

UNIVERSIDAD NACIONAL DEL ALTIPLANO

FACULTAD DE INGENIERÍA ESTADÍSTICA E INFORMÁTICA



PROJECT

Digital Platform for the Valuation and Commercialization of Alpaca Fiber to Empower Producers and Foster Business Success

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Introduction

Alpaca fiber is a valuable and traditional resource in alpaca-raising communities, being a vital source of income for many families. However, the current marketing system faces significant challenges that limit producers' potential to obtain fair benefits for their work. The lack of direct market access, unfair intermediation, and the shortage of tools to showcase product quality and the production process are issues affecting the economies of alpaca-raising communities.

In response to these difficulties, it is proposed to develop and implement AlpacaConnect, a comprehensive digital platform designed to enhance the valorization and direct commercialization of alpaca fiber, empowering producers and improving their economic situation. AlpacaConnect will allow producers to showcase their products from breeding to final sale, eliminating intermediation and providing direct market access. Additionally, the platform will provide production tracking tools, business training, and market statistics to enhance producers' competitiveness and management skills.

This research explores the development of AlpacaConnect, describing its main features, objectives, and implementation methodology. Furthermore, the potential benefits that this platform can offer to alpaca fiber producers and alpaca-raising communities in general are discussed. AlpacaConnect represents a unique opportunity to transform the marketing of alpaca fiber, promoting transparency, fairness, and economic development in alpaca-raising communities.

Problem Statement

In alpaca-raising communities, producers face a fundamental problem of lack of direct access to the market and dependency on intermediaries who set unfair prices. This situation prevents producers from obtaining fair profits for their alpaca fiber. Additionally, the lack of tools to showcase product quality and the absence of business training limit their ability to compete in the market and maximize their income. It is necessary to develop a platform that allows producers to sell directly, highlight the quality of their fiber. This will not only empower producers but also increase their market participation and improve their economic livelihood.

Justification

The breeding of camelids in Peru, especially alpacas and vicuñas, is of vital importance to the country's economy. Peru is a world leader in the production of alpaca and vicuña fiber, demonstrating the significance of this industry at both national and international levels. However, despite this leadership in fiber production, alpaca-breeding families face a series of challenges that limit their ability to maximize the benefits of this activity.

The importance of alpaca fiber in alpaca-raising communities is undeniable, serving as a vital source of income for many families. However, the current commercialization system

presents serious deficiencies that negatively impact producers. The lack of direct market access and unfair intermediaries result in insufficient income for producers, compromising their economic livelihood. Additionally, the lack of tools to showcase product quality limits the producers' competitiveness in the market.

Therefore, it is crucial to develop a solution that addresses these issues comprehensively. A digital platform that allows producers to sell their alpaca fiber directly and highlight the quality of their products is essential. This platform will not only benefit the producers but also strengthen the entire alpaca fiber value chain, contributing to the sustainable development of alpaca-raising communities.

Purpose

The purpose of AlpacaConnect is to improve the economic situation of alpaca fiber producers by providing them with a comprehensive digital platform for valorization and commercialization. This platform aims to address the challenges faced by producers, such as lack of direct market access and unfair intermediaries. By allowing producers to present their products directly to consumers and offering them tools for production tracking and market statistics, AlpacaConnect seeks to empower producers and enhance their competitiveness.

General objective:

To develop and implement a comprehensive digital platform, called AlpacaConnect, that allows to enhance the valorization and direct commercialization of alpaca fiber, benefiting producers and improving their economic situation in alpaca-raising communities.

Specific objectives:

- Create an intuitive and accessible digital platform that allows producers to showcase their alpaca fiber products from breeding to final sale.
- Establish a direct sales system on the platform.
- Provide production tracking tools on the platform from the breeding of the camelids to the development of the final product.
- Implement a statistical system on the platform that provides producers with detailed information about their sales performance, market trends, and consumer preferences, enabling data-driven decision-making.
- Provide a dynamic and easily accessible digital interface.
- Implement data security and privacy measures to protect user information.

System Scope

La plataforma, denominada AlpacaConnect, permitirá a las familias dedicadas a la producción de fibra de alpaca vender sus productos directamente, asegurando un alto valor añadido. Al reflejar el seguimiento completo de producción, desde la crianza hasta el producto final, se garantiza la calidad de los productos, convirtiéndolos en inventario del productor. Al evitar la intermediación del sistema de comercialización actual, la plataforma facilita la comercialización directa con los clientes. La plataforma actúa como una herramienta de negocio, para los productores primarios de fibra de alpaca. El objetivo de AlpacaConnect es que los usuarios dependientes de la actividad alpaquera sean autónomos, liberándolos de las intermedias del sistema de comercialización actual y asegurando que sus productos sean valorados tanto económicamente como éticamente, al presentar un seguimiento completo de la producción.

What AlpacaConnect will do	What AlpacaConnect will not do
Provide a digital platform for valorization and commercialization of alpaca fiber.	Not automatically guarantee the commercial success of producers.
Allow producers to showcase their products directly to consumers.	Not offer physical alpaca fiber production services.
Offer production tracking tools to record the entire production process.	Not provide personalized financial or legal advice.
Supply market statistics to help producers make informed decisions.	Not directly control the prices of alpaca fiber products.
Promote transparency in the marketing process.	Not be responsible for external issues, such as internet connectivity problems or service interruptions.
Enhance producers' competitiveness in the market.	
Act as an intermediary in transactions between producers and consumers.	

Requirements Classification (MoSCoW Method)

Must-have Requirements	Should-have Requirements
The system must allow users to log in with two-factor authentication.	Integrate the application with third-party APIs.
The application must load in less than two seconds.	The homepage should include an explanatory video of the platform.
Add support for multiple currencies in financial transactions.	Add advanced filters for data search.
The mobile application must work on both iOS and Android.	Add the ability to customize the interface with custom themes.
The database must be able to handle simultaneous transactions from up to 1000 users.	Implement a dark mode for the user interface.
Implement a daily backup system.	Add video conferencing functionality
Users must receive personalized push notifications.	Create a feedback tool that allows users to submit suggestions.
The application must comply with GDPR.	Integrate an inventory management system.
Allow purchases and sales.	Develop a task management module.
The application must be compatible with low-power devices.	Add multilanguage support for the chatbot.
Critical data must be encrypted.	Create an interactive frequently asked questions section.
The database must be replicated in multiple geographic zones for high availability.	Add a dynamic zoom feature for images and documents.
Implement a real-time error tracking system.	Add customization options for notifications.
Implement enhanced security measures for online purchasing and selling.	Implement a comments and ratings system for products or services.
Implement security filters to prevent inappropriate content.	Add a feature for creating and broadcasting events to users.
Allow users to make sales through the application.	Implement a secure data erasure function for personal data.
Integrate a buying and selling system.	Add augmented reality features for product visualization.
Develop an e-learning platform associated with the application.	Offer detailed privacy settings for users.
Implement a ticketing system for technical support.	Implement a notification system for important events.
Add a section for guides and video tutorials.	Develop a feature for reporting technical issues within the application.
Develop integrations with ERP or CRM systems.	Implement a friend recommendation or professional connections system.
Implement an online store to purchase related products.	Reports must be exportable to PDF format.
Develop a predictive analytics module.	
Add interactive visual effects for statistics.	
Develop a sales management module.	
Develop a tool for comparing statistics or historical data.	

Cloud have Requirements	Want have Requirements
The interface must be available in English and Spanish.	There must be a voice search function.
Implement a chatbot for customer assistance.	Create a customizable dashboard for each user.
Implement drag-and-drop functionality for file uploads.	Develop an integration with social media platforms.
The platform must be accessible according to WCAG 2.1 standards.	Implement facial recognition to enhance security.
Create an interactive tutorial for new users.	Add an interactive map for location services.
Allow users to customize notification alerts.	Implement functionality to schedule social media posts.
Allow users to specifically disable personalized ads.	Implement A/B testing for the user interface.
Add a calendar to manage events within the application.	Develop functionality for sharing documents in the cloud.
Add the ability to conduct surveys within the application.	Allow users to set up automatic reminders.
Offer online training for advanced system usage.	Add integration with smart assistants like Alexa or Google Home.
Implement a news section related to users' sector.	Allow users to archive conversations and data.
Develop an expense tracking module.	Implement gesture controls for navigation.
Add a personalized recommendations system.	Add an advanced search filter by date, content type, etc.
Allow users to set goals and objectives within the application.	Develop a location-based alert system.
Add customization options for notifications.	Offer integration with wearable devices.
Add an activity history that users can review.	Implement a power-saving mode for mobile devices.
Offer a gallery of customizable templates.	Offer a desktop widget for quick access.
	Develop a feature for automatic audio to text transcriptions.

IEEE-830

Definitions, Acronyms, and Abbreviations

- **DB:** Database.
- **AlpacaConnect Platform:** The comprehensive digital platform developed for the valorization and direct commercialization of alpaca fiber, as well as for providing business training to producers.
- **ACP:** Acronym for "AlpacaConnect Platform," used as a shortened reference to the platform.
- **Alpaca Fiber:** The natural fiber produced by alpacas, used for the manufacturing of various textile products.
- **Direct Commercialization:** The ability of producers to sell their products directly to consumers, without intermediaries.
- **Business Training:** Training provided to producers to enhance their management and operational skills in their businesses.
- **Production Tracking:** The process of recording and monitoring all stages of alpaca fiber production, from breeding to the final product's crafting.
- **Intermediation:** The marketing process between producers and consumers through the digital platform.
- **Valorization:** The process of adding value to alpaca fiber products, through monitoring production quality.
- **Producer Autonomy:** The ability of producers to operate independently, without depending on intermediaries in the commercialization process.
- **Local Economy:** The economic system based on local production and consumption, promoting the development of alpaca-raising communities.
- **MPI:** Acronym for "Market Performance Indicators," referring to the metrics used to evaluate the platform's performance in terms of sales and commercialization.
- **B2C:** Acronym for "Business to Consumer," referring to the business model in which companies sell products directly to end consumers.

