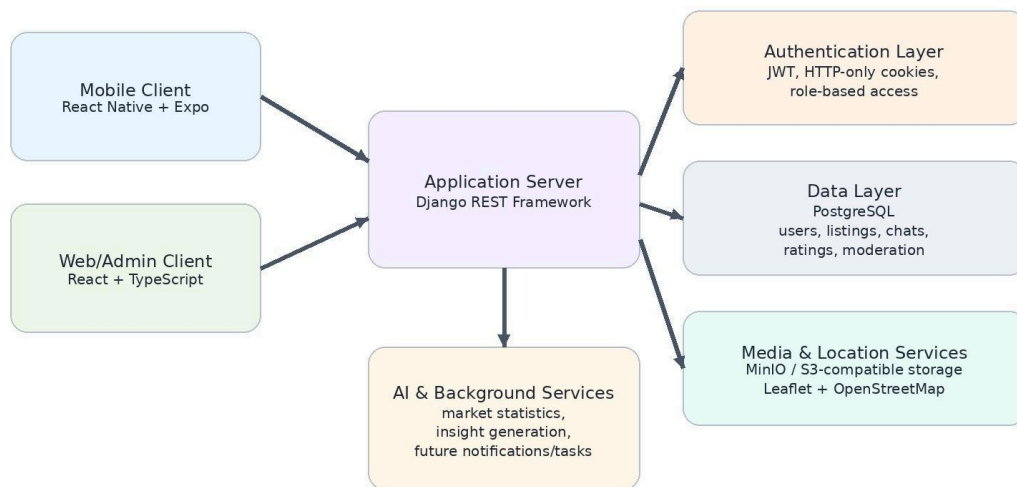


Final Report - CSCI 409 Senior Project - Spring '26 - Group 32

Title of the project:	"onAI Sharua" Farmers Technical Marketplace Platform"
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Figure 1. High-level architecture of the implemented onAI Sharua platform.

System Architecture of onAI Sharua



The implemented system separates presentation, application, data, and moderation logic. This architecture supports scalability, cleaner testing, and future deployment to cloud infrastructure.

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1. Executive Summary

onAI Sharua is a full-stack developed web marketplace, which aims to resolve the issue of trading between the farmers of Kazakhstan. The main issue is the wide region of Kazakhstan, which makes direct trade a complex challenge. Farmers tend to rely on intermediaries, and lack of trust in them, makes the purchase of machinery, equipment and crops difficult. The proposed solution should include product/service listing, inside application communication, easy and intuitive UI for the users.

The final version of our project delivers the list of features, according to the pains of the users. Solution includes mobile - first UI, since proportion of mobile users will be mobile users. Also, as backend infrastructure REST Django was used, so that persistent data storage, geospatial features and listing moderation can be implemented. On top of that, for increasing the trust among the dealers, we implemented a rating system and AI market insight helper. The system allows users to register, create/manage product and service listings, communicate with potential customers, leave a rating for a seller, check approximate map location. From the other side, a dashboard for admin was implemented, through which admins can approve/deny listings, which were sent from the sellers.

In comparison with the MVP which was finished last semester, during the current period, we made good progress and turned our system into the fully working, practical solution, which can be proposed for the users to use and test as pioneers. On top of the basic listing, registration features, we added messaging system, user ratings, AI insight about the pricing and supply. Most crucial changes were about adding the map preview and admin dashboard, by making the functionality of the website fully ready to use.

Main achievement of the project is proper implementation of data modeling, interface design, software engineering working as a whole system, helping the farmers to resolve issues that they were having for years.

2. Introduction

The agricultural sector stays as one of the most prospective fields in Kazakhstan, thanks to its large amount of land, appropriate for farming. However, many farmers are still struggling to buy machinery, equipment and crops, since there is no convenient marketplace for trading with used machinery. Most of the time, they are forced to buy new equipment for a higher price and cut their opportunity to invest in other aspects of their venture. Also, the current solutions are old-fashioned, inconvenient and not trustworthy.

The motivation of our group was to maintain the issue by creating a multimodal system, which will act not only as a single product catalogue but also serve as a trading assistant for every farmer. It will show the most attractive deals, show approximate map location, negotiate the price within the application and choose sellers according to the rating. The system is aimed to stimulate second hand trades within the farmers and resolve their issues with non-existence of platforms.

