants are not the primary model. In the platform the service marketplace is good, but combined product-service checkout is available compared to BookPlace.
Urban Company	Professional at-home services	Not a multi-vendor, commerce platform for multiple vendors with vendor payroll and product variants, which can be self-hosted on local environments.
Taskrabbit	Independent task marketplace	Limited catalog/vendor-controlled product-service bundling, limited flexible task booking, limited platform HR workflows, and loyalty.
Amazon Professional Services	Specializes in Amazon-related assembly and installation services.	This validates product/service needs in the Amazon space; it's not a standalone platform. This distinguishes it from the independent services marketplaces.

Best Buy Services	Delivery, installation and repair of appliances, protection	Retailer-specific rather than a generalized multi-vendor model, strong appliance service model.

2.6 Market and Competition Analysis

BookPlace is looking to compete in three markets: eCommerce marketplaces, on-demand service marketplaces and vendor operations software. In the context of Bangladesh, the Daraz product marketplace has educated people to search, compare and purchase online and to track products. Sheba.xyz is a service marketplace for offline services, where users can hire verified professionals to provide services in their homes and offices. Installation and repair services can often be value-added commercial components of appliance and electronics sales, as demonstrated in the retailer sector, e.g., Best Buy. Internationally, platforms like Urban Company and TaskRabbit have proven that the hierarchy, discovery, rating and scheduling of technicians can be businesses at scale.

BookPlace isn't competing to replace all large marketplaces. It's more of a solution/commerce system for vendors that require not just the commercial aspects, but also the actual execution by technicians. This is especially true for appliance companies, electronics stores, repair and installation companies, and retailers with a service mentality. These businesses do not necessarily rely on the product to sell. Thus, BookPlace can be established as an operational platform for book trading, rather than a "place" set up like a marketplace clone.

Table 2.2 Market and Competition Positioning

Competitive Dimension	**BookPlace Position**
Customer Value	One journey for product discovery, checkout, service scheduling, payment, invoice, refund, review, loyalty, and support.
Vendor Value	Centralized control of products, services, technicians, areas, themes, HR, payroll, orders, coupons, and reports.

Technician Value	Dedicated portal for assigned work, schedules, reviews, review points, withdrawals, and leave.
Admin Value	Platform governance across vendors, areas, refunds, coupons, reports, loyalty, themes, and technician withdrawals.
Market Differentiation	Combines product commerce, professional service booking, technician operations, loyalty, reviews, refunds, and vendor theming in one self-hostable system.

2.7 Research Gap

Through the literature survey and competitor analysis, it became apparent that there are various digital platforms containing individual elements of BookPlace. Many studies have explored ecommerce user acceptance, ecommerce trust, user online payment behaviors, delivery efficiency, customer satisfaction, etc. Writing on Product-Service System (PSS) has focused on how value can be created by offering products in combination with supporting services and on marketplace studies of the factors that shape customer trust: reviews, platform accountability, refunds, guarantees and transaction security. Likewise, there are partial implementations of these ideas in existing platforms like Daraz and Sheba.xyz, Urban Company, Taskrabbit, Amazon, Best Buy, etc.

The challenge in the research and implementation, however, is that these functions are usually designed and executed separately. The traditional ecommerce marketplace is centered on product discovery, seller operations, payment and checkout processing, and logistics. Home-service platforms, on the other hand, primarily focus on the professional booking and service completion workflows. The retailers' service models are sometimes restricted to only a few categories and tend to exist within a closed system. Consequently, there is not much existing multi-vendor service commerce solution that works like a service commerce platform with product sales but is self-hosted and vendor-operated, and has an integrated modular structure. Without a doubt, existing systems lack the capability to combine elements such as service add-ons, the technician's schedule, service-area validation, payment confirmation, refunds, consumer reviews, loyalty programs, HR and payroll management, vendor storefront customization and administrative analytics into a single platform.

To bridge that gap, BookPlace is creating an integrated service commerce ecosystem where the purchase of the product is as much a part of the integrated digital marketplace experience as is the booking of a professional service, allowing for a more complete, seamless and scalable experience.

3. System Description

3.1 System Perspective

BookPlace is a monolithic web system which is divided into modules. To the user, it's just one application with different portals according to its purposes. It is technically divided into blocks of Authentication, Catalog, Commerce, Payment, Service Operations, Geographic Management, Content Management, Loyalty, Reviews, Support, Notifications, Customer, Vendor and Administrator blocks.

The main thing this application does is leverage the Inertia.js package to bind Vue-powered pages to Laravel controllers without a separate single-page API when the user navigates in the browser. The benefit of this design is that you have a modern Vue frontend, but with the productivity of server-side routing & authorization. BookPlace also offers API access to cart, search, checkout, availability, payment, order tracking and reports.

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3.2 System Users

Table 3.1 System Users

User Type	Description
Administrator	Completely controls the entire platform: vendors, products, categories, areas, themes, coupons, refunds, loyalty settings, reports and technicians' withdrawals.
Vendor	Products, variants, services options, orders and bookings are managed by Vendors. They also manage technicians, availability, coupons, areas and themes, HR profiles, leave requests, and payroll run in a store.

Technician	Views assigned jobs, schedule, reviews, reward points, withdrawal requests, and leave requests on a separate technician guard.
Customer	Customers search and browse, purchasing items and selecting service options. They set up services, process payment, track orders and returns, make reviews and accumulate loyalty points as well as using Customer Services.
Guest Customer	Can place an order and then claim loyalty via safe claim links, or can register an account after the order.

3.3 Product Features

3.3.1 Discovery and Customer Storefront

The public storefront supports sections like home page, product detail pages, search behavior filters, cart drawer, and wishlist behavior as well as checkout. Substances which can be incorporated into products are images, variants, service options, warranty information, SEO fields, merchandising flags, and installation support.

