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Thesis

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Major**: Information Systems and Decision Optimization**

Comprehensive Web Platform for Digitizing Regional Information and Services

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Abstract

The main goal of the startup is to create an easily accessible web application that serves as a Comprehensive Web Platform for Digitizing Regional Information and Services for Algeria. The website caters to two types of users: Business Owners and Visitors.

Business Owner can input detailed information about their stores, which includes the business name, category, phone number, email address, physical address, location, pictures of the store and its products or services, social media links, and opening hours.

On the other hand, visitors can browse the website, search for specific business names, filter results by category, and view the business location and its social media links.

The design phase of this system is done by developing UML diagrams such as class diagram, use case diagram, sequence diagram, and activity diagram. The implementation phase of this system is done by developing the most usable and effective UI/UX (User Interface / User Experience) using the most suitable software tools.

Keywords: web application, Seller, Client, online store, product, category, service.

General Introduction

As digital technologies still and continue to transform everyday life, the need for a smart, accessible, and centralized online services is becoming increasingly urgent. around the world, people are relying more than ever on digital tools to access public services, interact with businesses, and obtain trustworthy local information. In this context, web platforms that aim to present localized content has an important role in making the modern lifestyles come true.

However, despite this revolutionary tech era, many regions still face major challenges in the digitization of information. In Algeria, local data is often fragmented, outdated, poorly organized, or completely missing from the online space. This situation creates a dual hardship: business owners struggle to establish an effective digital presence, while citizens and visitors experience difficulty locating reliable, structured, and relevant information. These issues collectively hinder local commerce, limit service accessibility, and reduce overall user satisfaction.

This thesis proposes a concrete and practical solution through the development of WilayaTech, a startup initiative focused on building a user-friendly digital platform that addresses these regional information gaps. The platform is designed to serve two main audiences. For business owners, it allows them to create and manage detailed profile that improve their visibility and online presence. On the other hand, users will be provided with a well structured and easy to use interface for searching and discovering local content relevant to their daily needs. The platform also provides the business exact location on the map and its social media links, further enhance the platform's accessibility and engagement.

WilayaTech's goals align with Algeria's national digital strategy, Digital Algeria 2030, which includes the ambitious goal of launching over 500 digital projects by the year 2026. However, the absence of centralized and accessible databases continues to present a major obstacle . WilayaTech aims to fill this gap by offering a scalable, inclusive, and community-informed web platform capable of organizing and digitizing regional information across all wilayas. The project seeks to support digital inclusion, economic visibility and civic participation.

CHAPTER 1
Analysis phase

1.1 Introduction

The following section outlines the key motivations behind the project, main objectives and provides the theoretical and conceptual foundations upon which WilayaTech is built.

1.1.1 Context and Motivation

The rapid growth of digital technologies has not only changed global economies and communication but has also redefined how individuals interact with their local environments on a daily basis. In the 21st century, the expectations are no longer limited to having internet access, it now includes having access to a useful and locally relevant digital content. Citizens expect timely updates while businesses seek for digital presence. These changes is important in developing nations where digital information is tied to the national development goals.

In Algeria, while digital literacy is on the rise and internet usage is improving, there remains a noticeable gap between digital infrastructure and practical local implementation. Algeria aims to launch over 500 digital projects by 2026 , clearly reflects a strategic intention to modernize public services and bridge regional inequalities. Yet the execution of such a vision requires more than broad national strategies , it requires tools that are rooted in local realities and responsive to daily needs.

One of the most pressing challenges lies in the decentralization and inaccessibility of regional information. Most wilayas lack any unified digital framework to present essential data such as service directories, business listings, cultural events, or local infrastructure updates. This does limit the everyday convenience of citizens and visitors and also weakens local entrepreneurship and amplifies inequality between urban and rural areas. Without a system that allows for transparent real-time data aggregation and distribution at the wilaya level, entire communities remain disconnected from the benefits of digital progress.

The motivation behind the WilayaTech project emerges from this structural void. It is based on the recognition that digital transformation has to begin with visibility, accessibility, and credibility at the local level. WilayaTech aims to provide a bridge between local 'businesses & services' and the informational needs of citizens and institutions, the platform aspires to be an ecosystem that adapts to each region’s specific context, supports local actors, and evolves with user participation.

In this sense, the motivation for WilayaTech has two sides which are supporting Algeria's national digital roadmap and help both citizens & business owners to achieve their primary need.

1.1.2 Objectives of WilayaTech

WilayaTech is developed to address regional information gaps by providing a unified digital platform that enhances service accessibility, business visibility, and community engagement at the wilaya level. Its core objectives can be summarized as follows:

- **Accessibility:** Provide citizens, tourists, and businesses with a single access point for discovering regional services, from healthcare facilities and restaurants to cultural venues and administrative offices.
- **Accuracy and Community Engagement:** Leverage a hybrid data collection model where manual research, community contributions (via an "Add Business" page), and user ratings/feedback ensure that information remains current and reliable.
- **Scalability:** Design the system architecture to accommodate rollout across multiple wilayas, enabling local administrators to manage, verify, and update data effectively.
- **Transparency:** Promote accountability and service quality by displaying user-generated ratings and feedback for each listed entity.

1.1.3 Structure of the Chapter

To support a comprehensive understanding of the WilayaTech project, this chapter is divided into key thematic parts that outline the theoretical and conceptual foundations on which the platform is built, as follows:

- **Digital Transformation in Regional Services** examines global trends, Algeria's strategic priorities, and the benefits and challenges associated with digitizing local information.
- **Theoretical Foundations of Information Systems** discusses key design principles, user-centric methodologies, data quality governance, and community-driven (crowdsourced) models.
- **Data Collection, Verification, and Update Mechanisms** analyzes manual gathering, community contributions, admin verification, support-driven updates, and user feedback loops.
- **Scalability, Replicability, and Maintenance** explores the challenges and best practices for scaling WilayaTech across all wilayas.
- **Theoretical Implications and Expected Outcomes** assesses the anticipated impact on citizen engagement, service accessibility, and regional development.

- **System Architecture and Technology Stack** details the front-end and back-end technologies (vanilla HTML/CSS/JavaScript, PHP, MySQL), data flow, and administrative workflows.
- **Summary and Transition** concludes the chapter and outlines the segue into the next section of the thesis.

1.2 Digital Transformation in Regional Services

The next section examine key aspects of digital transformation in regional services, including: definitions and concepts, global trends in e-services, Algeria's "Digital Algeria 2030" strategy, the benefits and challenges of digitizing local information, and finally, WilayaTech as a practical response.

1.2.1 Definitions and Concepts

Digital transformation refers to the integration of digital technologies into all sections of an organization or service delivery system, changing how value is created and experienced. In regional services, this involves migrating traditional & paper-based processes to online platforms, enabling real-time access to information and services. Key concepts include e-service delivery, interoperability, and digital inclusion.

The following terms must be comprehended to understand the concept of the project:

- **Digital platform** are hardware or software structures that provide technological services and tools, programs and applications for the distribution, management and creation of free or paid digital content and services, including through the integration of multiple media (integrated digital platforms). (Bassan, 2021)
- **Website application** consists of a set of pages that are accessible by users through a browser and are transmitted to the end-user over a network. A web page can be static—where content is constant for all users, or dynamic—where content changes with user input. In web applications user input (navigation and data input) affects the state of the system. An application's client pages are typically written in HTML with embedded JavaScript or VBScript and rendered by the web browser on the client side. The server-generated pages typically consist of CGI scripts, Active Server Pages, Java Server Pages, or servlets that are executed by the web server on the server side and provide information to clients. (Sampath, 2012)

- **E-commerce** refers to using the Internet and intranets to purchase, sell, transport, or trade data, goods, or services. (E. Turban, 2018)

- **Web Development** Web development encompasses the tasks associated with developing websites for hosting via intranet or internet. The process includes web design, web content

development, client/server-side scripting, and network security configuration, among other tasks. (Tittel, 2015)

- **Wilaya** In Algeria, a wilaya is an administrative division equivalent to a province. It serves as a territorial collectivity with legal personality and financial autonomy, established by law as a decentralized administrative unit of the state. (Algeria, 1970)

1.2.2 Global Trends in E-Services

E-services, or electronic services, refer to "the provision of services via the internet or other digital networks that allow users to interact with public or private institutions in a non-physical environment" (Rust, 2006). Globally, both governments and private sectors are investing in e-service infrastructures to streamline administrative procedures, improve transparency, and enhance user satisfaction. These efforts not only reduce operational costs but also promote inclusivity by making services more accessible and responsive to diverse user needs.

Several international initiatives exemplify the transformative potential of e-services:

- **India – Aadhaar System:**
  One of the world's largest biometric identification programs, Aadhaar provides over a billion citizens with secure access to essential services such as government subsidies, banking, and healthcare. (UIDAI, 2021)
- **Estonia – e-Residency Program:**
  This initiative allows global entrepreneurs to establish and manage EU-based businesses entirely online, representing a fully digitized governance model that eliminates the need for physical presence. (e-Residency, 2022)
- **China – Smart City Initiatives:**
  China's smart cities integrate technologies like IoT, artificial intelligence, and big data to enhance urban service delivery, including transportation, energy management, and public safety systems. (Chai, 2021)

1.2.3 Algeria's "Digital Algeria 2030" Strategy

Algeria's "Digital Algeria 2030" strategy represents a national roadmap aimed at transforming the country into a digitally enabled society and economy. The strategy outlines the implementation of approximately 500 digital projects by 2026, spanning critical sectors such as education, healthcare, transport, justice, finance, and public administration (Ministry of Post and Telecommunications, 2021)

A central pillar of this strategy is the development of robust digital infrastructure across all regions, including underserved and remote wilayas. This includes efforts to expand internet access, adopt cloud computing technologies, and promote the use of open data platforms (Ministère de la

Numérisation et des Statistiques, La stratégie nationale pour le développement du numérique en Algérie, 2022)

WilayaTech aligns closely with the objectives of **Digital Algeria 2030** by offering a practical and scalable response to one of the country's most pressing digital challenges: the decentralization and digitization of regional information and services.

1.2.4 Benefits and Challenges of Digitizing Local Information

Digitizing regional services brings a wide range of benefits that can significantly improve how citizens interact with their local environment and how administrations manage public services. These benefits include:

• **Improved Accessibility**: Citizens in remote or underserved areas gain easier and more equitable access to essential services and information.
• **Real-Time Updates**: Digital systems allow for continuous updates, ensuring that information remains current and relevant for users.
• **Cost and Time Efficiency**: Automation of routine administrative tasks reduces operational costs and shortens service delivery times.
• **Better Data for Decision-Making**: Digitization facilitates structured data collection and analysis, supporting informed planning and policy-making at the local level.
• **Increased Visibility for Local Businesses**: Digital platforms offer small and medium enterprises greater exposure to customers, helping local economies grow.

However, there are still several challenges that must be addressed to ensure an inclusive and effective digital transformation process:

- **Infrastructure Gaps:** Limited internet connectivity in some areas can hinder adoption.
- **Data Quality and Governance:** Ensuring the accuracy and consistency of manually collected or crowdsourced data requires robust verification mechanisms.
- **Digital Literacy:** Varying levels of user technical proficiency necessitate user-centric designs and training initiatives.
- **Administrative Coordination:** Coordinating multiple stakeholders (local admins, support teams, contributors) demands clear protocols and scalable workflows.

1.2.5 WilayaTech as a Practical Response

In response to the specific challenges facing regional digital transformation in Algeria, WilayaTech, through its prototype "BiskraDz" directly addresses many of the challenges associated with digitizing regional services in Algeria:

- **Infrastructure Gaps:** By using lightweight, efficient technologies (vanilla HTML, CSS, JS, PHP), WilayaTech ensures fast load times and compatibility even in regions with limited internet bandwidth.
- **Data Quality and Governance:** The platform implements a hybrid data validation model—manually collected data is supplemented by community submissions, which are verified by local admins before publication. This approach balances openness with quality control.
- **Digital Literacy:** The interface is intentionally kept simple and intuitive, making it accessible to users with varying technical skills. Additionally, the system allows business owners and users to reach support for help with data entry or correction.
- **Administrative Coordination:** WilayaTech is designed with decentralization in mind. Each wilaya can appoint its own admin(s) to manage and verify entries, ensuring localized accuracy and ownership without requiring a massive centralized workforce.
- **Community Engagement:** Features like ratings and feedback for each business foster user participation and ensure ongoing accuracy and transparency. This also builds a sense of trust and civic contribution among users.

1.3 Theoretical Foundations of Information Systems

This section outlines the key theoretical principles that guide the design and functionality of digital information systems, with a focus on user needs, system structure, and collaborative data models.

1.3.1 Core Principles of Information Systems Design

Information systems are built upon a foundation of interrelated components: data, processes, people, and technology. Effective design relies on putting these elements together in order to achieve wanted objectives such as data accessibility, reliability, and security. In our case, the design follows an efficient model. By relying on technologies that are both well-made and easy to maintain, the platform ensures reliability without complexity for users.
A central principle is modularity: WilayaTech separates content into classes & categories such as services, news, and businesses (doctors, stores, etc.). This separation supports both scalability (across different wilayas) and ease of administration (each wilaya has its own management interface and moderation protocol).

1.3.2 User-Centric Design and Usability

User experience (UX) plays a critical role when it comes to determine the success of digital platforms. A system may be powerful in terms of data handling, but if it's hard or slow to navigate,

users will abandon it. WilayaTech emphasizes simplicity by adopting a clean layout and a limited set of visual components. This avoids confusion, especially for users with low digital literacy.
Moreover, the inclusion of feedback mechanisms like business ratings and comment sections supports a dynamic relationship between users and the platform. This is more than just functionality it's a design choice grounded in participatory theory which argues that users should actively shape the information environments they rely on.

1.3.3 Community-Driven Data Models (Crowdsourcing)

Crowdsourcing, when properly managed, can be a powerful tool for maintaining digital content. Platforms like Wikipedia and OpenStreetMap (Google Maps) rely on user contributions mostly, and WilayaTech is adopting a similar logic. Through the "Add Business" feature, users will be able to suggest new listings, and with the ratings and feedback from registered users, help surface changes in service quality or business activity.
Unlike purely automated systems, WilayaTech recognizes the importance of local context and prioritizes it due to the challenges that come from the lack of data centers. Admins review each request, sometimes backing it with personal research on the field, which adds a layer of human judgment that algorithms alone cannot have, especially in diverse and dynamic local environments (smaller cities).

1.4 Data Collection, Verification, and Update Mechanisms

This section presents the methods used to collect, validate, and maintain accurate data on the platform. It highlights the combination of manual research, user participation, and administrative oversight that ensures information remains current and trustworthy.

1.4.1 Initial Data Gathering

Due to the absence of accessible public databases in Algeria, the initial dataset was gathered manually. This involved field research, online searches, and consultation with local sources. The website prioritizes the categories with a high demand like "healthcare services", "restaurants", and "educational institutions". The process required considerable effort, especially to ensure that listings were accurate, complete, and geographically categorized.
The emphasis during this phase was on building a trustworthy foundation. Accuracy and relevance took precedence over sheer quantity, as the long-term success of the platform depends on user trust and data reliability.

1.4.2 User Submissions and Crowdsourced Entries

WilayaTech let users contribute publicly once the first data was acquired. Through the "add a business page", users can submit new businesses, no matter what category they are in. Each submission

includes required fields such as name, category, contact information, and optional description, opening hours, or media attachments.
This feature democratizes data collection and allows the platform to grow organically. However, to avoid the misinformation, spamming, or abuse, these entries are held for review by admins and not published automatically.