One of the most important aspects of our project is usability. We are understanding that most of the audience will not be highly technical, so during the implementation we were trying to make the interface and processes as intuitive as possible. On the final design we paid attention to large

interaction objects, direct user and task flows, and of course clear separation between the separate functions as creating listing, viewing listing and messaging.

This report describes the final state of the project and final list of deliverables that were made. It includes major constraints affecting the different decisions, explanation of the system architecture, design decisions, implemented approach, team workflow and semester-by-semester progress. Document concludes with the evaluation of the work done, and how progress helped to meet/fail initial goals of the project.

3. Identification of Constraints

Project onAI Sharua is affected by economic, social, ethical and technical aspects. For that reason, our system should be considered not only an unrealistic solution, but ready to use, practical solution for the current existing issues in a field.

3.1 Economic constraints

The project was implemented by a group of students, who are limited by budget. Because of that factor, we were using open-source tools and frameworks: to lower the cost of development. For frontend ReactNative/Expo was used, while on backend we preferred Django REST framework together with PostgreSQL for storage and OpenStreetMap for geospatial features. Practice of high costing frameworks kept projects as economically feasible and low-cost.

3.2 Social and usability constraints

A large proportion of the targeted audience are not technically advanced and not aware of digital commerce systems. This factor sets up the usability criteria: design and interface of the system should be intuitive, easy to use and clear separation of workflows. Also, the language was important, since we should consider the audience. That's why we implemented the interface in Russian.

3.3 Ethical and trust constraints

It is obvious that the marketplace should avoid misleading information, fraud and misuse. In onAI Sharua these issues were prevented by two solutions. First, before going public, all listings should be moderated by admins, and only after that they can be published and visible. Second, user information is included in the listing profile, so there is no way of making fraud and having no consequences - every seller has its own rating system.

3.4 Privacy and legal constraints

The project uses sensitive information of users, including passwords, telephone numbers, login credentials, and approximate location. Because that team has clear limits on exposure of the content, to keep privacy measures. From a legal perspective, the platform should align with Kazakhstan's laws and regulations regarding personal data protection. It will obviously affect the user consent, data storage, access control and proper account deletion should be implemented, in case of going to production.

3.5 Technical and deployment constraints

Application has several subsystems, which should be merged and turned into one system, which will be used by users without any delays or confusions. Subsystems include: map preview, listing creation and

management, messaging system and AI market insights. In addition to that, the project should be still maintainable by a student - led development team, so that every possible issue would be preventable easily.

3.6 Sustainability and operational constraints

Sustainability constraints include the opportunity of scaling and maintaining in the future. Which means that the system should be implemented in that way, so later it can be easily scaled according to the demand from the audience and load on the system. Reusable components and a relatively standard web architecture approach was chosen to face these constraints. At the same time, the idea of the project itself is to prolong the useful time of machinery and other equipment and promote the idea of sustainable consumption.

4. Background and Related Work

The need for digital solutions among farming trades is pretty obvious in research and practice. In multiple local and international sources it's mentioned and proven that proper digital solutions help to decrease the transaction costs, improve price visibility and connect dispersed regions into one ecosystem of farmers. It's extremely important for Kazakhstan, where agricultural objects are usually far from each other and making trades becomes challenging.

International practices such as Agro24, FarmLead and eNAM show the obvious design pattern. Successful and popular platforms usually provide intuitive and strong product listing, search and filtering features, clear navigation and fraud prevention. More advanced features help to get a hidden advantage from the competitors.

At the same time, in the market of Kazakhstan, existing solutions don't align with basic customer needs. They usually fail to provide basic product listing, review systems and filtering/sorting systems. Also in most of them there are no opportunities of communicating within the app, which makes the process of trade harder.

Additions from this semester were clear observations from other services, since moderation makes a huge difference in fraud prevention and detection, and also keeps only reliable and appropriate content for the listings. Seller ratings also is one of the measures built to ensure transparency and fraud prevention, since fraud users can be easily rated low and reported. Geospatial display is essential if you take into account the fact of land sizes in Kazakhstan. Usually it's not possible to identify the exact location of farms and it creates misunderstandings between the farmers. Messaging features are also important to ensure that all deals will be conducted within the app and there will be no need to move to another platform for communication.

For these reasons, all the changes made during the current semester played a big role in establishing the proper working, intuitive and safe system, which will stimulate the second hand deals between the farmers.