Referenced Documents

1. **IEEE 830-1998:** You can access the IEEE 830-1998 standard directly on the IEEE website. Here is the link: IEEE 830-1998 (<https://ieeexplore.ieee.org/document/720574>)
2. **Alpaca Fiber Marketing Platform (PVCFAP):** <https://www.fao.org/camelids-2024/events/event-detail/alpaca-fiesta-peru-fashion-deco-2024/es>

3. Alpaca Fiber Market Study

- Genetic evolution of the alpaca in the Peruvian Andean south: http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1609-91172023000600007&lang=es
- Characterization of herds of alpaca production systems in the central sierra of Peru: http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1609-91172023000600007&lang=es
- International Alpaca Association (AIA): <https://aia.org.pe/>
- Analysis of the alpaca fiber and derivatives market: <https://repositorio.sierraexportadora.gob.pe/bitstream/handle/SSE/296/Fibra%20de%20alpaca%20-%20Abril.pdf?sequence=1&isAllowed=y>
- Trade Map market report on alpaca: https://www.trademap.org/CountrySelProduct_TS.aspx?nvpm=3%7c%7c%7c%7c%7c6114%7c%7c%7c4%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1%7c1
- Alibaba trading platform: https://www.alibaba.com/premium/chinese_online-markets.html?src=sem_ggl&field=UG&from=sem_ggl&cmpgn=20788097515&adgrp=162573244544&fditm=&tgt=kwd-356095218939&locinrstr=&locphyscl=1011142&mtchtyp=b&ntwrk=g&device=c&dvcmdl=&creative=681216151670&plcmnt=&plcmntcat=&aceid=&

4. Specific Technologies Documentation

- **PHP:**
 - Official PHP documentation: <https://www.php.net/manual/es/>
 - PHP tutorial on w3schools: <https://www.w3schools.com/php/>
- **Bootstrap:**
 - Official Bootstrap documentation: <https://getbootstrap.com/docs/4.1/getting-started/introduction/>
 - Bootstrap tutorial on w3schools: <https://www.w3schools.com/bootstrap/>
- **Visual Studio Code:**
 - Official Visual Studio Code documentation: <https://code.visualstudio.com/docs>

5. Regulations and Norms: Look for relevant regulations on government websites or legislation databases. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32000L0031>

General Document Description

Product Perspective

The system will interface with:

- Web browsers such as Google Chrome, Mozilla Firefox, Microsoft Edge, etc.

- Digital payment systems like YAPE.
- The Apache server via XAMPP, which is a free and open-source distribution that includes Apache, MySQL, PHP, and Perl.
- XAMPP version for Windows 8.0.30 or 8.1.25 will be used.
- Databases: XAMPP will be used as it includes MySQL, for storing the quality tracking of products (from breeding to final product), as well as sales records for statistical purposes.
- Development tools such as XAMPP, Visual Studio Code, PHP, and MySQL.

Product Functions

For an unidentified user

1. Register on the platform.
2. Log in to the platform.
3. Access information about alpaca fiber products.
4. View advertisements related to alpaca fiber.
5. Check if a product is available.
6. Make inquiries to customer service.

For an identified producer user

1. Log in to their account on the platform.
2. Showcase their alpaca fiber products on the platform.
3. Manage information about their products.
4. View sales statistics of their products.
5. Receive notifications about the status of their products.

For an identified buyer user

1. Log in to their account on the platform.
2. Search and explore alpaca fiber products.
3. Make purchases directly from producers.
4. Access detailed information about products.
5. Provide ratings and reviews for products.

For a platform administrator

1. Manage users and profiles on the platform.
2. Moderate and manage platform content.
3. Perform maintenance and updates on the platform.
4. Analyze data and generate reports on platform usage.
5. Manage queries and issues reported by users.
6. Manage platform policies and terms of service.

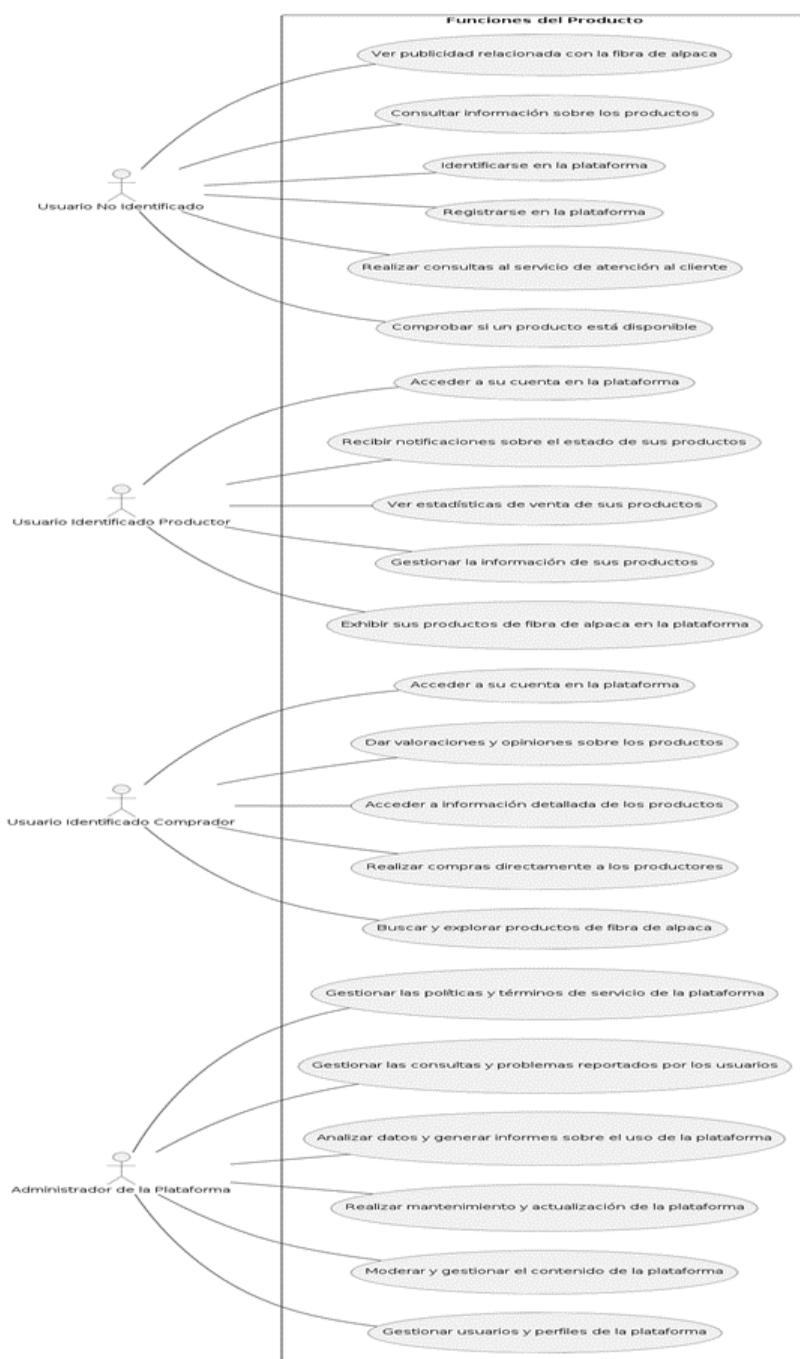


Figure 1: Use case diagram

User Characteristics

- **For an unidentified user:** Basic skill level and must be able to navigate the platform and complete simple forms.
- **For an identified producer user:** Intermediate skill level, must have basic knowledge of web navigation and account management, and is expected to have experience in the production and commercialization of alpaca fiber.

- **For an identified buyer user:** Intermediate skill level, must have basic web navigation and online shopping skills, and is expected to have an interest in alpaca fiber products and the ability to conduct online transactions.
- **For a platform administrator:** Advanced IT knowledge, experience in system and online platform administration, and the ability to perform maintenance, moderation, and data analysis tasks on the platform.

Restrictions

- Comply with data protection regulations, such as the General Data Protection Regulation (GDPR).
- Comply with applicable e-commerce legislation, such as the Law on Information Society Services and Electronic Commerce (LSSICE).
- Internationalization of the system to support multiple languages and regions.
- Use of HTTPS protocol on all forms to ensure data security.
- Use of a specific development methodology, such as Métrica v3.

Assumptions and Dependencies

- **Dependency on network infrastructure:** It is assumed that the platform will have access to a reliable and stable network infrastructure to ensure user connectivity.
- **Assumption about the stability of the technological environment:** It is presumed that the technologies and tools used for the development and operation of the platform (e.g., programming languages, databases, web servers) will remain stable and receive regular updates.
- **Dependency on the availability of external services:** It is assumed that these services will be available and operational reliably.
- **Assumption about market evolution:** It is presumed that the demand for alpaca fiber products and the interest of producers and buyers will remain constant or increase.
- **Dependency on data integrity:** It is assumed that the data stored on the platform will be accurate and up-to-date, whether entered by users or sourced from external providers.
- **Assumption about legal and regulatory stability:** It is presumed that the relevant laws and regulations related to e-commerce, data protection, and intellectual property will remain stable and not undergo significant changes.
- **Dependency on platform security:** It is presumed that adequate cybersecurity measures will be implemented to protect the platform and user data against external threats.
- **Assumption about the availability of human resources:** It is presumed that qualified personnel will be available for the continuous maintenance, support, and updating of the platform.

Future Requirements

1. **Integration of additional payment systems:** Allow payments through various methods such as PayPal, Apple Pay, and Google Pay, in addition to the existing payment methods.
2. **Enhancement of user experience:** Implement personalization features so users can configure their display preferences, notifications, and product recommendations.
3. **Expansion of internationalization:** Add support for more languages and currencies, and adapt the platform to the regulations and business practices of different countries.
4. **Integration with social networks:** Allow users to share products, reviews, and experiences on popular social networks like Instagram, Pinterest, and LinkedIn.
5. **Development of a mobile application:** Create a mobile app for iOS and Android that offers a similar experience to the web version of AlpacaConnect but optimized for mobile devices.
6. **Integration with IoT devices:** Enable the integration of IoT devices to collect data on alpaca fiber quality, breeding conditions, and other relevant aspects for producers.
7. **Implementation of artificial intelligence:** Use AI to provide personalized product recommendations, improve the accuracy of sales tracking, and optimize inventory management processes.
8. **Development of advanced analytics features:** Add advanced data analysis tools to provide producers with detailed information on market trends, customer behavior, and growth opportunities.
9. **Expansion of the virtual community:** Enhance virtual community features to encourage active user participation, such as discussion forums, interest groups, and virtual events.
10. **Optimization of logistics:** Implement more advanced order and shipping management tools to optimize logistics and reduce delivery times.