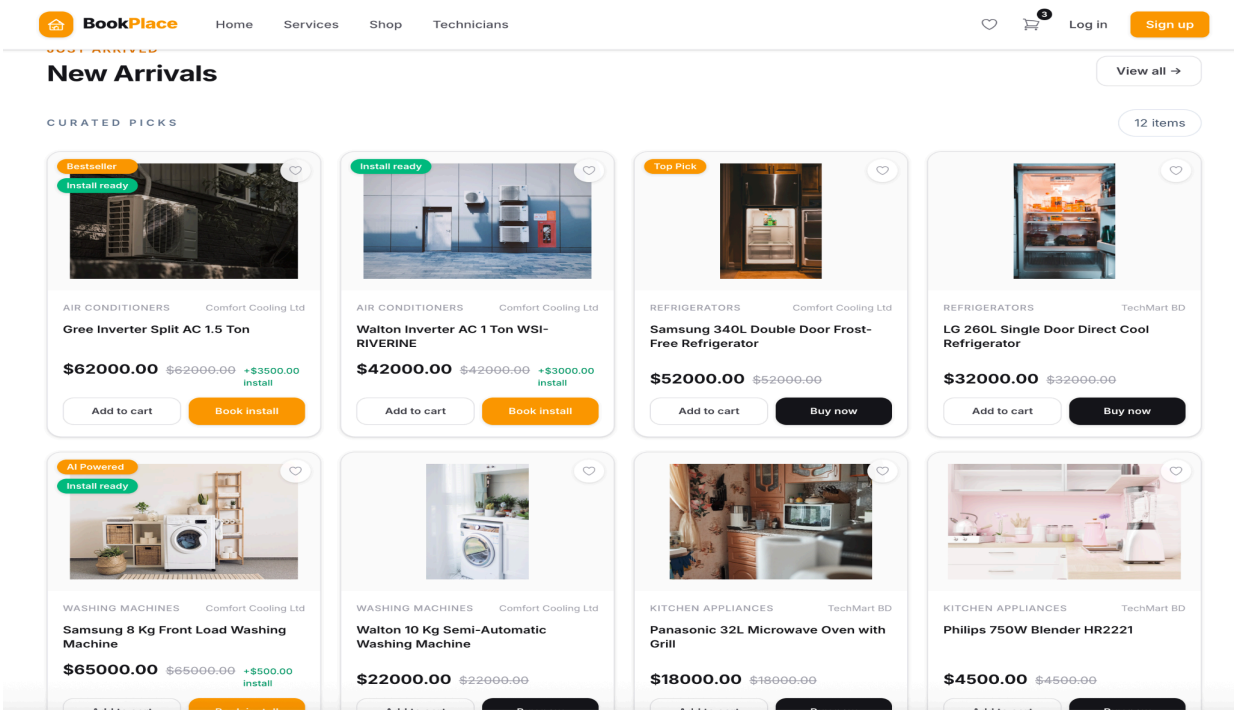

Figure 3.1 Homepage and storefront user interface.

3.3.2 Product Detail and Service Add-On

Maintaining a balance between the product and its add-on is crucial in marketing and sales.

The product detail process enables clients to view product information, variants, vendor information, related services and service availability. The main design concept is that the customer buys a product and also "buys" an installation contract at the same time, enabling the customer to place a setup, repair, inspection or maintenance contract upon leaving the cashier's desk.

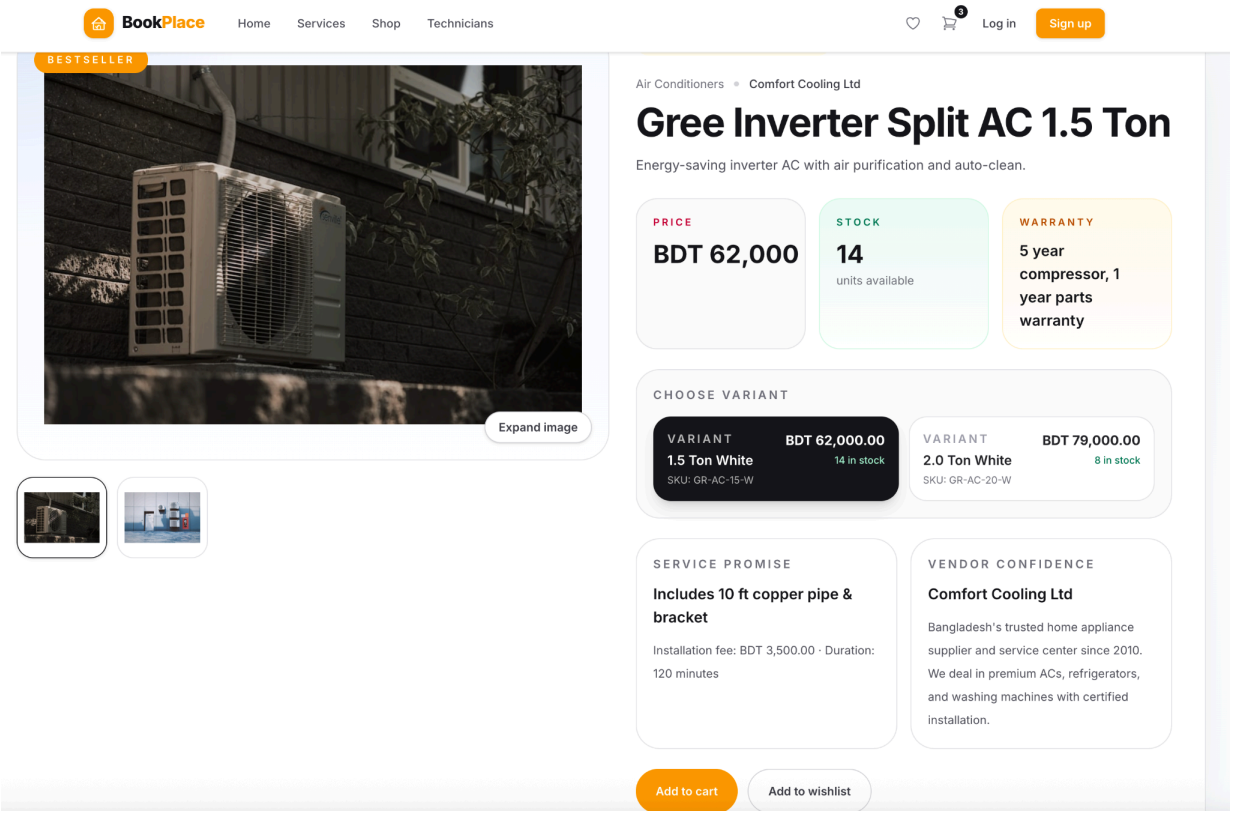

Figure 3.2 Product detail and service add-on user interface.