1.4.3 Admin-Based Verification and Moderation

Each wilaya in the system is assigned to one or more administrators responsible for reviewing pending submissions. The admin panel includes tools for:

- Approving or rejecting new entries
- Editing information for clarity or correction
- Deleting duplicates or outdated listings

Admins verify data through independent online searches, users reports & feedback, business owners direct contact, and field verification when needed.

1.4.4 Data Updates: Business Owners and User Feedback

Updating the information is as critical as collecting it. The website provides two ways to keep data up to date:

1. **Business Owners**: Can contact the support team directly to request updates. Requests must include proof of ownership and supporting documentation (e.g., updated contact info, hours of operation).

2. **Platform Users**: Can report errors or suggest edits through a support or feedback interface (registered users only). These suggestions are evaluated by the admin(s) based on credibility and given evidence.

This mechanism ensures that even inactive or unmonitored businesses will stay up to date with the community.

1.4.5 Ratings and Feedback Loops

On any business page, registered users can rate and write comments (feedback). This feature serves two main purposes: enhancing transparency and providing indirect indicators of outdated or

misleading information. For instance, multiple users flagging an incorrect phone number or a closed location will require the admin to take actions.
These feedback loops are a distributed approach of quality assurance as well as a user engagement tool. They help identify issues continually and create a sense of shared responsibility among the community, and the best example we could mention is "Google Maps".

1.5 Scalability, Replicability, and Maintenance

This section presents the methods used to collect, validate, and maintain accurate data on the platform. It highlights the combination of manual research, user participation, and administrative oversight that ensures information remains current and trustworthy.

1.5.1 Design for Scalability Across Wilayas

WilayaTech is built with a modular design that allows it to be replicated easily across different wilayas. Each wilaya instance operates under the same structural framework but customized with local data, categories, and administrative staff. The current prototype "BiskraDz", represents this model by serving as a fully functional pilot made specifically for the Wilaya of Biskra.
The website's database schema is generalized, which allows multi-wilaya entries, scalable category trees, and flexible content structures. The admin interface supports enabling independent management without needing to redevelop the core codebase.

1.5.2 Minimal Resource Requirements

One of the key strengths of WilayaTech's architecture is its low dependency on high-performance infrastructure. The choice of lightweight programming languages (PHP, MySQL, vanilla JS) makes sure that the platform runs efficiently on shared hosting environments, reducing deployment costs and increasing accessibility for small-scale or regional operators.

This low-cost structure is vital for long-term sustainability, especially if the project is to be scaled nationally or offered as a solution for other regions with limited resources.

1.5.3 Replication Strategy

Expanding to a new wilaya involves three main steps:

1. **Data Collection:** Local volunteers or administrators gather initial listings.

2. **Admin Setup:** Admin accounts are configured with access to the moderation tools.

3. **Local Launch:** The new sub-platform is linked under the broader WilayaTech brand (e.g., [wilaya-name].dz) and promoted through local channels.

This process can be repeated without significant development overhead, making the system highly replicable. Documentation and support resources are being prepared to assist new wilayas in onboarding effectively.

1.5.4 Ongoing Maintenance and Content Moderation

Regular maintenance tasks are essential to ensure the platform remains functional, secure, and up to date over time. These tasks support the platform's long-term sustainability and reliability, and include the following:

- Monitoring for outdated or inactive listings
- Responding to update requests
- Reviewing new submissions
- Moderating user feedback
- field verification when needed

These activities are distributed across wilaya-level admins, ensuring that no single group is overloaded. The system also supports occasional backend updates for security patches or feature enhancements, which can be deployed without disrupting the platform's core functionality.

1.5.5 Community Involvement and Long-Term Sustainability

A key element of scalability is not just technical feasibility, but social engagement. WilayaTech is structured to encourage contributions from the community. Business owners are incentivized to keep their listings accurate; users are empowered to report problems and suggest improvements.

This community-centered model reduces the administrative burden and builds a more resilient platform. Over time, it is expected to grow organically, making each wilaya's section more efficient, accurate, reflective of local needs, and self-sustaining.

1.6 System Architecture and Technology Stack

This section describes the technical foundation of the platform, detailing the front-end and back-end components, user role management, and the rationale behind the chosen technologies to ensure scalability, efficiency, and accessibility.

1.6.1 Front-End Architecture (HTML, CSS, JavaScript)

WilayaTech's front-end is developed using HTML, CSS, and JavaScript, ensuring high compatibility, low resource consumption, and ease of maintenance. The design prioritizes responsiveness and usability, with a dynamic layout to users in regions where smartphones are the primary device for internet access, or in cases when users have different types of devices. The absence of heavy frameworks also reduces load times, which is essential in areas with slower internet connectivity.

1.6.2 Back-End Infrastructure (PHP, MySQL, phpMyAdmin)

The back-end is built using PHP, a widely-used server-side scripting language suitable for dynamic web applications. Data is stored and managed using MySQL, a reliable relational database management system, while phpMyAdmin serves as the administrative interface for direct database operations.

Server-side logic includes:

- Business and institution listing management
- User authentication and role differentiation
- Data submission, storage, and moderation processes
- Structured categorization and search functionality

The system architecture supports both scalability and modularity, allowing new wilayas to be added with minimal code duplication.

1.6.3 User Roles and Permissions

WilayaTech supports multiple user roles:

- **Visitors:** Can browse, search, and view public content.

- **Registered Users:** Can submit new businesses and contribute feedback or ratings.

- **Admins (per Wilaya):** Review, verify, and manage content. Each wilaya has its own admin(s), enabling decentralized moderation tailored to local knowledge.

1.6.4 Technical and Strategic Justification

The selected stack (HTML/CSS/JS + PHP + MySQL) was chosen for being lightweight, cost-effective, and widely supported by Algerian hosting providers. It enables fast deployment, straightforward debugging, and easy onboarding of local developers or contributors. This aligns with the project's goals of being sustainable, replicable, and maintainable under real-world regional constraints.

1.7 Conclusion

WilayaTech emerges as a practical, scalable, and socially grounded response to Algeria's fragmented access to regional information. From the prototype "BiskraDz", the project has already demonstrated its potential to centralize and digitize vital data related to services, businesses, and institutions across a wilaya. developed with lightweight, accessible technologies, the platform gives a balance between modern web usability and the technical limitations still present in much of the country.
The theoretical foundations discussed in earlier sections—user-centric design, modular data structures, community-driven input, and scalable architecture—are not just academic ideals but actively embedded in the system’s logic. "WilayaTech" addresses the difficulties coming from data shortage through a dynamic model made of the manual collection of data and crowdsourced contributions, validated by local admins from every single wilaya.

CHAPTER 2
Design

2.1 Introduction

This chapter will provide the project's design phase, starting with an UML definition and followed by different diagrams types which are: class diagram, use case diagram, activity diagram, sequence diagram, and the last thing is a general architecture of the app.

2.2 UML (Unified Modeling Language)

The Unified Modeling Language (UML) is widely recognized as the formalization of accumulated knowledge, experience, and best practices in the field of software and systems modeling. It constitutes a well-structured integration of the most effective modeling techniques throughout the history of software engineering and the domain of object-oriented design and analysis. As articulated by Seidl, UML is a consolidation of the best practices that have been established over the years in the use of modeling languages. (M. Seidl, 2015)

UML first appearance was in the mid-1990s, as a response to the increasing complexity of software systems and the growing demand for a common language that could fill the gap between business stakeholders, system architects, analysts, developers, and quality assurance teams. Before creating the UML, the software engineering landscape was into multiple modeling notations and design methodologies, for example, the Booch method, the Object Modeling Technique (OMT), and the Object-Oriented Software Engineering (OOSE).

Practically we can say that UML is a graphical modeling language designed to be flexible, extensible, and adaptable across various domains including but not limited to information systems, embedded systems, real-time software. Rumbaugh clearly articulated in his book that The UML (Unified Modeling Language) is a general-purpose visual modeling language intended "to specify, visualize, construct, and document the artifacts of a software-intensive system." UML captures design decisions and system understanding in a standardized notation that supports static, dynamic, environmental, and conceptual views — making it applicable across various development methods, lifecycle stages, domains, and media (Rumbaugh, 2005) One of UML's most powerful aspects is its multi-view architecture, which acknowledges that no single perspective is sufficient to capture the full complexity of modern software systems, it provides a rich and diverse set of diagram types to capture a particular aspect of system behavior, structure, or interaction. for example, there are 'Structural Diagrams' that represent the static organization of system elements and their relationships such as class

diagrams, object diagrams, component diagrams, and deployment diagrams. There are also the 'Behavioral Diagrams' that illustrate the dynamic aspects of systems including workflows and interactions over time, such as use case diagrams, sequence diagrams, activity diagrams, and state machine diagrams.

Another type of diagrams which are the ‘Implementation Diagrams’, they help visualize software components and their mappings to hardware nodes which provide clarity during deployment and infrastructure planning. the UML has another critical benefit and it is its capacity to support platform-independent modeling, particularly when combined with standards like the Model-Driven Architecture (MDA), also defined by OMG.

Models can be designed independently of implementation details and later on can be transformed into code or system configurations through tools; the results of such benefit reflect on the developer productivity and reducing inconsistency between models and implementations.

The UML also contributes significantly to improving system documentation & traceability especially in large-scale systems where numerous developers and stakeholders are involved, it achieves that by maintaining clear and updated models of system components and behaviors, and also organizations can reduce onboarding time for new developers, facilitate change management, it also improve compliance with industry standards and quality assurance protocols. Finally, and from an academic perspective, The Unified Modeling Language represents an embodiment of formal modeling principles adapted for practical, industrial use.

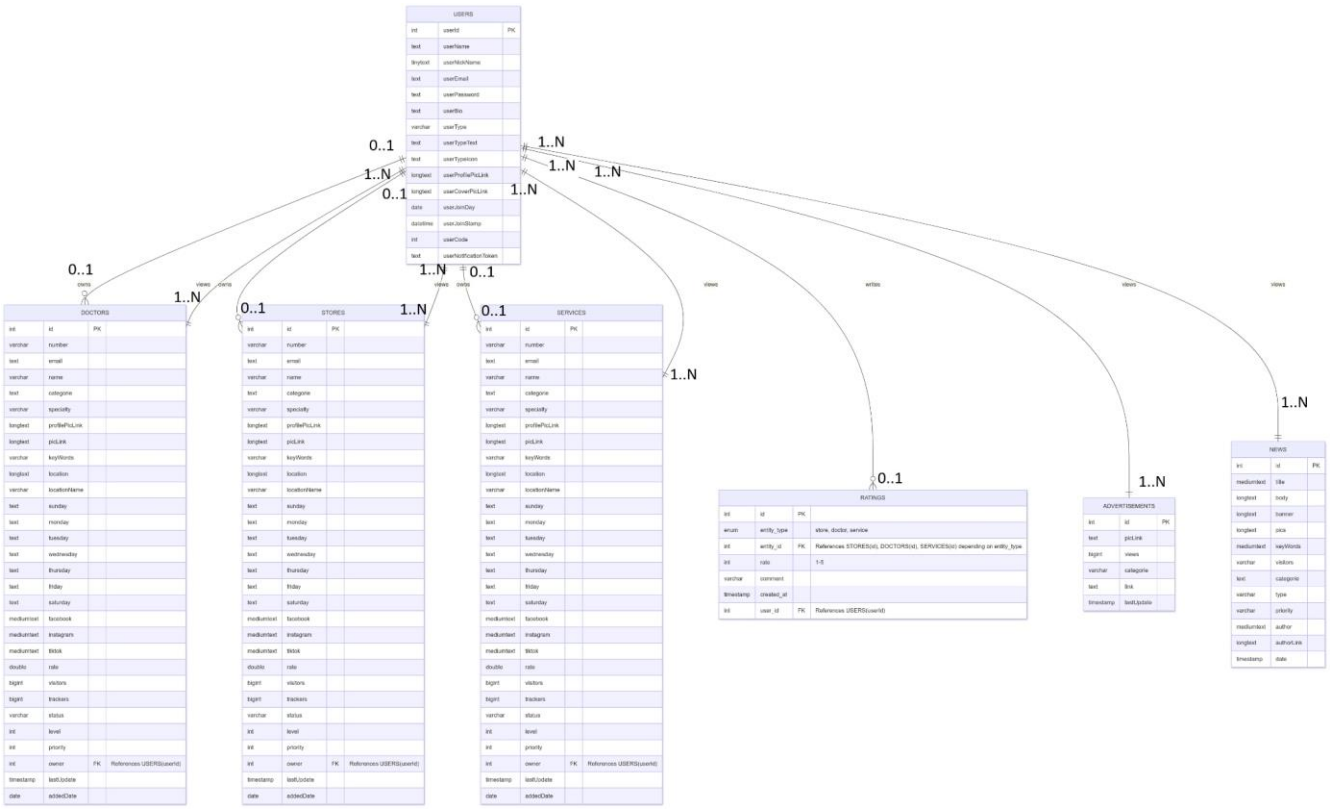
It is semantically rich, meaning its elements have well-defined meanings that support rigorous interpretation and tool-based analysis. At the same time, it is easy and clear enough to be understood by non-specialists which enables participatory system design and validation.

2.3 Diagrams

A diagram is a structured graphical representation of a system's components or behavior, used to model, analyze, and communicate aspects of a system. (Pressman, 2010)

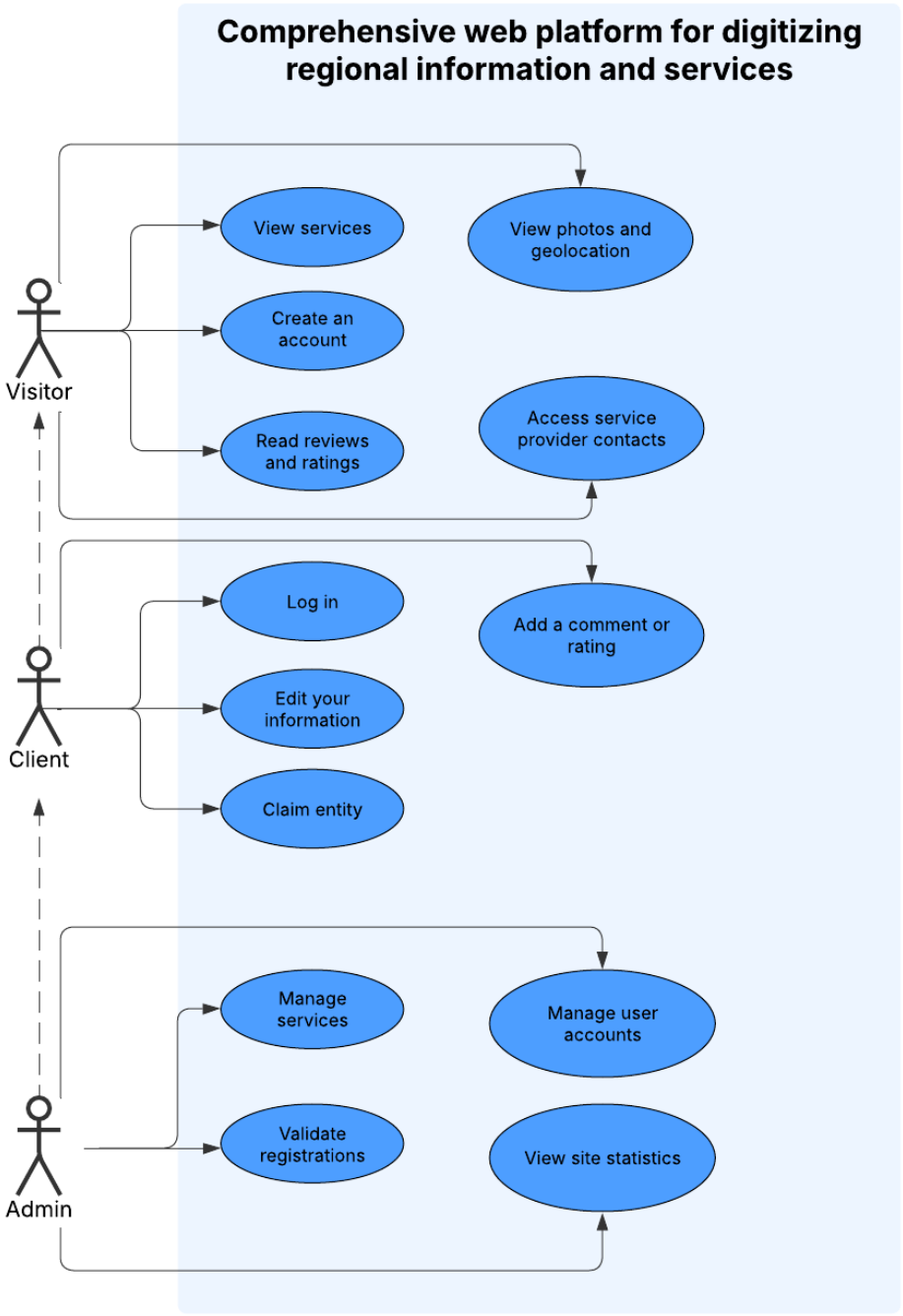
2.4 Conceptual Data Model

The following diagram represents the structure of our system using a Conceptual Data Model:



2.5 Use case diagrams

The use case diagram shows the functionalities provided by the system through several actors, in our case they are the business owner and the visitor.