Specific Requirements

User Interfaces

- AU-IU-1. The platform will be accessible to users through a web browser.
- AU-IU-2. An intuitive and user-friendly interface will be provided for users to navigate and perform actions on the platform.
- AU-IU-3. The platform will be compatible with any operating system such as Windows and MacOS.

Hardware Interfaces

N/A

Software Interfaces

- AU-IS-1. The platform will offer access to digital payment methods.
- AU-IS-2. The platform will integrate a payment system for the sale of products.
- AU-IS-3. The system will offer the option to download documents in PDF format on the platform.
- AU-IS-4. The platform will allow the registration and monitoring of the entire alpaca fiber production process, from breeding to the final product.
- AU-IS-5. The platform will be hosted on a reliable and secure Apache server.
- AU-IS-6. The platform will integrate logistics and shipping for products sold to customers.
- AU-IS-7. The platform will manage the commercialization of user-related alpaca fiber products (producers).
- AU-IS-8. The platform will allow the visualization and analysis of product sales through statistics.
- AU-IS-9. The platform will show market analysis concerning the alpaca fiber of identified producer users.
- AU-IS-10. The platform will allow notifications for identified consumer and producer users about their purchases and sales.

Functional Requirements

Producers

- Producer Registration: Allow producers to register on the platform by providing basic information and details about their products.
- Product Catalog Management: Enable producers to add, edit, and delete products from their catalog, including descriptions, prices, and photos.
- Production Tracking: Provide tools for producers to record and track the entire production process, from camelid breeding to the final product.
- Statistical Visualization: Allow producers to access statistics on their product sales and market trends.

Buyers

- Buyer Registration: Allow buyers to register on the platform by providing basic information.
- Product Exploration: Enable buyers to search and explore alpaca fiber products in the catalog.

- Shopping Cart: Allow buyers to add products to the shopping cart and complete transactions securely.
- Product Details Viewing: Provide detailed information about products (from breeding to the final product), including prices and photos.
- Ratings and Comments: Allow buyers to give ratings and comments on products.
- Order Tracking: Allow buyers to track the status of their orders and receive notifications about the shipping process.

Administrators

- User Management: Allow administrators to manage user accounts, including producers and buyers.
- Content Moderation: Moderate and manage platform content, including products and comments.
- Data Analysis: Provide tools for analyzing sales data, market trends, and user preferences.
- System Maintenance: Perform system maintenance and updates to ensure optimal operation.
- Customer Support: Provide customer support to resolve queries and issues reported by users.

Non-functional Requirements

- **Security:** Implement robust authentication, encrypted communication, and secure data storage.
- **Reliability:** Operate reliably under normal conditions, with minimal downtime or errors.
- **Maintainability:** Facilitate maintenance and updates through well-structured code, clear documentation, and modular architecture.
- **Scalability:** Be scalable to accommodate an increase in the number of users and data volume without significant performance degradation.
- **Portability:** Be compatible with various operating systems, web browsers, and devices.
- **Usability:** Be user-friendly with intuitive interfaces and clear navigation.
- **Performance:** Operate efficiently with fast response times and minimal latency.
- **Authentication and Authorization:** Enforce user authentication and authorization mechanisms to control access to sensitive functions and data.

- **Data Integrity:** Ensure data integrity through measures to prevent unauthorized access, modification, or corruption of data.
- **Compliance:** Comply with relevant regulations and standards, including those related to data protection, industry security, and accessibility.

Design Constraints

- **Browser Compatibility:** The platform must be compatible with modern web browsers such as Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge.
- **Responsive Design:** The user interface must be fully responsive and adaptable to different devices, including desktops, tablets, and mobile devices.
- **Regulatory Compliance:** The platform must comply with data protection regulations such as the General Data Protection Regulation (GDPR) and local data protection laws.
- **Information Security:** Adequate security measures must be implemented to protect users' confidential information, including personal and payment data.
- **User Experience:** The platform design must focus on providing an intuitive and user-friendly experience for all users, including producers and buyers.
- **Scalability:** The platform design must be scalable to allow for future expansions and updates without significantly affecting performance.
- **Payment Integration:** Secure and reliable payment methods must be integrated.
- **Load Time:** The platform design must be optimized to ensure fast load times and a smooth user experience.

System Attributes

- **Security:** The platform must ensure data security and user privacy through robust authentication mechanisms, encrypted communication, and secure storage of sensitive information.
- **Reliability:** The system must operate reliably under normal conditions, with minimal downtime or errors. It should handle user requests efficiently and consistently.
- **Maintainability:** The platform must be designed to facilitate maintenance and updates. This includes well-structured code, clear documentation, and a modular architecture to ease changes and improvements.
- **Scalability:** The system must be scalable to accommodate an increase in the number of users and data volume without significant performance degradation. It should support horizontal and vertical scaling as needed.

- **Portability:** The platform must be portable across different environments and devices. It should be compatible with various operating systems and web browsers, ensuring a consistent user experience.
- **Usability:** The system must be easy to use, with intuitive interfaces and clear navigation. It should provide helpful feedback, error messages, and guidance for users.
- **Performance:** The platform must operate efficiently, with fast response times and minimal latency. It should handle concurrent user requests, large datasets, and complex operations effectively.
- **Authentication and Authorization:** The system must enforce user authentication and authorization mechanisms to control access to features and sensitive data. This includes user role and permission management, password policies, and session management.
- **Data Integrity:** The platform must ensure data integrity by implementing measures to prevent unauthorized access, modification, or corruption of data.
- **Compliance:** The system must comply with relevant regulations and standards, including data protection laws, industry security standards, and accessibility guidelines.

Other Requirements

- **Interoperability:** The platform must be capable of integrating with external systems, such as Customer Relationship Management (CRM) systems, inventory management systems, and accounting systems, via APIs or other integration methods.
- **Data Backup and Recovery:** A regular backup system for the platform's database and files must be implemented, along with a disaster recovery plan to ensure data availability and integrity in case of failures.
- **Regulatory Compliance:** The platform must comply with local and international regulations related to online sales, data protection, and consumer rights.
- **Notifications and Alerts:** A notification system is required to inform users about order updates, product status changes, and other important communications.
- **Order and Shipment Tracking:** Users must be able to track the status of their orders and shipments through the platform, including integration with courier services and package tracking.
- **Review and Rating Management:** The platform must allow users to leave reviews and ratings for products and their shopping experience, with the capability to moderate and respond to comments as needed.
- **User Profile Customization:** Users must be able to customize their profiles on the platform, including communication preferences, billing and shipping information, and notifications for products of interest.

- **Return and Refund Policies:** A clear and transparent process for product returns and refunds must be established, with policies that comply with local regulations and provide a positive customer experience.
- **Social Media Integration:** The platform must allow users to share content and products on social media, as well as log in using their social media accounts for a simplified login experience.

Development structure

Software Architecture

Architecture Design

Microservices Architecture

Microservices architectures offer an updated, scalable, and distributed system. This means that the system can easily expand according to needs and be distributed into multiple independent components. It is compatible with PHP and Apache in XAMPP.

Each microservice can be developed and deployed independently, and Bootstrap can be used to design user interfaces.

Features

- Decoupling of components: Allows for the development, deployment, and operation of services independently, streamlining application management and minimizing impacts on other services in case of changes or updates.
- Ease of maintenance and testing: Facilitates experimentation with new features, their rollback if they don't work, and efficient identification and correction of errors, improving software development agility and quality.
- Small and agile teams: Encourages autonomous and multidisciplinary teams that can work independently, reducing bureaucracy and accelerating development processes.
- Organization around business capabilities: Teams focus on specific functionalities, optimizing efficiency and allowing better alignment with business needs.
- Infrastructure automation: Improves efficiency in development and deployment by allowing for automatic creation and deployment of services, ensuring fast and consistent delivery.

Microservices Architecture for Alpaca Fiber Platform

General Description

The microservices architecture divides the platform into several independent services, each responsible for specific functionality. These microservices communicate with each other via RESTful APIs. The platform will be developed in PHP

with Visual Studio, deployed in a XAMPP environment (Apache, MySQL), and Bootstrap will be used for the frontend.

Microservices Architecture Components

1. User Management Service

- **Functionality:** Registration, authentication, profile management.
- **Technologies:** PHP, MySQL.
- **Endpoints:**
 - POST /register
 - POST /login
 - GET /profile
 - PUT /profile

2. Product Management Service

- **Functionality:** Add, edit, delete alpaca fiber products.
- **Technologies:** PHP, MySQL.
- **Endpoints:**
 - POST /products
 - GET /products
 - PUT /products/{id}
 - DELETE /products/{id}

3. Sales Management Service

- **Functionality:** Purchase processing, sales statistics.
- **Technologies:** PHP, MySQL.
- **Endpoints:**
 - POST /sales
 - GET /sales
 - GET /sales/stats

4. Customer Support Service

- **Functionality:** Management of queries and customer support.
- **Technologies:** PHP, MySQL.
- **Endpoints:**
 - POST /support
 - GET /support/tickets
 - PUT /support/tickets/{id}
 - DELETE /support/tickets/{id}

