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Development of an online retail platform with multiple sellers and integrated recommendation systems.

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Résumé

Le commerce électronique en Algérie offre un potentiel de croissance immense, mais il est confronté à plusieurs défis, notamment l'absence de liens directs entre les vendeurs et les acheteurs, le manque de fonctionnalités pour promouvoir les petites entreprises et les limitations de paiement. Pour répondre à ces problèmes, notre projet vise à développer une plateforme de commerce électronique innovante.

Notre plateforme agira en tant qu'intermédiaire entre les fabricants et les acheteurs, facilitant ainsi les transactions et garantissant une expérience sécurisée pour toutes les parties impliquées. Nous mettrons en œuvre des technologies avancées telles que l'intelligence artificielle et les systèmes de recommandation pour personnaliser l'expérience utilisateur, augmenter les ventes en ligne et stimuler l'économie locale en encourageant l'entrepreneuriat et la croissance des petites entreprises.

Notre mémoire propose une vision stratégique pour combler les lacunes du marché algérien en matière de commerce électronique, en mettant l'accent sur l'innovation technologique, la satisfaction client et le développement économique local.

Mots clés : l'intelligence artificielle, les systèmes de recommandation, Le commerce électronique

Abstract

E-commerce in Algeria offers immense growth potential but faces several challenges, including the lack of direct links between sellers and buyers, insufficient features to promote small businesses, and payment limitations. To address these issues, our project aims to develop an innovative e-commerce platform.

Our platform will act as an intermediary between manufacturers and buyers, facilitating transactions and ensuring a secure experience for all parties involved. We will implement advanced technologies such as artificial intelligence and recommendation systems to personalize the user experience, boost online sales, and stimulate the local economy by fostering entrepreneurship and small business growth.

Our thesis presents a strategic vision to address the gaps in the Algerian e-commerce market, emphasizing technological innovation, customer satisfaction, and local economic development.

Keywords: artificial intelligence **,** recommandation systems ,E-commerce,

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Abreviations list

AI	Artificial intelligence
CF	Collaborative filtiring
RS	Recommendation System

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Chapter 01:

General introduction

1.1 Context

Our relationship with the world now goes through the internet and is used for communication, obtaining information, or meeting various needs such as buying and selling. In the contemporary global economy, the emergence of e-commerce platforms represents a revolution in how consumers interact with markets and products.

In the current Algerian economic context, the emergence of e-commerce platforms represents transformative potential for the country. However, despite this development, the country faces major challenges in the field of e-commerce. Existing platforms, such as Jumia Algeria, face major challenges. The main challenge faced by e-commerce platforms in Algeria is the direct connection between the seller (supplier) and the buyer, meaning purchasing directly from the manufacturing company, which significantly reduces the selling price. Additionally, they lack features that promote collaboration with local suppliers and support entrepreneurial spirit.

Therefore, developing our platform achieves the latter, as it acts as an intermediary between the seller and the buyer, facilitating and supervising the buying and selling process. The platform will ensure a smooth and secure experience for all parties involved. This presents a strategic opportunity to address many gaps in the Algerian market. By implementing these solutions, the platform will significantly contribute to addressing the gaps in the Algerian market. The use of recommendation systems will enhance the user experience, boost online sales, and energize the local economy by promoting entrepreneurship and fostering the growth of small businesses.

1.2 Where we stand

1.2.1 Artificial intelligence

Artificial intelligence (AI) is a process that imitates human intelligence and relies on the creation and application of algorithms executed in a dynamic computer environment. The purpose of AI is to enable computers to think and act like humans.[1]

1.2.2 Recommendation systems

Recommendation systems are a specific form of information filtering aimed at presenting information items that are likely to interest the user. They can be defined as programs that attempt to recommend the most suitable items (products or services) to particular users (individuals or businesses) by predicting a user's interest in an item based on related information about items, users, and their interactions.[2]

1.2.3 Economy

The economy is the science that studies how scarce resources are used to satisfy the needs of the people living in society. It focuses on the essential operations of production, distribution, and consumption of goods, as well as on the institutions and activities aimed at facilitating these operations.[3]

1.2.4 Trade

Trade comprises statistical units (companies, legal entities, or establishments) whose main activity is the resale of purchased goods, with some incidental production activities.[4]

1.2.5 E-commerce

E-commerce, or electronic commerce, refers to the online sales of goods or services through merchant websites. These electronic commercial transactions primarily occur via an internet network.[5]

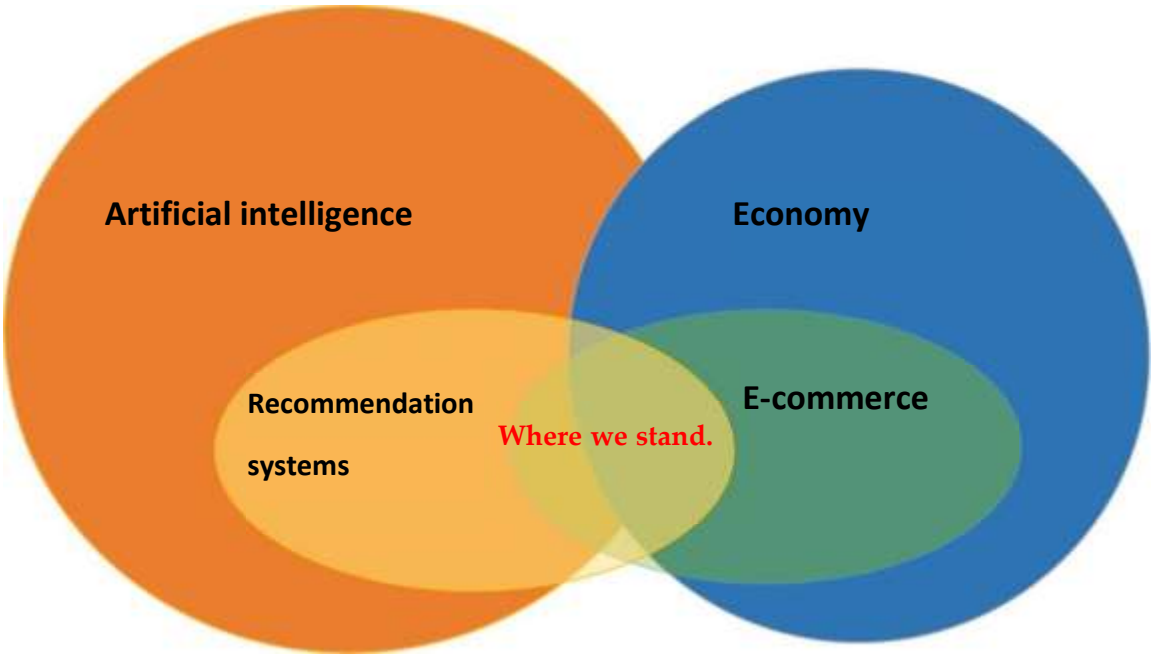

Figure 1.1: Explanatory diagram of the domain in question.

These concepts interact with each other as follows: Artificial intelligence (AI) is used to analyze data and generate recommendations. Recommendation systems rely on artificial intelligence techniques to provide accurate recommendations to users. Recommendations affect user behavior in e-commerce, which in turn impacts the economy in general [**Figure 1.1].**

1.3 Problematic and gap

E-commerce has witnessed remarkable success in recent years, especially due to the wide selection and favorable prices offered on the internet. Through a comprehensive analysis of the Algerian market platforms, we find:

- Individual sale, like on Facebook Marketplace.
- Commercial enterprise: Jumia Algeria.
- A website like Ouedkniss is not strictly an e-commerce platform like other websites. It is primarily used for the sale of second-hand products. Although it allows for the publication of sale ads, it does not function like a traditional e-commerce site with a shopping cart and online transaction.

we notice several challenges, including :

- The absence of a feature linking the seller (supplier) with the buyer, meaning the buyer purchases directly from the manufacturer, impacts the price and quality of the product, as it greatly ensures the latter.
- Are not geared towards promoting small businesses to support entrepreneurship, payment restrictions and the lack of secure and reliable payment methods .
- The available e-commerce platforms do not link multiple sellers, buyers, and delivery services.
- Algerian platforms face difficulties in accepting a variety of payment methods, including electronic payments.
- The risk of transferring money from the buyer to the seller when the payment method is cash on delivery is that the money can be exposed to theft.

1.4 The objective

To fill all market gaps in Algeria, especially the challenges faced by e-commerce platforms, we are developing our own e-commerce platform. Our objective is:

- To achieve a direct link between manufacturers and buyers, thereby enhancing the entrepreneurial spirit of these companies for marketing their products.
- We focus on ensuring consumer satisfaction, offering special promotions, and providing various delivery options at competitive prices.
- Our platform relies on cutting-edge technology, particularly artificial intelligence, utilizing recommendation systems as a means to attract consumers in Algeria. We customize various products for them, thereby increasing sales.
- Pricing of our products is determined based on several factors, including customer loyalty, product sales percentage, and others Promotion of Entrepreneurial Spirit.

- Contributing to the development of the Algerian local economy and tracking financial flows. Additionally, our inspiration includes aspects of the success of AliExpress, a wellestablished international e-commerce platform. By learning from their success in efficiently connecting sellers and buyers, we aspire to emulate some of their operating models while adapting our approach to meet the specific needs of the Algerian market.[6]

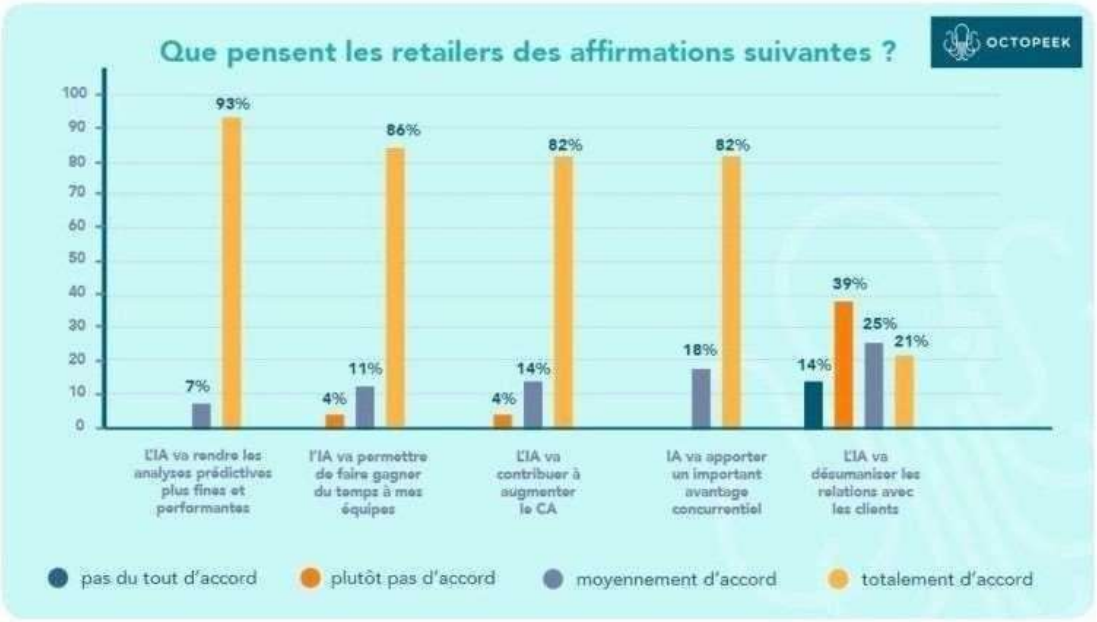

Figure 1.2: AI for time-saving and performance boost.[7]

Among the advantages of AI widely agreed upon are time saved by teams (93%), more accurate and effective predictive analyses (86%), a competitive advantage (82%), and its contribution to revenue increase. **(Figure 1.2).**[7]

Furthermore, artificial intelligence has the capability to analyze customer data in order to understand users' needs, identify trends, and preferences in advance based on customer demand

and interest in specific products. Additionally large companies can forecast their inventory needs ahead of time. Another positive aspect of artificial intelligence is the enhancement of customer service. Also enables the customization of the customer shopping experience by utilizing data collected to make product recommendations based on their purchase and browsing history.

1.5 Organization of our report

To present our thesis, we have developed a work plan consisting of four chapters:

- **The first chapter:**

<General introduction>. In the first place, we will define the context, which consists of a comprehensive overview of the project. Next, we will indicate the domains concerned. Highlighting the main challenges faced by existing platforms. Our main objective will be to address market gaps through the development of our own platform, using cutting-edge technologies such as artificial intelligence and recommendation systems to enhance the user experience and stimulate market growth.

- **The second chapter:**

<Features and requirements> **.** Delves into the analysis of functional and non-functional requirements, recommendation systems, challenges encountered by these systems, and pricing strategies. Furthermore, it emphasizes the significance of customer retention through the implementation of the coin system.

- **The third chapter:**

< Conception of our platform >. This chapter deals with the analysis and design of a platform, utilizing UML diagrams such as use cases, class diagrams, and sequence diagrams. The analysis aims to improve user comfort, system efficiency, and reliability, while the design establishes the overall architecture of the platform. The iterative development process prioritizes use cases and addresses identified risks, covering functionalities such as navigation, order management, and payment processing. The diagrams illustrate the system's actions and structure, providing a comprehensive view of the software and hardware deployment of the platform .

- **The fourth chapter:**

< Implementation of our platform > . The implementation begins with an introduction where we describe the environment and tools used for developing the application. We conclude with a presentation of the application itself. We detail the three-tier architecture and explain its importance. Then, we introduce Laravel, PHP, Apache Tomcat server, MySQL, HTML5, CSS, JavaScript, Bootstrap, and Visual Studio Code. We provide a flowchart of the application before

describing in detail the various pages, such as the homepage, product page, shop, cart, payment, user account, order tracking, admin interface, vendors, reviews, and refunds. We discuss pricing determination algorithms,

including examples of competition-based and value-based strategies. Finally, we evaluate the achieved objectives and present our future vision for the project. We conclude by summarizing the development tools and environment used, the platform presentation, and the proposed pricing algorithms.

- **The fifth chapter:**

< General conclusion>This chapter discusses the Contributions of our project, emphasizing its innovative approach to solving e-commerce challenges in Algeria by connecting sellers and buyers, promoting small businesses, and using advanced technologies for a secure, personalized user experience. We then address the Limitations, such as scalability issues, technical challenges with AI, highlighting the need for continuous improvement. Lastly, we outline our Future Work and Perspectives, focusing on integrating a currency system, innovative pricing strategies, and supporting the local economy to build a robust e-commerce ecosystem in Algeria.

Chapter 02:

Features and requirements

2.1 Introduction

Embarking on the development of an e-commerce platform is an ambitious venture that necessitates a thorough analysis of functional and non-functional requirements. Understanding recommendation systems, data collection strategies, pricing tactics, and loyalty programs is crucial for devising a successful and competitive e-commerce solution tailored specifically to the demands and preferences of the Algerian market.

2.2 Requirements analysis

Creating an e-commerce platform in Algeria is an ambitious undertaking that requires a thorough analysis of both functional and non-functional requirements to ensure the success and viability of the project.

2.2.1 Functional requirements

The analysis of functional requirements involves identifying the essential features that the platform must offer to meet user expectations and operational requirements:

- **User registration and authentication**: Process for users to create an account and log in securely.
- **Product search**: Feature allowing users to find products by keywords or filters.
- **Product navigation and categorization:** Organization of products into categories for better navigation.
- **Product display:** Showing product details, such as images, prices and descriptions.
- **Add to cart:** Ability to add selected products to a virtual cart.
- **Add an order:** Completing the purchase by providing delivery and payment details.
- **Order tracking:** Allows users to track the status of their order until delivery.
- **Management of reviews and ratings:** Allows users to leave reviews and ratings on products.
- **Customer service:** Assistance provided to users to answer their questions and resolve their problems.