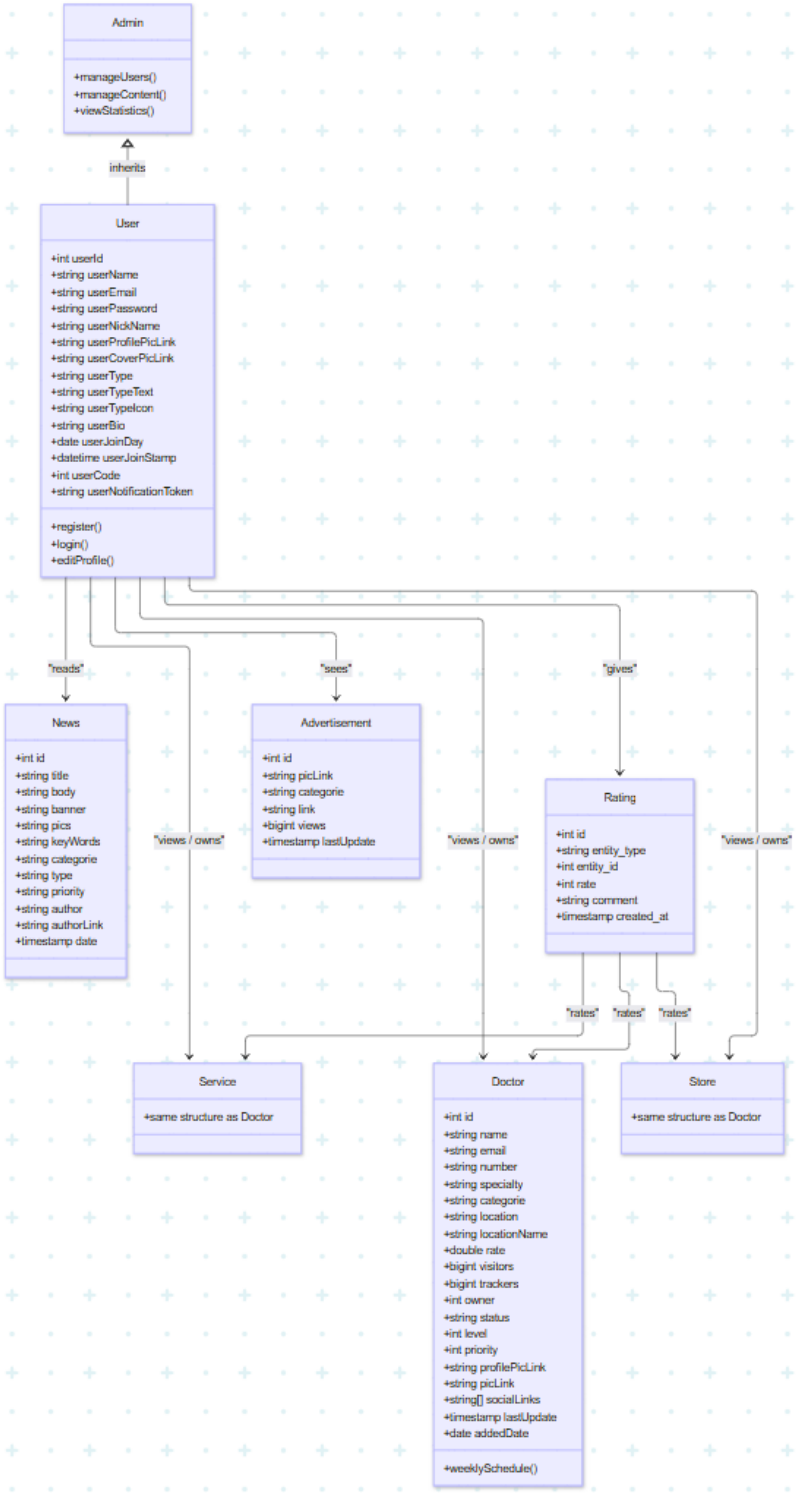


The following table describes all actors and their associated use cases:

Actors	Use Cases	Description
Visitor	Browse services	Navigate through the list of doctors, shops, services, news, etc.
	Create an account	Sign up on the platform to access more features.
	Read reviews and ratings	Read ratings and comments left by other users.
	View photos and geolocation	See images and locations of providers on the map.
	Access provider contact information	View contact details of the listed professionals.
Client	Edit personal information	Update user profile.
	Add a comment or rating	Leave a rating or review on a service, doctor, or shop.
	Log in	Sign in with an existing user account.
Admin	Manage user accounts	Edit, deactivate, or delete user accounts.
	Validate registrations	Approve or reject provider registration requests.
	Manage listed services	Add, edit, or remove services (doctors, shops, etc.).
	View site statistics	Allows the administrator to view analytical data related to the listed entities (doctors, services, shops, news, etc.).

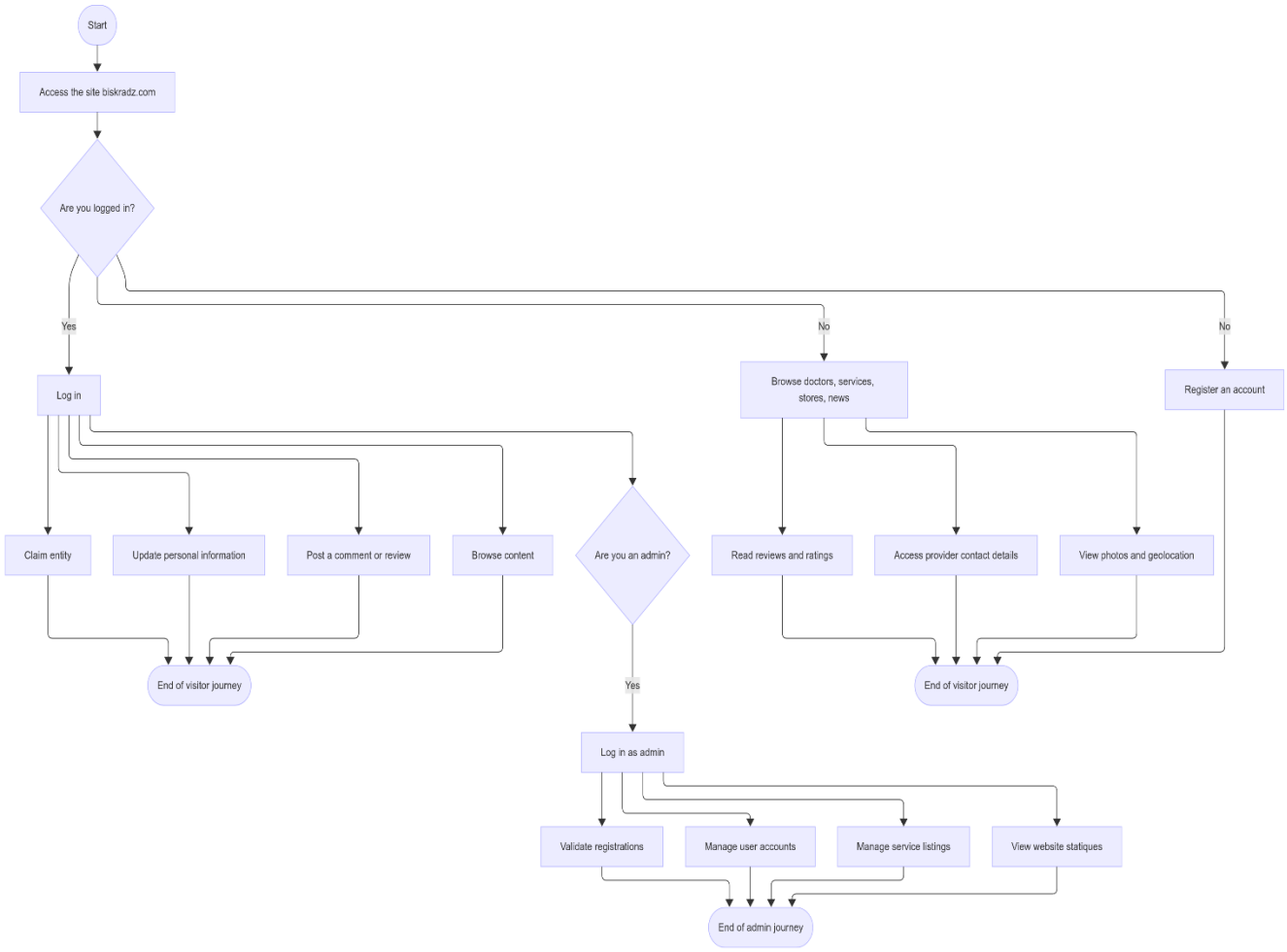
Table 1: Use case diagram’s description

2.6 Class diagram



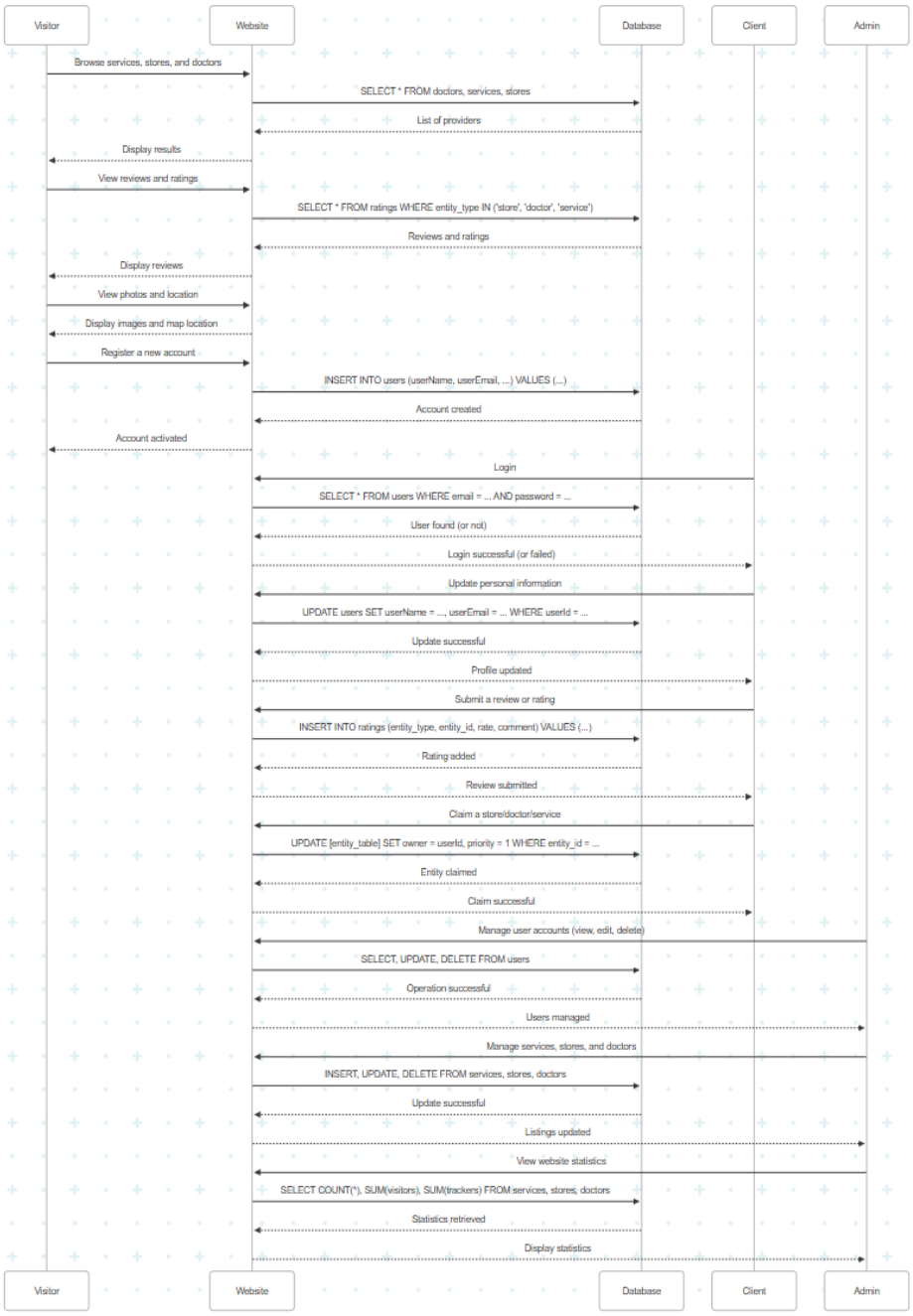
2.7 Activity diagram

This figure summarizes the global functionality of our system task using activity diagram:



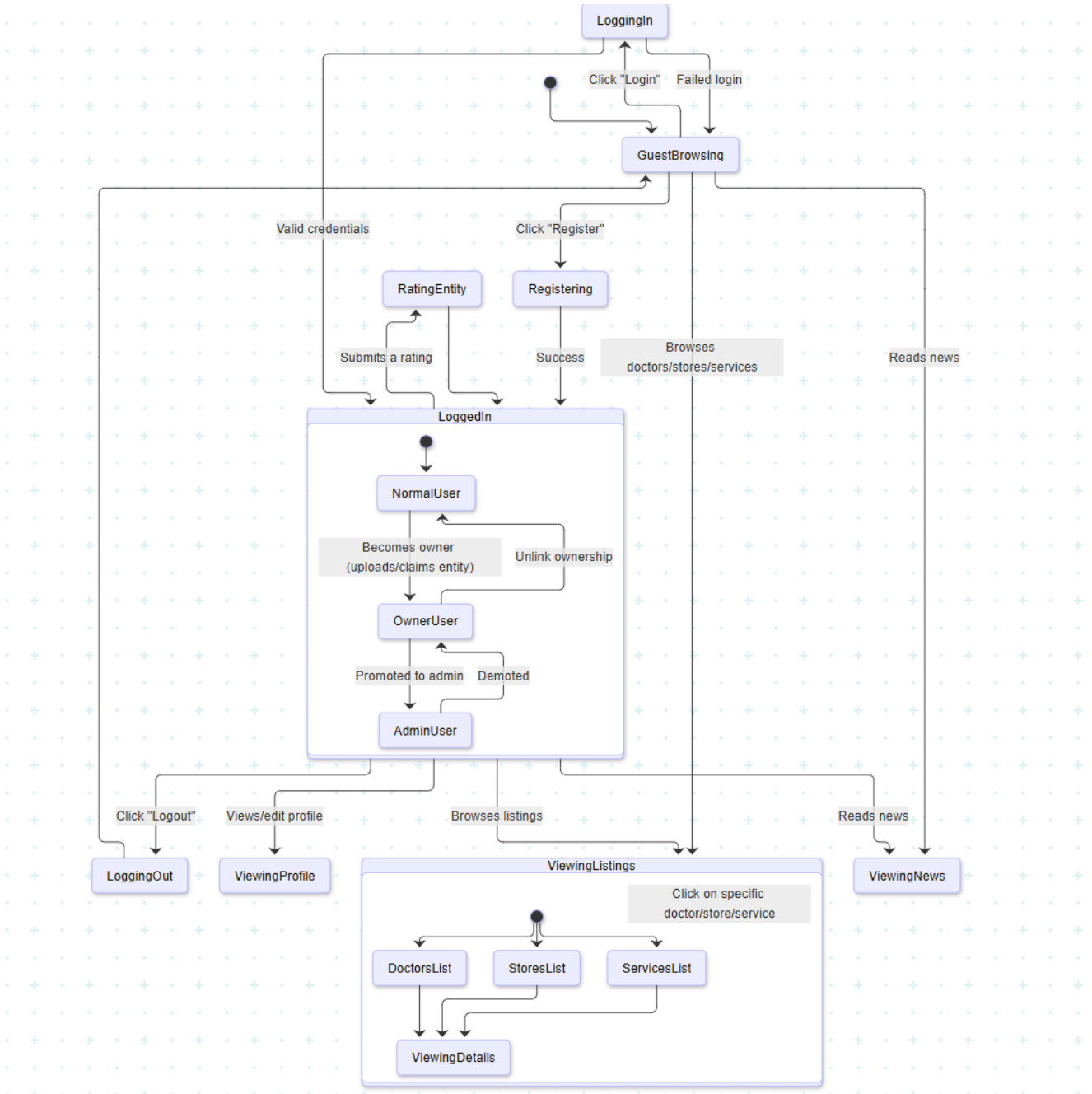
2.8 Sequence diagram

The Dynamic behavior of our application is shown as a set of sent messages using a sequence diagram



2.9 State diagram

The following diagram represents the state diagram of the website



2.10 Conclusion

In Chapter 2, we used the Unified Modeling Language (UML), a comprehensive modeling language for software and systems, and responded to various high-level representations of the system to demonstrate its multiple static and dynamic components.

The class diagram showed us the main entities in the system and the structure of the relationships between these entities so that a more clear data structure for the application can be formed. The use case diagrams captured and recorded the functional interactions between the user (visitor and business owner) and the system, and how this would lead to the development of key services. The activity diagrams communicated the user flow of the features in step form, showing how a user or visitor would engage with features in the system such as business registration, or how they engage with the search for business locations.

The sequence diagrams showed us the sequential exchange between components of the system, exposing the internal logic behind the major actions taken by the user. The architecture overview of the system summarized how the parts of the client–server model, interfaces, and databases would interplay with each other to create the service.

CHAPTER 3
Implementation

3.1 Introduction

This chapter will allow us to have a look at some of the website's interfaces and their purpose, we can divide them into two main views which are the business owner's view and the visitor's views, and finishing with a conclusion. This section is devoted to the implementation phase of our website application. The software tools that have been used will explained, the website's database tables, and several GUI from the website.

3.2 Software tools

During the development phase of the mobile application, the following tools has been used:

- **HTML (HyperText Markup Language):** HTML is the standard markup language used to create and structure content on the web. It defines the meaning and structure of web content through a system of elements and attributes. (Freeman, 2011)
- **CSS (Cascading Style Sheets):** CSS is a stylesheet language used to describe the presentation of a document written in HTML or XML. It allows developers to control the layout, colors, fonts, and overall visual appearance of web pages, enabling separation of content from design. (Meyer, 2011)
- **JavaScript:** JavaScript is a high-level, interpreted programming language that enables interactive web pages. It is an essential part of web applications, allowing for dynamic content updates, control of multimedia, and animation. (Flanagan, 2020)
- **MySQL:** MySQL is an open-source relational database management system (RDBMS) that uses Structured Query Language (SQL) for accessing and managing data. It is known for its reliability, scalability, and ease of use, making it a popular choice for web applications. (DuBois, 2003)
- **phpMyAdmin:** phpMyAdmin is a free software tool written in PHP, intended to handle the administration of MySQL over the Web. It supports a wide range of operations on MySQL and MariaDB, including managing databases, tables, columns, relations, indexes, users, permissions, and executing SQL statements. (Delisle, 2012)

3.3 Database tables

This section explains the relations between the application's database tables:

- **Advertisements:** id, picLink, views, categorie, link, lastUpdate

- **Doctors:** id, number, email, name, categorie, specialty, profilePicLink, picLink, keyWords, location, locationName, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, facebook, Instagram, tiktok, rate, visitors, trackers, status, level, priority, owner, lastUpdate, addedDate
- **News:** id, title, body, banner, pics, keyWords, visitors, categorie, type, priority, author, authorLink, date
- **Ratings:** id, entity_type, entity_id, rate, comment, created_at
- **Services:** id, number, email, name, categorie, specialty, profilePicLink, picLink, keyWords, location, locationName, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, facebook, Instagram, tiktok, rate, visitors, trackers, status, level, priority, owner, lastUpdate, addedDate
- **Stores:** id, number, email, name, categorie, specialty, profilePicLink, picLink, keyWords, location, locationName, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, facebook, Instagram, tiktok, rate, visitors, trackers, status, level, priority, owner, lastUpdate, addedDate
- **Users:** userId, userName, userNickName, userEmail, userPassword, userBio, userType, userTypeText, userTypeIcon, userProfilePicLink, userCoverPicLink, userJoinDay, userJoinStamp, userCode, userNotificationToken

The following tables represent the structure of the website's database:

Table	Action	Rows	Type	Collation	Size	Overhead
advertisements	Browse Structure Search Insert Empty Drop	3	InnoDB	utf8mb4_general_ci	16.0 KiB	-
doctors	Browse Structure Search Insert Empty Drop	26	InnoDB	utf8mb4_general_ci	16.0 KiB	-
news	Browse Structure Search Insert Empty Drop	25	InnoDB	utf8mb4_general_ci	96.0 KiB	-
ratings	Browse Structure Search Insert Empty Drop	11	InnoDB	utf8mb4_general_ci	16.0 KiB	-
services	Browse Structure Search Insert Empty Drop	17	InnoDB	utf8mb4_general_ci	16.0 KiB	-
stores	Browse Structure Search Insert Empty Drop	29	InnoDB	utf8mb4_general_ci	48.0 KiB	-
users	Browse Structure Search Insert Empty Drop	152	InnoDB	utf8mb4_general_ci	96.0 KiB	-
7 tables	Sum	263	InnoDB	utf8mb4_general_ci	304.0 KiB	0 B

Table 2: Website's main table

Server: localhost » Database: biskradz_biskra » Table: advertisements

Browse | Structure | SQL | Search | Insert | Export | Import | Operations | Triggers

Table structure | Relation view

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(11)			No	*None*		AUTO_INCREMENT	Change Drop More
2	picLink	text	utf8mb4_general_ci		Yes	'https://biskradz.com/Img/Outher/no_image.png'			Change Drop More
3	views	bigint(12)			Yes	0			Change Drop More
4	categorie	varchar(50)	utf8mb4_general_ci		Yes	الرئيسية			Change Drop More
5	link	text	utf8mb4_general_ci		No	'https://biskradz.com'			Change Drop More
6	lastUpdate	timestamp			Yes	current_timestamp()		ON UPDATE CURRENT_TIMESTAMP()	Change Drop More

Table 3: Advertisements table

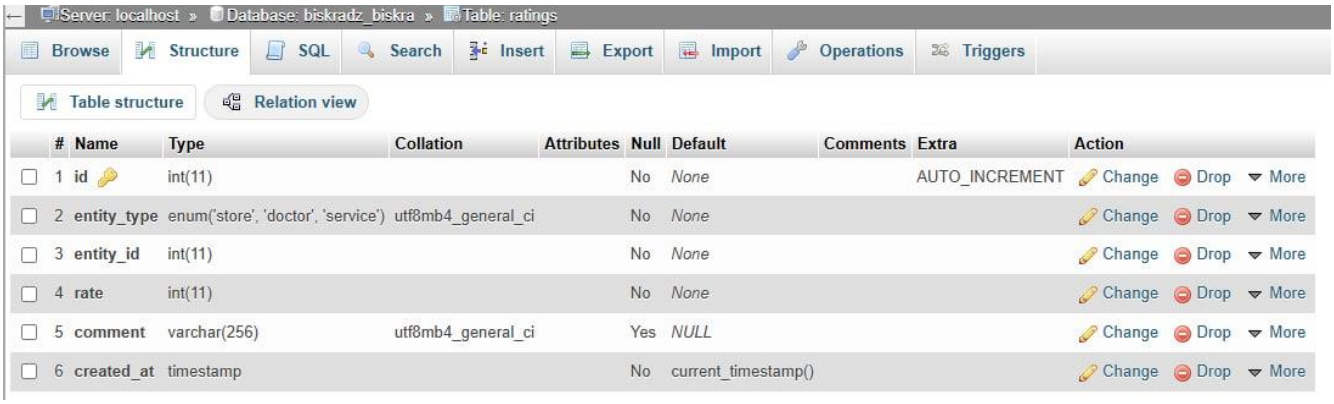
Server: localhost » Database: biskradz_biskra » Table: news

Browse | Structure | SQL | Search | Insert | Export | Import | Operations | Triggers

Table structure | Relation view

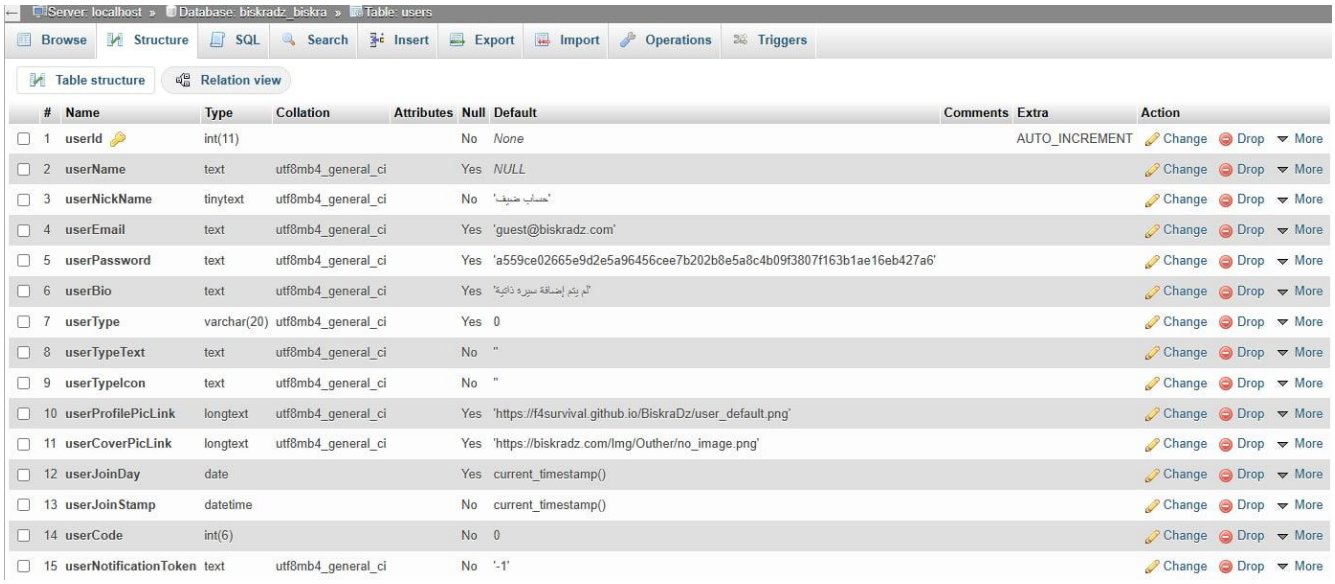
#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(11)			No	*None*		AUTO_INCREMENT	Change Drop More
2	title	mediumtext	utf8mb4_general_ci		Yes	'محتوى فارغ'			Change Drop More
3	body	longtext	utf8mb4_general_ci		Yes	'نص لمحتوى فارغ'			Change Drop More
4	banner	longtext	utf8mb4_general_ci		Yes	'https://biskradz.com/Img/Outher/no_image.png'			Change Drop More
5	pics	longtext	utf8mb4_general_ci		Yes	'https://biskradz.com/Img/Outher/no_image.png'			Change Drop More
6	keyWords	mediumtext	utf8mb4_general_ci		Yes	'خبر حصري جديد اخبار بسكرة'			Change Drop More
7	visitors	varchar(255)	utf8mb4_general_ci		Yes	1			Change Drop More
8	categorie	text	utf8mb4_general_ci		No	'اخبار'			Change Drop More
9	type	varchar(255)	utf8mb4_general_ci		No	مخفي			Change Drop More
10	priority	varchar(255)	utf8mb4_general_ci		Yes	2			Change Drop More
11	author	mediumtext	utf8mb4_general_ci		Yes	'بسكره ديزاد'			Change Drop More
12	authorLink	longtext	utf8mb4_general_ci		Yes	'https://biskradz.com'			Change Drop More
13	date	timestamp			Yes	current_timestamp()			Change Drop More

Table 4: News table



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(11)			No	*None*		AUTO_INCREMENT	Change Drop More
2	entity_type	enum('store', 'doctor', 'service')	utf8mb4_general_ci		No	*None*			Change Drop More
3	entity_id	int(11)			No	*None*			Change Drop More
4	rate	int(11)			No	*None*			Change Drop More
5	comment	varchar(256)	utf8mb4_general_ci		Yes	*NULL*			Change Drop More
6	created_at	timestamp			No	current_timestamp()			Change Drop More

Table 5: Ratings table



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	userId	int(11)			No	*None*		AUTO_INCREMENT	Change Drop More
2	userName	text	utf8mb4_general_ci		Yes	*NULL*			Change Drop More
3	userNickName	tinytext	utf8mb4_general_ci		No	'حساب ضيف'			Change Drop More
4	userEmail	text	utf8mb4_general_ci		Yes	'guest@biskradz.com'			Change Drop More
5	userPassword	text	utf8mb4_general_ci		Yes	'a559ce02665e9d2e5a96456cee7b202b8e5a8c4b09f3807f163b1ae16eb427a6'			Change Drop More
6	userBio	text	utf8mb4_general_ci		Yes	'لم يتم إضافة سيرة ذاتية'			Change Drop More
7	userType	varchar(20)	utf8mb4_general_ci		Yes	0			Change Drop More
8	userTypeText	text	utf8mb4_general_ci		No	''			Change Drop More
9	userTypeIcon	text	utf8mb4_general_ci		No	''			Change Drop More
10	userProfilePicLink	longtext	utf8mb4_general_ci		Yes	'https://f4survival.github.io/BiskraDz/user_default.png'			Change Drop More
11	userCoverPicLink	longtext	utf8mb4_general_ci		Yes	'https://biskradz.com/Img/Outher/no_image.png'			Change Drop More
12	userJoinDay	date			Yes	current_timestamp()			Change Drop More
13	userJoinStamp	datetime			No	current_timestamp()			Change Drop More
14	userCode	int(6)			No	0			Change Drop More
15	userNotificationToken	text	utf8mb4_general_ci		No	'-1'			Change Drop More

Table 6: Users table

<u>Remark:</u>

Both Services and Stores tables have the same architecture and columns as the Doctors table.