5. Advertising Service

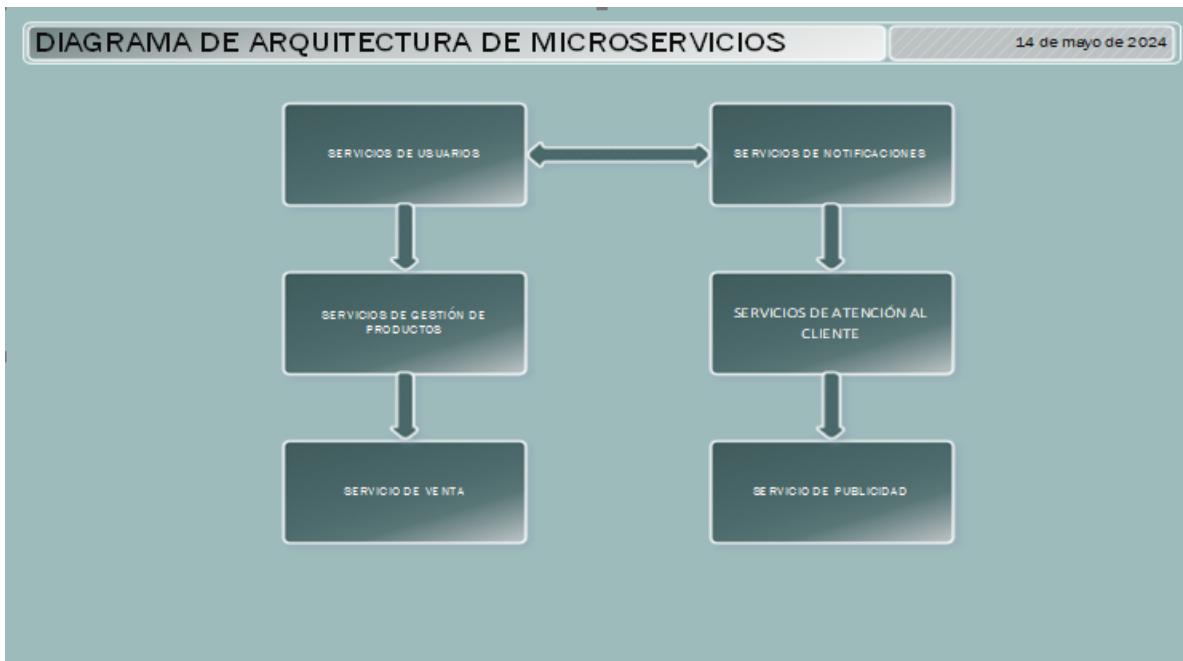
- **Functionality:** Management and display of advertising related to alpaca fiber.
- **Technologies:** PHP, MySQL.

- **Endpoints:**

- POST /ads
- GET /ads
- PUT /ads/{id}
- DELETE /ads/{id}

6. Notification Service

- **Functionality:** Sending notifications to users about their products and purchases.
- **Technologies:** PHP, MySQL.
- **Endpoints:**
 - POST /notifications
 - GET /notifications



(a) Microservices Architecture Diagram

Technologies and tools

Programming languages

- **PHP:** Main language used for server-side development, handling business logic and database interaction.
- **JavaScript:** Used for client-side programming, providing interactivity and dynamism to the user interface.

Frameworks and Libraries

- **Bootstrap:** CSS framework used to design a responsive and modern user interface.

- **Laravel:** PHP framework (optional if chosen) that facilitates web application development through an MVC structure and integrated tools for common tasks.

Web server

- **Apache:** Web server used to host the application, included in the XAMPP distribution.

Development Environments

- **XAMPP:** Software package that includes Apache, MySQL, PHP, and Perl, facilitating the setup of the local development environment.
- **Visual Studio Code:** Source code editor used to write, debug, and maintain project code.

Databases

- **MySQL:** Relational database management system used to store application data, included in XAMPP.

Version control

- **Git:** Distributed version control system used to manage source code history and collaborate with other developers.
- **GitHub:** Web-based platform for hosting Git repositories and facilitating collaboration in project development.

Automation Tools

- **Composer:** Dependency manager for PHP, used to install and manage packages and libraries.
- **npm (Node Package Manager):** Used to manage JavaScript dependencies and frontend build tools.

Development Methodologies

- **Agile:** Methodologies adopted to promote collaboration, continuous integration (CI), continuous delivery (CD), and continuous deployment (also CD), improving the efficiency and quality of development.

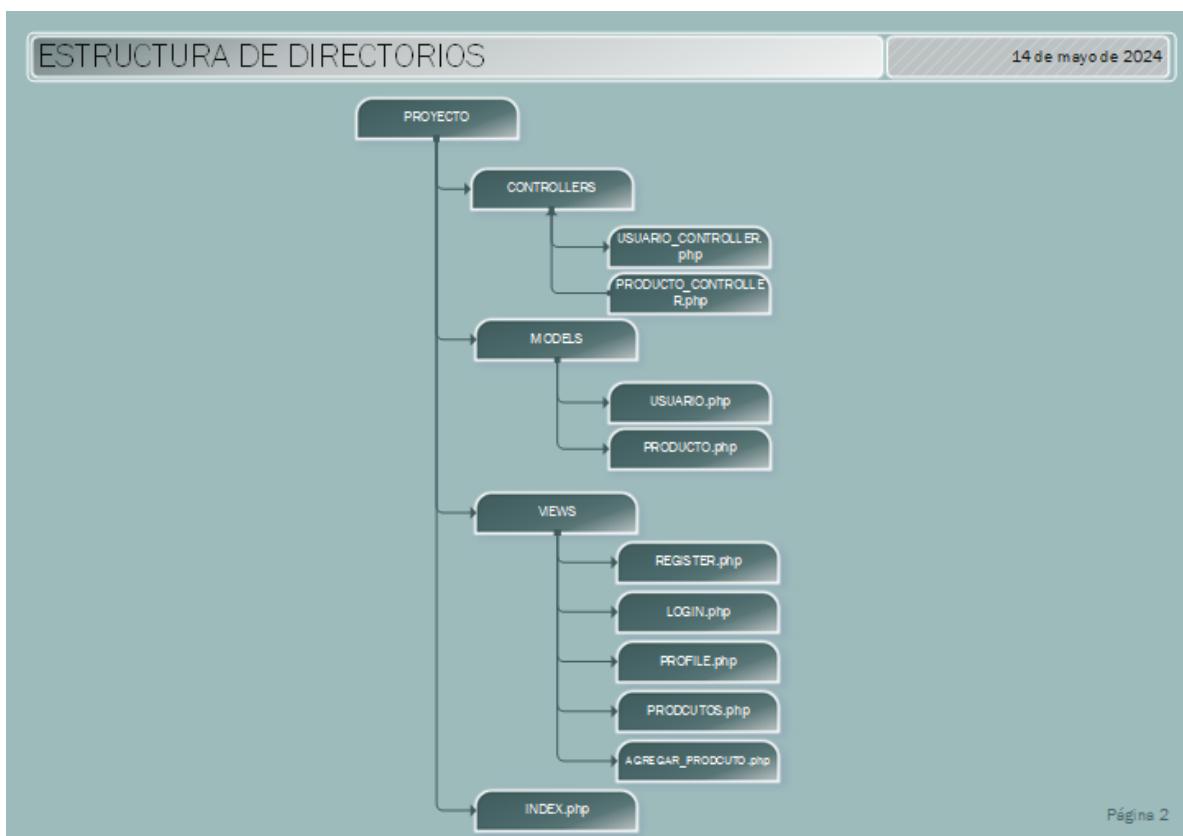
Security

- **HTTPS:** Security protocol used to secure communication between the client and server.
- **Implementation of security measures:** Authentication, authorization, and data encryption to protect users' sensitive information.

Security for Llamayu

Security Practices

- **Authentication:** Implement secure authentication using JWT tokens to handle user sessions. Each user must authenticate before accessing any protected resources on the platform.



(a) Directory structure

- **Authorization:** Define clear roles and permissions (e.g., producers and buyers) and use access control policies to ensure that users can only access resources they are allowed to.
- **Data Encryption:** Ensure that all sensitive data, such as passwords and payment details, is encrypted both in transit (using HTTPS) and at rest (using database encryption techniques).
- **API security:** Implement security measures in the API, such as input validation, rate limiting, and protection against common attacks (e.g., SQL injection, XSS).

Security Tests

- **Vulnerability scan:** Conduct regular vulnerability scans using automated scanning tools (e.g., OWASP ZAP) to identify and mitigate potential security weaknesses in the code and infrastructure.
- **Penetration tests:** Hire security experts or use penetration testing services to simulate real attacks and discover vulnerabilities that could be exploited by attackers. These tests should be performed periodically and after significant changes to the system.

AlpacaConnect Maintenance

Corrective maintenance

- **Error detection and resolution:** Establish an error tracking

system to detect and fix any issues on the platform quickly. Use tools like Sentry to monitor and log errors in real-time.

- **User support:** Implement a technical support channel for users to report issues and receive timely assistance. This may include a ticketing system and live chat.

Preventive Maintenance

- **Software updates:** Keep the Apache server, MySQL database, and other platform components (PHP, XAMPP, etc.) up to date to avoid known vulnerabilities and improve performance.
- **Proactive Monitoring:** Use monitoring tools like Nagios or New Relic to monitor system health, server performance, and database activity, identifying potential issues before they affect users.

Evolutionary Maintenance

- **Implementation of new functionalities:** Plan and develop new features and enhancements on the platform, such as integration with new payment methods, multilingual support, and UI improvements.
- **Continuous optimization:** Continuously review and improve code and database queries to ensure optimal performance. Conduct regular code reviews and optimize SQL queries to enhance speed and efficiency.

Adaptive Maintenance

- **Adaptation to new technologies:** Stay updated on new technologies and trends in web development, and adapt the platform to leverage these innovations. This may include using new versions of frameworks and libraries.
- **Normative compliance:** Ensure that the platform complies with local and international regulations.

Scrum Agile Methodology

Scrum will be adopted due to its efficiency in managing projects through short and focused iterations, essential for AlpacaConnect's development. Scrum will facilitate the incremental delivery of features, ensuring the platform continuously evolves to meet user needs and enhance their direct marketing experience.

Scrum methodology with the JIRA platform

Producers

User Registration

- Design the database to store user information.
- Implement the user registration interface.
- Develop backend logic for registration and data storage.

- Implement a password encryption function.
- Implement login functionality.
- User testing and bug fixes.

Platform Access

- Create a registration form.
- Create a login form.
- Create data retrieval functionality for registrations.

Product Catalog Management

- Design the database to store products.
- Create a user interface to add, edit, and delete products.
- Develop backend logic for product management.
- Add functionality to upload images.
- User testing and bug fixes.

Production Tracking

- Design the database for production tracking.
- Create the user interface to record the production process.
- Develop backend logic to manage production tracking.
- Integration testing and bug fixes.

Statistics Visualization

- Design the database to store and query statistics.
- Create the user interface to display statistics.
- Implement backend logic to calculate and return statistics.
- User testing and bug fixes.

Buyers

Product Exploration

- Design the user interface for product exploration.
- Implement search and filter logic for products.
- User testing and bug fixes.