2.2.2 Non functional requirement

Simultaneously, the analysis of non-functional requirements aims to define the criteria for performance, security, scalability, and user- friendliness of the platform :

- **Performance:** How quickly and efficiently the system performs its functions, including page loading speed and traffic management.

- **Accessibility:** The ease of use of the system for all users, including those with special needs, through user-friendly design.
- **Recommendation system:** The analysis of user preferences to recommend relevant products or content, thereby improving the user experience.
- **Price determination**: The process of setting prices for products or services based on various factors such as costs, demand and competition.
- **Security:** The protection of user data and transactions from unauthorized access and malicious attacks through security measures such as encryption and secure authentication.

2.3 Definition of recommendation systems

A recommendation system is a tool that utilizes a series of algorithms, data analyses, and artificial intelligence (AI) to formulate online recommendations. These are computer systems designed to predict or suggest relevant items to a user based on their preferences, activity histories, or the characteristics of the items themselves. These systems aim to filter available information and present personalized recommendations to the user that cater to their specific needs or interests. They are widely used in various domains such as e-commerce, entertainment, social networks, and information retrieval to enhance user experience and increase engagement. [8], [9]

2.3.1 Recommendation systems in e-commerce

Recommendation systems are widely adopted in retail commerce to streamline the consumer purchasing process. By utilizing these systems, shoppers can discover products matching their preferences without actively searching. Moreover, these systems also present them with relevant items they may not have otherwise considered but that meet their needs and tastes. [10]

2.4 Data collection in recommendation systems

Data collection in recommendation systems is essential for their functioning and effectiveness. In the digital landscape, where vast amounts of information are generated daily, recommendation systems sift through this data deluge to provide users with tailored suggestions and personalized experiences. In this context, understanding the intricacies of data collection in recommendation systems becomes essential for optimizing their performance while simultaneously respecting user privacy and consent. These data allow building a user profile that will then be used by the algorithms.

Two primary categories of data, explicit and implicit, each offer unique insights into user preferences and behaviors.

- **Explicit data:**

This is a form of direct information. It is directly collected from user interactions with the recommendation system. This may include explicit ratings, reviews, comments, or actions such as purchases or clicks on recommended items.

- **Implicit data:**

Instead, or in addition to explicit feedback represented by ratings, a recommendation system may also have access to implicit feedback. This data is collected indirectly from user behavior without their explicit interaction. For example, if a user frequently listens to music by an artist, it is reasonable to assume that they like that artist. Similarly, if a user purchases clothing and does not return it, one can assume that it's because they appreciate it.

2.5 Categories of recommendation systems:

Recommendation techniques can be classified in various ways. Sometimes multiple terms are used to refer to the same method or approach. The most commonly used classification relies on three types: content-based filtering, collaborative filtering, and hybrid filtering [11], [12], [13],[14], [15]

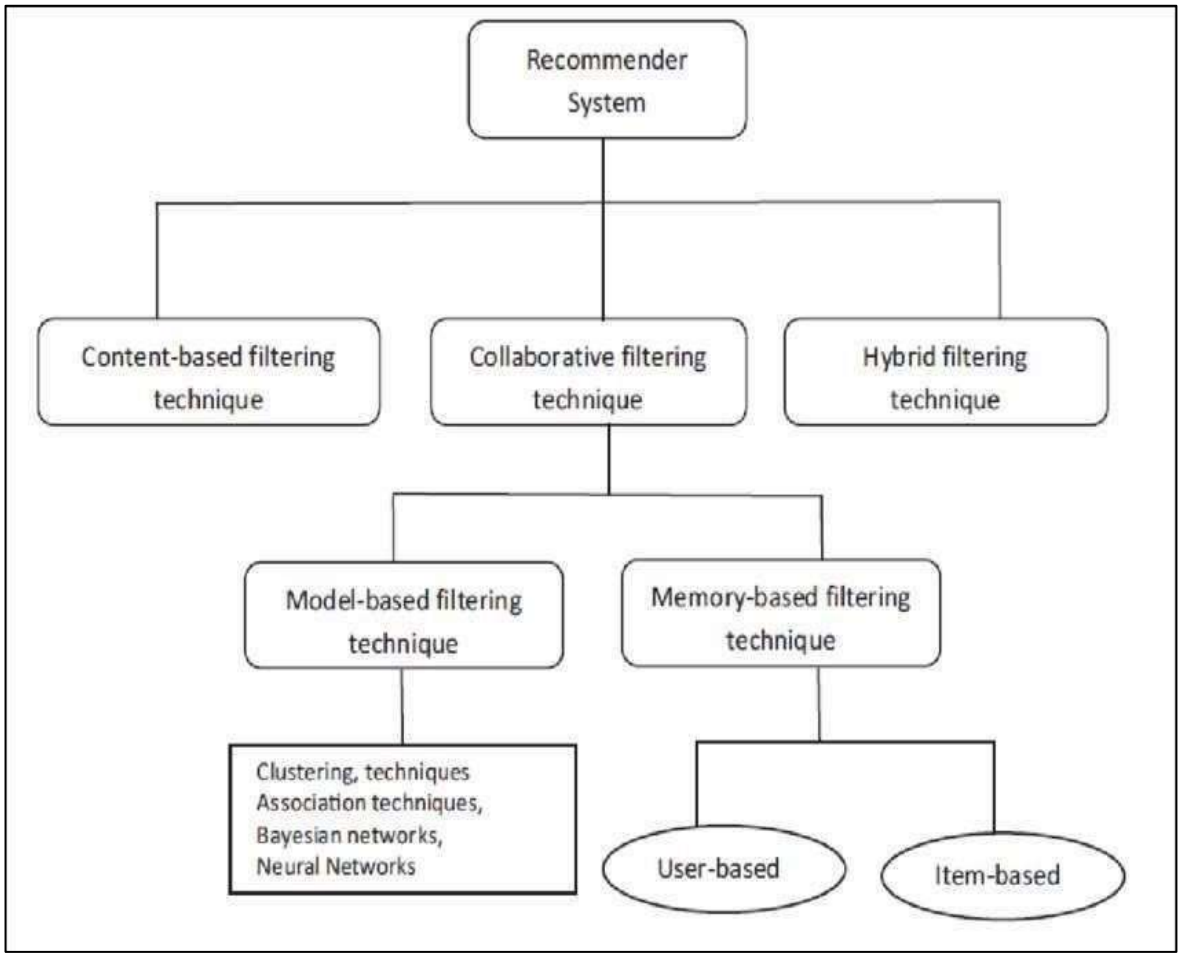

Figure 2.3 : The main types of recommendation system [16]

2.5 Content-based filtering approaches

A content-based recommendation system is a search system that uses the similarity of descriptions between items to be recommended to the current user and items the user has interacted with. It takes into consideration common points such as specific actors, directors, film genres, etc.

For content-based recommendations (**see Figure 2.4**), the task involves determining which items from the catalog best match the user's preferences. The user profile is essential in this type of system, which is content-based and contains what the user has rated. It is expressed as a list of interests based on similar characteristics.

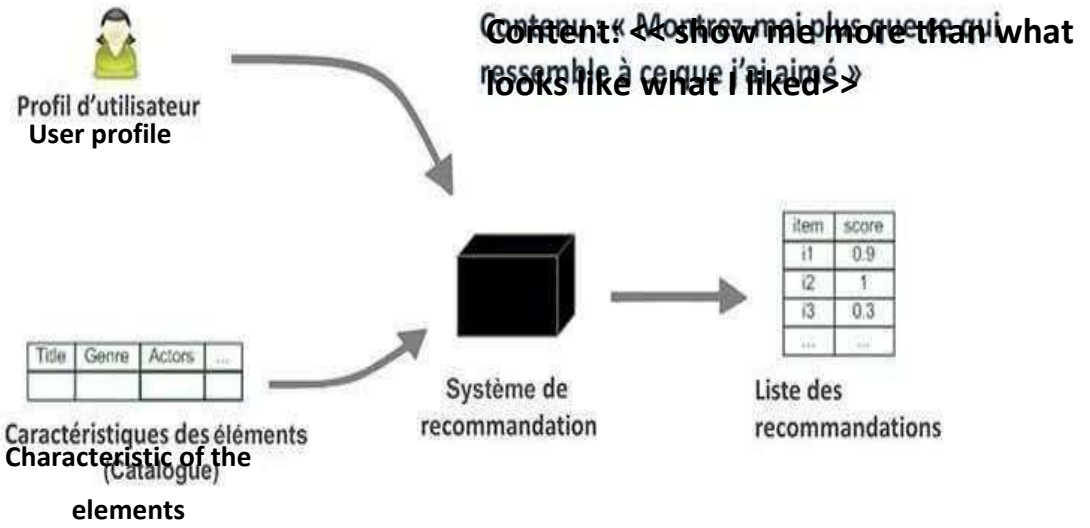

Figure 2.4: A content-based recommendation system[17]

However, this approach has some limitations, such as when a new user starts using the system, there is no history.

2.5.2 Collaborative filtering

This type of filtering focuses on evaluating our user with other users, meaning it produces recommendations by calculating the similarity between one user's preferences and those of other users. Its goal is to predict the values of missing ratings, based on available ratings **(Figure 2.5).**

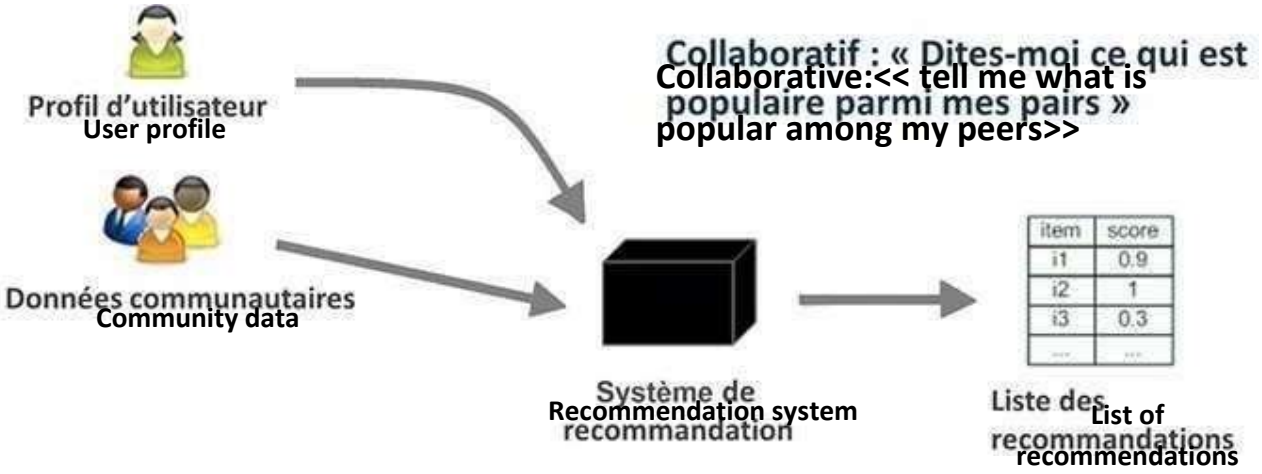

Figure 2.5: A collaborative recommendation system.[17]

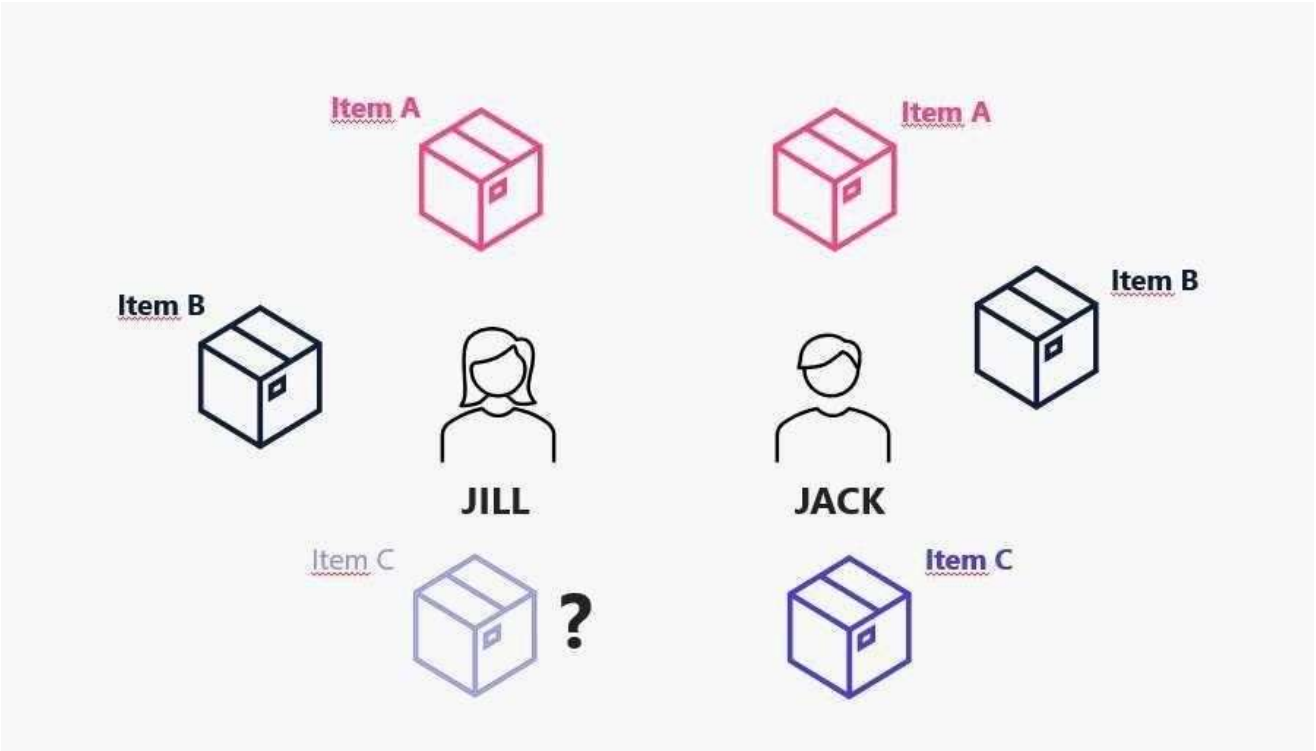

Figure 2.6: Example of Collaborative Filtering.[18]

Let's consider an example (**Figure 2.6**) of two customers - Jack and Jill . If Jill has purchased items A and B, and Jack has purchased items A, B, and C, it means that if Jack and Jill have already agreed on 2 items, there is a high chance that Jill would also like item C. So, using collaborative filtering approach, we would then recommend item C to Jill.[18]

Collaborative filtering methods can be divided into two subcategories [11]: Memory- based collaborative filtering and Model-based collaborative filtering.

2.5.2.1 Memory-based collaborative filtering

Memory-based collaborative filtering (CF), also known as neighborhood-based collaborative filtering, is a recommendation technique that relies on similarities between users or between items to generate recommendations. The primary strategy of this approach is to use algorithms such as k- nearest neighbors (KNN) to find the most similar users or items to a given user or item. Then, recommendations are generated based on the ratings of these similar neighbors.

This approach is based on the following assumptions:

- **Similar users rate items similarly:** This means that if two users are similar in their preferences or past behaviors, they are likely to give similar ratings to similar items. Therefore, if one user enjoyed a certain item, a similar user is also likely to enjoy that item.

- **Similar items receive similar ratings:** Similarly, if two items are similar in their content or characteristics, they are likely to receive similar ratings from users. Therefore, if a user enjoyed a certain item, other similar items are likely to appeal to them as well.