3.3.3 Cart, Checkout, and Payment

The checkout flow gathers information on customers, address, delivery method, coupon, special services, payment method, and totals. Incorporates Stripe, PayPal and SSLCommerz integration and COD-style finishing. However, if you think of working specifically with Bangladesh, SSLCommerz is very important because of its ability to provide support to the

local payment behavior and payment validation using its success callback and IPN(Central Callbacks).

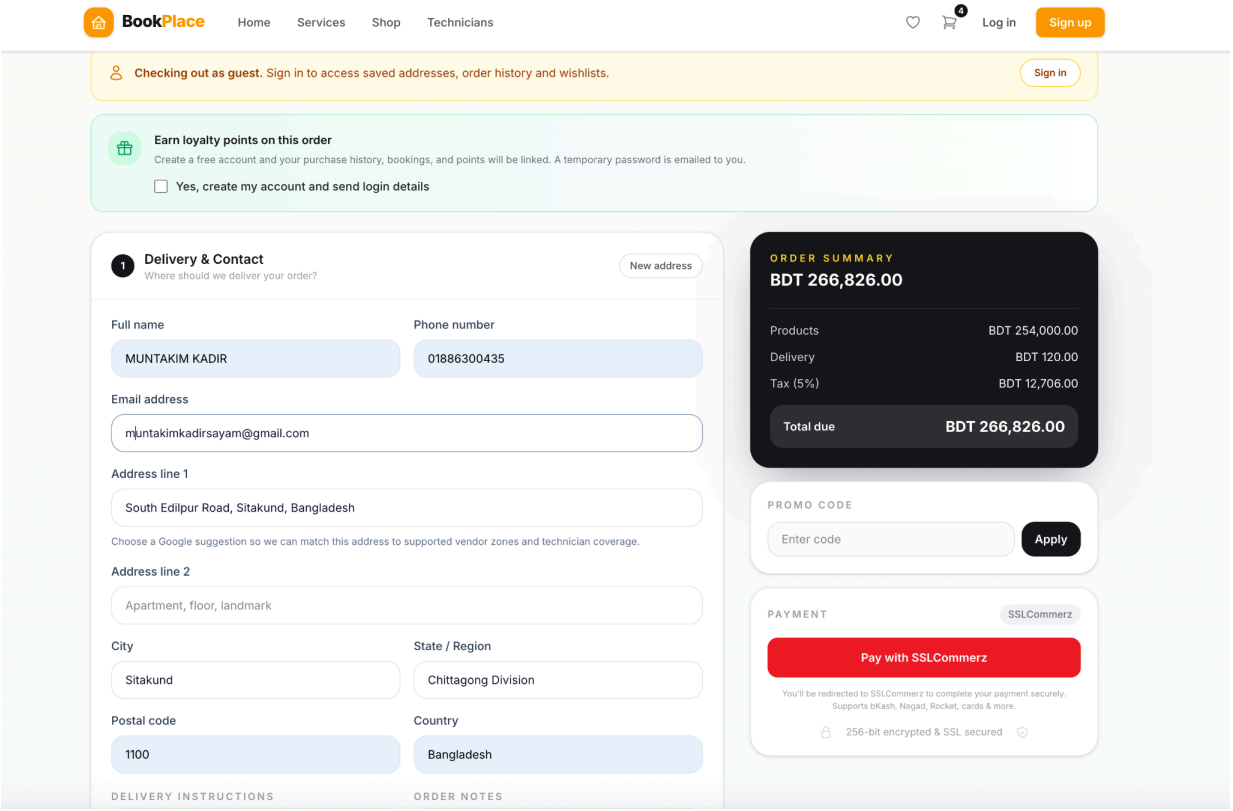

Figure 3.3 Checkout and payment user interface.

3.3.4 Vendor Operations

An essential, distinguishing feature of one of the vendors' portals is made up. The vendors can add their products and product variations, add services, manage their services, view vendors' techs' profiles, set techs' weekly availability, set service areas, add coupons, manage store appearance & look, view their employees' profiles, mark employee leaves, run payroll and more. This will remove the need for a lot of tools such as spreadsheets, text messaging applications, standalone HR sheets, manual phone scheduling, etc.

