



INTERNATIONAL ISLAMIC UNIVERSITY CHITTAGONG

Department of Computer Science and Engineering

TurfHub

Suggesting Professionalism and Seamless Turf Management

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B. SC. IN COMPUTER SCIENCE AND ENGINEERING

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DECLARATION

We hereby declare that the work in this project is our own except for quotations and summaries which have been duly acknowledged.

16 October 2024

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SUPERVISOR'S DECLARATION

I hereby declare that we have read this project and in my opinion this project is sufficient in term of scope and quality for the award of the degree of B. Sc. in Computer Science & Engineering.

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TurfHub

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ABSTRACT

TurfHub is a web-based platform designed to simplify the process of turf booking, enhance community engagement, and support the management of turfs for owners. By centralizing access to turfs across Chittagong, TurfHub offers players the ability to seamlessly browse, book, and manage turf reservations in real-time, reducing reliance on fragmented methods like social media and word-of-mouth. The platform is equally beneficial for turf owners, offering them a free listing service, user management tools, and data analytics to optimize usage.

TurfHub also fosters social interaction within the sports community through its community feature, which allows teams to search for players and vice versa, encouraging collaboration and match organization. Additionally, the platform integrates a merchandise marketplace, generating revenue while providing players with easy access to sports gear. With its user-friendly interface, real-time updates, and a vision for scalability and expansion, TurfHub positions itself as a valuable tool for both players and turf owners, enhancing the sports culture in Chittagong and beyond.

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CHAPTER 1: INTRODUCTION

1.1 Research Background

Sports play a vital role in promoting physical health, mental well-being, and community engagement. Regular participation in sports helps reduce the risk of chronic diseases like obesity and cardiovascular problems, improves mood and cognitive function, and fosters a sense of teamwork and collaboration among participants (Wolbring et al., 2022). In Chittagong, the growing number of artificial turfs is transforming how people access sports facilities (Chowdhury, 2024). These turfs provide an accessible and flexible option for people to book private sessions, making sports more available to different parts of the community. Unlike public fields that may be far from many residential areas or restricted by local usage, turfs can be conveniently located in open spaces and can be used for various sports and events.

The artificial turf business is rapidly expanding in Chittagong (Hoque, 2024), with more investors recognizing the sector's potential. This rise in turf facilities reflects the increasing demand for sports infrastructure in urban areas. With more people seeking spaces for recreational sports and organized games, the turf business presents a unique opportunity to cater to this growing market (Straw et al., 2021). As the popularity of these facilities grows, so does the competition among turf owners, highlighting the need for platforms that can connect players and turf managers efficiently.

1.2 Problem Statement

In Chittagong, players and turf owners encounter several challenges despite the growing number of artificial turfs in the city. One of the main problems is the lack of a centralized platform that efficiently connects players with turf owners, making it difficult for players to find and book available turfs. Turf owners also face difficulties in maximizing their turf usage due to limited visibility and access to potential customers. While some turf booking platforms exist, they either do not offer additional benefits to turf owners or lack comprehensive features that could make the booking process more streamlined. TurfHub aims to solve these issues by providing a free, simple, and centralized booking system for both players and turf owners. Unlike other platforms, TurfHub will generate revenue by selling merchandise to players, rather than charging fees to either the players or turf owners. This model ensures that turf owners can list their turfs without financial constraints, and players can book their preferred locations with ease, benefiting the entire sports community.

1.3 Motivation

The motivation for building TurfHub stems from the experiences of students, teachers, and everyday players like us who regularly use these turfs for leisure and fitness. Many of us, including our project supervisor, play on these turfs frequently, but one of the recurring problems we face is the lack of accessible information about the turfs. Details such as the condition, facilities, or location of turfs are often unclear. Relying on word-of-mouth or social media is slow and unreliable, especially when we need information quickly.

Playing on turfs is more than just a physical activity; it's a way for friends, families, and colleagues to bond and enjoy group sports. For such meetups, we need a reliable system that provides quick access to turf information, independent of social media. Furthermore, many people struggle to find information about the turfs or compare them easily, highlighting the need for a centralized platform.

To address this, we developed TurfHub as a free service for turf owners, allowing them to list their turfs without any financial burden. The platform sustains itself through merchandise sales, offering players a convenient way to purchase turf-specific kits and gear. Additionally, integrating SSLCOMMERZ has streamlined the payment process, ensuring secure transactions for bookings and enhancing the overall user experience. The development of an Android app also allows users to access TurfHub easily on mobile, making booking more convenient.

This model allows TurfHub to serve both players and turf owners while generating revenue through merchandise and providing a seamless booking experience.

1.4 Objective of Project

The objective of TurfHub is to provide a platform that simplifies turf booking while fostering community engagement in sports. Our key goals are:

1. **Centralized Booking Platform:** To offer a user-friendly system where players can find and book turfs with real-time information on availability and location.
2. **Community Engagement:** To create a space where teams can find players, and individuals can join teams, encouraging social connections and match organization.
3. **Free Service for Turf Owners:** To provide turf owners with a free listing service, maximizing turf usage and increasing visibility.
4. **Revenue through Merchandise:** To generate revenue by offering sports merchandise, adding value for users and sustaining the platform.