Two types of approaches are distinguished in memory-based collaborative filtering:

- **User-based collaborative filtering:** Recommendations are made by finding users with similar opinions. In other words, it involves selecting neighbors with similar tastes and preferences to the current user in order to generate personalized recommendations. Similarity between users is often calculated based on the ratings they have given to similar items

- **Item-based collaborative filtering:** Recommendations are made by finding items that evoke similar interest among multiple users. Similarity between items is typically calculatedby comparing the rating scores given by users to similar items.

2.5.2.2 Model-based collaborative filtering

Model-based collaborative filtering learns a descriptive model linking users, documents, and votes. It applies machine learning or data mining techniques (such as Bayesian networks, linear classifiers, neural networks, association rules, clustering, etc.) to learn a model using ratings provided by users.

Collaborative filtering also has drawbacks such as the cold-start problem: when a new user utilizes the system, their preferences are not known.

2.5.3 Hybrid approaches

A hybrid recommendation system combines components from different recommendation approaches to optimize the quality of the recommendations provided. It leverages the advantages of the approaches it consists of while mitigating their drawbacks.

2.6 Similarity calculation approaches

Identifying similarity between item features and user preferences is crucial for providing relevant and accurate recommendations. Several similarity metrics are used to quantify this relationship and facilitate the recommendation process.

- **Cosine similarity:** Cosine similarity is a mathematical concept commonly used in recommendation systems to assess how similar two elements are. In the context of recommendation systems, these elements can be products, articles, users, and so on.[19]

- **Coefficient of pearson correlation:** The pearson correlation coefficient is a statistical measure used in recommendation systems to assess the linear correlation between two sets of data. In the context of recommendation systems, these data sets can represent users and their preferences for different items, such as products, movies, or articles. [19]

2.7 Problems with recommender systems

Recommendation systems are software tools that assist users in finding relevant and personalized items. However, recommendation systems also present potential risks and challenges. [20], [21]

2.7.1 Cold start

The cold start problem is very common in recommendation systems. This problem is twofold, affecting both users and items. It occurs when recommendations are needed for items or users for which we have no explicit or implicit information.

2.7.2 Sparsity

A recommendation system suffers from sparsity when the number of items evaluated by users is very low compared to the total number of items present in the system. This means that users only evaluate a few items available in a database, which reflects on the quality of recommendations (weak recommendations) offered to the active user and on the performance of the entire system.

2.7.3Gray sheep

Users of a recommendation system may have particular tastes and highly unusual preferences compared to others. They will have fewer similar neighbors, making it difficult for them to find similar users and relevant recommendations.

2.8 The pricing strategies

We must choose a pricing strategy that suits our business situation to achieve the ideal price. Setting a very low price will result in a loss of money, while setting a very high price will lead to a loss of sales. Therefore, finding the balance between these extremes is crucial for our success.

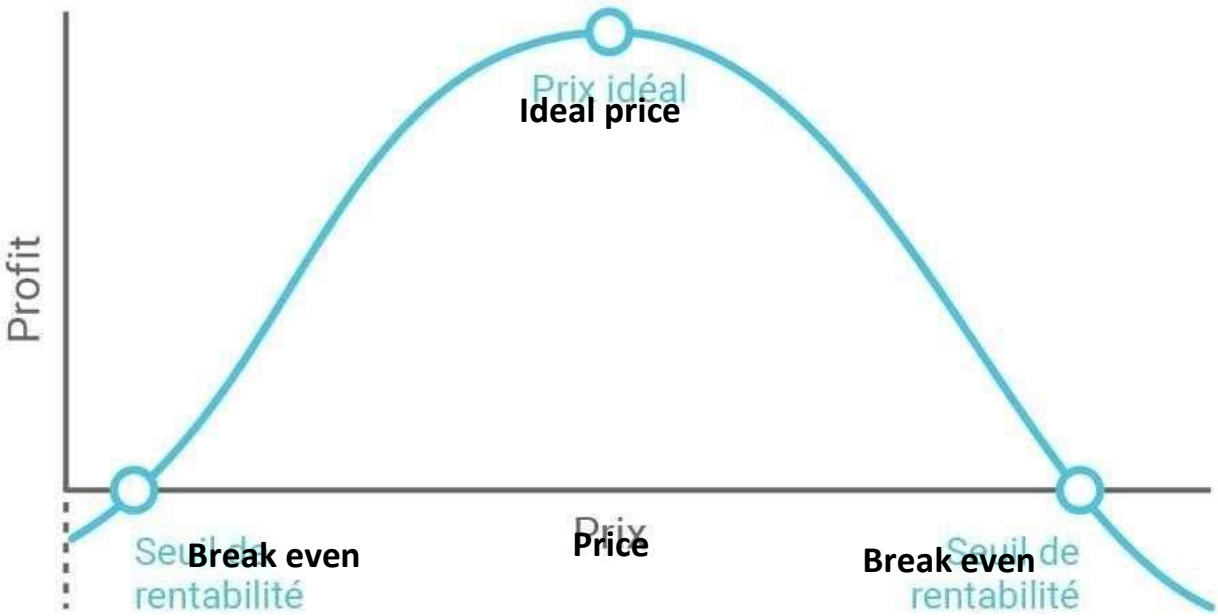

Figure 2.7: The effect of price on profit. [22]

We notice: As you increase your price (from left to right), your profitability increases, but only up to a certain point. Beyond that point, where you have raised your price too much, your profitability decreases. [22]

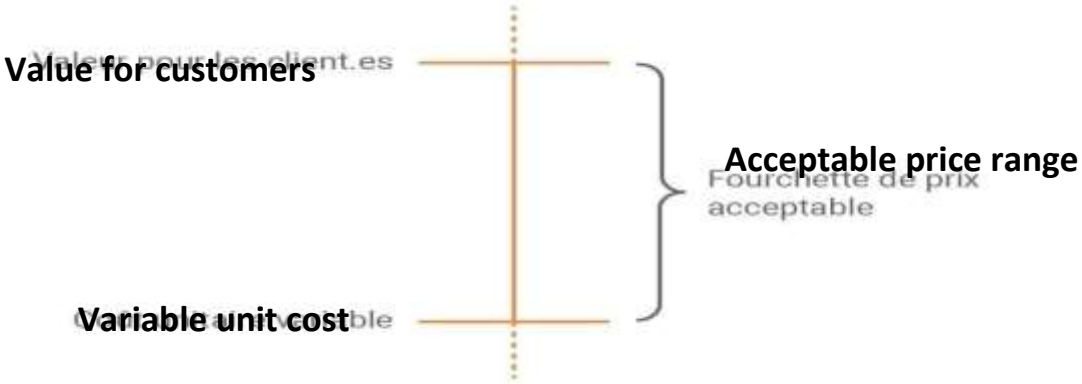

Figure 2.8: Floor price and ceiling price.[22]

We notice: The maximum price should align with the value your customers place on your offering, meaning the prices perceived as acceptable by your customers fall between the minimum and maximum price.

Several factors need to be considered for this alignment [22]:

- Operating costs.
- Stock scarcity or abundance.
- Shipping costs.
- Demand fluctuations.
- Your competitive advantage.
- Perception regarding your price.

2.8.1The five most common pricing strategies

2.8.1.1Pricing based on cost markup

This strategy takes into account all input costs, along with an added fixed percentage. It simply involves calculating all costs related to producing or acquiring a product, then adding a profit margin to determine the selling price. For example, if a product costs $50 to produce or purchase, and you want a profit margin of 30%, you would set the selling price at $65. This ensures that all costs are covered and that you make a profit on each sale.[22]

2.8.1.1Pricing based on free market competition

Eric Dolansky explains, "If I'm selling a product similar to others, like peanut butter or shampoo, part of my job is to monitor what competing companies are doing in terms of prices and make the necessary adjustments."[22]

There are several methods for this strategy [22]:

- **Cooperative pricing:** : Cooperative pricing involves setting your prices based on those of your competitors. This helps maintain price stability and keeps you in line with the market.
- **Aggressive pricing:** Eric Dolansky explains: "By taking an aggressive stance, you're telling competing businesses, 'If you raise your price, I'll keep mine the same. And if you lower your price, I'll reduce mine even more.' You're trying to widen the gap between you and your competitors. You're letting them know that whatever they do, they're better off not targeting your prices, or else the situation will worsen for them."[22]

  Clearly, this strategy is not suitable for every company. Those that adopt an aggressive pricing approach must differentiate themselves from their competitors and have solid profit margins to rely on.

- **Independent pricing:** If your prices reflect the value of your products and services, meaning your products are unique, you can apply this approach and set the prices you want, thereby widening the gap between you and competing companies in the market.

2.8.1.3 Setting a skimming price

Companies use this strategy when launching new and innovative products with no competition. The price is initially raised, then lowered after market saturation, following the recovery of development costs.

2.8.1.4 Pricing for market penetration purposes

Setting a market penetration price involves setting a low price to quickly attract a large customer base and stimulate demand. This strategy aims to differentiate from competitors, increase sales, and potentially reduce unit costs. [22]

2.8.1.5 Pricing based on value

Establishing prices b ased on value, according to Eric Dolansky, means adjusting prices to reflect the perceived value by customers rather than solely focusing on costs. This approach aims to better meet customer needs, increase profits, and foster business growth by evaluating the unique differences of the product compared to competitors and ensuring that the perceived value by customers exceeds the costs. [22]

2.9 The coin system

The coin system is a loyalty and rewards program for customers who regularly purchase on the platform. Customers earn "coins" by making purchases or by completing specific actions, such as leaving reviews on products. These coins can then be used to obtain discounts or benefits on future purchases. It's a strategy aimed at customer retention and encouraging repeat purchases. [23]. The number of coins to give to a customer for playing depends on several factors, such as the value you want to assign to each action or transaction, the frequency with which you want to encourage customers to return to your platform. For example:

Purchase: 1 coin for every X units of currency spent (e.g., 1 coin for every 10€ spent)

As for reducing coins when the customer is not active on the platform, it depends on your loyalty strategy. Some platforms choose to maintain the coins accumulated by customers even if they are not active for a certain period, while others may implement a progressive reduction policy for unused coins over a specified period to encourage ongoing engagement.

2.9.1The algorithm for using coins

The algorithm for using coins on a platform can vary widely and largely depends on the loyalty strategy and business goals of the platform:

1. **Coins allocation:** Users earn coins when they make purchases on the platform. For example, 1 coin for every X units of currency spent.
2. **Products affected by coins:** Coins can be used to obtain discounts or benefits on a range of products available on the platform. The products eligible for coin discounts can be determined based on different criteria, such as product popularity, profit margin, or the desire to boost sales of specific items.
3. **Coins to discounts conversion**: Establish a clear conversion rate for coins to discounts. For example, 100 coins = 1€ discount. When users decide to use their coins to obtain discounts, the system automatically calculates the applicable discount based on the number of coins they wish to use.
4. **Displaying coin discounts**: Clearly display on the platform which products are eligible for coin discounts. Specify the number of coins required for each discount and the amount of discount obtained for each relevant product.

5. **Using coins:** When users proceed to check out, they have the option to use their coins to benefit from discounts on eligible products. Coin discounts are applied to the total order amount before final payment.

2.10 Conclusion

This chapter has explored the critical aspects of recommendation systems, e-commerce platform requirements, and pricing strategies. It emphasizes the importance of personalized recommendations, thorough analysis of functional and non-functional requirements, and strategic pricing decisions for business success in the digital landscape. Additionally, the introduction of loyalty programs like the coin system highlights the significance of customer retention strategies in sustaining business growth.

Chapter 03:

Conception of our platform

1.6 Introduction

Analysis and design is the most important phase in the software development life cycle. This chapter represents the overall structure and detailed architecture of the system using UML diagrams, including UML use cases, UML class diagrams, and UML sequence diagrams, to provide more detailed specifications of its operation.

1.7 Problem analysis

• Provide comfort, save time, and reduce effort for users and administrators.

• Increased confidence and enable excellent assessment.

• Allow for easy updates to information.

• Offer a creative form that aligns with real-world scenarios.

1.7.1 Conception analysis

1.7.1.1 Overall architecture

The following figure represents the overall architecture of the system:

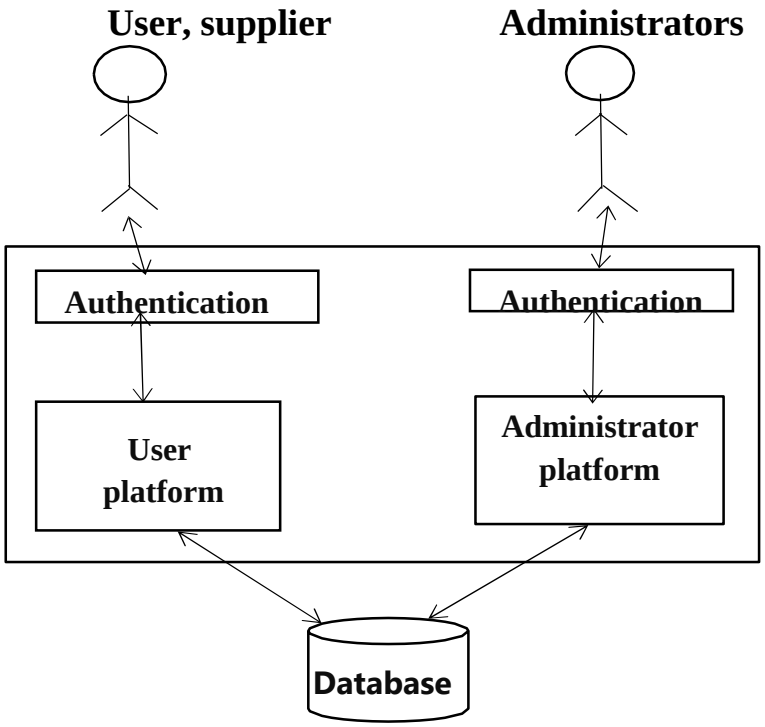

Figure 3. 9: Overall architecture.

3.3 Unified process

The development process follows an iterative and incremental approach based on a centralized architecture. It is driven by use cases, which contain features and operations. Each iteration focuses on one or multiple use cases, guided by identified risks.

Use case	**Priority**	**Risk**	**Iteration**
Consult the site	Upper	Lower	12
Consult the product	Average	Lower	4
Consult the details of the product	Lower	Lower	24
Add to basket	Average	Lower	5
Manage the basket	Upper	Lower	23
Subscribe	Upper	Average	2
Add a command	Average	Upper	3
Manage the user's account	Average	Lower	13
Consult the history of commands	Lower	Lower	22
Write reviews and evaluate product	Average	Lower	28
Manage notification	Average	Lower	21
Contact the support client	Lower	Lower	27
Track delivery	Average	Upper	5
Manage the favorites	Lower	Lower	20
Use coupons and promo codes	Lower	Average	26
Receive personalized recommendations	Upper	Lower	25
Consult evaluation and comments of others clients	Lower	Average	29
Manage administrator account	Upper	Upper	1
Manage clients	Average	Lower	14
Manage products	Average	Average	7
Manage commands	Upper	Average	6
Manage actualities	Average	Lower	19
Manage payment	Upper	Average	10
Payment authentication	Average	Upper	8
Secure transaction processing	Average	Upper	9

Management of payment information	Average	Lower	31
Payment verification	Average	Upper	11
Track transaction	Upper	Lower	30
Payment notification	Lower	Lower	32
Product management	Upper	Lower	15
Storage management	Upper	Lower	16
Reception of commands	Average	Lower	17
Updating information	Average	Lower	18

Table 3.1 :Unified process.

Table

3.4 Use case diagram:

To illustrate the use cases of my system, we present the different actors who intervene in our application: the administrator, and users (clients and providers), each representing a set of action sequences that are performed by the system and produce an observable result of interest to a particular actor.