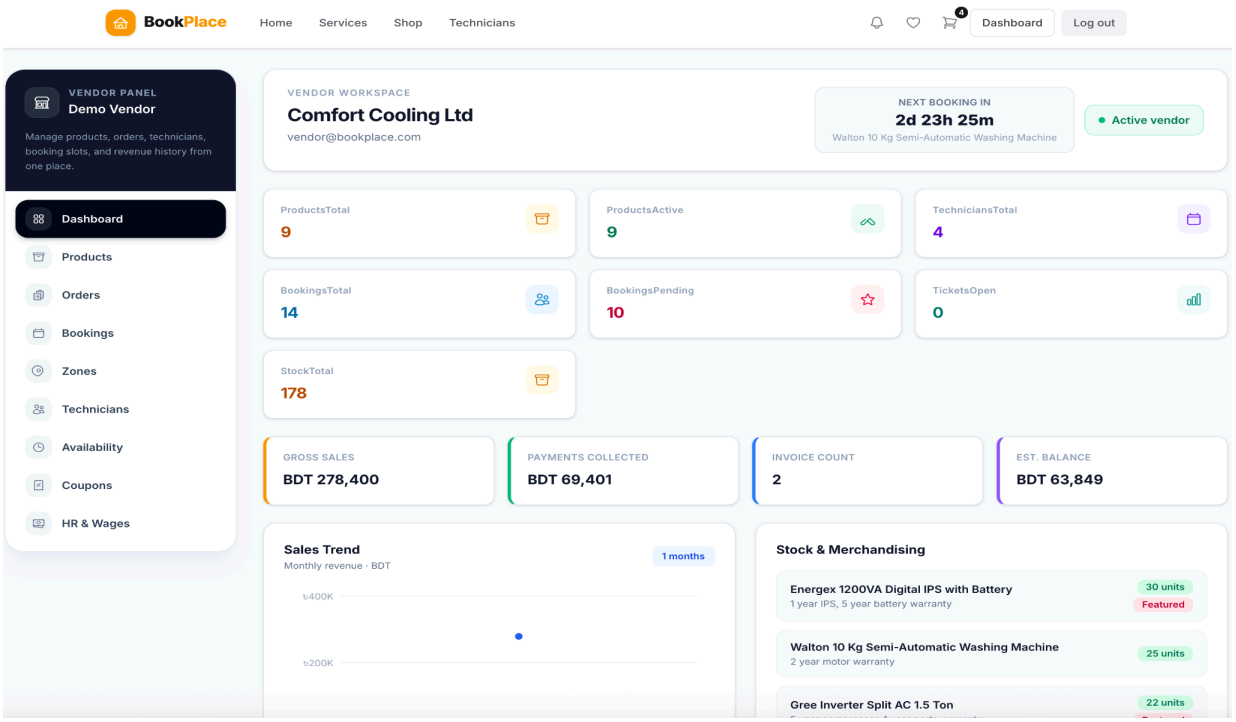

Figure 3.4 Vendor dashboard user interface.

3.3.5 Technician Portal

There's even a separate portal and an authentication guard for technicians. This prevents the technician from entertaining customers or vendors while working with them. Technicians can check bookings assigned to them, upcoming work, calendar bookings, service areas, reviews, the review point balance, withdrawals, and leave status.

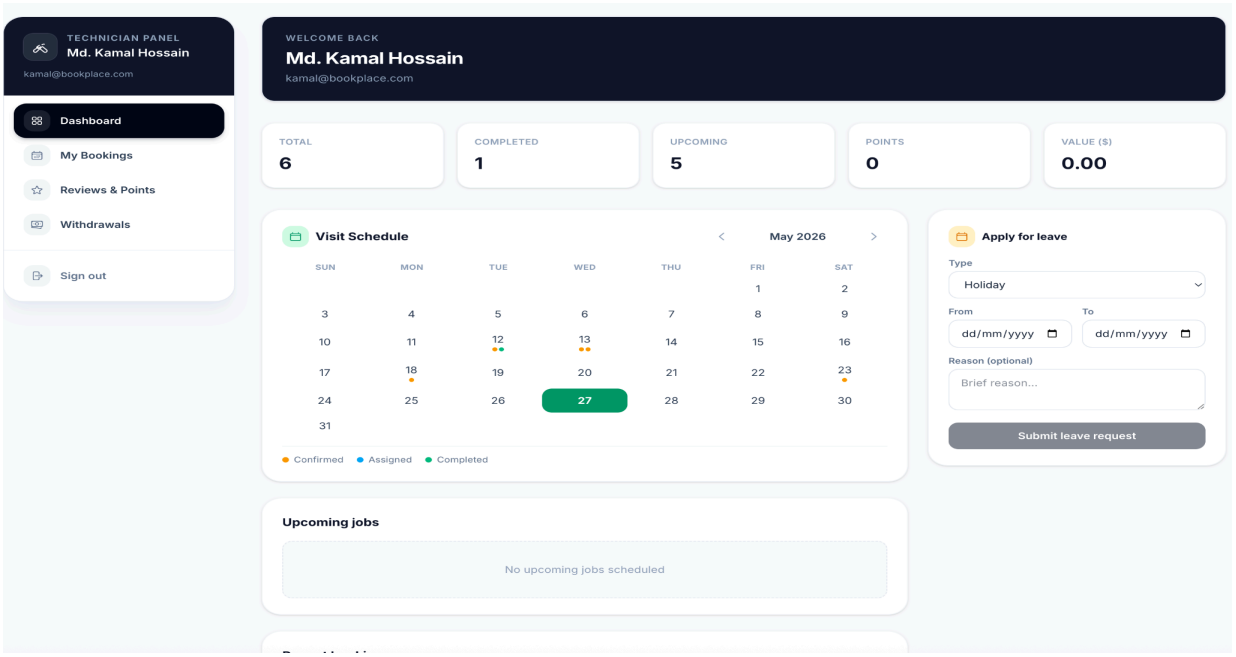

Figure 3.5 Technician portal user interface.

3.3.6 Administrative Reports and Governance

Platform governance via the admin panel includes vendor management, product management, category management, control over service areas, theme management, coupon management, return management, loyalty settings, technician withdrawals and reports. The report service gives a summary of vendors, orders, bookings, completed orders, products, tickets, payments, monthly sales, status breakdown, top products and top vendors.