5. Project Approach

Our project's design is a layered client-server application, containing mobile-first interface, a REST backend, and a relational database. The aim of this design was to provide a solution that would work as a student project prototype, while being strong enough by structure to extend into a production system.

Figure 2. Main workflow from user authentication to moderated publication and subsequent buyer interaction.

Listing and Moderation Workflow



5.1 Design goals

The implementation process within our team was guided by five principles of design. First of all, the interface should be easy to understand and intuitive, since most of the audience are not familiar with digital products. Secondly, all data in the backend should be clearly organized to ensure that there is clear role separation between the roles. Thirdly, all of the listings should be moderated by the admin, to ensure a safe environment within the application. Next, we should keep the system extensible and scalable, so that in case of further development, all features can be modified and extended easily. Lastly, systems should work as a whole, not as only a bunch of subsystems, isolated from each other.

5.2 Technology stack

Our frontend technology uses React-based frameworks, for its easily mobile responsiveness setting and adaptation. Also it allows to create product listing, dashboard management and chatting very easily. The backend side of the system uses Django REST, which helps to create API driven development. For database management and utilization, our team used PostgreSQL, because of its dependable, good documentation and suitability for marketplace purposes. Map preview was implemented using the OpenStreet Map tools.

5.3 Main subsystems

Our project consists of six interconnected subsystems. The authentication module works out onboarding and secured sign-in. The module responsible for marketplace stores listings, categories, prices, and statuses. The moderation subsystem controls whether to make incoming listings as public or reject them if they are suspicious or inappropriate. The communication module manages chatting between end users. The geospatial module captures region and district information, in order to filter listings by their distance from the user. The analytics module computes and presents LLM-generated insight about a listing, including whether listed price appears attractive relative to marketplace status quo.

5.4 Data and state model

At the level of data, the system focuses on small number of core entities: user, listing, listing category, listing status, seller profile, chat thread or message, rating, and administrative review. The entity responsible for listing links descriptive data (such as title, description, price), media data (photos), geographic location, and workflow state (pending, approved, rejected). By making status an explicit property, we could implement role based access control: user dashboards both for admins and regular users using the same underlying record.

After user login, they can easily access the product listing dashboard, with all necessary information with a number of listings, separated by categories. When the listing is created, it should be first considered by the moderator (admin). If only after admin's approval, listing becomes public and starts displaying for everyone. This moderation process is one of the significant changes from the last semester.

5.5 Team process and division of work

We decided to use an iterative implementation approach, same as in the last semester. We created and managed the development process using the weekly sprints, to easily track all the progress. Alibi was focused on the backend development, while Ilyas's field of responsibility was frontend development. Nurkhan was responsible for integration of map preview and AI insights, while Ulan was responsible for product management and design decisions across the platform. This approach helped us to guide through the development system and have a clear separation between responsibilities.