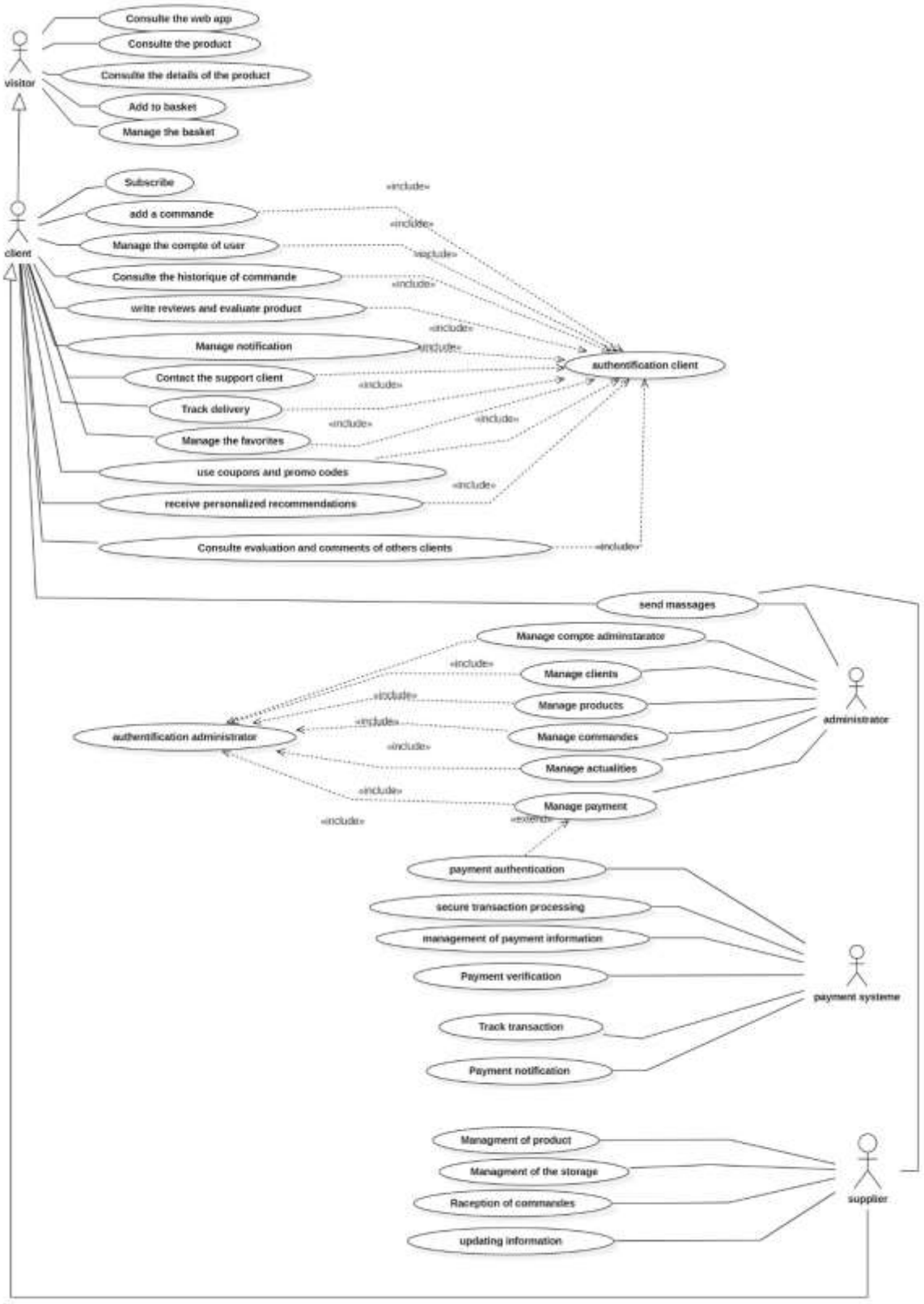

Figure 3.10: Use case diagram.

3.2 Sequence diagram

3.2.1 Searching for product

The following sequence diagram illustrates the search process for a product on our platform. Through a series of interactions between the user and the system, this diagram highlights key steps, such as entering search criteria, the query to the system, the processing of the results and the final selection of the product.

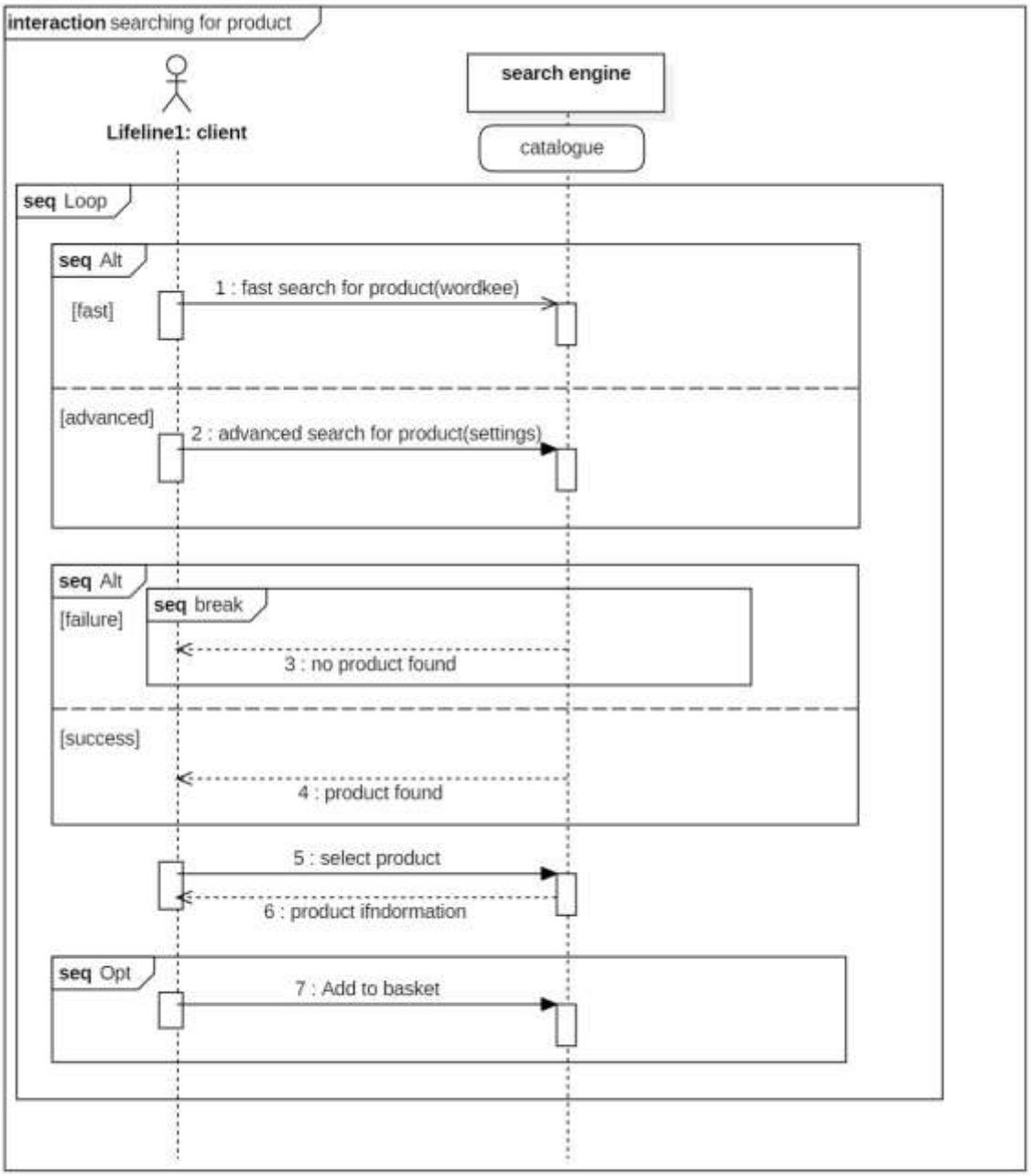

Figure 3.11: Sequence diagram (searching for product).

3.2.2 Add item in basket

Our sequence diagram illustrates the fluid process of adding a product to the shopping cart. Through a series of interactions between the user and the system, we explore key steps, such as product selection, checking its availability, and finally, adding it to the basket.

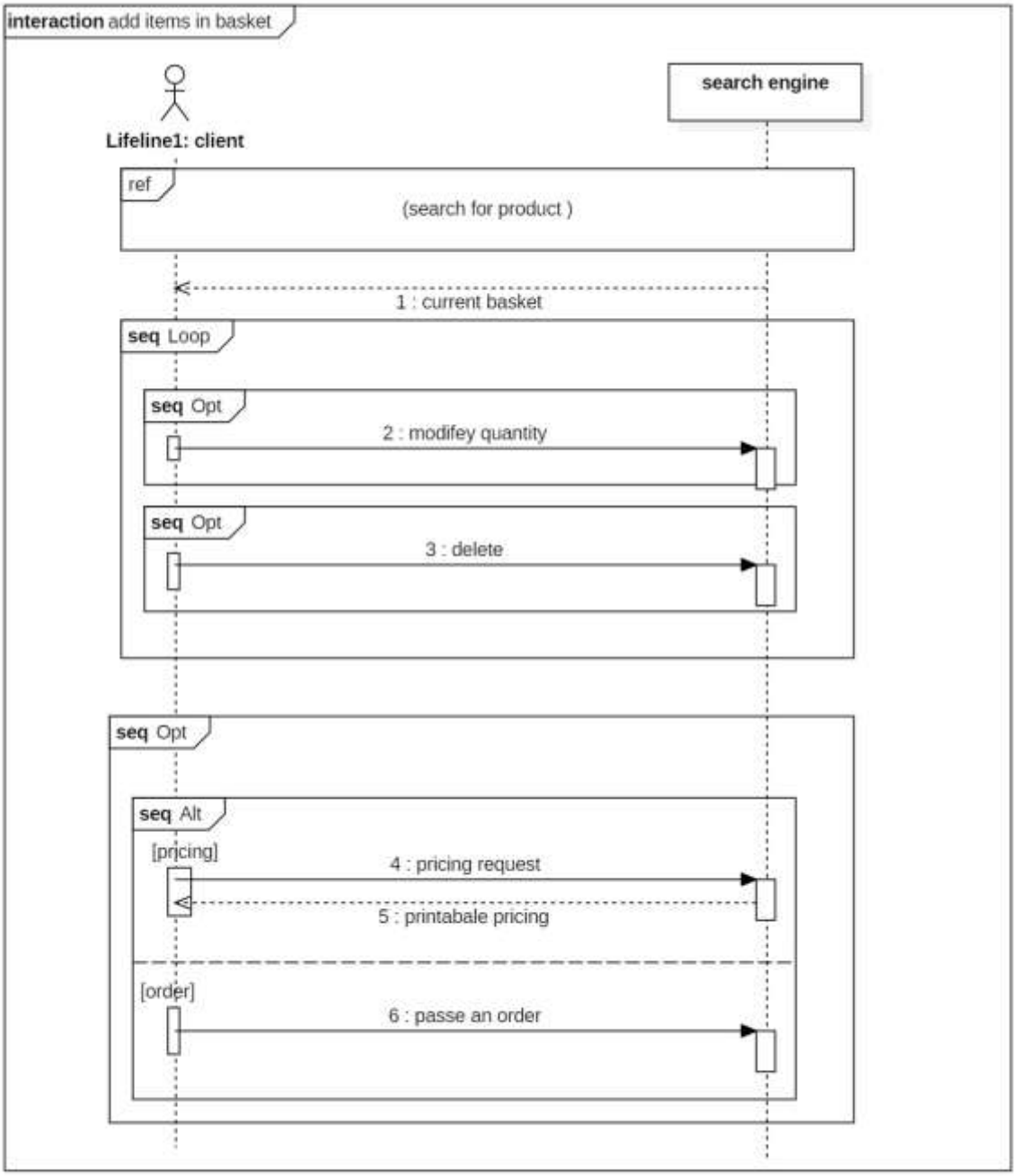

Figure 3.12: Sequence diagram (Add item in basket).

3.2.3 Passe an order

The following sequence diagram illustrates the flow of interaction between the different actors involved in the ordering process. From the moment a user selects a product until the order is confirmed, each step is broken down into sequential actions, highlighting the exchanges of information between the customer, the ordering system and possibly other entities such as the storage system or the payment system.

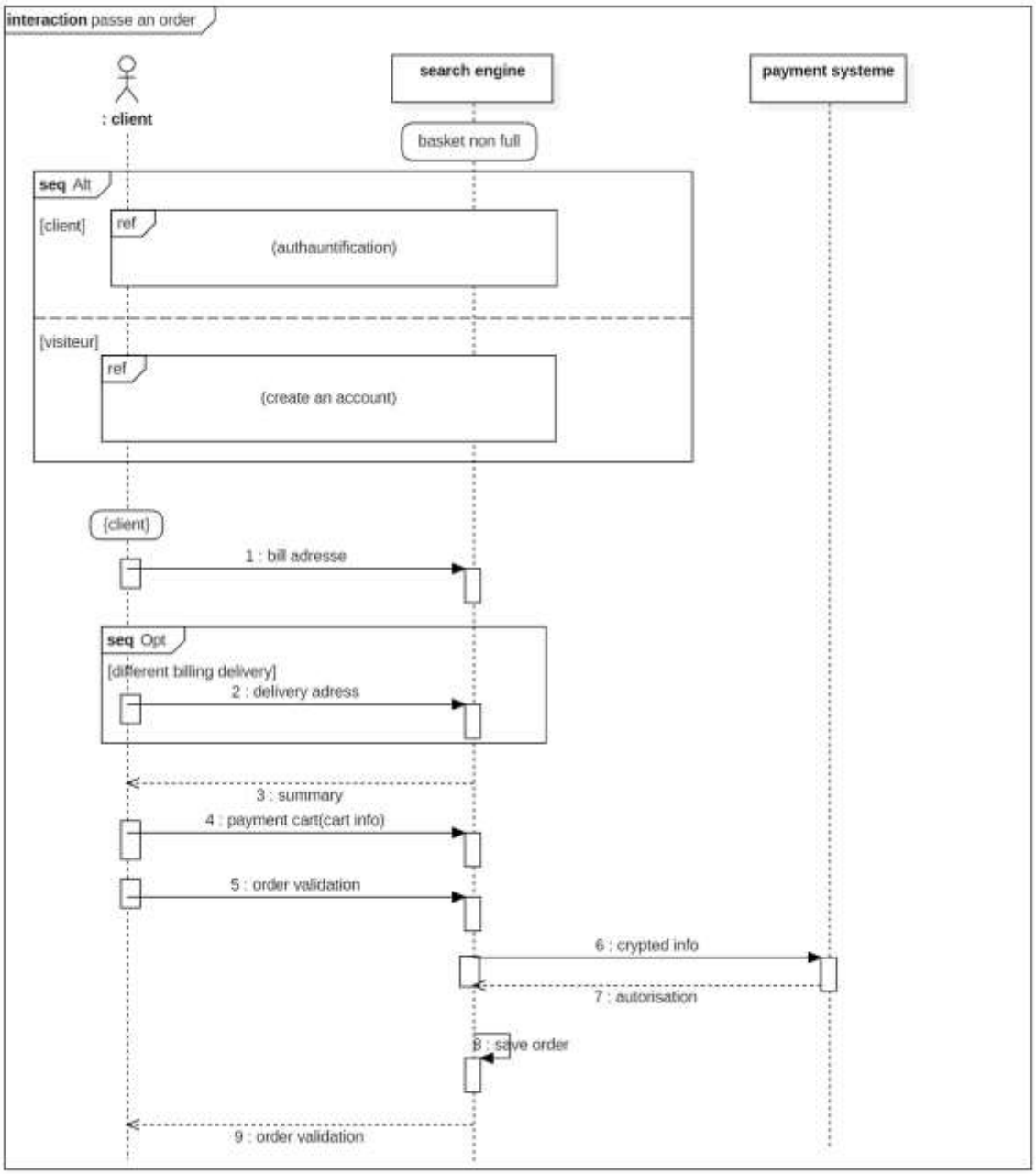

Figure 3.13: **Sequence diagram (passe an order).**

3.3 Class diagram

An organization chart whose task is to display categories in a specific system with all the relationships between them.

