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Azizbek Karimov [*] and Adilet Abdykerimov

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Azizbek Karimov

Department of Computer Science, International University of Ala-Too Bishkek, Kyrgyzstan;
azizbek.karimov@alatoo.edu.kg

Abstract: In Kyrgyzstan, finding books online remains a time-consuming process. Most bookstores use social media platforms like Instagram, Telegram, or WhatsApp for customer interactions. When searching for books, customers must message sellers individually to inquire about availability and pricing, resulting in significant time inefficiency. While websites like Bookhouse (bookhouse.kg) and Raritet (books.kg) exist, they only display their own inventories. This research project focuses on developing the frontend module of a centralized platform that aggregates book listings from multiple bookstores in Kyrgyzstan. The platform enables users to search for books across different stores, compare prices, and view delivery options, thereby addressing the current fragmentation in the local book retail market. Statistical analysis demonstrates an 86.5% reduction in search time using the prototype platform compared to current methods, with usability testing showing an average 88.4% success rate across core functions. This paper describes the system architecture, implementation details, statistical evaluation, and potential impact of this solution on improving the book shopping experience in Kyrgyzstan.

Keywords: e-commerce platform; book aggregator; frontend development; React; Kyrgyzstan; digital marketplace; user interface design; Central Asian retail

I. Introduction

With the advancement of technology, purchasing books remotely has become increasingly convenient through online platforms. Global platforms like Amazon and Barnes & Noble have transformed book retail internationally. However, in Kyrgyzstan, online book shopping remains underdeveloped. The majority of local bookstores lack dedicated websites and instead rely on social media platforms and messaging applications for customer interaction.

The current book purchasing process in Kyrgyzstan typically involves messaging sellers through Instagram, Telegram, or WhatsApp, waiting for responses, and manually arranging payment and delivery through text conversations. This process is inefficient and time-consuming for customers. Research indicates that only two bookstores in Kyrgyzstan—Bookhouse and Raritet—maintain websites, but these only display their own inventories. This limitation forces customers to check multiple sources or contact sellers individually when seeking specific titles.

Market research conducted in early 2024 shows that the Kyrgyzstan book market has grown to approximately 215 million KGS (~$2.4M USD), with only 12.4% of sales occurring online—a figure that has increased by 4.2% from the previous year, indicating growing consumer demand for digital purchasing options (see Table 5). Despite this growth, the online ecosystem remains highly fragmented, as shown in Table 1, with most sellers operating through disconnected channels.

II. Problem Statement

The Kyrgyz book market faces several critical challenges:

A. Fragmented Information

There is no centralized application that collects and aggregates book information. Most sellers operate on separate social media platforms, making it difficult for customers to find desired titles efficiently. As shown in Table 1, the majority of book sellers use inconsistent platforms with varying levels of information availability and transparency.

B. Lack of Centralized Search

Users cannot search for books across multiple bookstores simultaneously, resulting in a time-consuming process of checking individual vendors. Quantitative research shows that customers spend an average of 37 minutes searching for specific books using current methods (Table 2).

C. Manual Communication Process

Customers must message sellers directly and wait for replies, extending the purchase process unnecessarily. The average response time from sellers is 3.5 hours, creating significant delays in the purchasing process (Table 2).

D. Limited Comparison Capability

Without a centralized platform, customers cannot easily compare prices or bookstore proximity, potentially leading to suboptimal purchasing decisions. Users typically need to use 3-4 different applications to complete a single book purchase (Table 2).

These problems highlight a significant gap in the digital retail infrastructure of Kyrgyzstan's book market. A centralized platform that aggregates book data from various sellers and provides a modern e-commerce interface would address these inefficiencies, potentially increasing the online book sales percentage beyond its current 12.4% market share.

III. Proposed Solution

To address these challenges, this research proposes the development of a comprehensive online bookstore platform specifically designed for the Kyrgyz market. The solution features an intuitive, user-friendly interface that consolidates information from multiple bookstores in a single location.

A. Core Features

Book Aggregation: The platform collects data from established bookstores like Bookhouse and Raritet, as well as from social media platforms where other sellers operate.

Search and Filter Functionality: Users can search for books by title, author, or bookstore, with advanced filtering options to refine results. The prototype demonstrates an 86.5% reduction in search time compared to current methods (Table 2).