Figure Set A. Authentication and account onboarding

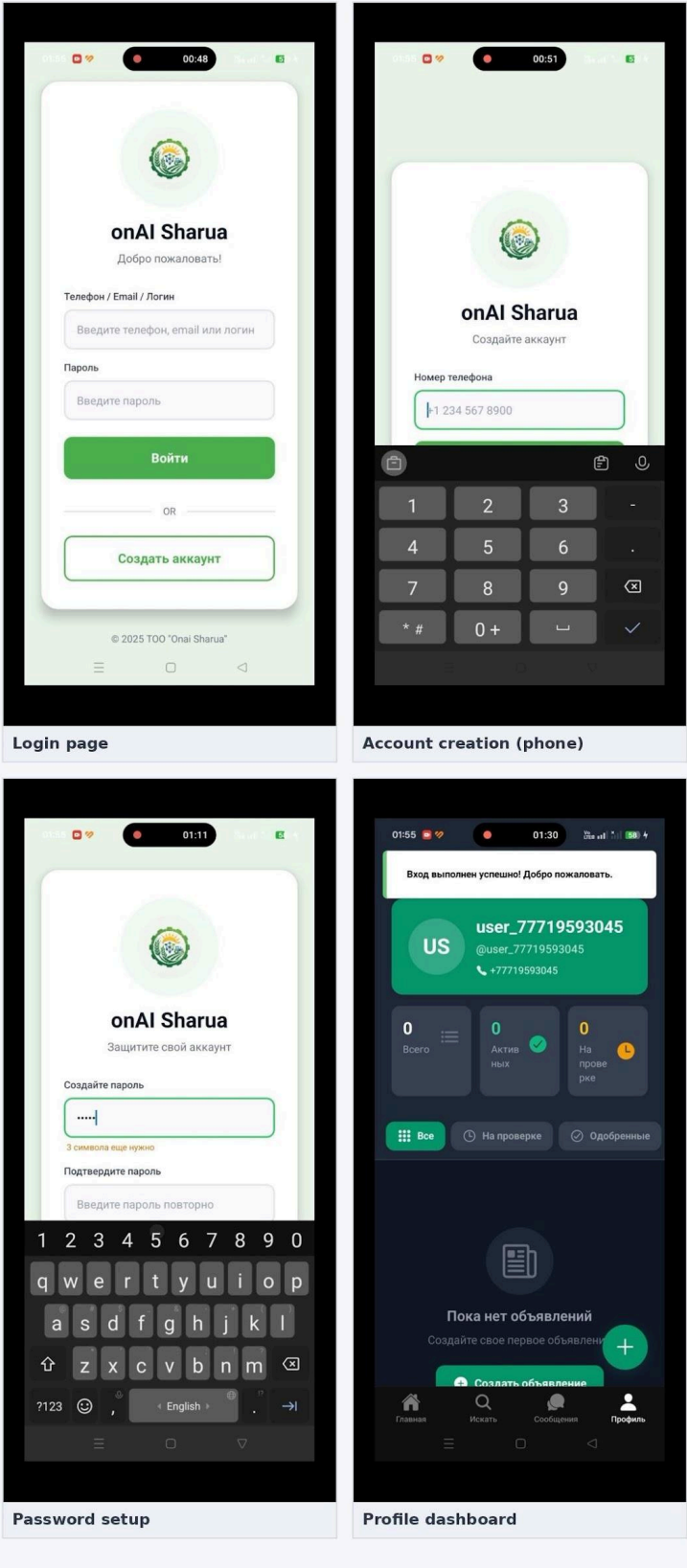
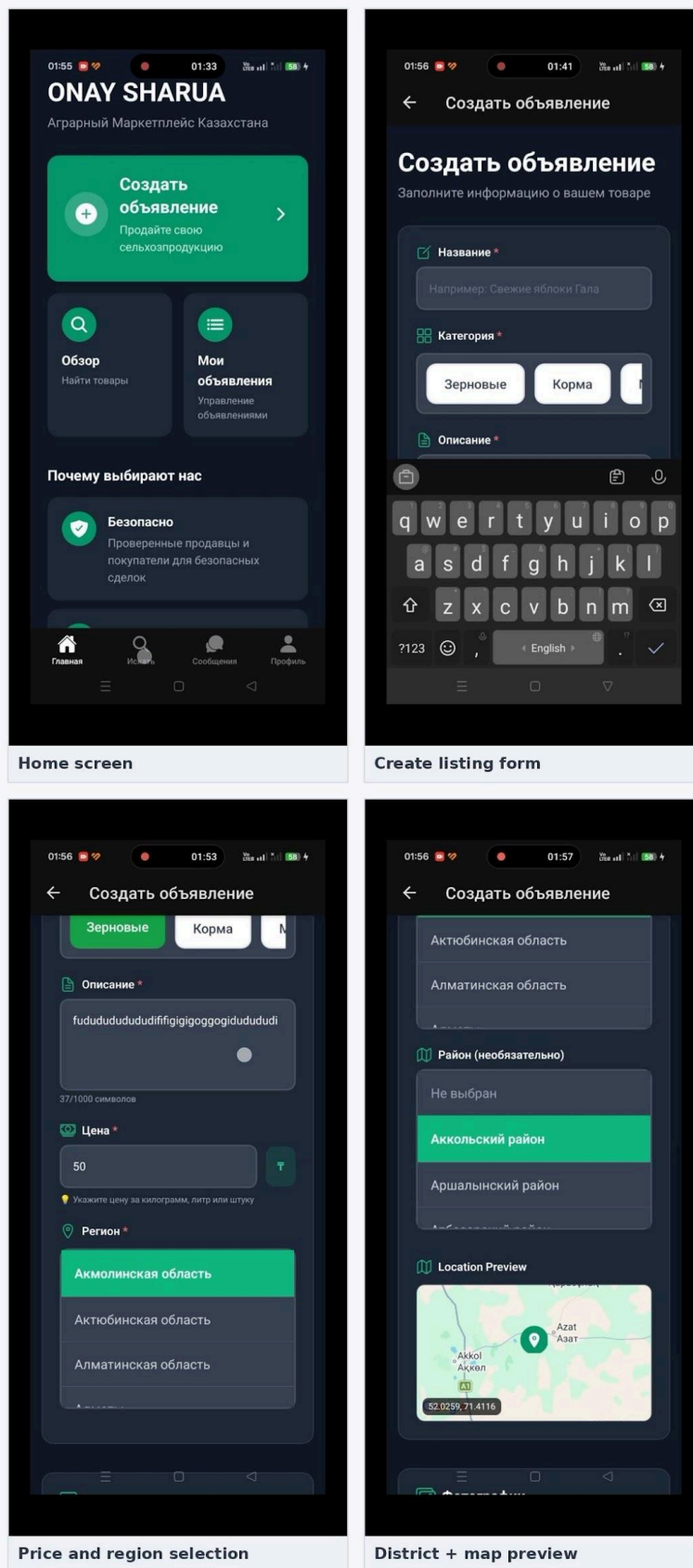