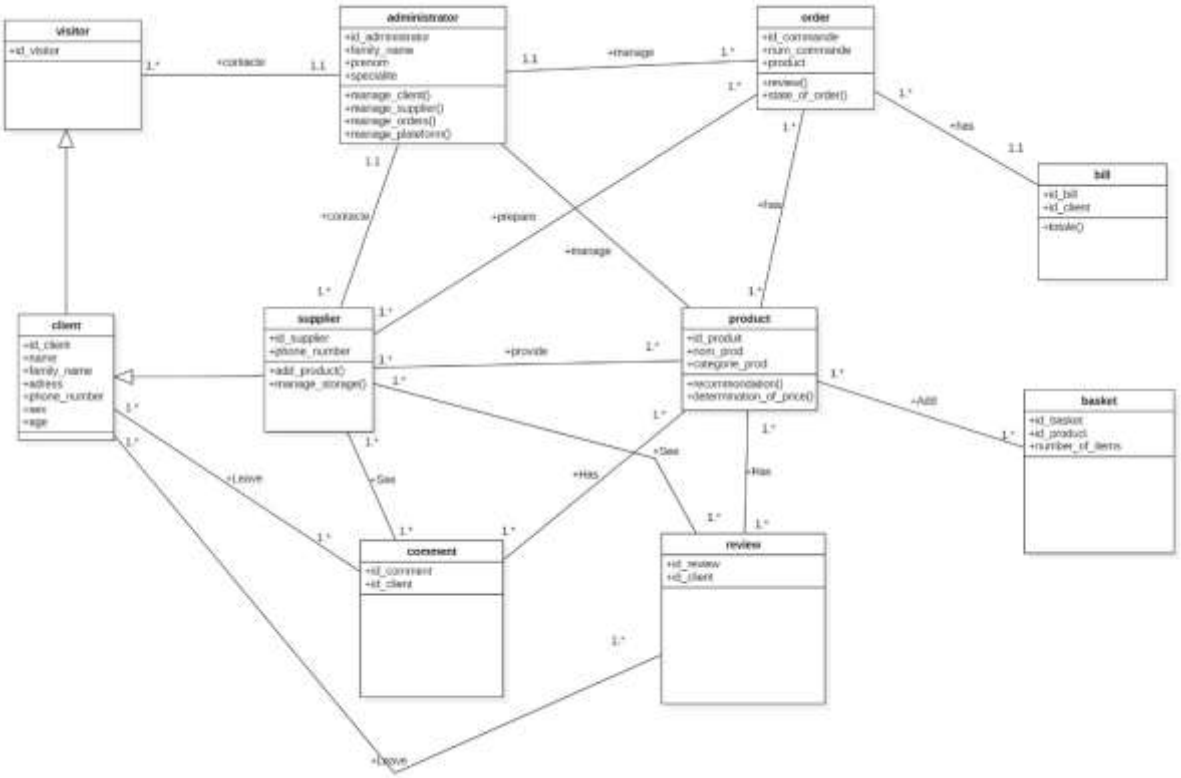

Figure 3. 14: Class diagram**.**

3.4 Deployment diagram

A deployment diagram is a type of modeling diagram used in software engineering to represent the hardware and software configuration of a computer system. It shows how the different software and hardware components of an application are deployed on physical or virtual nodes such as servers, computers or mobile devices.

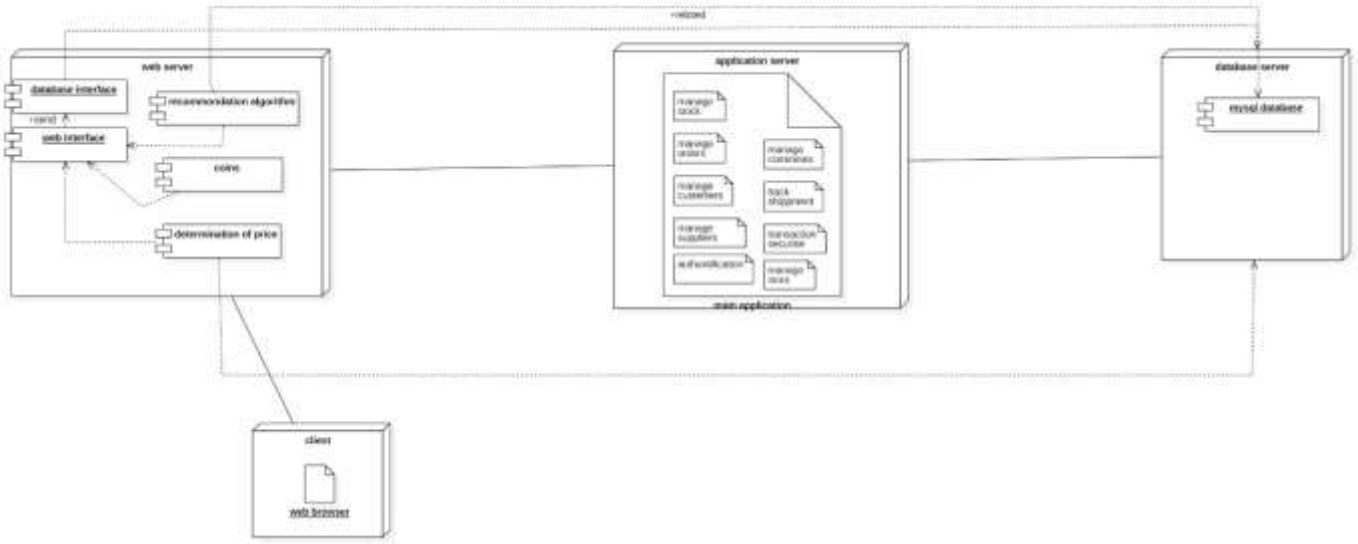

Figure 3.15 : Deployment diagram.

3.5Conclusion

In this conception section, we followed the Unified Process to create a complete system. Through use case, sequence, class, and deployment diagrams, we captured requirements, defined behavior, structured entities, and organized the physical architecture. This methodical approach allowed us to design in a coherent and comprehensive manner, taking into account the functional, dynamic and structural aspects of the system. By combining these perspectives, we have established a solid foundation for development, ensuring a better understanding of the system and facilitating its implementation.

In the next chapter, we will move from conception to implementation and realization of our web application, implementing the concepts and structures defined here to realize our vision into a functional and efficient product.

Chapter 04:

Implementation of our platform

4.1 Introduction

In the following chapter, we present the implementation part, which represents the final conclusion of our project. We will describe the environment and the tools that were used for the development of the application, and we will conclude with a presentation of the application.

4.2 Development environment

4.2.1 Three-Tier architecture

The three-tier architecture is a well-established software application architecture that organizes applications into three logical and physical computing tiers:

The Presentation tier, or user interface, the Application tier, where data is processed, and the Data tier, where the application's associated data is stored and managed.

The three-tier architecture provides a crucial advantage in that, since each tier operates on its own infrastructure, each tier can be developed simultaneously by a separate development team and can be updated or scaled as needed without impacting the other tiers.

For decades, the three-tier architecture has been the dominant architecture for client-server applications. Today, most three-tier applications are targets for modernization, utilizing cloud-native technologies such as containers and microservices, and for migration to the cloud. [24]

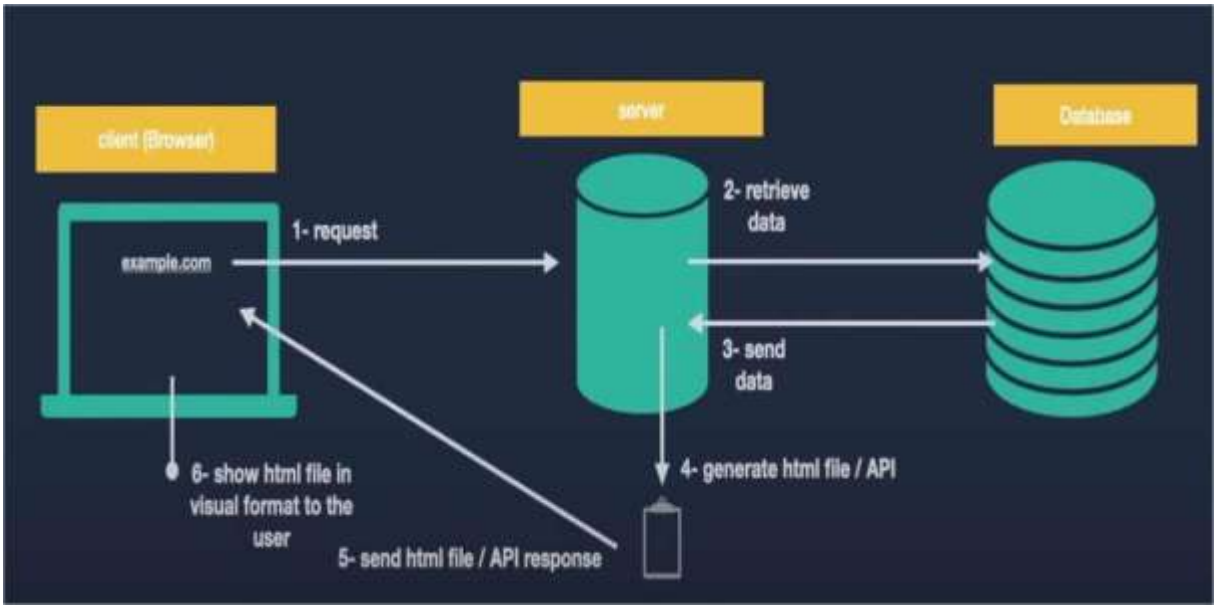

Figure 4.16 : Three-Tier architecture

Figure 4. 17: Development tool

4.2.2 Laravel

Laravel is a popular open-source PHP framework used to simplify the development and creation of websites. It was created by Taylor Otwell in 2011, and since then, it has become one of the most popular frameworks for the PHP programming language in the world. This success is primarily due to its ease of use, flexibility, and rich feature set.

The Laravel framework is built on the MVC (Model-View-Controller) model. This means it separates the business logic of the application from the presentation and user interactions.

Laravel also provides a range of out-of-the-box features, such as user authentication, database migrations, data validation, file management, and queue management. We will detail these features further.

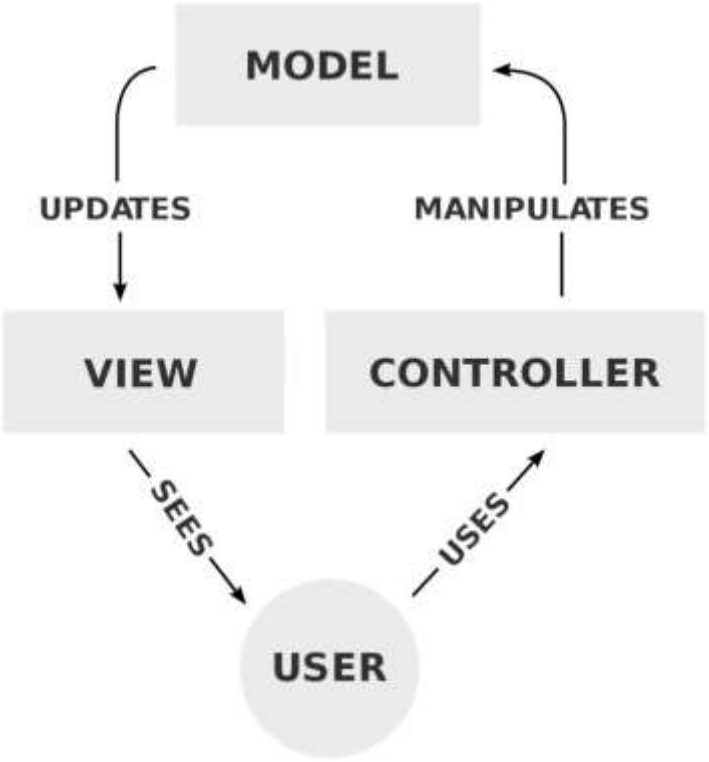

Figure 18: MVC diagram.[25]

4.2.3 PHP

PHP, which stands for Hypertext Preprocessor, is a programming language, or scripting language, primarily used for designing dynamic websites. It is an open-source programming language, meaning it can be used by anyone completely free of charge. Created in the early 1990s by Canadian and Greenlandic programmer Rasmus Lerdorf, PHP is often associated with the MySQL database server and the Apache server. [26]

4.2.4 Apache tomcat server

Apache tomcat is an open-source web application server software designed for Java programming and developed and maintained by Jakarta, the Apache Foundation's Java open-source project group. The initial purpose of the Apache Tomcat software is to host and deploy Java servlets. [27]

4.2.5 MySQL (My Structured Query Language)

MySQL is an open-source relational database management system (RDBMS). This Oracle RDBMS is based on the SQL (Structured Query Language) and operates on virtually all platforms, such as Linux, UNIX, and Windows. MySQL is based on a client-server model,

where the MySQL server handles all instructions. The original purpose of this relational database management system is to efficiently manage large databases. Many well-known websites and applications, such as Facebook, Twitter, and YouTube, use MySQL. [28]

4.2.6 CSS

CSS is the acronym for "Cascading Style Sheets." CSS is a programming language used to style web pages (HTML or XML). This language is composed of the well-known "cascading style sheets," also called CSS files (.CSS), and contains coding elements. [30]

4.2.7 JAVASCRIPT

JavaScript refers to a computer development language, specifically an object-oriented scripting language. It is primarily found in internet pages and allows for the introduction of small animations or effects on a web page or HTML, among other functionalities.

Created in 1995 by Brendan Eich, along with Java technology, JavaScript differs from server-side languages in that task execution is performed by the browser itself on the user's computer, rather than on the web server. Therefore, it is typically activated on the client's computer rather than the server side. [31]

4.2.8 BOOTSTRAP

Bootstrap is a framework developed by the team at the social network Twitter. Offered as opensource software (under the MIT license), this framework utilizes the HTML, CSS, and JavaScript languages, providing developers with tools to easily create a website. [32]

4.2.9 Visual code studio

Visual Studio Code is a lightweight yet powerful source code editor that runs on your desktop and is available for Windows, macOS, and Linux. It comes with built-in support for JavaScript, TypeScript, and Node.js, and has a rich ecosystem of extensions for other languages and runtime environments (such as C++, C#, Java, Python, PHP, Go, .NET).[33]

4.4.1 Index

The homepage represents the initial contact with the site; it is the first page that appears to the user.