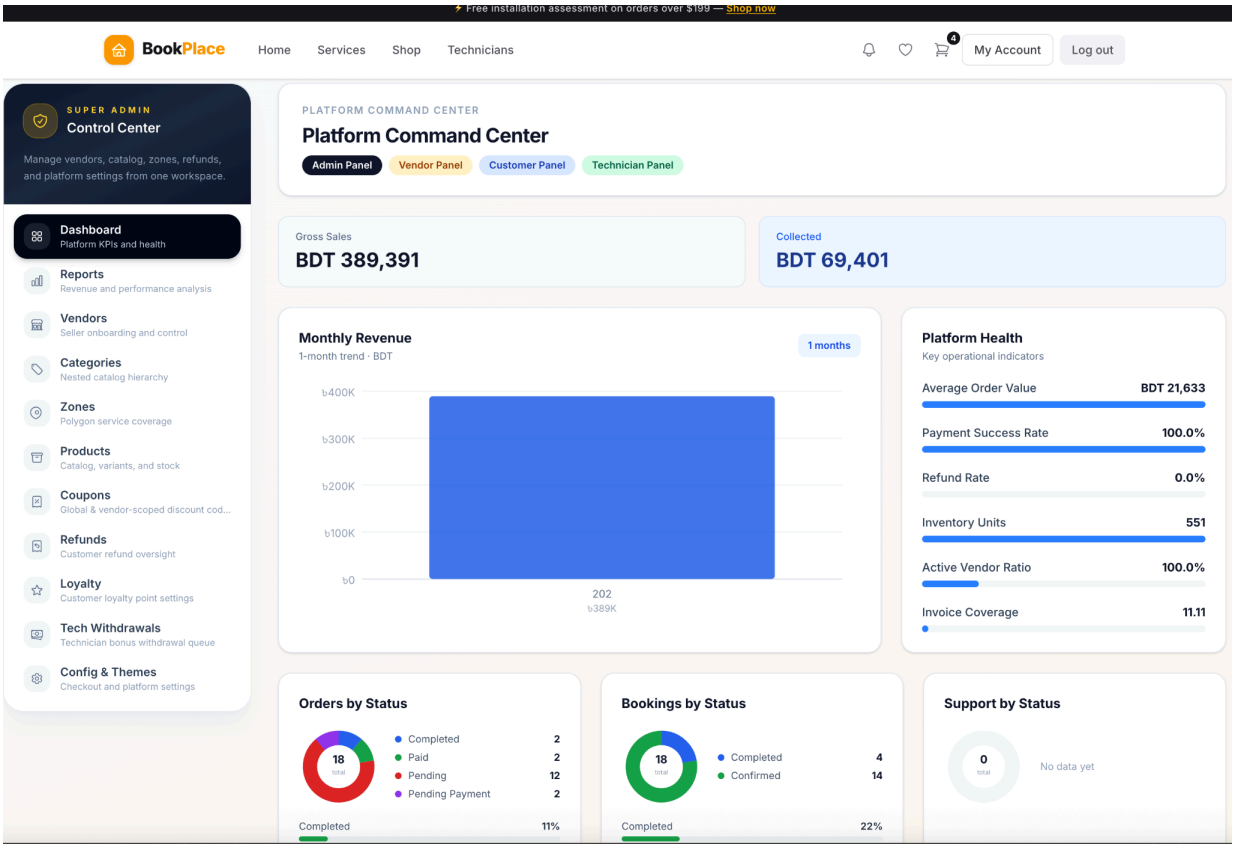

Figure 3.6 Admin reports user interface.

3.3.7 CMS and Theme Builder

BookPlace has a theme and section model for customizing stores. Themes can save settings like payment provider, refund window, loyalty settings and section content. Customizable sections are available for vendors via (theme) sections, so vendors can customize their storefront without being technical.

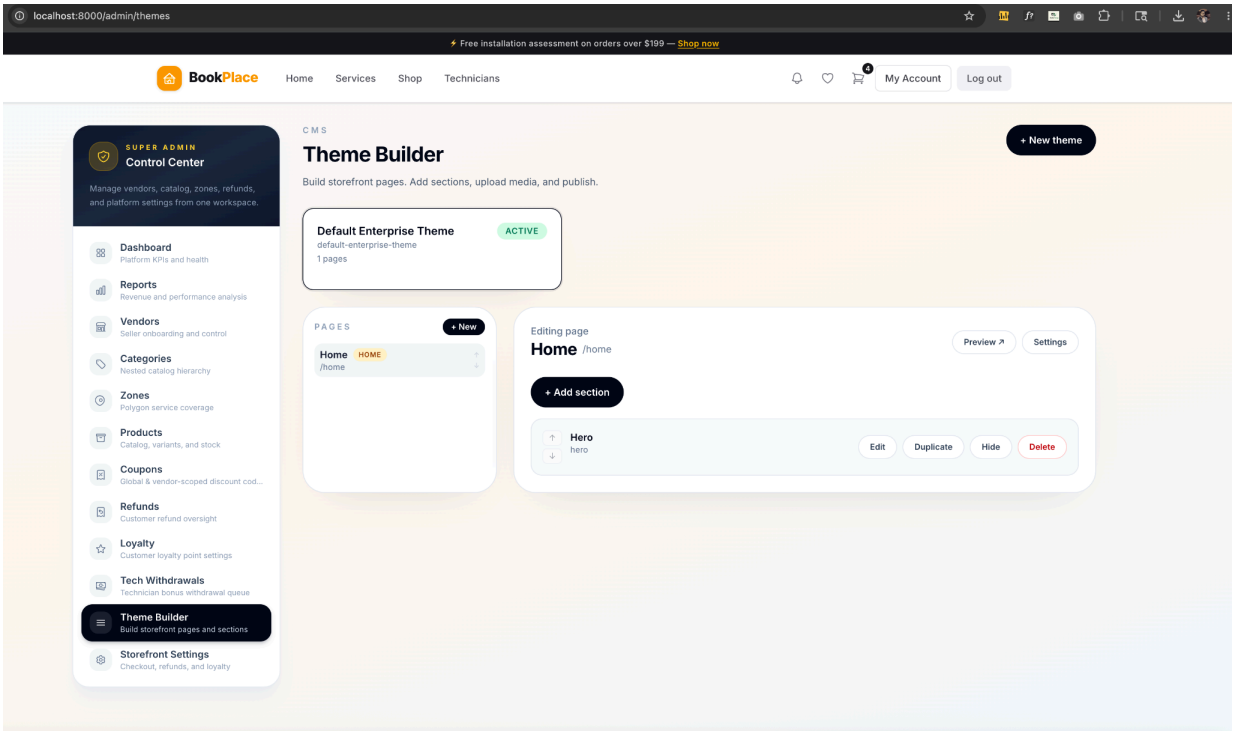

Figure 3.7 Theme builder user interface.

3.4 User Stories

Table 3.2 User Story Summary

User Group	Representative User Stories
Customer	I'm a customer, and I want to purchase a product and have the service installed in a single checkout, without having to call for service.
Customer	Order tracking, Invoice, Refunds, Reviews, Loyalty as a Customer to ensure I trust the platform after paying.
Vendor	I, as a vendor, want to have the products, service options, technicians, orders, payroll, and anything else I add, all in one dashboard – not scattered everywhere.
Technician	I'm a technician and would like a separate portal that shows my bookings, reviews, points, withdrawals and leaves, so I can see my work status in one place.