Server: localhost » Database: biskradz_biskra » Table: doctors

Browse | Structure | SQL | Search | Insert | Export | Import

Table structure | Relation view

#	Name	Type	Collation	Attributes	Null	Default
1	id	int(11)			No	None
2	number	varchar(30)	utf8mb4_general_ci		Yes	0000000000
3	email	text	utf8mb4_general_ci		No	'support@biskradz.com'
4	name	varchar(200)	utf8mb4_general_ci		Yes	لا توجد معلومات
5	categorie	text	utf8mb4_general_ci		No	'أطباء'
6	specialty	varchar(255)	utf8mb4_general_ci		No	لا توجد معلومات
7	profilePicLink	longtext	utf8mb4_general_ci		No	'\'https://biskradz.com/Img
8	picLink	longtext	utf8mb4_general_ci		Yes	'\'https://biskradz.com/Img
9	keyWords	varchar(2000)	utf8mb4_general_ci		Yes	لا توجد معلومات
10	location	longtext	utf8mb4_general_ci		Yes	'\'https://www.google.dz/m
11	locationName	varchar(500)	utf8mb4_general_ci		No	بسكرة
12	sunday	text	utf8mb4_general_ci		No	'لا توجد معلومات'
13	monday	text	utf8mb4_general_ci		No	'لا توجد معلومات'
14	tuesday	text	utf8mb4_general_ci		No	'لا توجد معلومات'
15	wednesday	text	utf8mb4_general_ci		No	'لا توجد معلومات'
16	thursday	text	utf8mb4_general_ci		No	'لا توجد معلومات'
17	friday	text	utf8mb4_general_ci		No	'لا توجد معلومات'
18	saturday	text	utf8mb4_general_ci		No	'لا توجد معلومات'
19	facebook	mediumtext	utf8mb4_general_ci		No	''
20	instagram	mediumtext	utf8mb4_general_ci		No	''
21	tiktok	mediumtext	utf8mb4_general_ci		No	''
22	rate	double			No	1
23	visitors	bigint(20)			No	1
24	trackers	bigint(20)			No	1
25	status	varchar(255)	utf8mb4_general_ci		No	'وقاتين'
26	level	int(12)			No	4
27	priority	int(12)			No	4
28	owner	int(12)			No	0
29	lastUpdate	timestamp			Yes	current_timestamp()
30	addedDate	date			No	current_timestamp()

Table 7: Doctors table

3.4 Website’s interfaces

The next section shows the most important GUI (Graphical User Interface) from the website on a desktop and mobile screens:

3.4.1 Home page

The first interface that desktop users will get when entering the site is the home page, which contains many components: Homepage ads, website sections, recently added businesses & doctors, a search bar and lastly a button to add a business or a doctor.

Figure 3.1: Desktop Home Page interface

For the mobile view of the website, users will encounter the following interface, which contains: Homepage ads, recently added businesses & doctors, search bar icon, and sidebar menu icon.

Figure 3.2: Mobile Home Page Interface

3.4.2 Classes & Sections

The website has different classes and sections for businesses, and they are well organized on both desktop and mobile views, with full details for easy and fast search for a specific need.

3.4.2.1 Classes

This part of the site contains all the different website classes, and each class has its sections: Homepage, Biskra stores, Biskra doctors, Biskra news, and Biskra services.

Figure 3.3: Classes on desktop view

And for the Mobile version, you can find the classes when you click the sidebar menu icon.

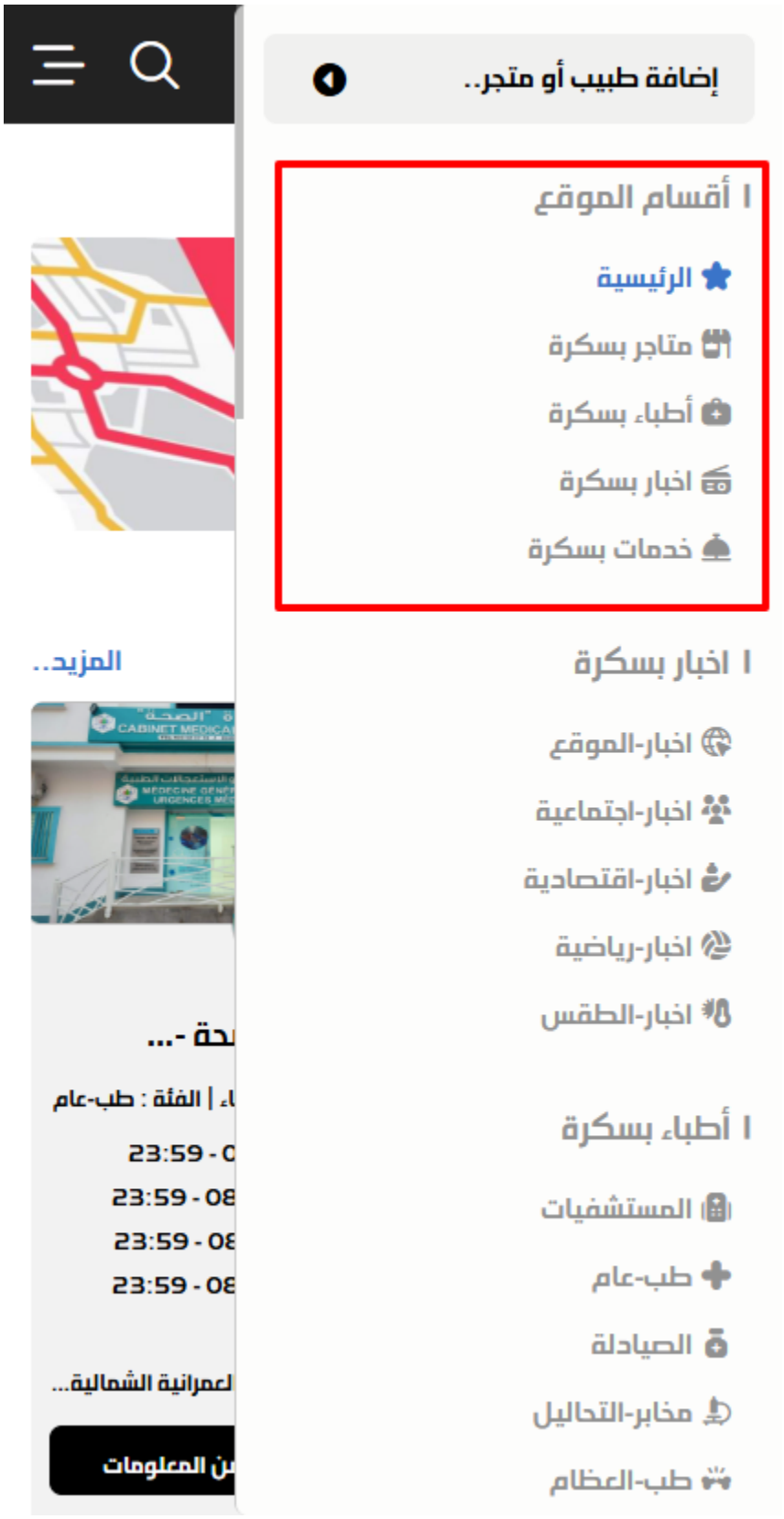


Figure 3.4: Classes on Mobile view

3.4.2.2 News

The news class has different sections (Site news, Social News, Economic News, Sports News, Weather news), and each section has articles related to it.

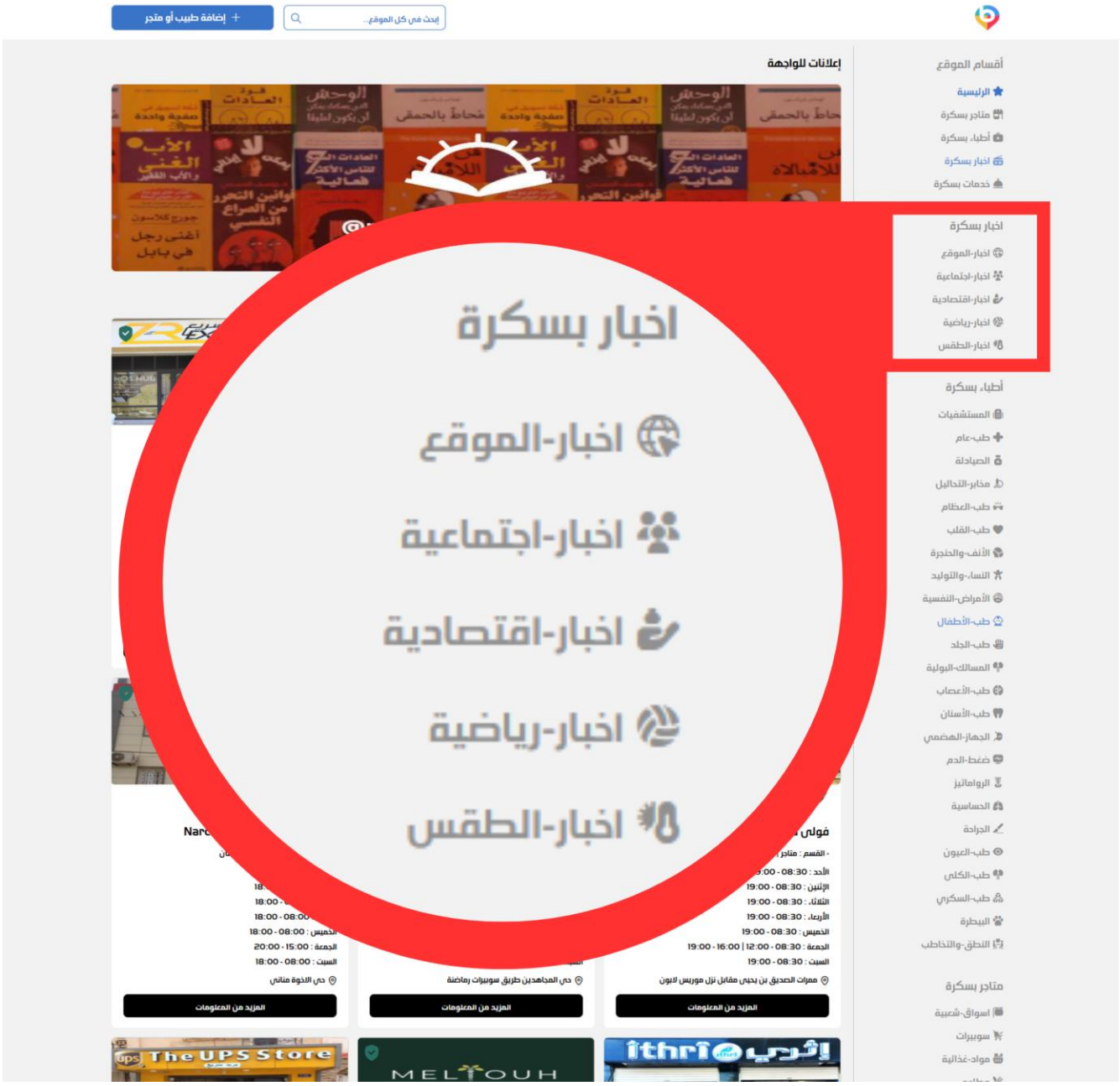


Figure 3.5: News class on desktop view

The following figure (Figure 3.6) represents the news page on desktop view. The page used in the example is the social news page.

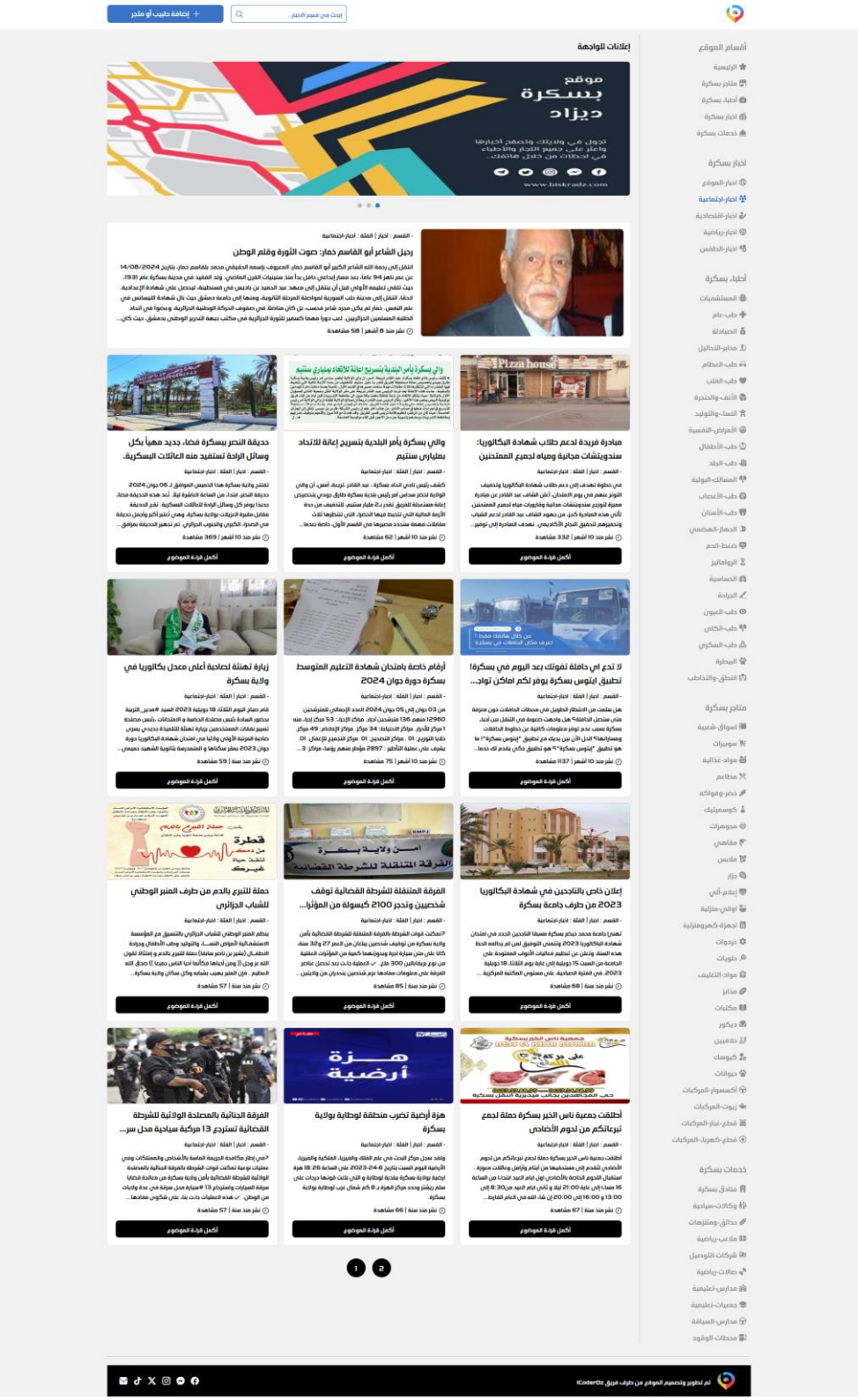


Figure 3.6: Social news page on desktop view

The article page (Figure 3.7) contains many components, which are: article pictures, article title, article date, author, views, body text, and suggested articles to read.