Shopping Cart

- Design the database for the shopping cart.
- Implement the user interface for the shopping cart.
- Develop backend logic to manage the cart and transactions.
- Implement secure payment methods (Yape QR).
- User testing and bug fixes.

Product Detail View

- Create the user interface for product detail view.
- Implement backend logic to provide detailed information.
- User testing and bug fixes.

Ratings and Reviews

- Design the database to store ratings and reviews.
- Create the user interface to add and view ratings and reviews.
- Implement backend logic to manage ratings and reviews.
- User testing and bug fixes.

Order Tracking

- Design the database to store order statuses.
- Implement the user interface for order tracking.
- Develop backend logic to update and display order status.
- User testing and bug fixes.

Administrators

User Management

- Design the database to manage users.
- Implement the user interface for user management.
- Develop backend logic to manage user accounts.
- Integration testing and bug fixes.

Content Moderation

- Create the user interface for content moderation.
- Implement backend logic to manage products and comments.
- User testing and bug fixes.

Data Analysis

- Design the database to store and analyze data (Hash).
- Create the user interface for data analysis visualization.
- Implement backend logic to calculate and display analysis.
- User testing and bug fixes.

System Maintenance

- Plan and execute system updates.
- Perform regression testing after updates.
- Implement monitoring processes to ensure optimal performance.
- Document maintenance procedures.

Customer Support

- Implement a ticket system for customer support.
- Create a user interface for ticket tracking and management.
- Develop backend logic to manage support requests.
- User testing and bug fixes.

1 Job link

1.1 Link platform JIRA

Llamayu project: JIRA

1.2 Video link on YouTube

Llamayu project: YouTube

1.3 Link del mi repositorio de github

Llamayu project: Github

Jira platform

The screenshot shows the JIRA Backlog interface for the 'PROYECTO_PAGINA_DIGITAL' project. The backlog is currently empty, indicated by the message 'Lograr que Iniciar sesión y registrar a los usuarios'. A single issue, 'PPD-1 Registro de los usuarios', is listed under 'Sprint 1' (25 may - 25 may) with a status of 'FINALIZADA'.

Figure 4: Sprint 1

The screenshot shows the JIRA Backlog interface for the 'PROYECTO_PAGINA_DIGITAL' project. It displays two sprints: 'Sprint 2' and 'Sprint 3'. 'Sprint 2' contains one issue, 'PPD-2 Acceso a la plataforma digital'. 'Sprint 3' contains two issues: 'PPD-12 PRODUCTORES_Gestión de catálogo de productos' and 'PPD-82 CRUD de la gestión de productos'. Both sprints have a status of 'INICIAR SPRINT'.

Figure 5: Sprint 2, Sprint 3

Proyectos / PROYECTO_PAGINA_DIGITAL

Backlog

Sprint 4 Añadir fechas (1 issue)

PPD-13 Seguimiento de producción

Sprint 5 Añadir fechas (1 issue)

PPD-14 Visualización de estadísticas

Sprint 6 Añadir fechas (2 incidencias)

PPD-15 CLIENTES_Exploración de productos

PPD-16 Carrito de compras

Importar trabajo Insights Ver configuración

Iniciar sprint

TAREAS POR HACER

1 incidencia | Estimación: 0

1 incidencia | Estimación: 0

1 incidencia | Estimación: 0

Figure 6: Sprint 4, Sprint 5, Sprint 6

Proyectos / PROYECTO_PAGINA_DIGITAL

Backlog

Sprint 7 Añadir fechas (2 incidencias)

PPD-17 Visualización de detalles del producto

PPD-18 Valoraciones y comentarios

Sprint 8 Añadir fechas (2 incidencias)

PPD-19 Seguimiento de pedidos

PPD-20 ADMINISTRADORES_Gestión de usuarios

Importar trabajo Insights Ver configuración

Iniciar sprint

TAREAS POR HACER

2 incidencias | Estimación: 0

0 0 0

0 0 0

Figure 7: Sprint 7,Sprint 8

Proyectos / PROYECTO_PAGINA_DIGITAL

Backlog

Sprint	Incidentes	Tareas
Sprint 9	2	PPD-21, PPD-22
Sprint 10	2	PPD-23, PPD-24

Figure 8: Sprint 9, Sprint 10

Proyectos / PROYECTO_PAGINA_DIGITAL

Backlog

Sprint	Incidentes	Tareas
Sprint 11	2	PPD-76, PPD-77
Sprint 12	3	PPD-78, PPD-79, PPD-80

Figure 9: Sprint 11, Sprint 12

Llamayu digital platform

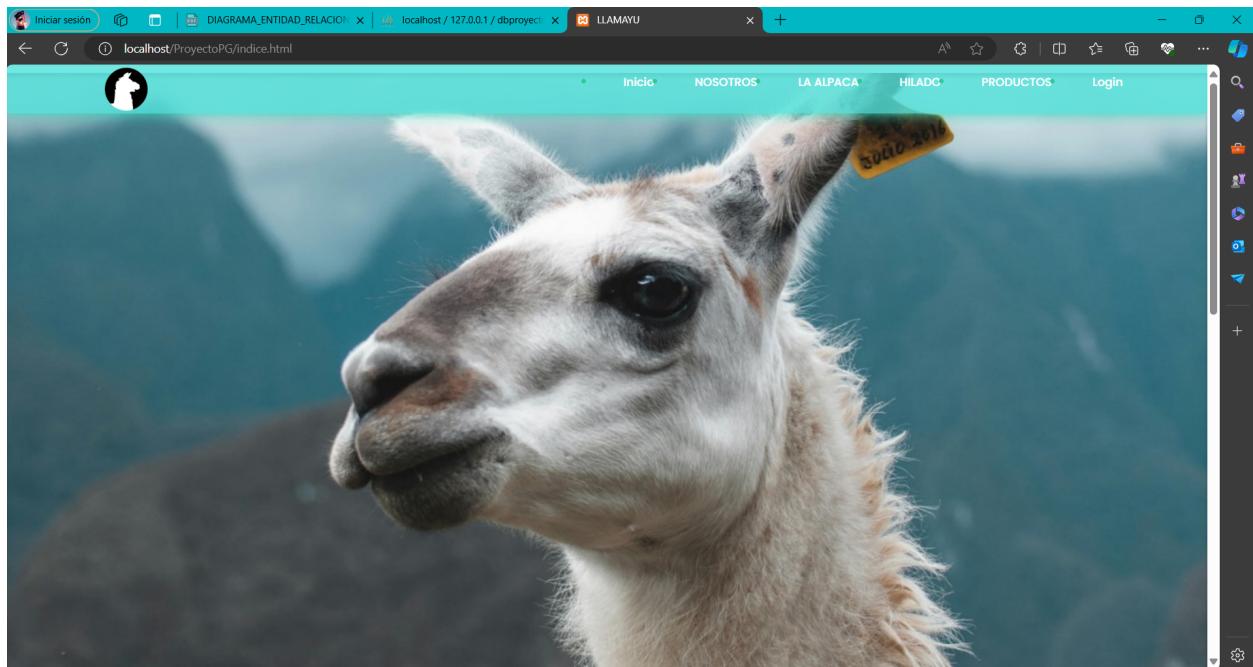


Figure 10: Digital platform previews

Login in

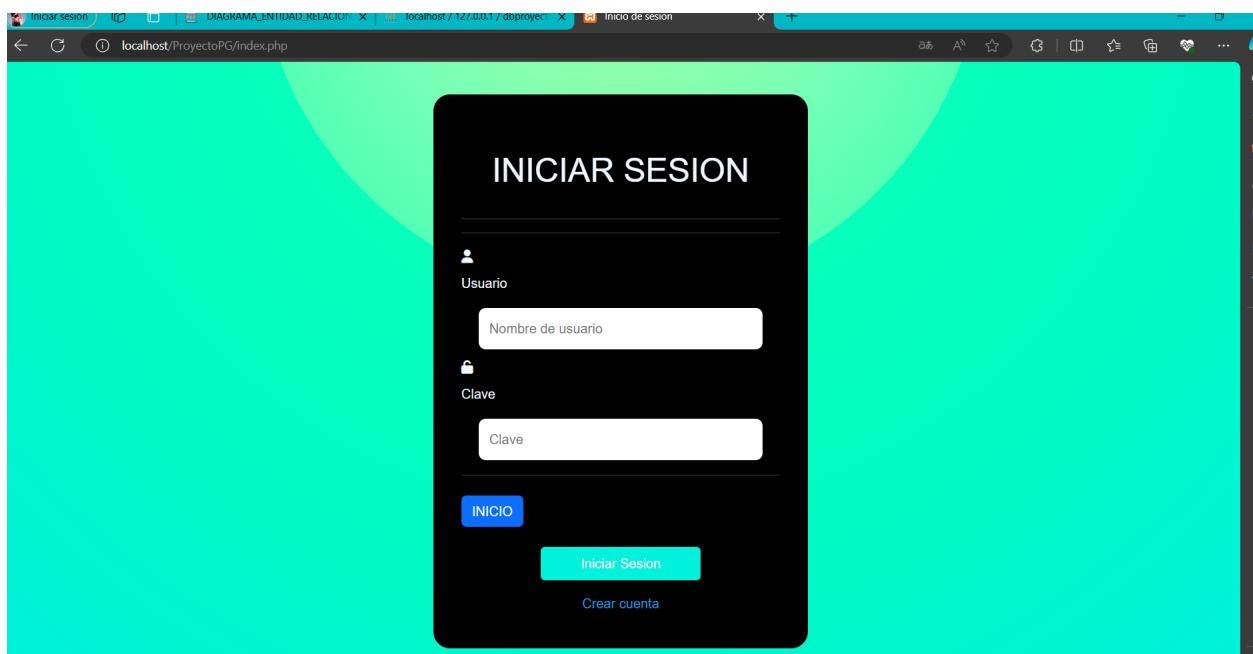


Figure 11: Login in

Registration process

The screenshot shows a registration form titled "Crear Cuenta". The form fields are as follows:

- Nombres: Vladimiro Aldo
- Apellidos: Carlosviza Amanqui
- Correo electrónico: vladimiramanqui@gmail.com
- Tipo de usuario: Cliente
- Nombre del usuario: Aldo
- Clave: (redacted)
- Confirma la clave: (redacted)

A green "Registrarse" button is located at the bottom of the form.