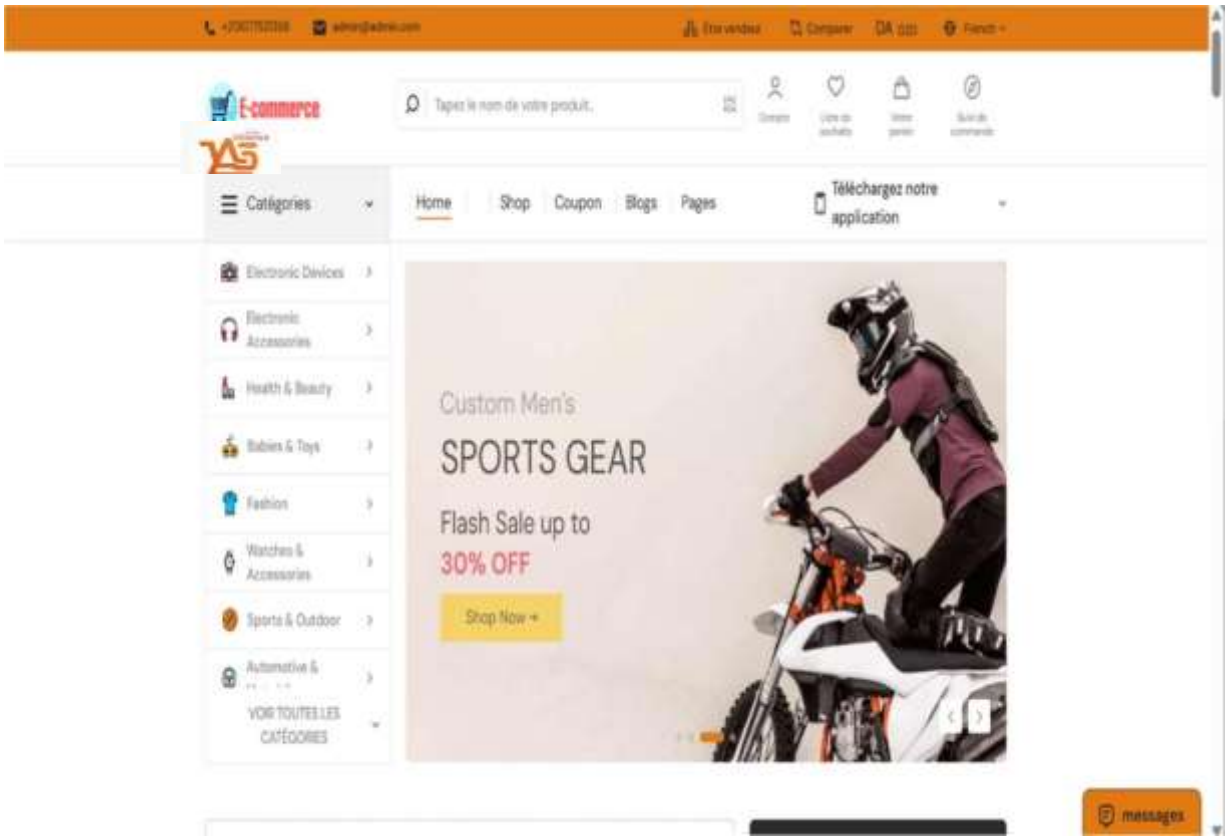

Figure 4. 20: Index.

4.4.2 Product details and payment options

On this page, the user finds the product they have selected, along with all the information related to it. They will find its description, rating, and comments from other users, as well as delivery options and payment methods. On this page, the user can add the product to their shopping cart or modify their request.

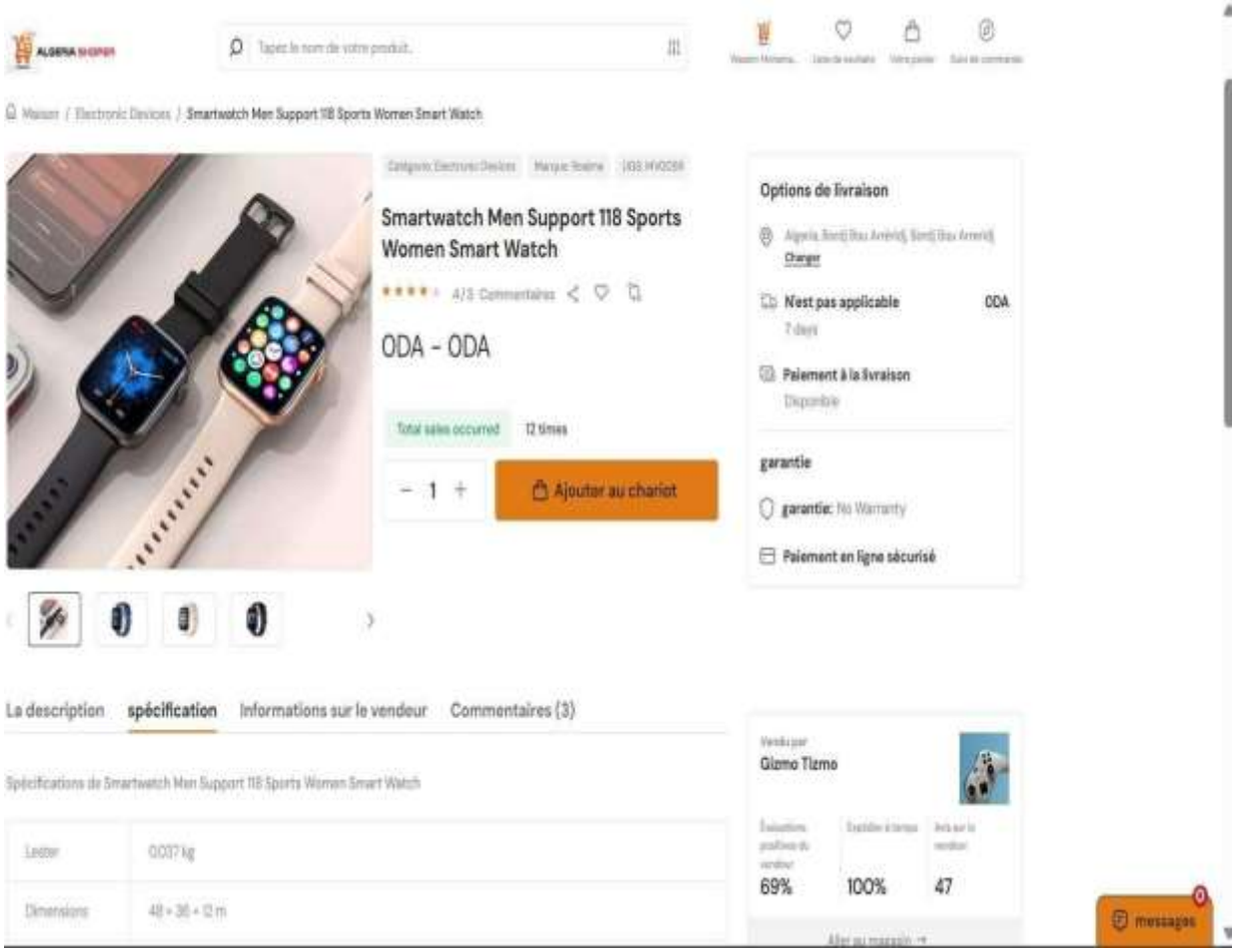

Figure 4. 21: Product page.

4.3.3 Personal shop management

A shop represents a specific sales space for a user, featuring only their own products. The user can manage their shop as they wish, including adding, modifying, or deleting products listed in it. They can also accept or reject customer orders.

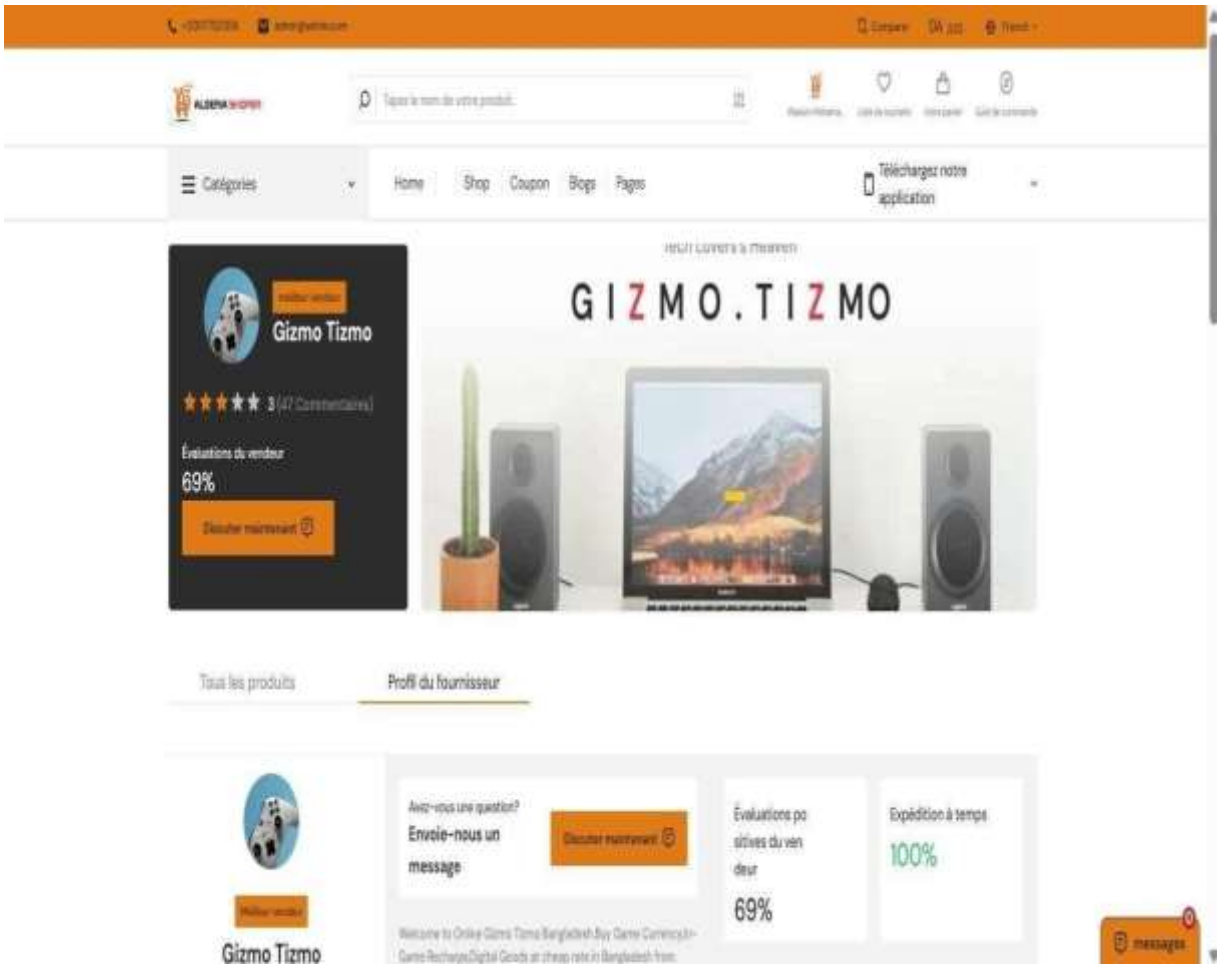

Figure 4.22: Personal shop.

4.4.4 Cart overview

A user's cart contains all the products they have previously selected, represented in the form of a table where each row represents a product.

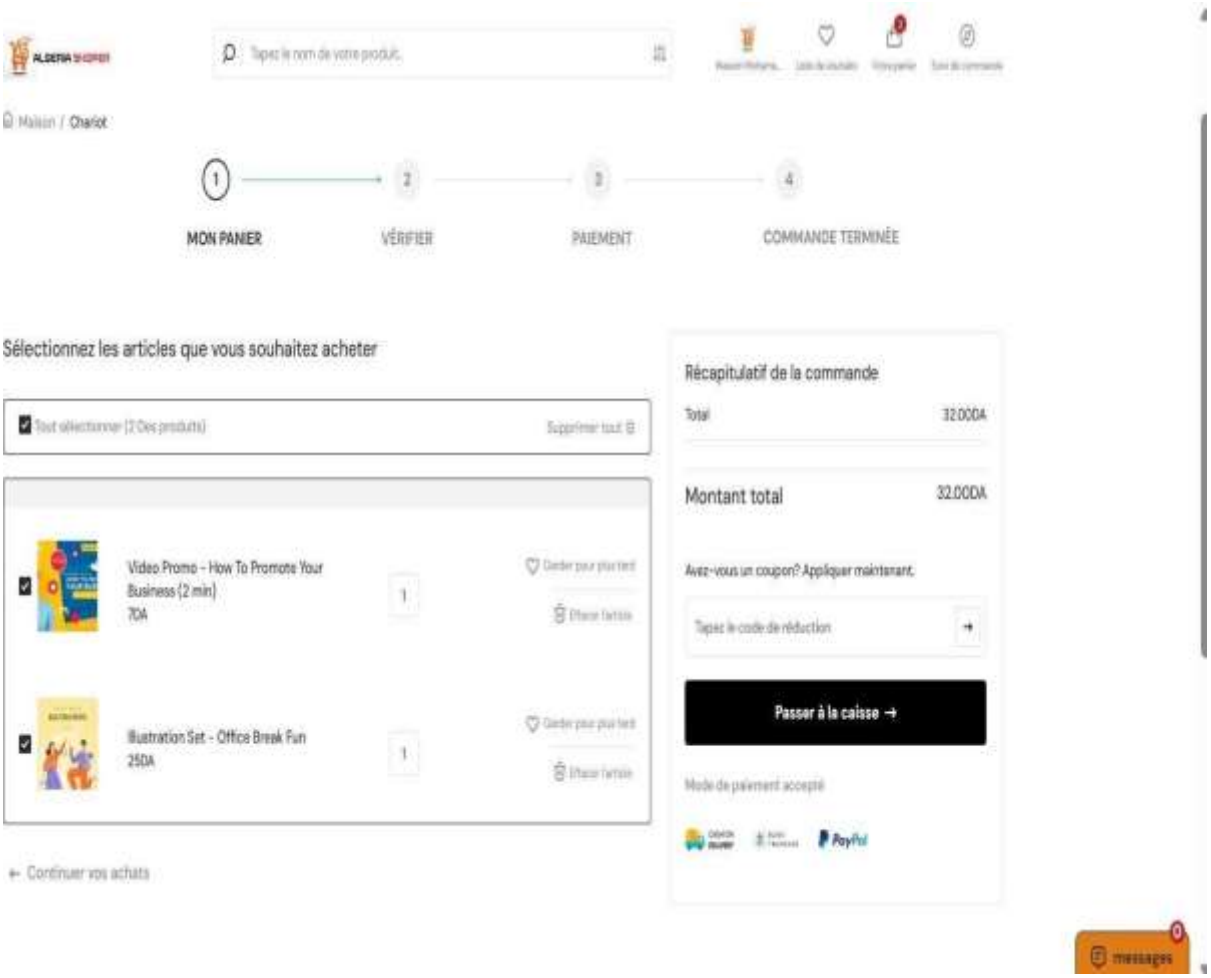

Figure 4. 23: The cart.

Order payment and confirmation process

After placing the order, the user is directed to a payment page to complete the transaction by entering
their personal information. At the end, they are redirected to a page to choose the payment method:cash on delivery, alegria poste, or PayPal. A confirmation message is displayed based on the outcome of the transaction.