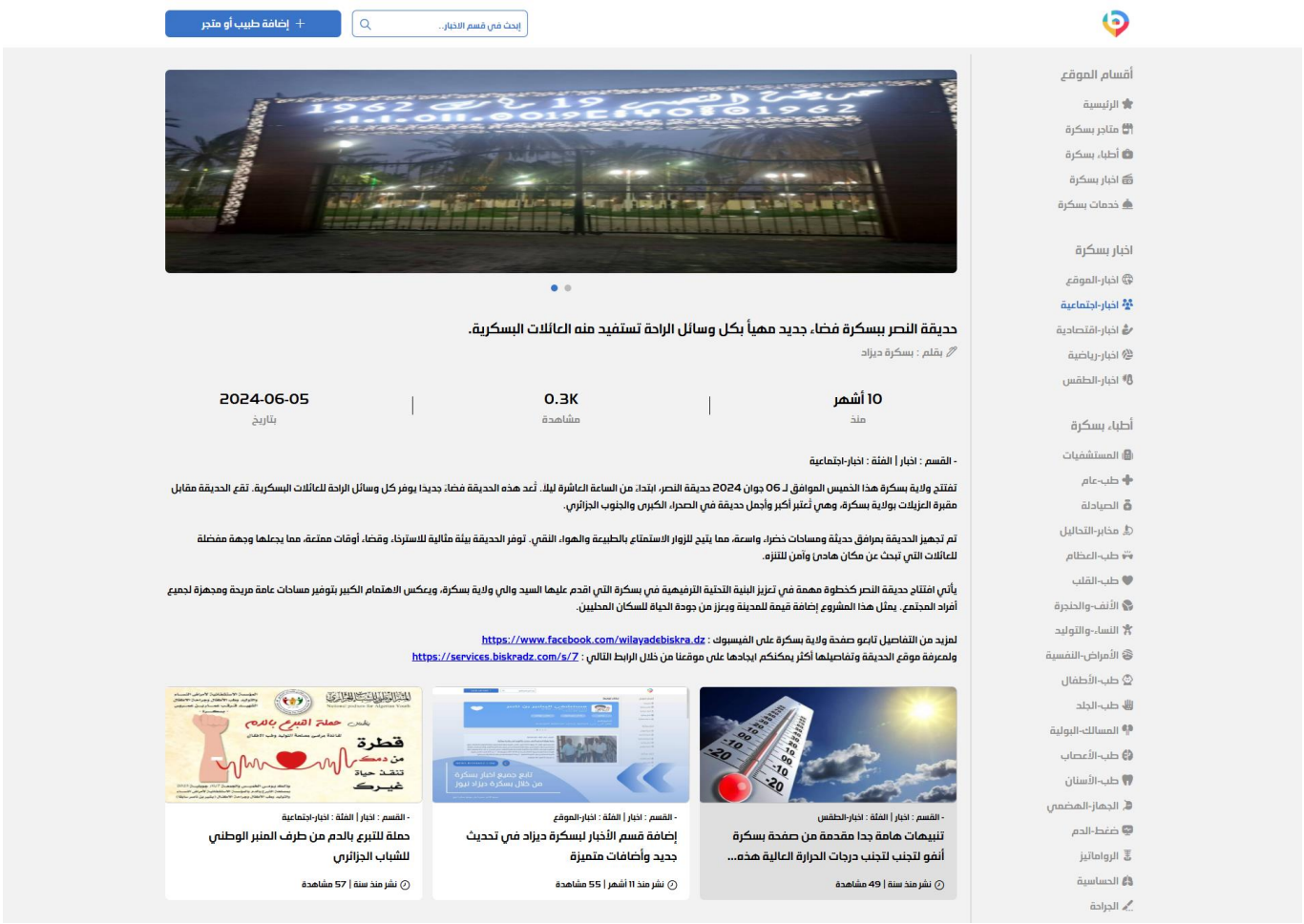


Figure 3.7: An article page on desktop view

The article page on mobile view using the same previous article (Figure 3.8).

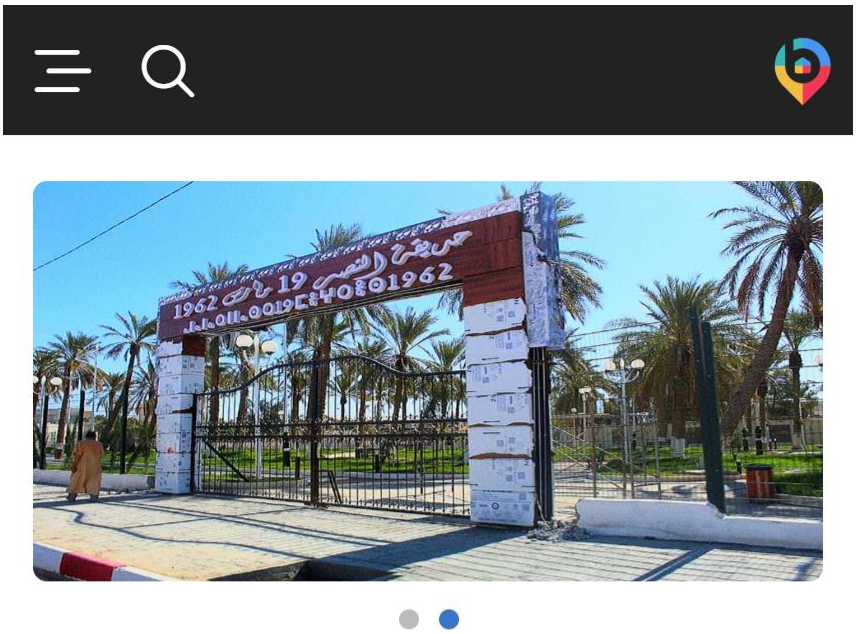


Figure 3.8: An article page on mobile view

3.4.2.3 Doctors

The doctor's class has different sections (Hospitals, General Medicine, Pharmacists, Analysis Labs, Orthopedics, Cardiology, ENT, Obstetrics and Gynecology, Psychiatry, Pediatrics, Dermatology, Urology, Neurology, Dentistry, Gastroenterology, Hypertension, Rheumatology, Allergology, Surgery, Ophthalmology, Nephrology, Diabetes, Veterinary Medicine, Speech and Language Pathology), each section having its own related businesses.

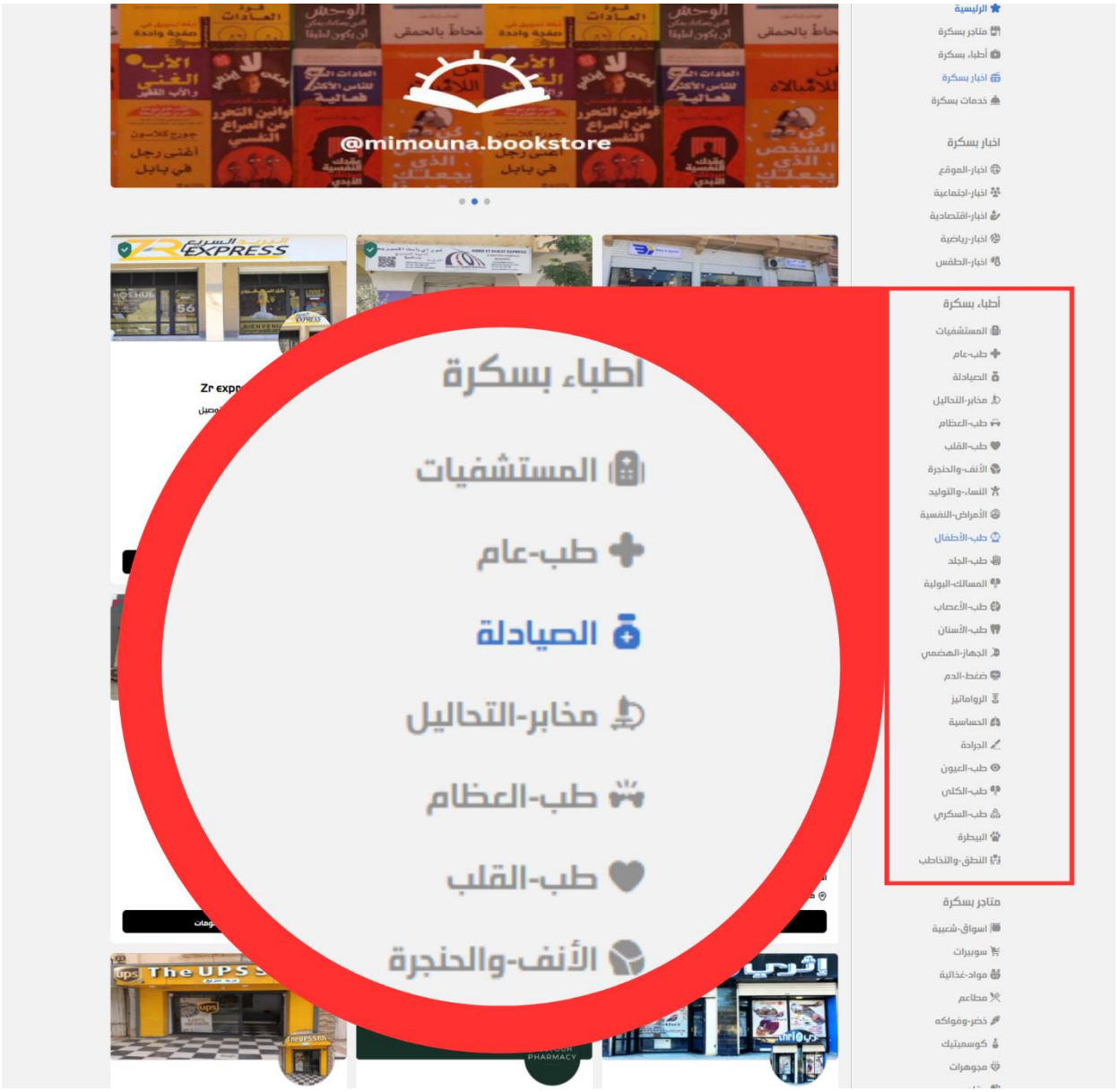


Figure 3.9: Doctors class on desktop view

The following figure (Figure 3.10) represents the doctors page on desktop view. The page used in the example is the Pharmacists page.

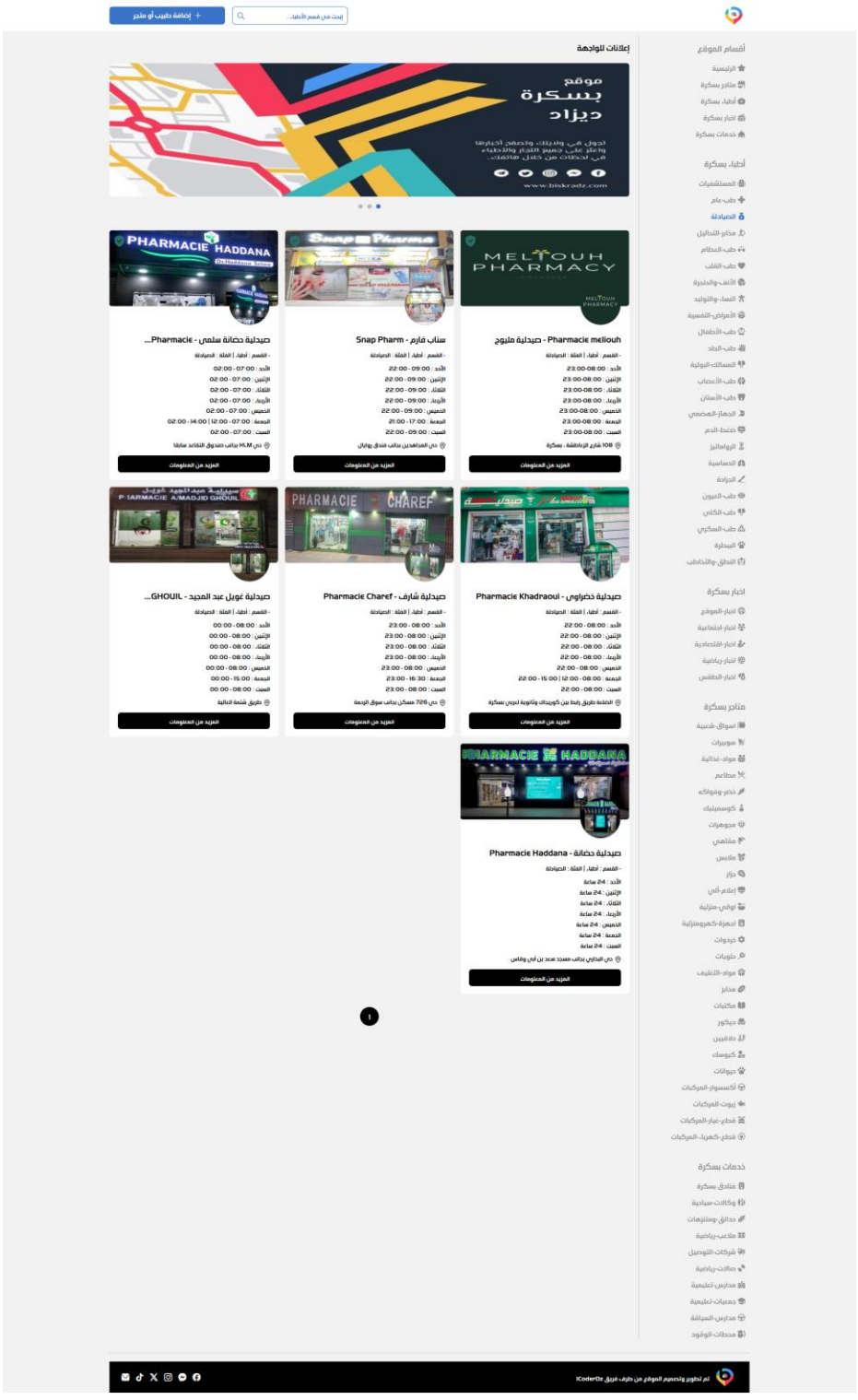


Figure 3.10: Pharmacists' page on desktop view

The business page (Figure 3.11) contains many components, which are: the business name, the business location, the business social media links, the business location on Google Maps, the business rating, the business category, the business phone number, the business opening hours, how many clicks the business, and how many times the business location been requested.