Figure 12: registration process

Producer

The screenshot shows a producer profile page. At the top, it says "Bienvenido, Melany Kiara". Below that, there's a "Perfil del Usuario" (User Profile) section with the following information:

Información del Usuario

Nombre de Usuario: Melany
Nombres: Melany Kiara
Tipo de Usuario: productor
Contenido específico para Productores...

At the top right, there are three buttons: "Cerrar Sesión" (Logout), "Registrar productos" (Register products), and "Catálogo" (Catalog).

Figure 13: Producer

CRUD

The screenshot shows a web browser window with the URL `localhost/ProyectoPG/Productos/nuevoModal.php`. The title bar says "Registro de productos". The main content area has two sections: a form on the left and a table on the right.

Form (Left):

- Section:** Ingresar Nuevo Producto
- Nombre del Producto:**
- Descripción:**
- Precio:**
- Cantidad:**
- Categoría:** Seleccione una categoría
- Imagen del producto:** Elegir archivo | No se eligió ningún archivo

Table (Right):

ID	NOMBRE	DESCRIPCIÓN	PRECIO	CANTIDAD	CATEGORIA	IMAGEN	Acciones
10	Chalina	Hecho de lana de Vicuña	200.00	11	2	Chalina.jpg	
11	Chompa	Hecho de lana de Alpaca	500.00	10	1	chompa.jpg	
13	Lana de alpaca	Color Crema medio	300.00	20	4	Fib_alpca.jpg	

Figure 14: Create, edit and delete products

Register product

The screenshot shows a web-based application for managing products. On the left, there's a modal window titled "Ingresar Nuevo Producto" (Enter New Product). The form contains the following fields:

- Nombre del Producto: "Lana de alpaca"
- Descripción: "Color Gris claro"
- Precio: "200"
- Cantidad: "50"
- Categoría: "Hilos y Fibras" (selected from a dropdown menu)
- Imagen del producto: A file input field showing "Elegir archivo" and "fibra_alpaca.jpg".

On the right side of the screen, there is a sidebar displaying a table of existing products:

ID	NOMBRE
11	Chompa
13	Lana de alpaca
14	Abrigo

Figure 15: Producer

Modify

Iniciar sesión

DIAGRAMA_ENTIDAD_RELACION X localhost / 127.0.0.1 / dbprojec... X Editar

localhost/ProyectoPG/Productos/editar_product.php?id=11

Añadir favorito | Imprimir | Descargar | Correo electrónico | ...

Editar productos

Nombre del Producto

Descripción

Precio

Cantidad

Categoría

Figure 16: Modify

Modified

Iniciar sesión

localhost / ProyectoPG / Productos / nuevoModal.php

Registro de productos

ID	NOMBRE	DESCRIPCIÓN	PRECIO	CANTIDAD	CATEGORIA	IMAGEN		
10	Chalina	Hecho de lana de Vicuña	200.00	11	2	Chalina.jpg		
11	Chompa	Hecho de lana de Alpaca	700.00	80	1	chompa.jpg		
13	Lana de alpaca	Color Crema medio	300.00	20	4	Fib_alpca.jpg		

Ingresar Nuevo Producto

Nombre del Producto

Descripción

Precio

Cantidad

Categoría

Imagen del producto

 No se eligió ningún archivo

Figure 17: Modified

Eliminate

The screenshot shows a web browser window with a modal dialog box in the foreground. The dialog box has a dark background with white text and buttons. It says "localhost dice" and "Estás seguro que deseas eliminar?". There are two buttons: "Aceptar" (Accept) and "Cancelar" (Cancel). In the background, there is a table titled "Ingresar Nuevo Producto" with fields for Nombre del Producto, Descripción, Precio, Cantidad, and Categoría. To the right of the form is a table titled "Ingresar Productos" showing three rows of product data:

ID	NOMBRE	DESCRIPCIÓN	PRECIO	CANTIDAD	CATEGORIA	IMAGEN
10	Chalina	Hecho de lana de Vicuña	200.00	11	2	Chalina.jpg
11	Chompa	Hecho de lana de Alpaca	700.00	80	1	chompa.jpg
13	Lana de alpaca	Color Crema medio	300.00	20	4	Fib_alpca.jpg

Figure 18: eliminate

Removed

The screenshot shows a web browser window with a success message in a green box: "Producto eliminado correctamente". Below this, there is a table titled "Registro de productos" showing two rows of product data:

ID	NOMBRE	DESCRIPCIÓN	PRECIO	CANTIDAD	CATEGORIA	IMAGEN
11	Chompa	Hecho de lana de Alpaca	700.00	80	1	chompa.jpg
13	Lana de alpaca	Color Crema medio	300.00	20	4	Fib_alpca.jpg