Figure Set B. Listing creation and geospatial input



5.6 Implemented feature set

The final project includes the following implemented user-facing features:

- Registration and login flow with account onboarding and secure credential handling.
- Listing creation with title, category, description, price, region, district, and image upload.
- User dashboard with listing counters and separated views for all, pending, and approved content.
- Administrator moderation interface with explicit approve and reject actions.
- Listing detail pages that display images, price, location, seller information, and action buttons.
- Seller rating display to reinforce trust and platform accountability.
- Approximate geospatial visualization of listing location on the detail view and during creation.
- Messaging interface for buyer-seller communication inside the application.
- AI insight panel that comments on price attractiveness and marketplace conditions.

We decided to focus on these only features even though we had several planned ones. This decision was taken as the result of analysis, which made us understand that it's a perfect balance of basic features required for making the trades and receiving the hidden advantage among competitors.

6. Project Execution

Our group was implementing this project across two semesters. In the Fall semester, we developed the baseline of our project: registration/login, creation of product listing. While in the current semester, we developed more advanced features.

6.1 What was completed in the first semester

In the Fall semester, we focused on the creation of basic features for the MVP. It included" registration and login system, creation of the product listing, basic features of sorting and filtering. This stage was also important, since we developed and set up all necessary frameworks for future implementation.

6.2 What changed in the final semester

In the current semester, we further developed strong MVP. First, we focused on the moderation of listings, since our priority was safety and fraud prevention among the users. Also, we decided to add map preview, since Kazakhstan is widely dispersed and farmers should know the approximate locations will help traders to understand the potential trading opportunity. As a result, our project developed from the initial MVP to the strong competitive solution for the existing problems of the farmers.

UI became better in the current semester and became significantly better. This was one of the biggest achievements. Screenshots from the final version of our projects shows that we reached a simple and intuitive design as we planned, users can navigate through the website easily. All functions working correctly.

6.3 Engineering challenges and how they were addressed

We have faced several challenges while implementing this project. The very first was a problem to synchronize frontend state with backend workflows. For example, listing status: the interface had to be familiar whether listing is approved, and listing should be demonstrated only if it is approved, and end users should not be able to witness rejected or pending ads. Such idea required careful API design to sustain Role Based Access Control.

A different challenge was to handle media and forms on a screen, that is more focused on mobile devices. Creating marketplace is not a one-line operation, because users have to enter text and descriptions, select categories and the price, other than choosing region and district. Finally, they have to add media, to make their listing more preferable by the users - so we did our best to make the flow understandable without cramming too much unto the screen. For this aim we did a multiple redesigns of UI.

A basic challenge for all apps is the messaging feature. It is different from static listings, because to create messaging that also needs to be fast and responsive, you have to implement threads, message ownership, security and other aspects in the backend. Even as a prototype, we had to model a conversation logic with a separate interface, that would fit the rest of the application easily.