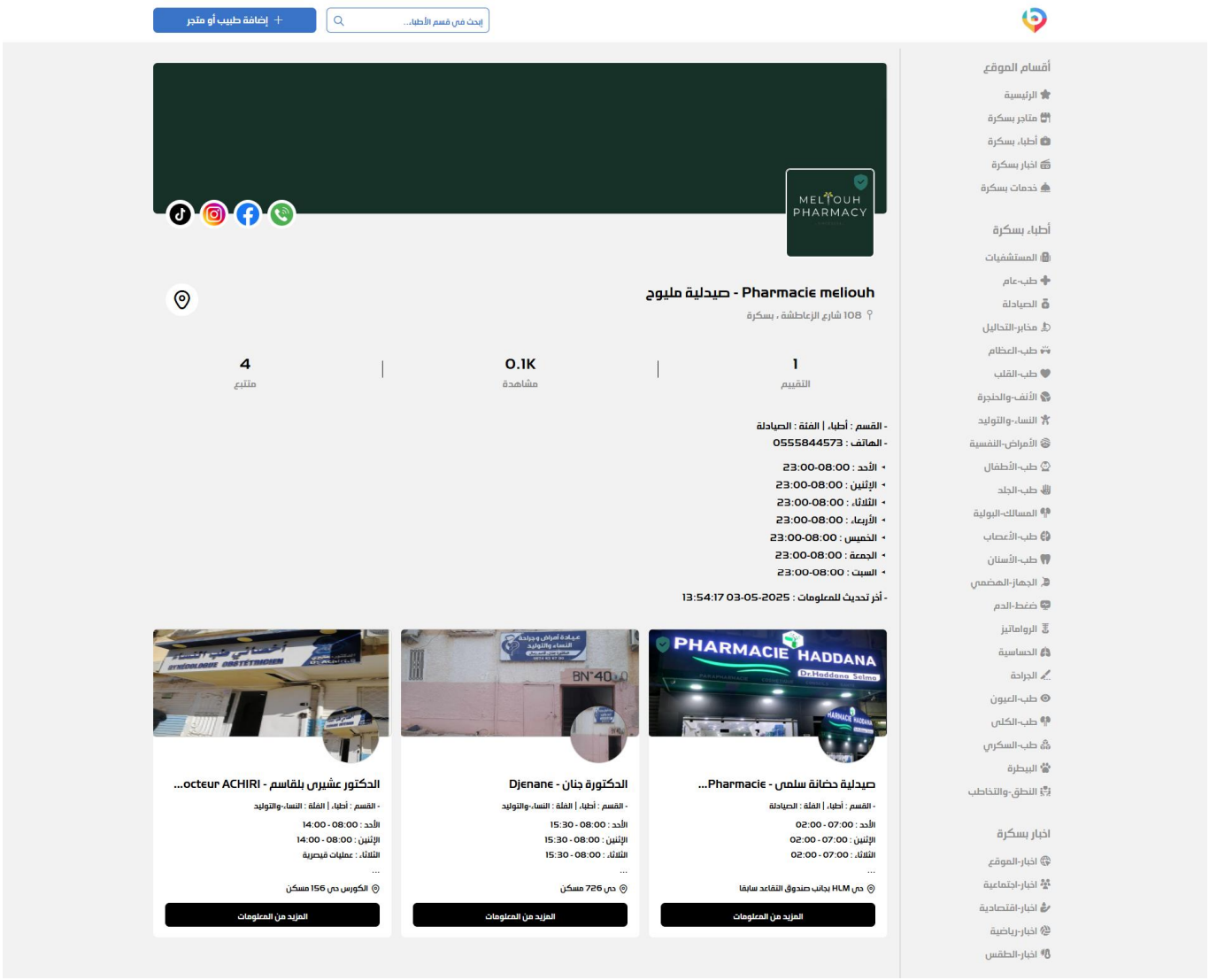


Figure 3.11: A business page on desktop view

REMARK:

The business page is used to represent doctors, stores, and service businesses. All three classes of businesses have the same layout.

The business page on mobile view using the same previous business (Figure 3.12).

Figure 3.12: A business page on mobile view

3.4.2.4 Stores

The store class has different sections (Traditional markets, Supermarkets, Groceries, Restaurants, Vegetables and fruits, Cosmetics, Jewelry, Coffee shops, Clothes shops, Butchers, Tech shops, Kitchenware, Electronics, Tools, Pastries, Bookstores, Furniture, Barber shops, Kiosks, Pet Shops, Vehicle Accessories, Vehicle Oils, Vehicle Spare Parts, Vehicle Electrical Parts), each section has its own related businesses.

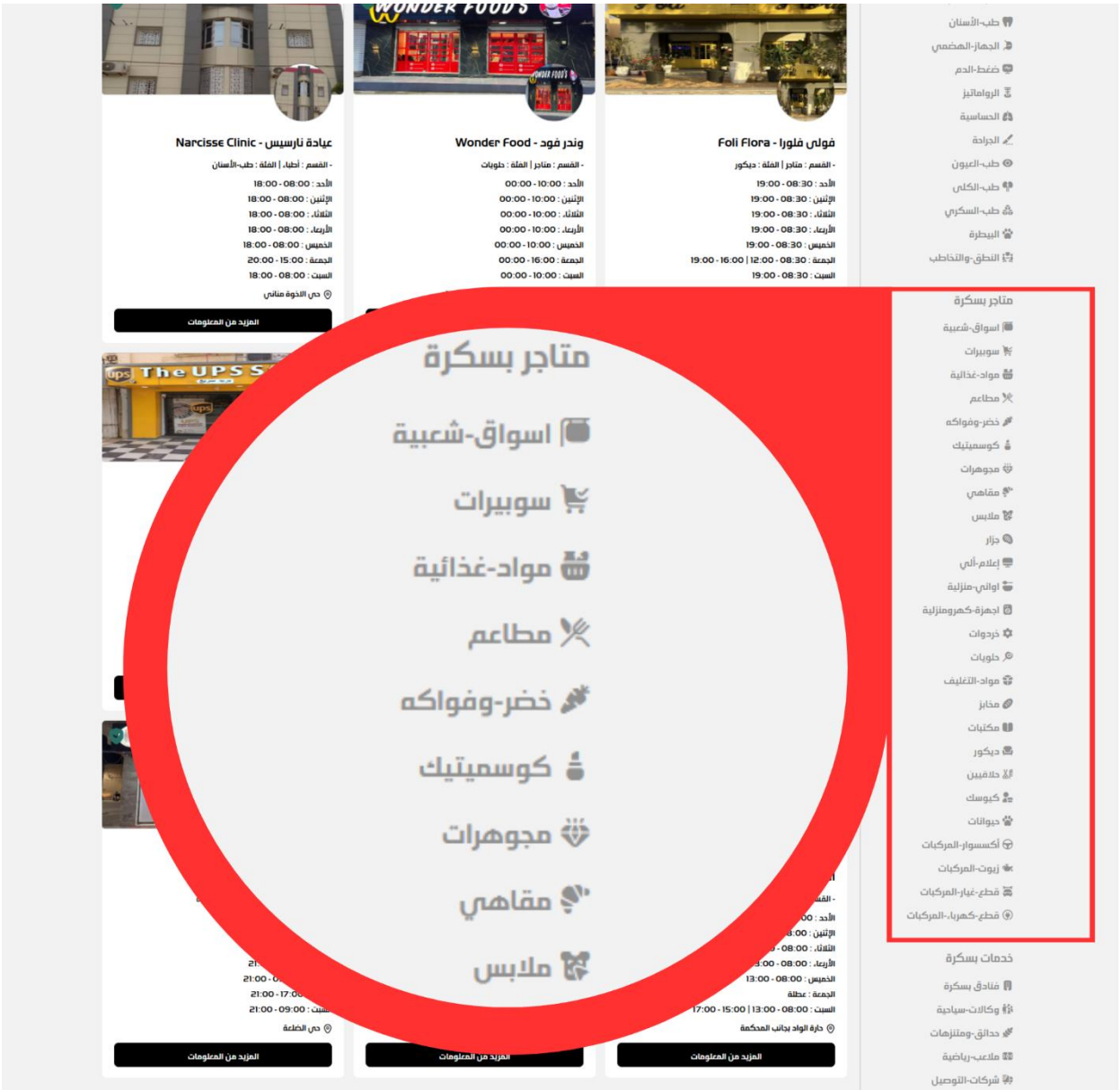


Figure 3.13: Stores class on desktop view

The following figure (Figure 3.14) represents the doctors page on desktop view. The page used in the example is the Groceries page.

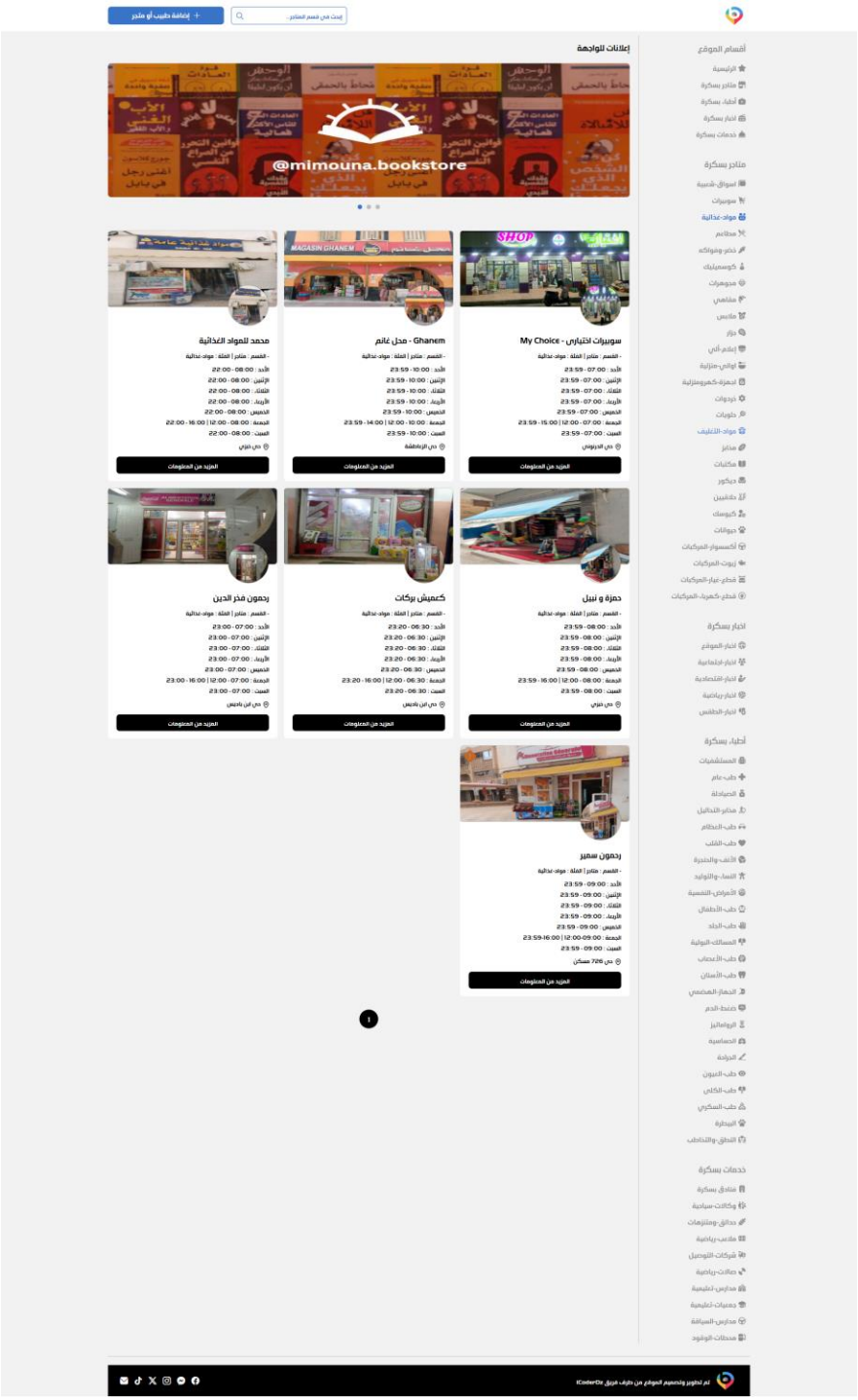


Figure 3.14: Groceries page on desktop view

3.4.2.5 Services

The services class has different sections (Hotels, Travel agencies, Parks, Stadiums, Delivery companies, Gyms, Teaching facilities, Private schools, Driving schools, Fuel stations), each section has its related businesses.

Figure 3.15: Services class on desktop view

3.4.3 Ratings & feedbacks

Every business on the website has a rating based on registered users' reviews only. Users can also add feedback on the business that will be displayed publicly.

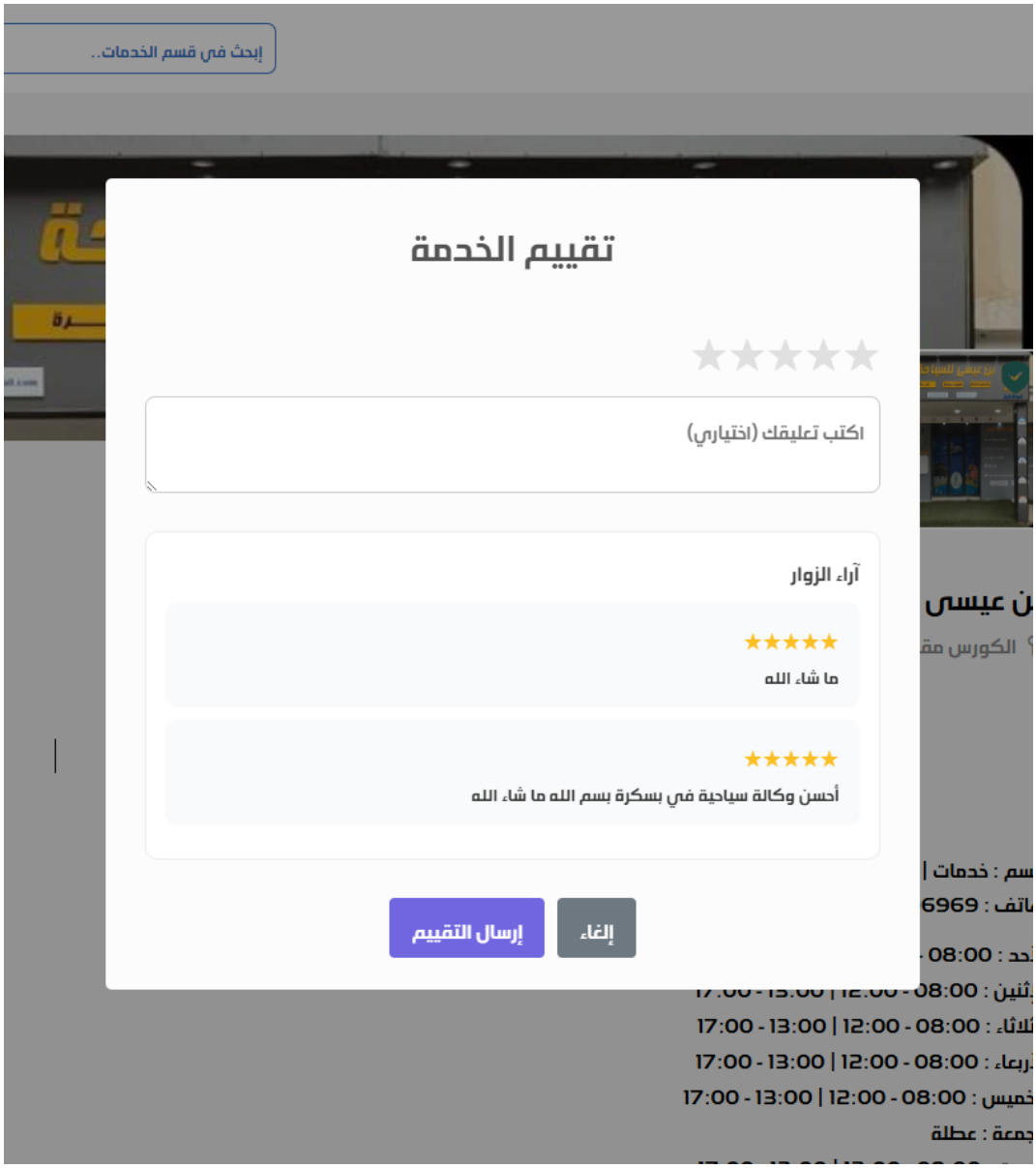


Figure 3.16: Add a rating & feedback on a business

3.4.4 Log-In & Sign-Up

To be able to rate a business or add feedback on the business, visitors must sign up first. In order to create an account on the website, users must fill out the following information: Full name, Email, Password.