Administrator	As an Admin I want to have control on refunds, generate reports, set permissions to manage the marketplace and manage Vendors.

4. Requirement Analysis

4.1 Functional Requirements

- FR1: Customers are able to browse products by detail page, vendor, product category and search.
- FR2: Product Variants to support stock, price, sale price and product-specific configuration.
- FR3 – Products can have services attached.
- FR4--The system shall enable the customers to add their product/service selections to the cart.
- FR5: The system shall check stock availability prior to checkout.
- FR6: Customers shall be able to enter their address and perform geolocation-supported service-zone checks via the system.
- FR7: The system shall provide available technician slots using vendor, duration, date, availability template, current booking load and service area.
- FR8: Before booking the final, the system shall automatically place a hold on the booking for a specified limited duration.
- FR9: The system shall order the product line items, service prices, taxes, discounts and metadata.

- FR10: Stripe, PayPal, SSLCommerz and COD style payment paths shall be supported by the system.
- FR11: The system shall verify payments and make holds on any booked services for hard ticketing.
- After payment has been successfully made, the system shall generate invoice FR12.
- FR13: Order tracking and order history should be supported.
- FR14: allow refund requests to be made according to configured refund rules.
- FR15: Loyalty points shall be assigned for orders that qualify, and the systems shall be used to keep track of the various customers' loyalty points.
- Guest loyalty claim links for guest users (FR16):
- FR17: The system shall request a review and use one review per booking token.
- FR18: The system shall use technician review points to incentivize technicians who give positive reviews.
- Access and removal of technicians are requested and approved by the system.
- FR20: These are the features the FR system must provide to vendors for managing technicians, availability, bookings, service area, HR profiles, leaves, payroll, etc.
- FR21: The system will provide a management tool for the administration to manage Vendors, Products, Areas, Themes, product categories, Coupons, Refunds, Loyalty and Reports and Technician withdrawals.

- FR 22: The system should provide API endpoints for search, products, cart, checkout, availability, payment, order tracking, invoices and reports.

4.2 Non-Functional Requirements

Table 4.1 Non-Functional Requirements

Quality Attribute	Requirement
Security	The system shall adhere to the following limitations: Authentication, Authorization, Route middleware, Technician guard, Validation request and Payment validation.
Reliability	Every data item is involved in the checkout process, and upon payment completion, it is updated, including orders, stock, payment data, invoices, booking conversions, etc., using database transactions.
Maintainability	The business logic will be packaged within modules and service classes, NOT controllers.
Usability	Role-specific Dashboards shall only display information relevant to the user's role.
Scalability	One future goal is to support the extraction or scaling of modules within a modular monolith without the complexity of a microservice.
Interoperability	Future mobile/3rd party apps should be able to use search, cart, checkout, booking, payment and reporting via API endpoints.
Localization Fit	The Local Payment behavior shall be added with the BDT-oriented commerce assumption and SSLCommerz.
Data Integrity	StockDecrement, paymentComplete, and invoice generation; and bookingHold and reviewTokenInvalidation shall be in consistent state.

4.3 System Requirements

Table 4.2 Software Requirements

Component	Specification
Operating System	Windows/ macOS/Linux/ XAMPP/Laravel.
Backend Language	Laravel 12 Application, PHP 8.4
Frontend	Vue 3/Typescript/Inertia.js/Tailwind CSS v4/Vite
Database	MySQL
Authentication	Spatie permissions, technical guard, Laravel session guards, and Laravel fortify
Payments	SSLCommerz, Stripe, COD type flow, etc.
Maps	Support for the Google Maps/Places-style address and service-area polygon.
Development Tools	Composer, npm, Laravel Artisan, PHPUnit, Pint, ESLint and Vue type checking

Table 4.3 Hardware Requirements

Component	Specification
Processor	Minimum: Dual Core i3 or similar; Development: quad core or above.
RAM	8 GB minimum; 12 GB or more recommended
Disk Space	50 GB recommended

Display	Minimum 1200 x 800 resolution

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4.4 SWOT Analysis

Table 4.4 SWOT Analysis

Strengths	**Weaknesses**
Four role platform, Laravel modular structure, single product/service checkout, technician guard isolation, vendor HR/payroll, local payment integration, rewards for customer loyalty and reviews, and a self-hostable ownership model.	Larger feature surface, resulting in greater burden for testing (these metrics are not available for testing in the live production database during the time of this report); other testing configuration requirements as per payment/provider requirements; advanced analytics can be pushed further.
Opportunities	Threats
Ecommerce of local services, digitization of local services, demand for appliance service, implementation of appliance services, mobile app expansion, B2B service contracts for maintenance, AI-based service scheduling, and a self-registration marketplace for maintenance providers.	Old customer base; incongruent trust in the market; necessity of the payment process; lack of uniformity in services; high testing costs with the vendor and technician; need for immediate services.

5. System Design and Implementation

5.1 System Architecture

The overall architecture of BookPlace is modular monolithic architecture. This translates to a single application deployment, with business capabilities separated into modules. Modules directory includes: Auth, Catalog, CMS, Commerce, Customer, GeoManagement, Loyalty, Notification, Payment, Review, ServiceOps, Support, Admin, and Vendor.. This design has the advantage of avoiding the future pitfall of becoming embroiled in microservice complexity too soon and, of course, of gaining familiarity with the code responsibilities.

Figure 5.1 BookPlace Modular Architecture Overview

Layer	Implementation
Presentation Layer	Reusable UI components, Tabs about Vue 3 pages, Navigation with Inertia.js, styling with Tailwind CSS and role-specific layouts
Application Layer	Controllers, form requests, middlewares, policies, route groups, fortify authentication and Spatie permissions are all included.
Business Service Layer	Other service classes include CheckoutService, CartService, PaymentWebhookService, BookingConfirmationService, AvailabilityService, InstallationScheduler, LoyaltyService, ReviewService, HrPayrollService, ThemeService and ReportService.
Data Layer	Migrations and Eloquent models are used to represent MySQL tables. Users, vendors, products and variants, service options, cart and orders, payments, technicians, service areas, loyalty, reviews, refunds, support, themes, and payroll are some of the key features.
Integration Layer	Stripe, Paypal, SSLcommerz, Google Maps location support, e-mail notifications and API endpoints.