Figure 19: Removed

Appendix

UML diagrams used in obtaining requirements

Appendix A

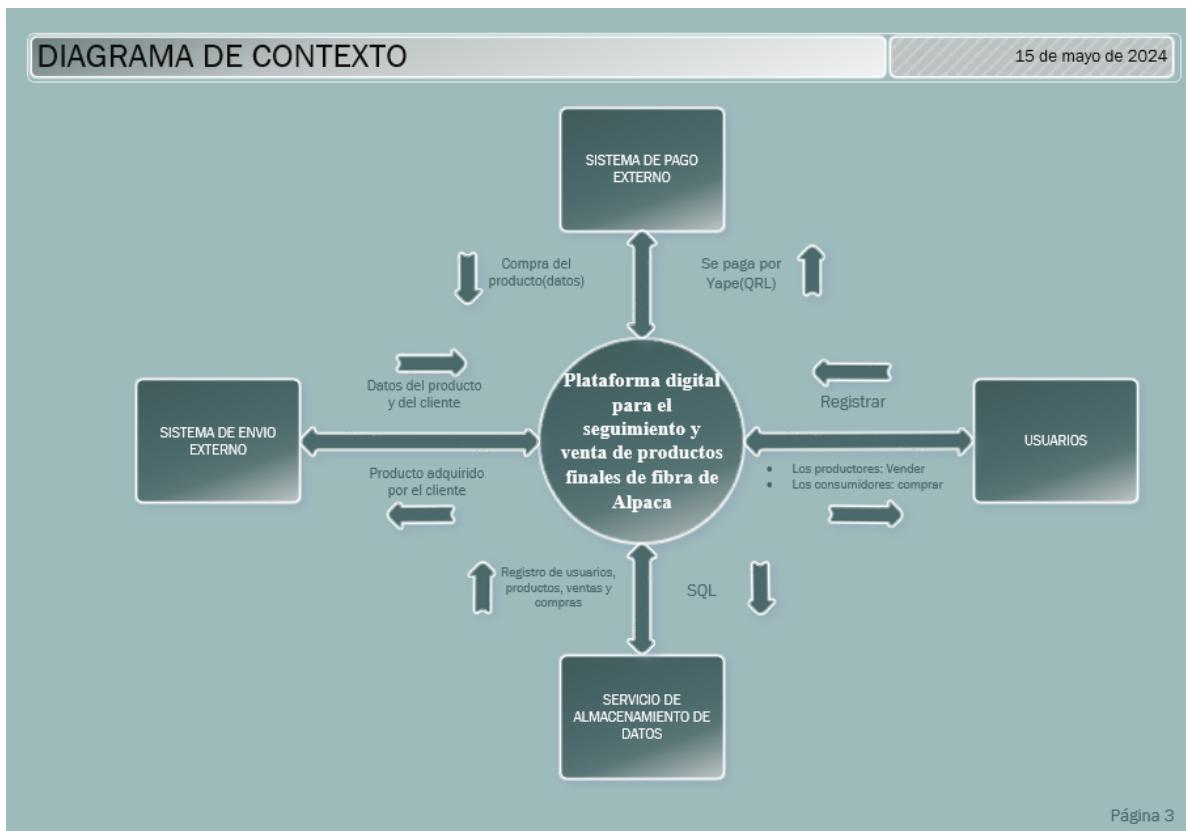


Figure 20: Context diagram

Use Case Diagram

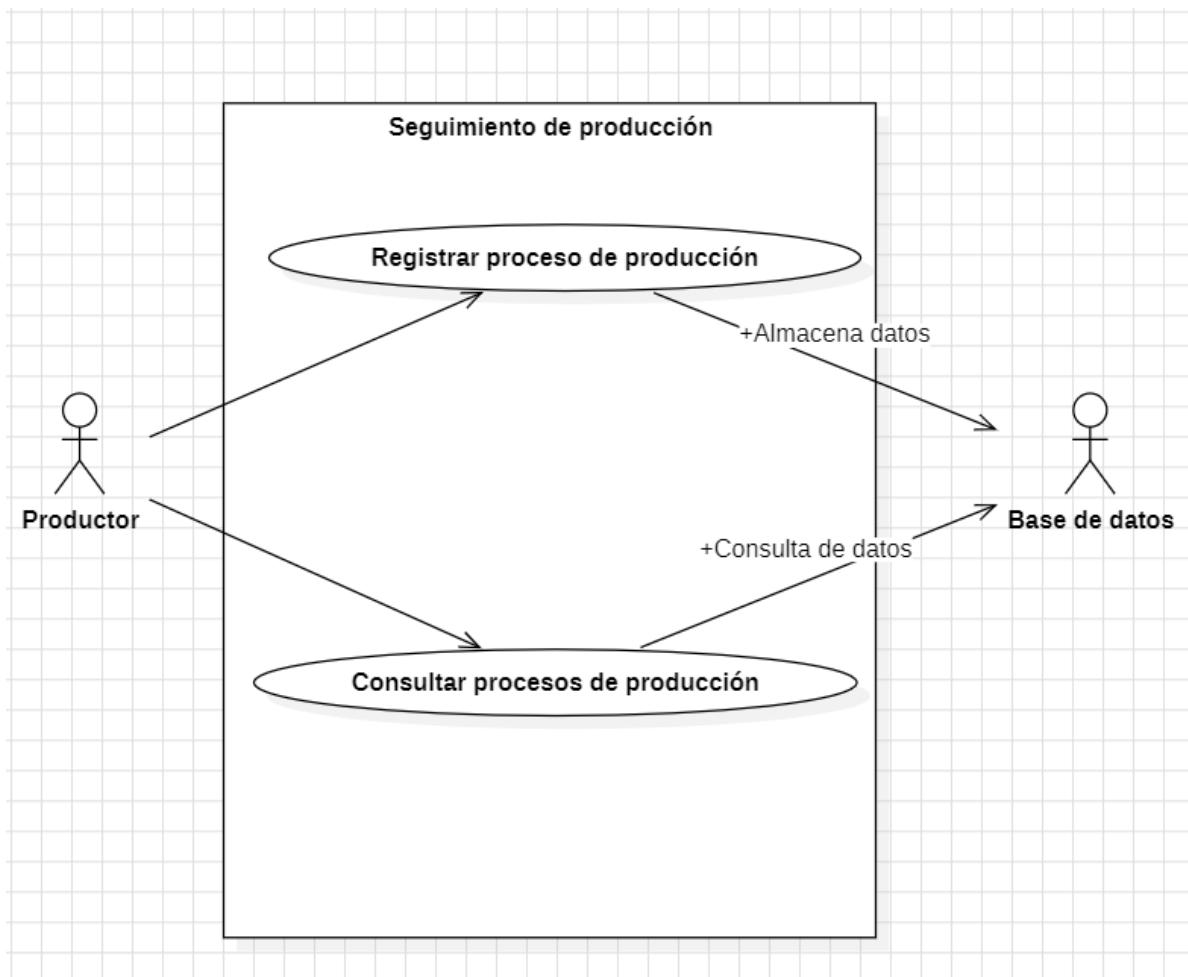


Figure 21: Production Tracking Use Case Diagram

Appendix B

Entity Relationship Diagram

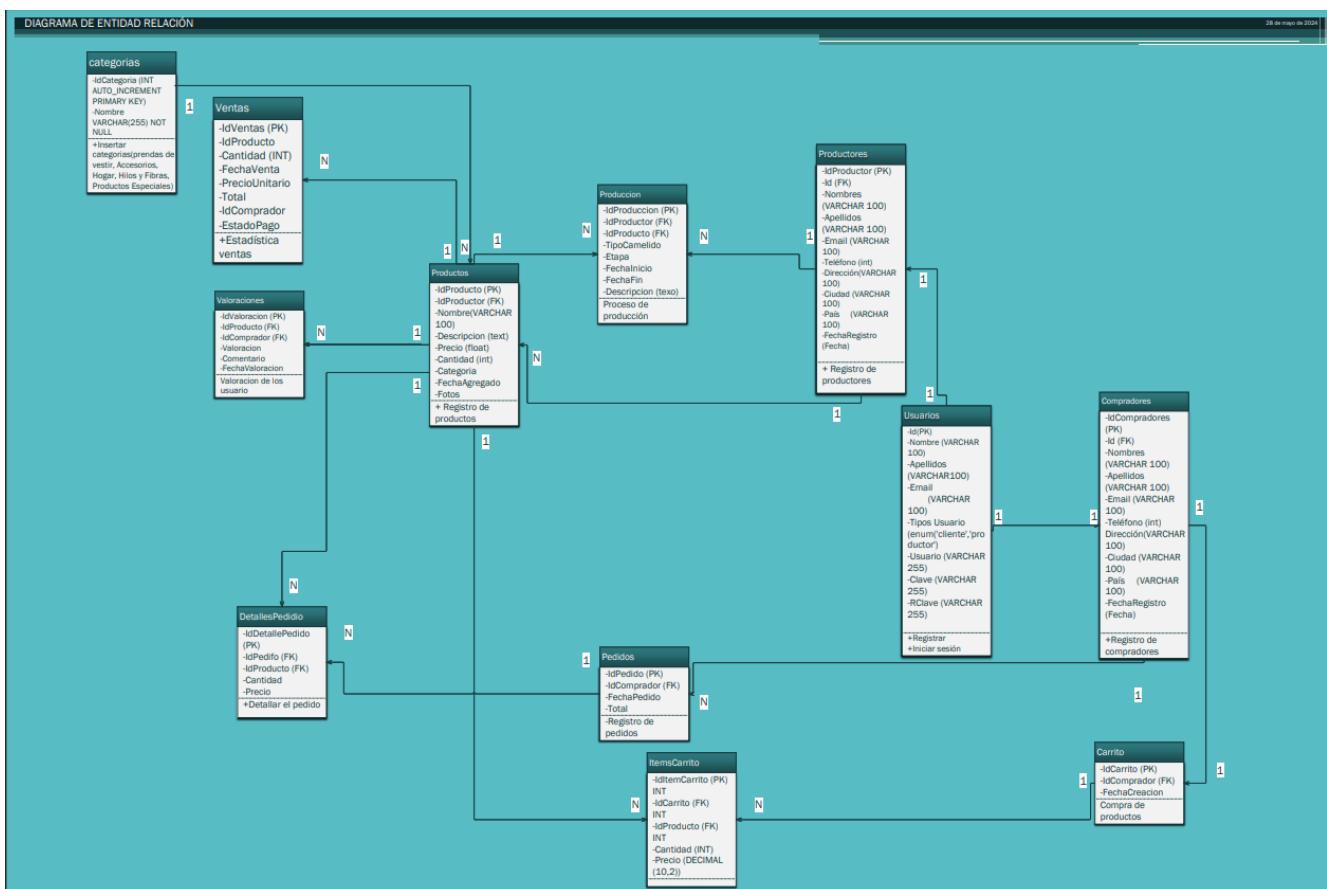


Figure 22: Digital platform entity relationship diagram

Appendix C

Sequence diagrams

Register of producers and buyers

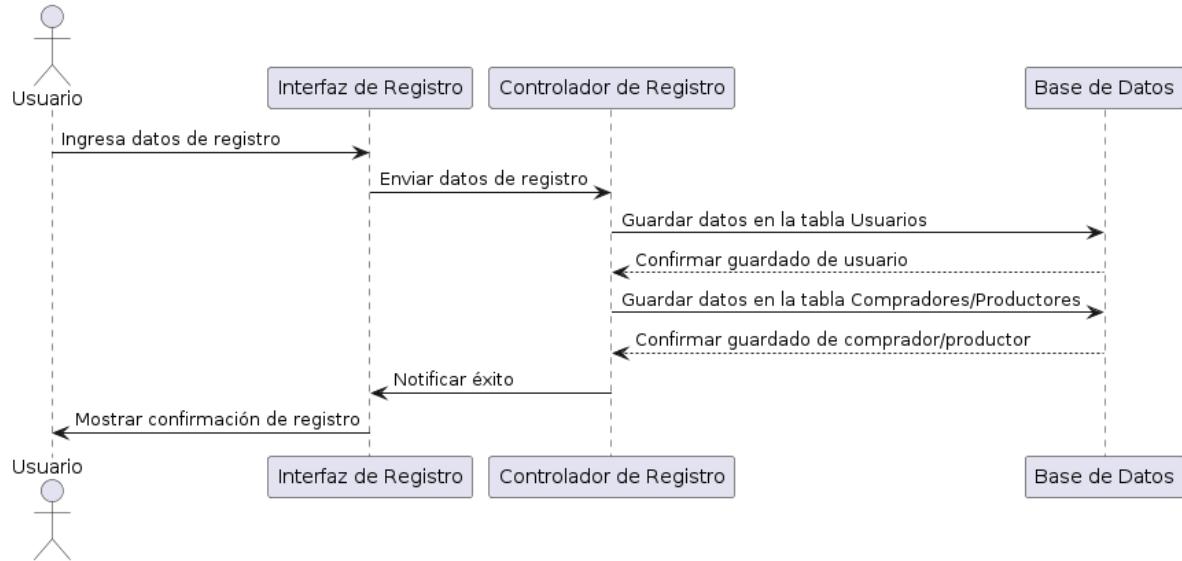


Figure 23: Register of producers and buyers