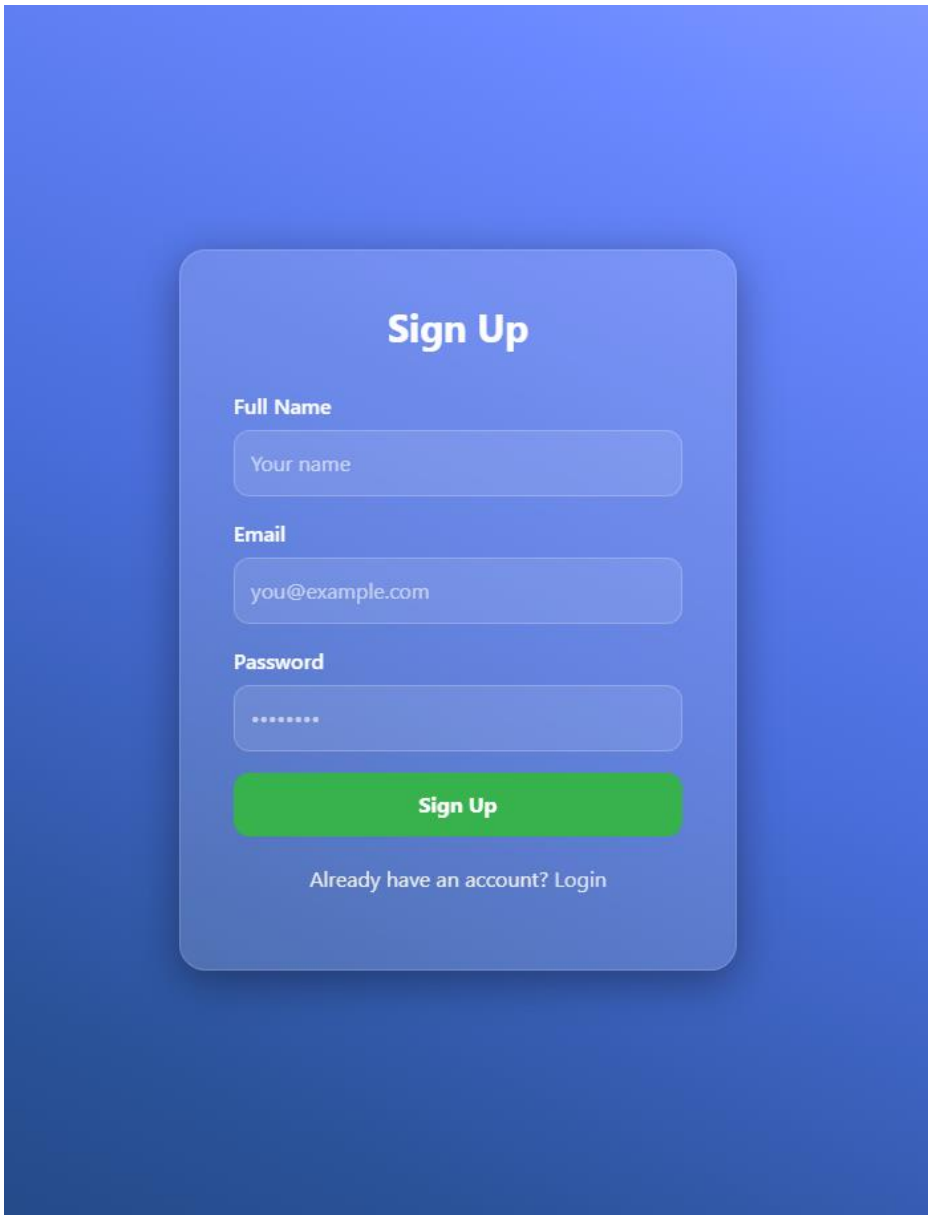


Figure 3.17: Sign-up page

In case the visitor already has an account, they can log in to their account from the login page. The required information to log in is: Email, password.

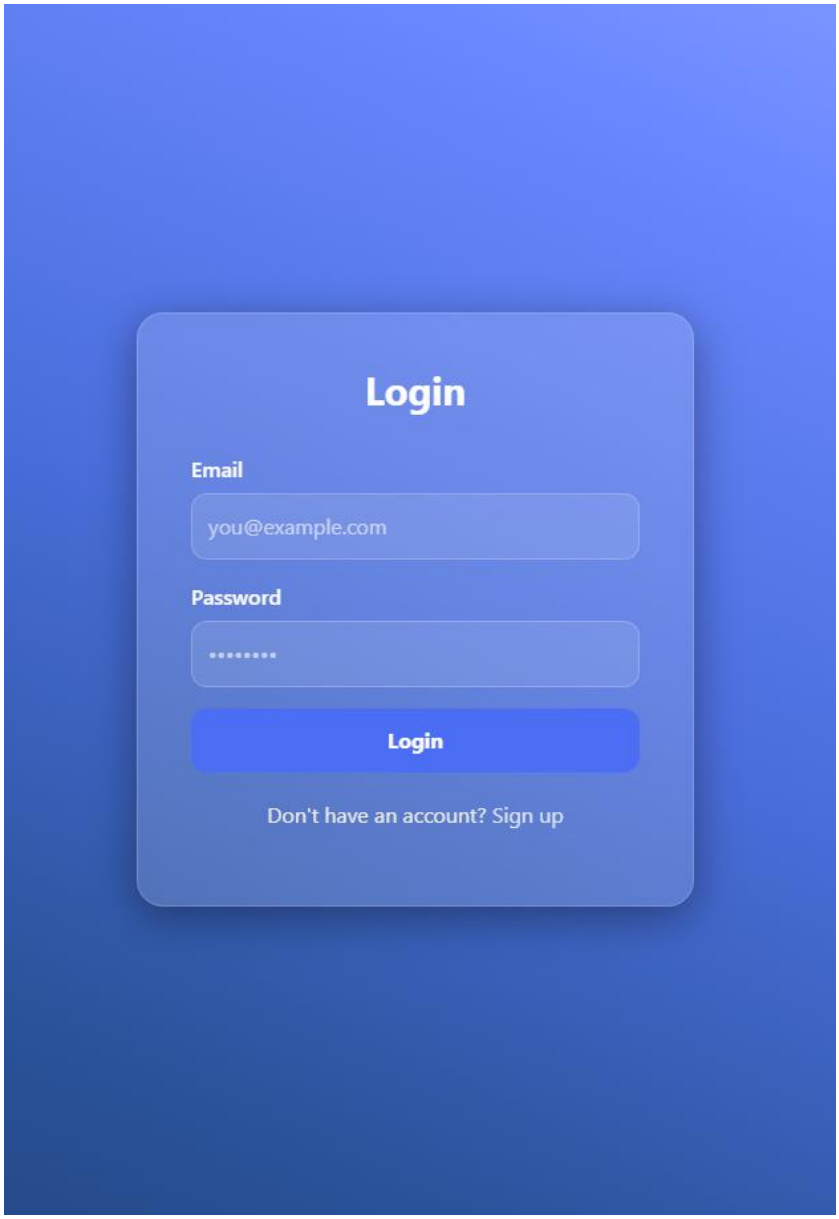


Figure 3.18: Log-in page

3.4.5 Admin page

The admin page contains different statistics on the website data, such as the number of views, the number of clicks on the business location, top-rated businesses, most-viewed businesses, and most-followed businesses. Admins can also manage the businesses, news, and users on the website by adding, removing, or editing anything on them.

3.4.5.1 General statistics

First part, the admin encounter is the general statistics on the whole website.

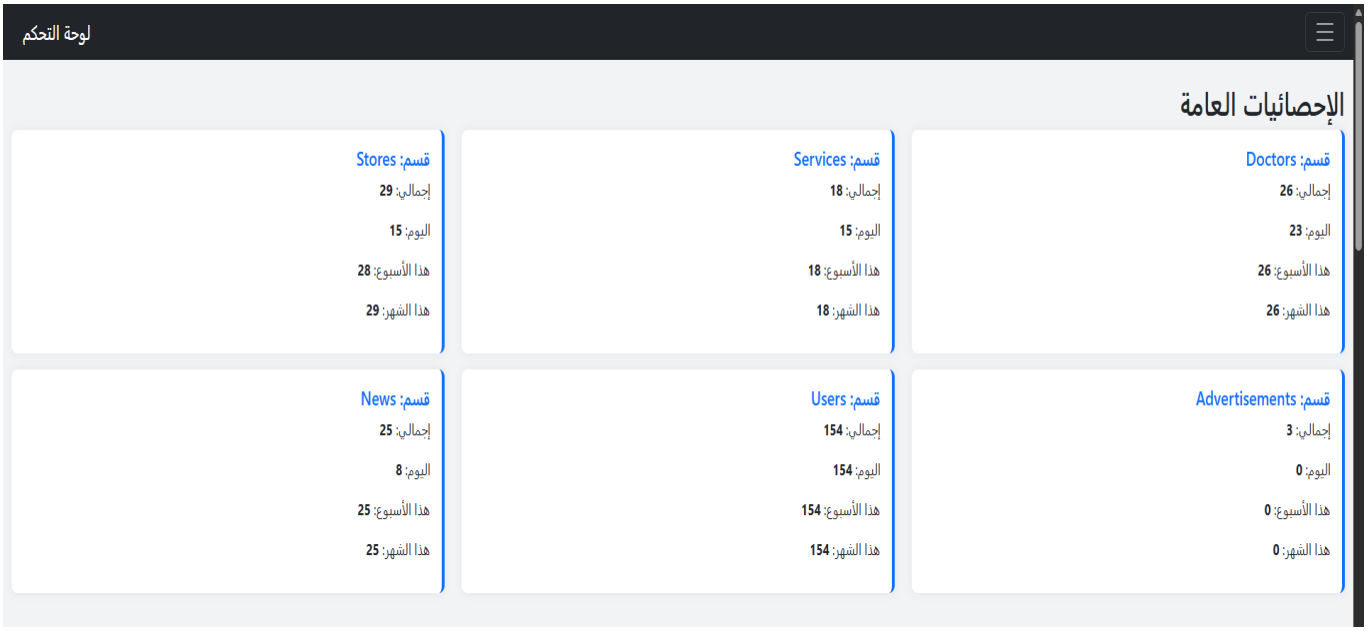


Figure 3.19: General statistics

3.4.5.2 Infographics

The second part will be the infographics, where the website's data is represented by two graphs: a comparison between classes by count graph, and a comparison between classes by periods graph

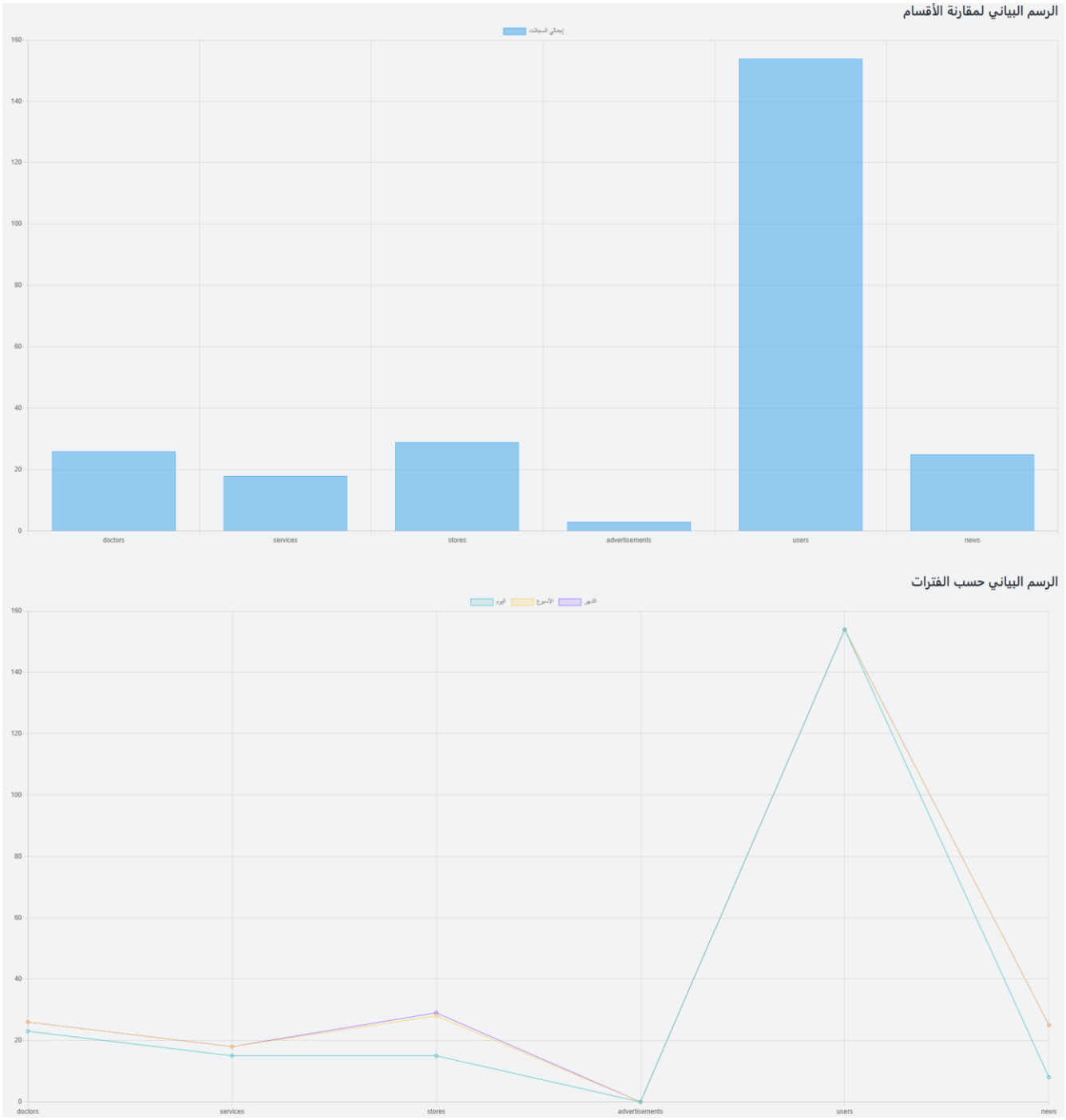


Figure 3.20: Infographics on the website data

3.4.5.3 top-rated / most-viewed / most-followed

In this part, the admin will get to know the three top-rated businesses, the three most-viewed businesses, and the three most-followed businesses.

Figure 3.21: top-rated / most-viewed / most-followed

3.5 Conclusion

In this chapter, we described the steps of implementing the platform. This included the selection of software tools, the creation of database tables, and the development of key website interfaces. Taken together, the three components created a functional environment that satisfied user-friendliness.

General conclusion & Future Perspectives

This thesis has presented the design and development of an all-in-one digital platform for services, businesses, and local information in Algeria. The analysis phase was able to provide a clear understanding of digital platforms and web applications, as well as e-commerce systems, and determined the objectives and context of the project. The design phase presented the structure of the system through UML diagrams and architectural planning. The implementation phase made it possible to develop these designs into a fully functional website prepared to serve users with excellent user interfaces and properly structured data.

Through this work we have shown that a localized user-friendly platform is possible and can engage with societal needs. Improvements will now foster larger scale and user engagement and will focus on performance.

Looking forward for several changes for the evolution of WilayaTech:

- **Geographical Expansion**: Scaling the platform across other wilayas through regional partnerships and volunteer networks.

- **Feature Enhancement**: Introducing tools like interactive maps, live event calendars, or direct contact through the platform.

- **Mobile Optimization**: Developing a mobile application for both Android & iOS users to take advantage of the native features of the operating systems

- **Public and Institutional Collaboration**: Partnering with local government bodies or NGOs to enhance data accuracy and promote official adoption.

In a national context where digital infrastructure is still developing, WilayaTech offers a tangible and locally adaptable solution. Its success will continue to depend on both its technical foundation and its ability to engage communities as co-creators of the information they need.

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