5.2 Core Functional Modules

Table 5.1 Core Functional Modules

Module	Responsibility
Catalog	Product, category, variants, service options, product pages available to the public, and search.
Commerce	Cart, checkout, orders, order items, coupons, refunds, invoice, tracking.
ServiceOps	Technicians/Bookings/Availability/Scheduling/BookingHold/Direct bookings, HR/Payroll/Leave and Withdrawals.
GeoManagement	Service Areas, Polygon Areas, Point in Polygon testing and Location resolution.
Payment	Stripe, PayPal, SSLCommerz, payment completion and webhook for payment.
Loyalty	Loyalty - settings, earned/redeemed points, balances and guest claims.
Review	Review Request Tokens, Review submission, Technician review points.
CMS	Themes and themesections, public pages, legal pages, behavior sitemap.
Admin	Plugins such as: dashboards, reports, vendor/category/product/theme refund/withdrawal management.
Vendor	Vendor dashboard, vendor profile, vendor management and vendor wishlist.
Support	Submit support tickets and support tickets user interface.

5.3 Checkout and Booking Workflow

The checkout and booking process should be as streamlined and efficient as possible.

BookPlace's most important integration means is the checkout methodology. When a customer orders, products and service options are selected, the stock and coverage service areas are checked, order creation (and order item creation), service order metadata is added, payment provider is initiated, payment is confirmed, stock of variants is decremented, invoice data is created, booking holds are converted to service bookings, notifications are sent, and there is loyalty if applicable.

Figure 5.2 Checkout and Booking Workflow

Step	**Workflow Description**
1	Customer selects product, variant, quantity, service selection, address, date and slot.
2	Availability service verifies the vendor, techs, dates, lengths, service area and open availability.
3	Remember playing the slot for a short period before receiving payment: a booking hold.
4	When checkout service is called, the order and order items are added to the database transaction.
5	Stripe, PayPal, SSLCommerz or COD flow starts from the payment service.
6	PaymentWebhookService does payment confirmation, order locking, payment recording, inventory syncing, paid order marking, hold matching and invoice producing.
7	The events and listeners track the addition or deduction of loyalty points, email/notifications about booking confirmation, the generation of an invoice, and logging activities.

5.4 Scheduling and Service Area Logic

Available templates, service bookings, tech service areas and point-in-polygon checks implement scheduling. Installscheduler provides potential slots for an active vendor tech. It will confirm DOW's availability, working hours, slot time, buffering time, reserved slots and selected location coverage. The ZoneService checks if the latitude/longitude is within a service area polygon. Not only is a filter by a city offered, but location-aware service booking is offered in this manner.

5.5 Security and Access Control

BookPlace has authentication issues with both regular users and technicians. The web guard is an offering for customers, vendors and administrators. Technician Guard for Technician. Security check for ownership using vendor ID checks, Spatie permission capability or an admin role in the Admin permission middleware. Technician middleware prevented unauthenticated and unauthorized technicians. Fortify has profile, password, two-factor authentication, password reset/session flows. There is also validation and transaction locking in the payment completion logic to ensure that any sensitive state changes are protected.

5.6 Frontend Architecture

Frontend Architecture Frontend pages implemented using Vue pages (resources/js/pages), role layouts, reusable components, Pinia stores, Inertia form/navigation patterns, Wayfinder generated actions, routes and TypeScript. The project being inspected has 60 Vue pages and 172 Vue components. With this much on the front end, it can host search, checkout, customer accounts, vendor management, a tech portal and admin, authentication pages, settings, legal pages, and utility pages.

6. Result Analysis

6.1 Practical Implementation Evidence

The scope of the implementation is emphasized by using the source structure, the route surface, the migrations, the models, the pages, the components/services, and the stable artifacts suitable for an academic implementation report.

Figure 6.1 Codebase Implementation Metrics

Implementation Indicator	Observed Value	Interpretation
Registered routes	172	The suite has a wide browser and API surface to handle public workflow, account workflow, admin workflow, vendor workflow, technician workflow, payment, review, support and settings.
API routes	25	Mobile and/or 3rd party integration via structured API endpoints.
Database migrations	51	It includes Users, Vendors, Products, Categories, Cart, Orders, payments, bookings, technicians, zones, loyalty, refunds, reviews, support, themes, payroll, and permissions.
Eloquent models	37	In lieu of a small prototype schema, the data layer is represented as a rich domain model.
Service files	37	Separation of business logic into the respective service classes for maintainability and testability.

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Vue pages	60	The frontend involves a wide range of screens related to the public, customers, vendors, technicians, administration, authentication, settings and legal aspects.
Vue components	172	The UI is modular and can be reused in complex workflows.

6.2 Performance-Oriented Analysis

No controlled-load benchmark was conducted for this report, but based on implementation evidence, a number of performance-related design decisions were made. Firstly, when an app or service is deployed in the early days, a modular monolith avoids the network latency between microservices. Secondly, Inertia minimizes duplicated REST endpoints for typical page changes and for other endpoints that can be implemented as JSON, if that is necessary. Thirdly, several controllers use Eloquent eager loading to avoid redundant queries for relationships. Fourth, transaction boundaries are for payment, inventory and booking confirmation. Finally, the scheduling workflow filters to vendor, activity status, date, availability template and service area before returning slots.

Table 6.1 Performance-Oriented Interpretation

Area	**Implementation Evidence**	**Performance Interpretation**
Routing	172 routes according to the group role level.	Routes are grouped by feature, which minimizes controller confusion and enables maintainable navigation.
Scheduling	Installation Scheduler has availability templates, date filtering, existing bookings and service zones.	Slot generation is vendor & date; it doesn't scan all the platform records.

Payment completion	In order to both prevent data loss and enable minor locking optimizations, PaymentWebhookService locks order and variant records during certain updates	Safe critical state changes: reduced risk of race conditions.
Frontend navigation	Save pages for later viewing: Inertia/Vue.	It can be a SPA-like navigation without having to duplicate entire API levels for every page.
Business logic	37 service files	Complex processes are simplified when it comes to isolating, testing and optimizing.