Product catalog management

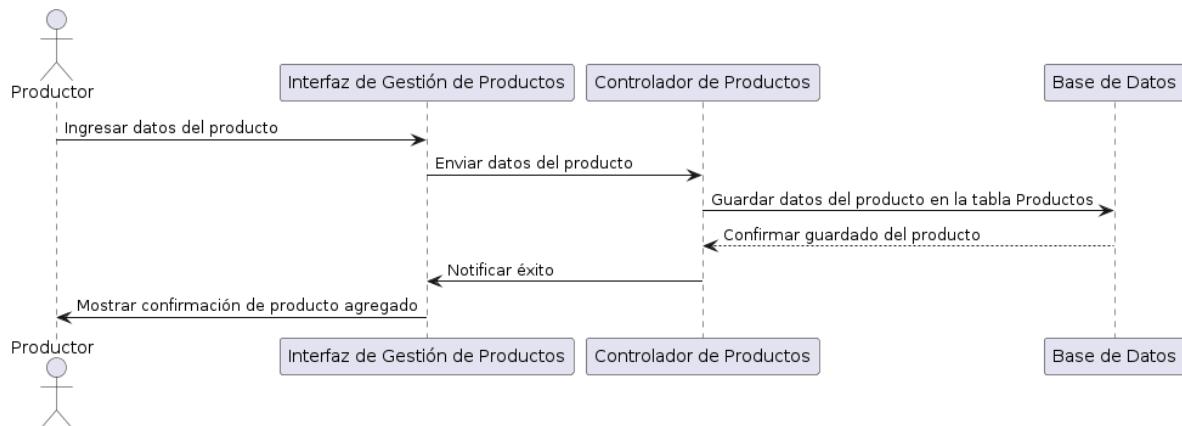


Figure 24: Product catalog management

Purchasing process

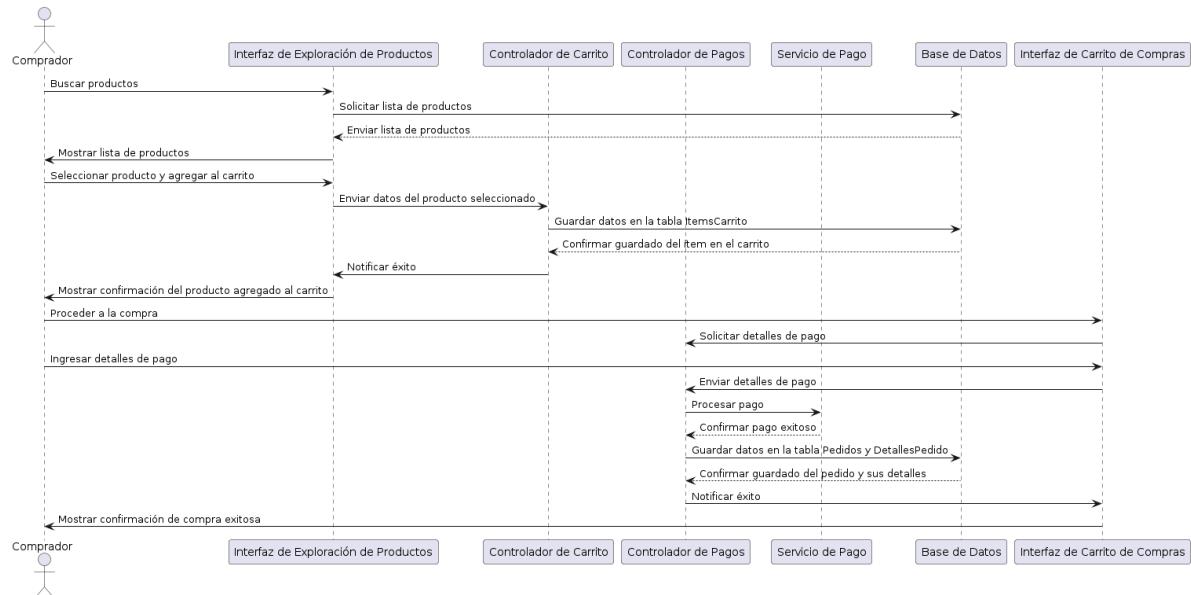


Figure 25: Purchasing process

Access to sales statistics

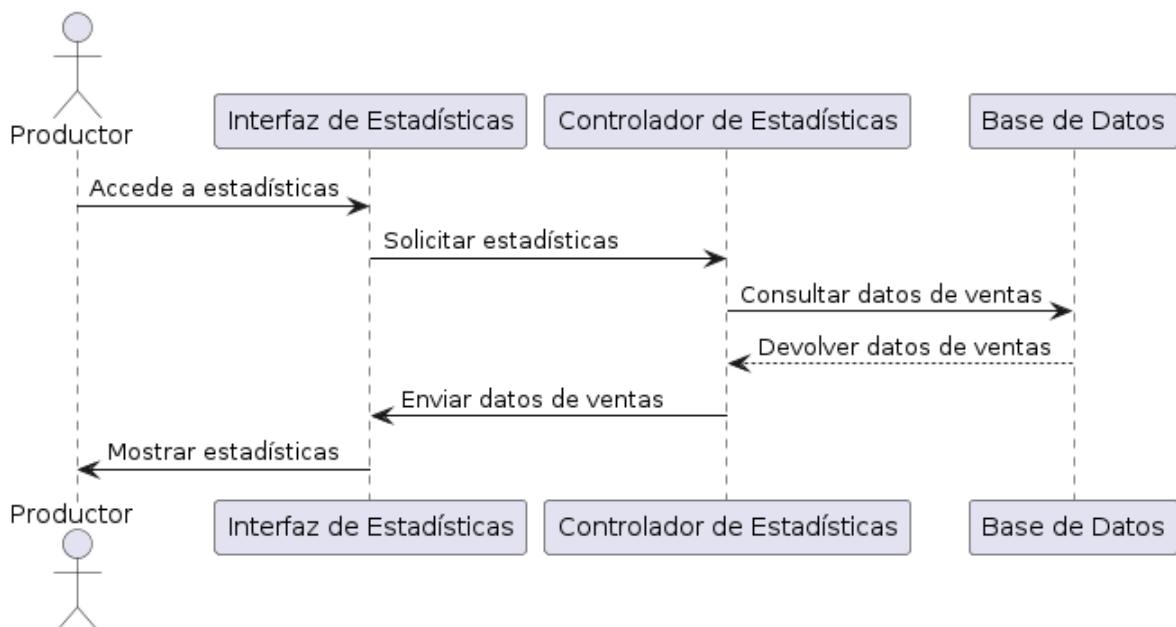


Figure 26: Access to sales statistics

Digital platform previews

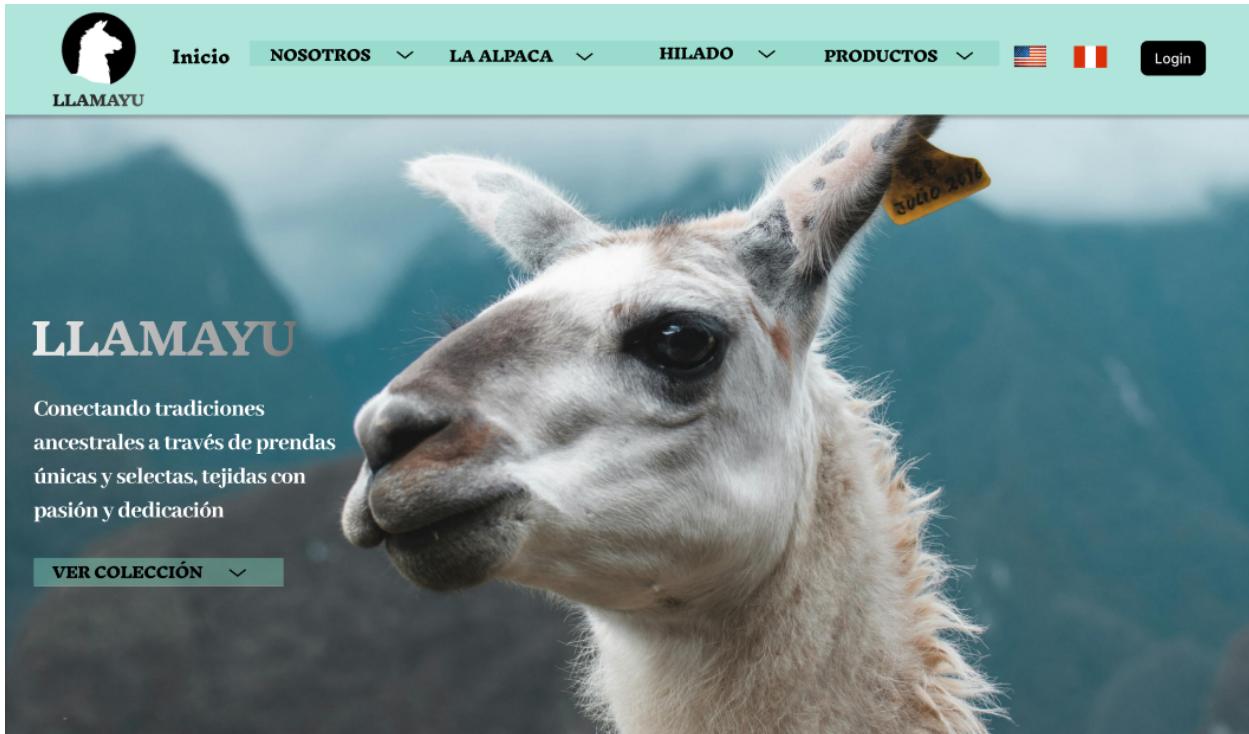


Figure 27: Digital platform previews

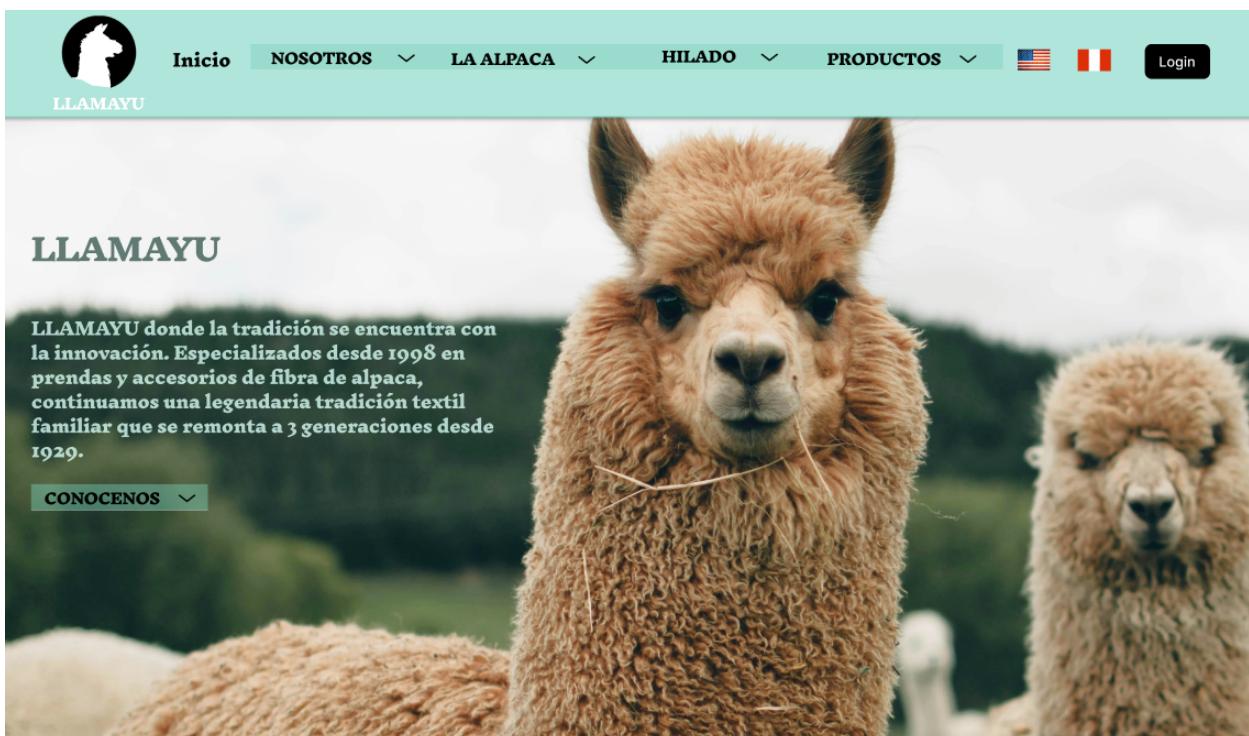


Figure 28: Digital platform previews



Figure 29: Digital platform previews