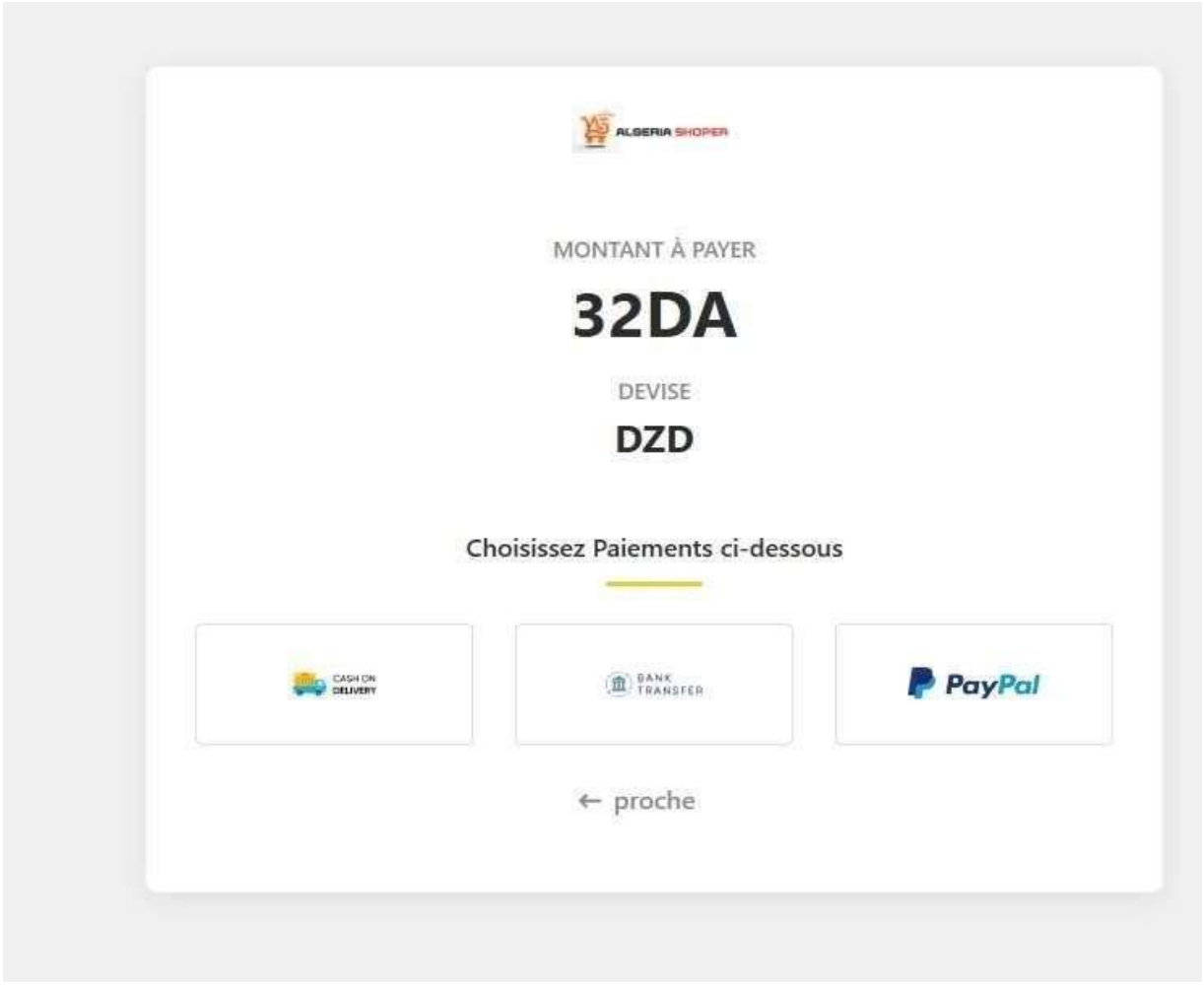

Figure 4. 24: Payments

4.4.6 User account management

The account page consolidates all the information specific to a user, primarily listing their shops and orders. This is also where orders are finalized (confirmation of product receipt, order cancellation, complaints, etc.).

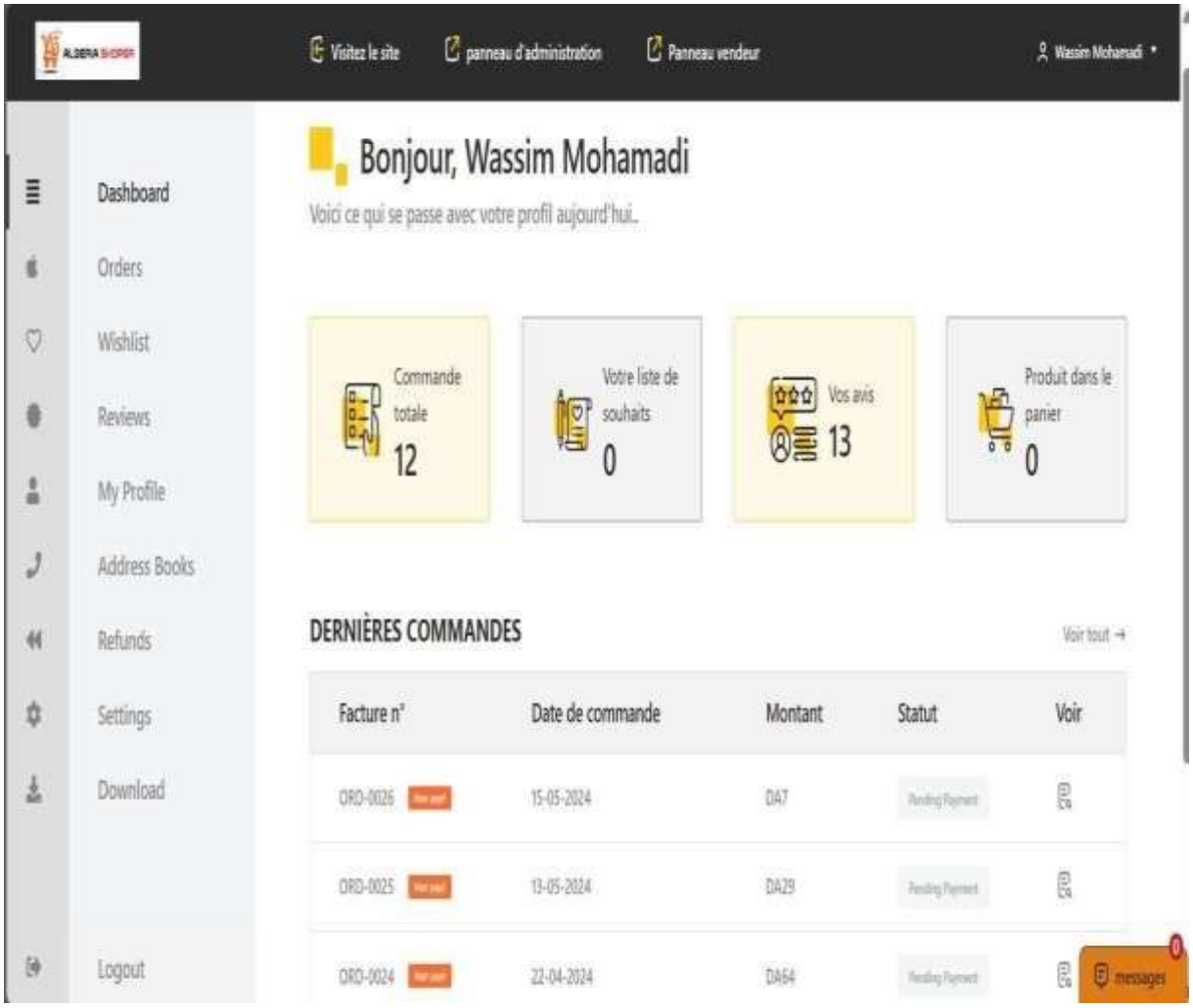

Figure 4.25: The account page.

4.4.7 Order tracking

Tracking a package on our platform is simple. It only requires entering the order code to track the package.

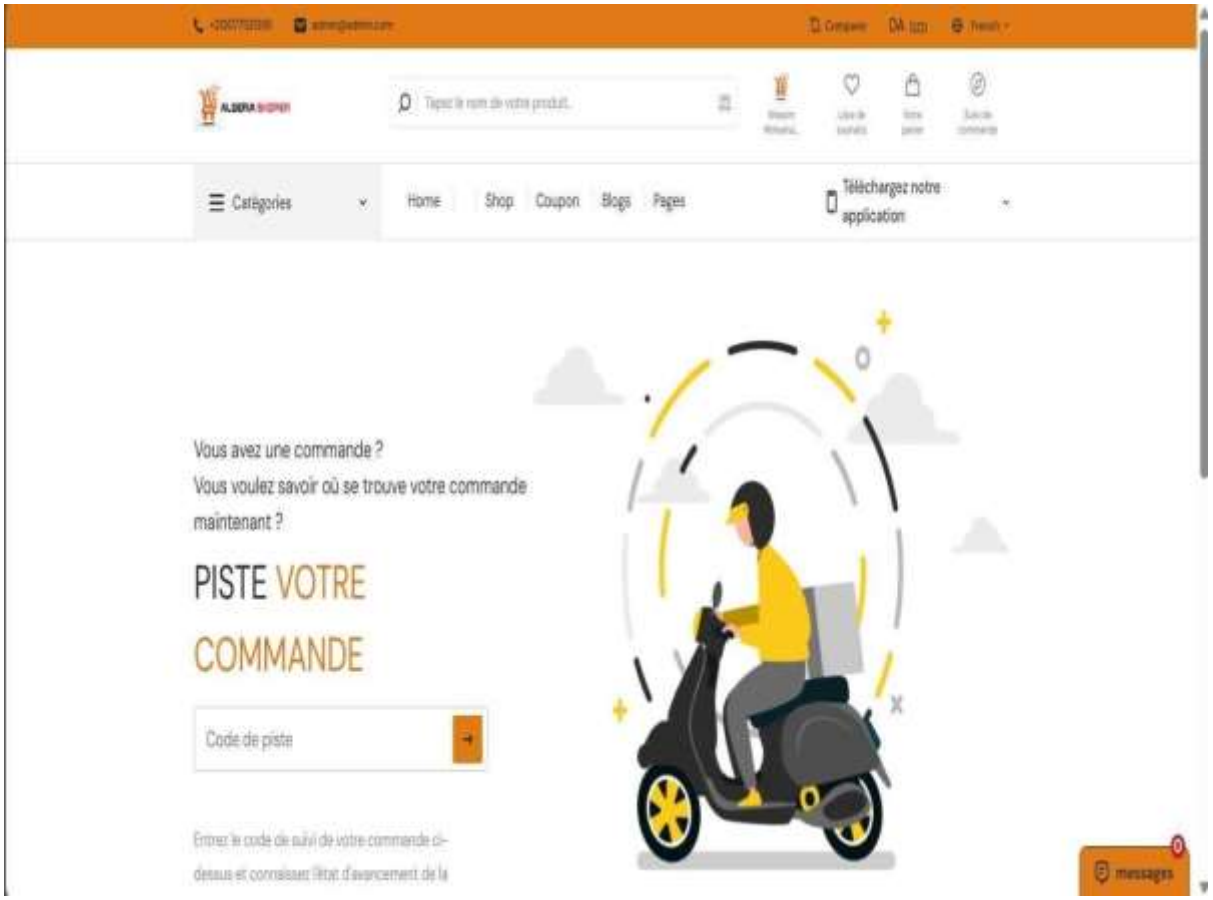

Figure 4. 26: Order tracking.

4.4.8 Administrator's dashboard

Once logged in, the administrator is directed to this page where the Dashboard, member accounts, products, and orders are displayed. They can delete any user account and are also able to perform various actions on the other pages listed on the left side.

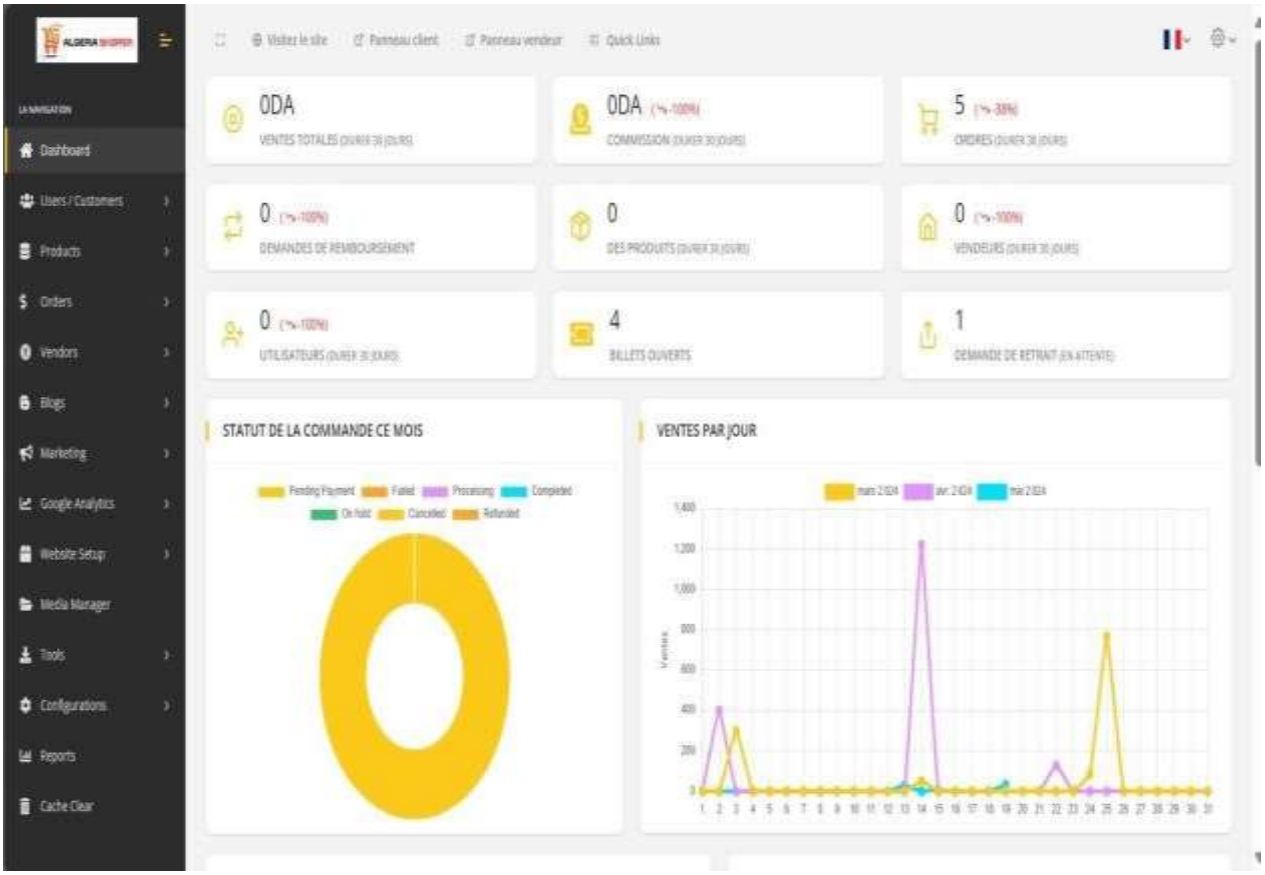

Figure 4. 27: Administrator dashboard overview**.**

4.4.9 Viewing seller information

Admins can see sellers' information such as product logos, email addresses, phone numbers, names, and status (whether accepted or not).