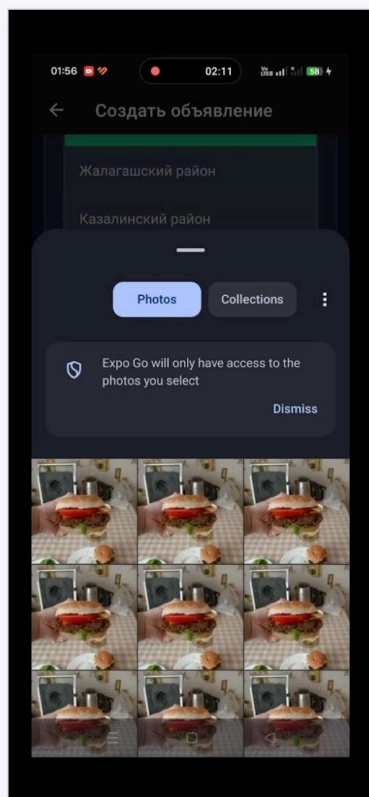
Last, the AI insights feature presented a different type of a problem. The system had to summarize price information in a way that is common and understandable, at the same time useful for marketplace context. Rather than providing exact predictions or trying to replace human judgment, the feature provides high-level explanatory market signals - "is it cheaper? Is it a good deal?" and so on. The approach is more suitable for student prototypes, and requires more data to be really useful in commercial projects.

6.4 Teamwork, coordination, and iteration

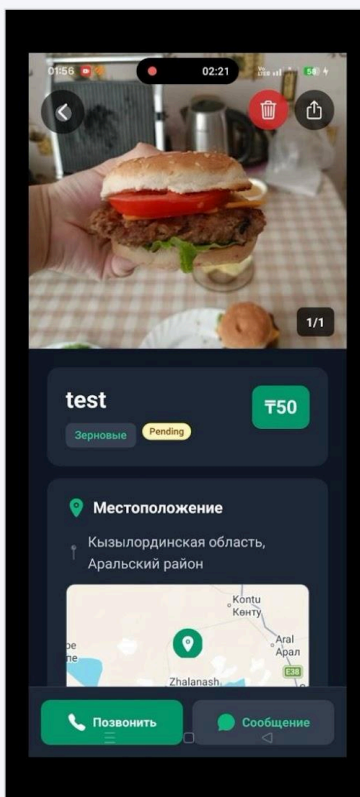
During this project we were required to communicate frequently, to ensure that all challenges are met easily and features being implemented on time. The moderation process required contribution from both frontend and backend sides, so this process was one of the most challenging parts of our project. Messaging features required storage capabilities and UI decisions with backend functionality to be easily managed and implemented in a real time. Geospatial functionality required teamwork as well, since for realization we needed form integration and visual map display.

Each new feature that we added fits into the same marketplace logic, instead of appearing as an isolated demonstration module for bragging.

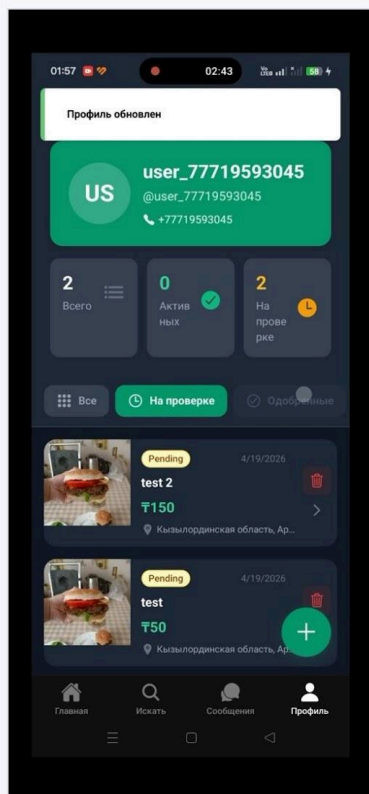
Figure Set C. Listing lifecycle, moderation, and analytics