6.3 Strength Analysis

BookPlace has several key technical and market advantages. It's a complete solution, including the most up-to-date Laravel backend (PHP), Vue front-end, MySQL database schema, payment integration, role-based access, service classes, event/listener formulars, and route helpers generated. On the practical level, it encompasses the product discovery process through service booking, payment, tracking, review, loyalty, refunds, and support. There is also the functional point of view which lets the vendor marketplaces include attributes they otherwise wouldn't have in the service marketplace: technician HR profiles, payroll, leave approvals, technician assignment to areas, and theme control for storefronts. The most interesting market friendly twist is "integration". BookPlace isn't just an ecommerce platform -- and BookPlace isn't just a marketplace for technicians. It is a trade service application. Appliance vendors, electronics retailers, repair companies, installation companies and neighborhood service providers have all thoroughly blended product with technician workflows; this is where this built-in position fits.

6.4 Limitations

The metrics for the operational database also were not able to be published, as a result of the lack of the area MySQL service. There are other payment flows that may need extra credentials

and sandbox setup to live test everything end-to-end. More research are to be done in advanced analytics, real-time chatting, GPS tracking, formal user satisfaction tests, and production load tests. The desire to do these things above does not necessarily detract from the implementing approach, it only shows what happens next.

6.5 User Feedback and Acceptance Indicators

No data related to the use of a user survey was available for this report. Therefore, user acceptance is addressed under the topics of ‘workflow completeness’ and ‘stakeholder coverage'. The system includes the basic needs of the customers, vendors, technicians and administrators. Visitors are presented with a complete shopper/marketer's journey. Operational control is given to the vendors. Technicians have a separate work portal. No governance and reporting is given to administrators. This level of stakeholders' involvement reflects the significant potential use; including structured user testing and satisfaction measurement are recommended as next steps in future investigations.

6.6 Research Question Answer Matrix

The following research questions guide the analysis of BookPlace. Each question is answered directly using implemented features and inspected codebase evidence.

Table 6.2 Research Question Answer Matrix

Research Question	Answer from BookPlace Implementation
RQ1: What can be done to have a single workflow in order to complete product purchase and service booking?	The user features of BookPlace enable the customer to look through the products and their variants, add additional services including installation or repair, reserve a technician, and make a checkout within one fluent sequence. The connections between product orders and service bookings are associated using cart items, order items, service options, booking holds, and confirmed service bookings.
RQ2: What can BookPlace do to lessen uncertainty	The system validates technician availability, service areas, services hold and scheduling logic (Technician available at the selected date, time and location). It reduces manual coordination, reduces duplicated bookings and prevents unsent bookings from going missing.

about the scheduling of technicians?	
RQ3: Which security measures does BookPlace place on various user roles?	BookPlace restricts the access of customers, vendors & technicians and administrators using role permissions. It deploys Laravel authentication, a separate technician guard, Spatie permissions, a middleware based on admin permission, and ownership checks on vendors and approving technicians to access role-specific information and actions.
RQ4: What is the benefit of BookPlace in terms of vendor operation management?	Vendors are able to circumscribe products, variants, service add-ons, orders, service booking, technicians, availability schedules, service areas, coupons, storefront themes, HR profiles, payroll, and leave requests through the dashboard. This substitutes the dispersed tools like spreadsheets, telephone conversations, and messaging apps.
RQ5: What are the customer trust effects of buying through BookPlace?	BookPlace helps to track the orders, invoices, refund requests, and technician reviews; claim loyalty points; and guest loyalty claims. These will enable customers to view what occurred after checkout and give them avenues of feedback, support, and accountability.
RQ6: How is BookPlace different enough to distinguish itself as compared to current e-commerce or service websites?	BookPlace is not a mere Internet shop, is not a mere system of booking technicians. Serves comprehensive, inbuilt and tightly coupled integration of product business, service scheduling, technician booking, vendor operation, HR, payroll, reviews, loyalty, refunds, support, reports, and storefront customisation - all in one modular service-commerce platform.

Summary and Conclusion

7.1 Summary

BookPlace was designed and evaluated to be a service-commerce platform for multi-merchant sales and booking professional services. The project has been built to overcome the divisions between e-commerce and home-service platforms by focusing on the product catalog, product services, technician scheduling, checkout, payment, order tracking, invoices, reviews, refunds, loyalty, support, vendor activities, technician workflow and administrative governance.

This application was built using Laravel 12, Inertia.js, Vue 3, Tailwind CSS, MySQL, Laravel Fortify, Spatie permissions, Stripe, Paypal, SSLCommerz & Modular service classes. It has a fair amount of codebase surface area – NLU routes (172), API routes (25), migrations (51), models (37), service files (37), Vue pages (60) and Vue components (172). This proves to be not only the prototype, but a wide-spread implementation..

7.2 Future Work

1. Build a mobile app using API endpoints.
2. Add real-time Customer/Vendor/Technician chatting features using the Websocket layer in Laravel Reverb.
3. Access real-time GPS location of techs on assignments.
4. SUPPORT AI INITIALIZATION FOR TECHNICIAN BY TYPE OF SERVICES, LOCATION, RATING, WORKLOAD AND COMPLETION RECORD.
5. Provide more reports for vendor performance, tech utilization, booking completion time, revenue per category, refund rate and customer retention on the analytics dashboard.
6. Allow vendors to self-register and onboard in BookPlace, turning it into an open marketplace. Throw in the formal production monitoring, load testing, user satisfaction surveys, and security audits.
7. Multilingual support is working well, and additional localization for "Bangla-first" travels is now in progress.

7.3 Conclusion

The study concludes that the BookPlace learning environment is a very good test for an integrated service commerce model, technically feasible and market-oriented. It addresses the real issues of product sales versus professional service bookings - and goes to work for vendors, techs, customers and administrators. The platform boasts significant academic value and covers areas such as Database Design, Multi-Role Authentication, Credentials Management, Authorization, Modular Architecture, Front-end, Payment integration, transaction-safe workflow, scheduling logic, Loyalty management, review system, and market analysis.

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