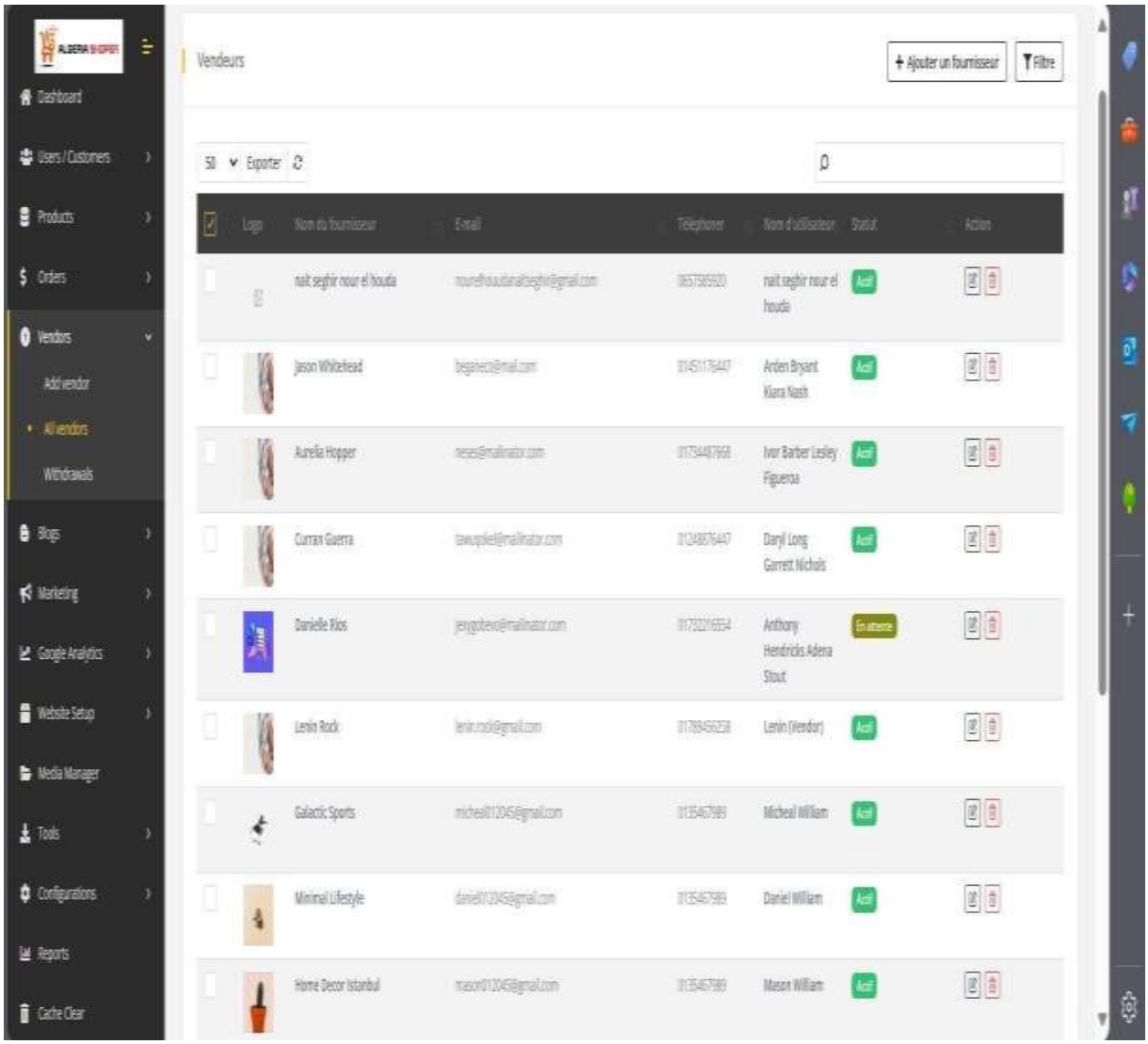

Figure 4.28: Seller information.

4.4.10 Admin access to customer ratings and comments

Admins can view various ratings and comments from customers.

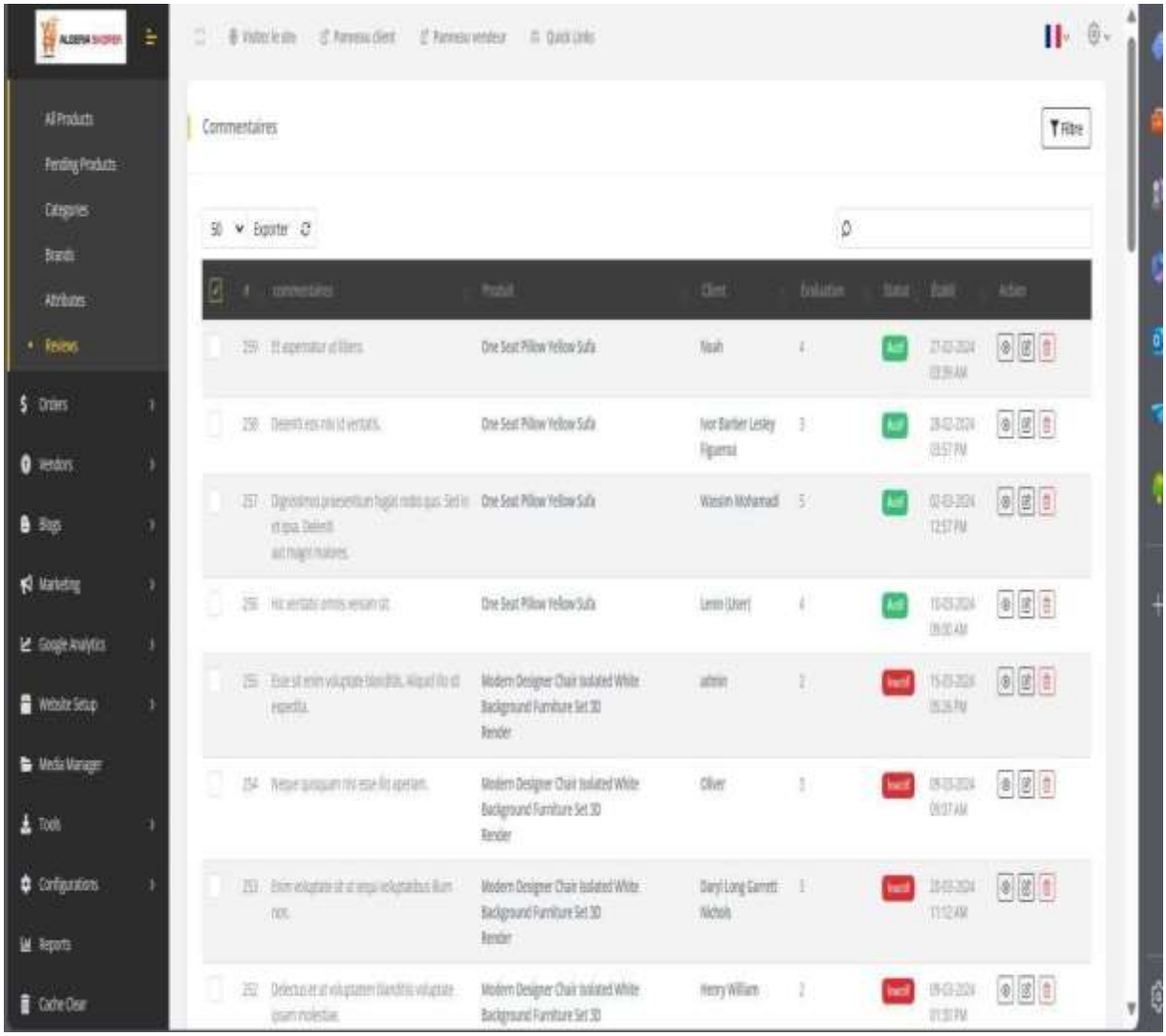

Figure 4.29: Reviews

4.4.11 Admin monitoring of refunds

Admins monitor refunds, their amounts, and the reasons for each customer's refund.

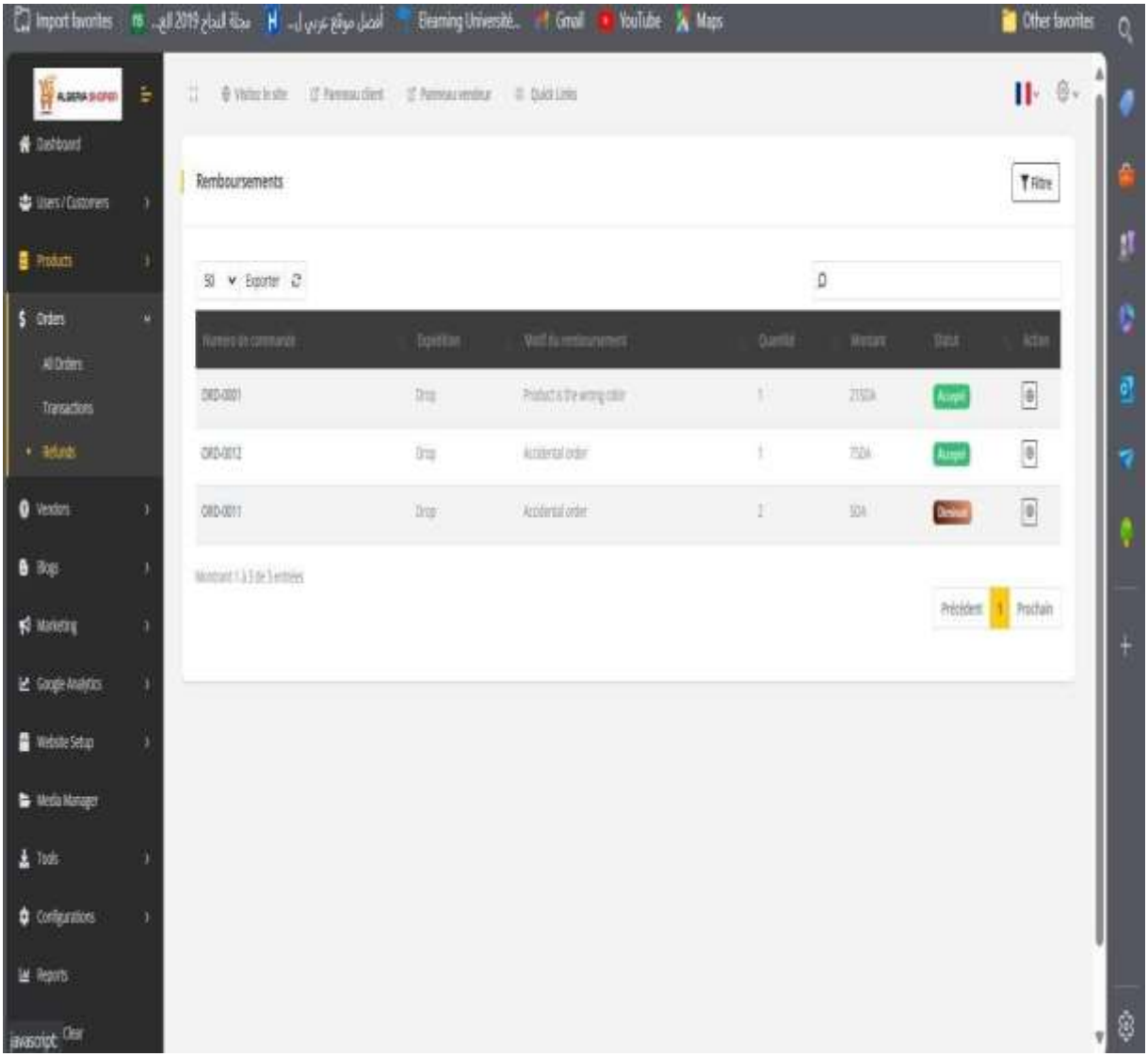

Figure 4.30: Refunds

4.5 Price determination algorithms

We previously discussed in Chapter Three various pricing strategies. In the future, we can rely on two strategies: market competition-based pricing strategy and value-based pricing strategy.

45.1 Algorithm for the competition-based pricing strategy in the free market (Python**):**

```
def price_based_on_market_competition(cost,
    profit_margin, market_price): base_price =  cost + (cost *
    profit_margin)

    i
      f
                                          b

                                          a

      s
```

Figure 4. 31 : Market-based pricing algorithm for determining selling price. [34]

4.5.2 Algorithm for the value-based pricing strategy (Python):

```
            def price_based_on_value(unique_features,  perceived_value):


        total_value = sum(unique_features.values()) # Assuming
          unique_features is a dictionary       with numeric
                                              values


       selling_price =

       total_value *
```

Figure 4.32: Value-based pricing algorithm for determining selling price. [35]

4.6 Requirements evaluation

Requirements evaluation is the process of systematically identifying, documenting, and assessing the necessary features and characteristics of a system or project to ensure it meets the needs and expectations of stakeholders. This process includes both functional and nonfunctional requirements. Evaluating requirements is crucial for the successful planning, development, and implementation of any project, particularly for complex systems like an ecommerce platform.

4.6.1 Data collection

- **Questionnaires:** We distribute questionnaires to users and administrators to evaluate the importance of each requirement on a scale of 1 to 10.
- **User testing:** We conduct user tests to obtain satisfaction scores on a scale of 1 to 10 for each requirement.

4.6.2 Calculation of percentages

- **Functional requirements:** When we evaluate all functional requirements, each requirement is considered at 100% to represent its full completion and importance. This means that each functional requirement has been fully assessed and given the highest priority in terms of implementation and performance. • **Non-functional requirements:**

Requirement	User importance (%)	Admin importance (%)	User Satisfaction (%)	Admin Satisfaction (%)
Performance	95	90	70	70
Accessibility	90	85	85	80
RS	70	65	60	60
Price determination	88	85	Pending implementation	Pending implementation
Security	98	95	94	91

Table 4.2: Table of evaluation of non-functional requirements.

- **Presentation of results:**

Category	Average (%)
Average user importance	**85.75**
Average admin importance	**81.25**
Average user satisfaction	**77.25**
Average admin satisfaction	**75.25**

Table 4. 3 :The presentation of results table

The obtained percentages help prioritize requirements based on their importance and perceived satisfaction by users and administrators. This evaluation guides development efforts to ensure that the most critical features and quality criteria are well implemented and optimized

4.7 Assessment

We were able to achieve the aim of connecting a diverse range of sellers on the same platform with the customer, creating a secure and direct relationship. Our specific achieved goals included:

- Connecting multiple sellers with the buyer and offering delivery services on the same platform .
- Management of goods and various suppliers.
- Managing the stores.
- We rely on advanced technology such as electronic payment and recommendation systems.

With these goals, we aim to fill gaps in the algerian market.

4.8 Conclusion

Our journey in implementing the e-commerce platform has been detailed in this chapter, showcasing the meticulous planning and technological choices that have shaped our project's success. We discussed the development environment, highlighting the significance of a threetier architecture in ensuring scalability and modularity. Utilizing tools like Laravel, PHP,

MySQL, and front-end technologies such as Bootstrap and Visual Studio Code, we created a robust system with visually appealing interfaces. Our emphasis on user experience and seamless functionality was evident throughout the implementation phase.

Moving forward, our strategic roadmap includes continuous improvement and innovation. We aim to enhance our pricing algorithms, leveraging AI for personalized recommendations and strengthening partnerships with local businesses. Expanding market reach and optimizing performance and security remain key priorities. Through these initiatives, we are poised to exceed user expectations and solidify our position as a leading e-commerce platform in Algeria.

Chapter 05:

General conclusion

5.1 Contributions

The contribution of our project lies in its response to the challenges of e-commerce in Algeria by creating an innovative platform that establishes direct links between sellers and buyers, promotes small businesses, and overcomes payment limitations. By integrating advanced technologies such as artificial intelligence and recommendation systems, our platform offers a personalized, secure, and seamless user experience. This strategic approach aims to stimulate the local economy by encouraging entrepreneurship and the growth of small businesses, while modernizing the commercial sector and providing better accessibility to local products, thus helping to bridge the gaps in the e-commerce market in Algeria.

5.2 Limitations

While our project has made significant strides in addressing key challenges in the algerian ecommerce landscape, it is essential to acknowledge certain limitations that warrant attention. One area of concern is the scalability of our platform, particularly in handling a large volume of transactions and users as it grows. Additionally, there may be technical challenges related to the integration of advanced technologies such as artificial intelligence, which could require ongoing optimization and updates to ensure optimal performance. Another aspect to consider is the regulatory and legal framework surrounding e-commerce in algeria, which may pose challenges in terms of compliance and operational procedures. These limitations highlight the need for continuous monitoring,adaptation, and collaboration with relevant stakeholders to overcome hurdles and ensure the sustained success of our project

5.3 Future work and perspectives

Our project's perspective revolves around continuous development, with a strong emphasis on both technical and technological advancements. We aim to integrate a currency system and implement innovative pricing strategies to enhance user experience and drive business growth.

Our commitment lies in fostering an entrepreneurial spirit, supporting the local economy, and effectively managing algerian suppliers. These perspectives guide our future endeavors as we strive to create a dynamic and thriving e-commerce ecosystem in algeria.

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