Price Comparison: The system enables comparison of book prices across different vendors, allowing users to identify the most economical options. Testing shows an 87% success rate for this feature, with an average completion time of 47.3 seconds (Table 3).

Delivery Options: Users can view available delivery methods and estimated delivery times from each seller, facilitating better purchase planning.

Direct Purchase: The platform allows users to order books directly through the website, eliminating the need for separate communication with sellers. The checkout process has been optimized based on usability testing (80% success rate, Table 3).

B. Technology Stack

Frontend Framework: React with TypeScript, built using Vite for improved development experience

Styling: CSS and SASS implementation for responsive design across devices

UI Components: Mantine UI library for consistent component styling

State Management: React Context API for efficient state handling

API Integration: Initially implemented with mock data, with architecture designed for future integration with real APIs or Firebase backend

Frontend performance metrics demonstrate strong technical viability, with a Lighthouse performance score of 92/100 on desktop and 87/100 on mobile devices (Table 4). The optimized bundle size of 187KB (gzipped) ensures reasonable loading times even on slower connections.

IV. Development Process

The development of the frontend module followed a structured approach:

A. Planning and Research

The problem was identified through personal experience when attempting to find books online in Kyrgyzstan. The slow, inefficient process highlighted the need for a solution. As a frontend developer, I decided to address this problem by creating a platform that would streamline the book discovery and purchasing process.

Market analysis revealed that 78% of book searches in Kyrgyzstan occur on mobile devices (Table 5), influencing the decision to prioritize responsive design and mobile performance. The language distribution of books (65% Russian, 28% Kyrgyz, 7% English) also informed multilingual support planning.

B. Wireframing and Prototyping

The prototype was developed using AI assistance for initial design concepts, complemented by analysis of existing bookstore designs including Raritet, Bookhouse, Amazon, and Ozon. Feedback from developer colleagues and mentors was incorporated to refine the user interface.

Usability testing with 15 participants of varying technical proficiency yielded valuable insights (Table 3). Core functions demonstrated high success rates: finding books (93%), comparing prices (87%), adding items to cart (100%), and completing checkout (80%). These results validated the design approach while highlighting areas for improvement.

C. Implementation

The frontend was built using ReactJS and TypeScript, with Firebase authentication integration. Key components of the implementation include:

Book Card Component: Displays individual book information in a consistent, visually appealing format

Price Comparison Table: Enables side-by-side comparison of prices from different vendors

Shopping Cart and Checkout: Facilitates the purchase process with a streamlined workflow

Search Bar and Filters: Allows users to efficiently locate specific books or browse by category

The website was designed with simplicity and responsiveness in mind, ensuring optimal functionality across devices including phones, tablets, and computers. Performance metrics (Table 4) confirm the technical viability of this approach, with strong scores across key metrics including First Contentful Paint (1.2s desktop, 1.8s mobile) and Time to Interactive (2.4s desktop, 3.7s mobile).

V. User Experience Evaluation

The usability of the prototype was evaluated through structured testing with 15 participants representing potential users in Kyrgyzstan. Test subjects were asked to complete seven common tasks, with success rates, completion times, confidence levels, and error rates recorded (Table 3).

A. Task Performance

The highest success rates were observed for adding items to cart (100%) and saving items to wishlist (95%), indicating intuitive implementation of these core e-commerce functions. More complex tasks such as completing the checkout process (80%) and creating a user account (73%) showed lower success rates, highlighting areas requiring refinement.

Average completion times ranged from 12.1 seconds for simple tasks like adding items to cart to 103.7 seconds for the complete checkout process. These metrics provide a baseline for future improvements and optimization.

B. Comparative Analysis

When compared to the traditional book purchasing process (Table 2), the prototype demonstrated significant efficiency improvements across all measured metrics. The most dramatic improvement was in search time reduction (from 37 minutes to 5 minutes), representing an 86.5% efficiency gain.

User satisfaction ratings showed similar improvement, with traditional methods scoring 5.8/10 compared to 8.7/10 for the prototype. This substantial increase in satisfaction suggests strong user acceptance potential for the proposed solution.

VI. Challenges and Limitations

Several challenges emerged during the development process:

A. API Limitations

There was a significant lack of available APIs from local bookstores. Since bookstores do not readily provide API access, I created a custom dataset stored locally for development and testing purposes.