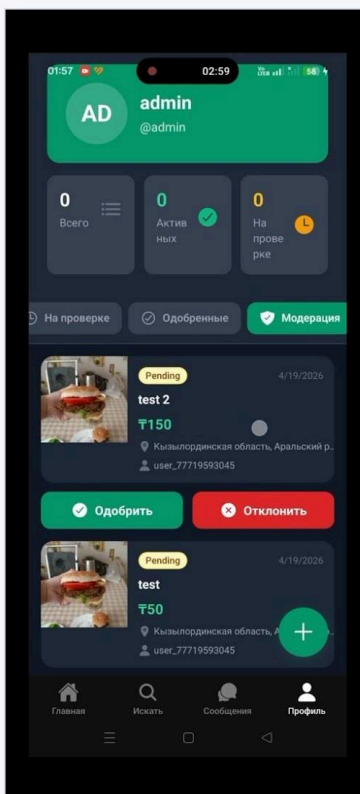
Listing detail



Dashboard with pending ads

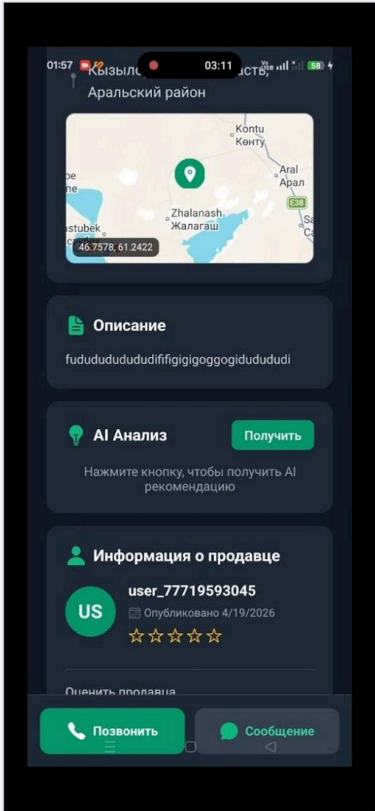


Admin moderation

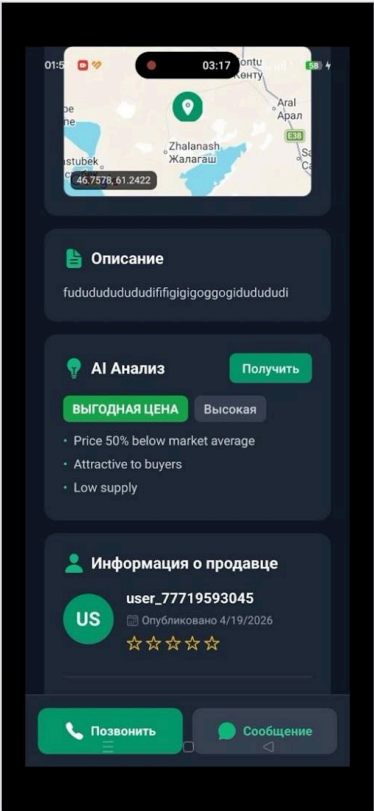


Seller info + AI analysis

Figure Set D. AI insight and messaging workflow



AI result details



Buyer message sent



Seller/admin message view



Conversation thread

7. Evaluation

The main goal of evaluation was for us to understand if onAI Sharua actually addressed the main problem defined in the introduction: improving trust, and communication in the agricultural trade. Our project is a prototype rather than a deployed commercial system, and that is why evaluation focused on structured validation of requirements, walkthrough based scenario testing, and examination of whether the implemented features support the intended user tasks.

7.1 Evaluation methodology

The evaluation used a scenario focused approach. Our evaluation is not focused on bug-finding, but we rather validated whether users could actually complete marketplace actions using our product. We tested scenarios, such as registering, creating advertisements with location, images and description, viewing the listing on the user dashboard in pending state, moderating the listing through the admin dashboard, opening the detail page, checking the seller information and the map, requesting AI insight, and sending direct messages and chatting.

This approach is suitable for where the project is right now, because it allows testing solution against real user intentions. It satisfies the reporting requirements to validate the computation solution itself, not just report on low-level development and performance tests. We had not run a large external user study within the project timeline, but we did validate the core processes end-to-end using the integrated modules of our project.