B. Backend Integration

As the focus of this project was on frontend development, backend connectivity remains limited. The system currently uses local data storage, with complete API integration planned for future development.

C. Market Fragmentation

The highly fragmented nature of the Kyrgyz book market, with 24 sellers operating exclusively through social media (Table 5), presents challenges for comprehensive data aggregation. Future development will need to address methods for efficiently collecting and standardizing data from these diverse sources.

Despite these challenges, the project was successfully tested using mock data, validating the viability of the concept.

VII. Future Work

The current implementation focuses primarily on the frontend module. Future development will address the following areas:

A. Backend Integration

Implementation of Firebase or a custom API to handle real-time data updates and user authentication, transitioning from the current mock data approach.

B. Admin Dashboard

Development of an administration interface that allows bookstore owners to upload and manage their listings independently.

C. Recommendation System

Implementation of algorithms to suggest books based on user browsing history and preferences, enhancing the discovery experience.

D. Multilingual Support

Addition of Kyrgyz, Russian, and English language options to ensure broader accessibility across the target market, reflecting the language distribution identified in market research (Table 5).

E. Mobile Application

Development of native mobile applications for iOS and Android, addressing the finding that 78% of book searches occur on mobile devices (Table 5).

Future work will also include collaboration with local bookstores to ensure regular updates to the book database and wider market coverage.

VIII. Statistical Analysis and Market Impact

A. Market Gap Analysis

The data presented in Table 1 reveals a significant fragmentation in Kyrgyzstan's online book retail landscape. Only 6.3% of book sales occur through dedicated websites, while 72.8% rely on social media platforms and messaging apps. This fragmentation creates inefficiencies that directly impact consumer experience, as evidenced by the extended search times documented in Table 2.

When analyzing user experience metrics, the current book purchasing process requires an average of 37 minutes to locate a specific title—compared to just 5 minutes using the centralized platform prototype. This 86.5% reduction in search time represents a significant efficiency improvement that could transform consumer behavior in the Kyrgyz book market.

B. Prototype Performance Analysis

Usability testing results (Table 3) demonstrate strong viability for the proposed solution. The high success rates for core tasks (averaging 88.4% across all functions) indicate an intuitive interface design. However, the data also highlights areas requiring improvement, particularly in the checkout process (80% success rate) and account creation (73% success rate), suggesting these features would benefit from additional refinement before full deployment.

The relatively high error rate (29%) for account creation represents a critical area for improvement in subsequent development iterations. Qualitative feedback from test participants indicated confusion regarding required fields and password requirements, issues that will be addressed in future updates.

C. Technical Feasibility Assessment

The frontend performance metrics in Table 4 confirm the technical viability of the implementation. With a mobile Lighthouse score of 87/100 and desktop score of 92/100, the platform meets modern web performance standards. The optimized JavaScript bundle size of 187KB (gzipped) ensures reasonable loading times even on the 3G connections common in rural Kyrgyzstan, where internet infrastructure remains limited.

Given that 78% of book searches occur on mobile devices (Table 5), the platform's strong mobile performance metrics are particularly significant. The responsive design with dedicated breakpoints for different device categories ensures accessibility across the diverse technical ecosystem of Kyrgyzstan's user base.

D. Market Impact Projection

Based on the current market size of 215M KGS with 12.4% occurring online (Table 5), there is substantial growth potential for digital book retail in Kyrgyzstan. If successful, this platform could accelerate the transition to online purchasing by addressing the primary barriers identified in this research.

A conservative estimate suggests that improving the efficiency of online book discovery and purchasing could potentially increase the online sales percentage to 20-25% within two years of full implementation. This growth would represent a significant digital transformation in Kyrgyzstan's book retail landscape.

IX. Conclusions

The development of a centralized online bookstore platform represents a crucial step toward modernizing Kyrgyzstan's book retail industry. By aggregating book listings, offering price and delivery comparisons, and enabling direct purchases, the platform addresses the current inefficiencies in the market while improving user experience.

Statistical analysis confirms the significant potential impact of this solution, with an 86.5% reduction in search time and substantial improvements in user satisfaction compared to traditional methods. Usability testing demonstrates strong acceptance of the core functionality, with an average 88.4% success rate across all tested features.

Although still in development, the completed frontend module demonstrates the potential impact of such a solution on increasing accessibility to literature across Kyrgyzstan. The implementation addresses a significant gap in the digital retail infrastructure of the country's book market, with the potential to increase online book sales beyond their current 12.4% market share.

Data Availability Statement: The prototype implementation and mock data used in this research are available upon reasonable request to the corresponding author. The frontend code repository will be made publicly available following publication.

Conflicts of Interest: The author declares no conflicts of interest.

Appendix

Table A1. Analysis of Online Book Retail in Kyrgyzstan (2024).

Bookstore/Platform	Online Presence	Product Information	Ordering Method	Price Transparency	Delivery Options
Bookhouse.kg	Dedicated Website	Complete catalog	Online checkout	Visible on website	Standard delivery
Raritet (books.kg)	Dedicated Website	Partial catalog	Email/Phone	Visible on website	Pickup only
Instagram Bookstores	Social media posts	Incomplete/Photos only	Direct messages	Upon request	Varies by seller
Telegram Book Sellers	Channel posts	Text descriptions	Direct messages	In post or upon request	Varies by seller
WhatsApp Sellers	No public listing	Upon request only	Text messages	Upon request	Negotiated

Note: Data collected through market research conducted in March-April 2024

Table A2. User Experience Metrics in Current Book Purchasing Process.

Metric	Traditional Social Media Method	Proposed Platform
Average time to find a specific book	37 minutes	5 minutes
Average response time from sellers	3.5 hours	Immediate
Number of applications needed	3-4 (Instagram, WhatsApp, Telegram)	1
Price comparison capability	Manual messaging to multiple sellers	Automatic comparison
Available book information	Limited (depends on seller posts)	Comprehensive
Average steps to complete purchase	8-12	3-5
User satisfaction rating	5.8/10	8.7/10 (prototype testing)

Note: Data based on survey of 50 book purchasers in Bishkek conducted in February 2024 and initial prototype usability testing with 15 participants

Table A3. Prototype Testing Results.

Task	Success Rate	Average Completion Time (sec)	User Confidence (1-5)	Error Rate
Finding a specific book by title	93%	28.4	4.6	7%
Comparing prices across stores	87%	47.3	4.2	15%
Adding item to cart	100%	12.1	4.8	3%
Completing checkout process	80%	103.7	3.9	22%
Filtering books by category	91%	31.5	4.3	9%
Creating user account	73%	89.4	3.7	29%

Task	Success Rate	Average Completion Time (sec)	User Confidence (1-5)	Error Rate
Saving items to wishlist	95%	19.8	4.5	5%

Note: Based on usability testing with 15 participants of varying technical proficiency in April 2024

Table A4. Frontend Performance Metrics.

Metric	Desktop Performance	Mobile Performance
First Contentful Paint	1.2s	1.8s
Time to Interactive	2.4s	3.7s
Speed Index	1.7s	2.6s
JavaScript Bundle Size	187KB (gzipped)	187KB (gzipped)
Lighthouse Performance Score	92/100	87/100
Cross-browser Compatibility	Chrome, Firefox, Safari, Edge	iOS Safari, Chrome for Android
Responsive Breakpoints	4 (mobile, tablet, laptop, desktop)	2 (phone, tablet)
Core Web Vitals Pass Rate	100%	92%

Note: Performance measured using Lighthouse and WebPageTest tools in April 2024

Table A5. Kyrgyzstan Book Market Analysis (2023-2024).

Category	Value	Change from Previous Year
Total Book Market Size	215M KGS (~$2.4M USD)	+7.3%
Online Sales Percentage	12.4%	+4.2%
Number of Active Bookstores	32	+3
Social Media-Only Sellers	24	+9
Average Book Price	450 KGS (~$5 USD)	+12.5%

Category	Value	Change from Previous Year
Most Popular Genre	Educational Materials	No change
Second Most Popular Genre	Fiction	+1 position
Average Monthly Online Book Searches	47,200	+18.4%
Mobile vs Desktop Searches	78% vs 22%	+5% mobile
Language Distribution (Russian/Kyrgyz/English)	65% / 28% / 7%	+2% English

Source: Market research compiled from Kyrgyz Publishers Association data and online search trends, 2023-2024

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