7.2 Requirements coverage matrix

Requirement / Goal	Implemented mechanism	Evidence in system	Assessment
Secure access and identity	Registration, login, authenticated profile dashboard	Fig. 3	Met
Create and manage agricultural ads	Listing form with category, description, price, photo, region, district	Fig. 4	Met
Prevent harmful or low-quality public ads	Pending state plus admin approval/rejection workflow	Fig. 5	Met
Show seller context and build trust	Seller block plus star-based rating display	Fig. 5	Met
Support geographically informed decisions	Map preview and approximate location on listing pages	Figs. 4-5	Met
Enable buyer-seller communication	In-app messaging screens and conversation thread	Fig. 6	Met
Provide market-oriented decision support	AI insight panel describing price attractiveness and demand context	Fig. 6	Met

7.3 Scenario-based findings

The evaluation process validated that the platform is at this point supporting the complete trading workflow we originally intended. Account registration & signing in works and leads users into a personalized dashboard. There, users can create listings with relevant agricultural information and visual evidence. The system requires moderation, because direct publication of all the ads would lead to chaotic or sometimes harmful contents being displayed publicly. Once a listing is published, the detail page provides actionable information: price, seller information, approximate location, and the ability to message the seller in app. The AI insights panel adds some interpretation layer to help users judge, whether the price and product is attractive or not.

Our results show, that the projects do address the original problem more effectively than the intermediate version. The initial MVP allowed ads posting and discovering, while the final system added a layer of control, explanation, and communication over it. Those functionalities matter since a marketplace is only useful if users trust its content and can really trust who or what they find there.

7.4 Limitations of the evaluation

However such evaluation has its own limitations. The limitation is in the fact that we did not do testings on actual users, so we can not really talk accurately about the adoption of this market, and the same about the possible revenue it could generate stakeholders. The feature providing AI insights is useful, but at the same time heuristic - not a prediction model backed by statistics since right now we do not have much data to build our statistics on. In app messaging worked correctly in our testing, yet we haven't tested it with hundreds of users at the same time, because such kind of load testing was beyond the scope of a senior year project timeline. We can not say that these are failures, but boundaries of the project given the time and resources we had. These limitations differ our student project from mature platform ready to deployment and usage by thousands of users.

7.5 Overall evaluation judgment

Our team insists, that what we have created fulfills our original plan and what we wanted to do. Our platform solves the core problem in a way that makes technical sense given our resources; we put our efforts into design and implementation, and the project is far better than what we had at the end of the first semester. onAI sharia demonstrates that the concept of agricultural online marketplace with multiple features, messenger, lightweight AI integration can help users and be useful in the agricultural sector of our country.

8. Conclusion and Possible Future Work

We started our project as a concept, goal of which was a specialized marketplace for farmers. Now it developed to become something fulfilled, over the course of these two semesters. The final output shows that our software, which has listings, moderation, descriptive advertisements, can really benefit

agricultural sector trade in the internet. This product now is far from separate windows combined together; it is now a working prototype built to be handy for farmers in Kazakhstan.

The second semester we shaped the system in a meaningful way - adding moderation made the platform safer by providing admins control over the listings; ratings system allow to build trust and reputation among sellers and buyers; geospatial display adds context by showing where products are located and allowing to filter by that factor; messaging provided another level of transparency, allowing users to connect in monitored chats that could be handy in case of frauds, apart from being useful for communication; LLM insights provided additional information to help users navigate and evaluate listings when there are lots of them. Together, these features bring the project closer to what users expect from a modern marketplace in internet.

Still we have room for improvement in the future. Firstly, we need multilingual support across Kazakh, Russian, and English that would make the platform accessible to a broader users number. Additionally, stronger analytics module could enable price benchmarking, analysis of trends, and category-level dashboards for market oversight accessible for end users. Also, it would be great to have strong notifications module that would display moderation results, new messages, and watched items - such add-on would keep users engaged without requiring constant manual checking of the application. Other than that, we would need a deployment hardening - including cloud storage improvement, operational monitoring, and stronger security policies if we want to deploy to real production. User assessment with farmers and agricultural stakeholders would provide useful feedback and that could help us validate whether the AI insight, or any other component delivers the value we expect it to deliver.

Our final project shows the technical advancement we did over the course of the final year. It is relevant to agricultural commerce, which means it is relevant to our country's economy, and it satisfies the goal we planned to achieve in the beginning of the year.

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Appendix A. Figure Notes

Figures in this report are based on the implemented application screens collected during the final semester. They are included as evidence of the functionality described in the main chapters and should be read as implementation artifacts rather than purely illustrative mock-ups.

Figure 3 documents the account onboarding path from authentication screens to the first user profile view.

Figure 4 shows that the listing form captures both market data and geospatial information, including region and district selection plus map preview.

Figure 5 demonstrates listing-state management and the moderation workflow from the perspective of both regular users and administrators.

Figure 6 illustrates the AI insight block and in-app messaging, which together support better decision-making and direct communication.