1.5 Scope of Project

TurfHub project aims to provide a comprehensive platform that caters to both players and turf owners in Chittagong. The scope of the project includes the following key aspects:

1. **Centralized Platform Development:** A user-friendly web and mobile application that allows players to browse, book turfs, and make secure payments through SSLCOMMERZ, simplifying the booking process across the city.
2. **User Registration and Profiles:** The platform allows users to create and manage personalized profiles, where they can update their information, view favorite turfs, booking history, community posts, and shopping purchases. This feature personalizes the user experience and provides easy access to all relevant information.
3. **Community Features:** A dedicated community page will connect players and teams, facilitating match organization and strengthening social engagement.
4. **Free Listing for Turf Owners:** Turf owners can list and manage their turfs for free, gaining real-time insights into turf usage and bookings, without incurring costs.
5. **Revenue through Merchandise Sales:** The platform will generate revenue by selling sports merchandise, such as turf-specific kits, offering convenience to players while keeping the service free for turf owners.
6. **Real-Time Booking and Availability:** Players will receive real-time updates on turf availability and can instantly book sessions through the platform.
7. **Ongoing Testing and Maintenance:** Rigorous testing, regular updates, and ongoing maintenance will be key to ensuring the platform's stability, functionality, and user satisfaction.
8. **Scalability and Expansion:** As the platform grows, it will scale to include more turfs and expand beyond Chittagong, adapting to a larger user base and different regions.

CHAPTER 2: LITERATURE REVIEW

2.1 Decentralized Sports Infrastructure and Limited Access to Turfs

In the context of TurfHub, "decentralized sports infrastructure" refers to the disorganized and scattered nature of turf facilities across Chittagong. Currently, the city has over 60 artificial turfs, but they are not connected by any centralized platform, making it difficult for players to locate and book available turfs. This decentralized system creates several challenges for both players and turf owners. For players, it often leads to confusion and delays in booking, as many rely on social media groups or word-of-mouth, which are not efficient for real-time bookings or gathering necessary information about the quality and availability of turfs (Elsborg et al., 2019).

Similarly, turf owners face difficulties in attracting new customers due to limited visibility. Existing systems for booking turfs are either paid services or lack significant features that could simplify the booking process. As a result, many turfs remain underutilized. This issue highlights the importance of creating a centralized platform, like TurfHub, which would streamline the booking process, increase the visibility of turfs, and make it easier for both players and turf owners to connect.

Physical Activity and Community Engagement are also major concerns in the current decentralized system. Sports, especially organized physical activities, play a crucial role in improving both physical and mental well-being. Research consistently shows that participation in organized sports can reduce the risk of chronic diseases, such as obesity and cardiovascular issues, while also promoting mental health and social interaction (Garcia et al., 2022). In Chittagong, turf-based activities provide an opportunity for players to engage in these beneficial sports activities, but the absence of a unified platform makes it difficult to organize such events consistently.

TurfHub aims to address this gap by providing a centralized solution where players can find, review, and book turfs easily. It also plans to introduce a community page where teams can find players, and individuals can search for teams, fostering social engagement and making the process of organizing matches more accessible. By connecting players and turf owners seamlessly, TurfHub not only promotes physical fitness but also strengthens the sense of community among sports enthusiasts (Wolbring et al., 2022)

2.2 Interventions to Promote Turf Usage and Community Engagement

The TurfHub project incorporates a variety of strategies aimed at making turf access easier for players while encouraging social interaction through sports. These interventions are designed to address the current challenges in turf booking and community engagement in Chittagong, creating an inclusive environment for all users. Below is an overview of the interventions integrated into TurfHub:

- 1. Centralized Booking System:** TurfHub provides a streamlined booking platform that allows players to easily find and reserve turfs in real-time. This intervention eliminates the confusion of finding available turfs through social media and helps players plan their activities more efficiently.
- 2. Community Page for Team and Player Search:** TurfHub encourages collaboration and social interaction by providing a community page where users can form or join teams, and players can find matches. This feature fosters a sense of teamwork, promotes healthy competition, and builds a stronger sports community.
- 3. Free Service for Turf Owners:** TurfHub offers turf owners a free platform to list their turfs, manage bookings, and increase visibility without any financial burden. This intervention ensures that more turfs are available to players, addressing the issue of underutilized facilities.

4. **Merchandise Marketplace:** To sustain the platform, TurfHub integrates a merchandise store where players can buy sports kits and gear. This not only generates revenue but also provides users with a convenient one-stop solution for their sporting needs.
5. **Inclusivity:** TurfHub aims to be inclusive by welcoming users of all ages, skill levels, and backgrounds. The platform ensures that everyone, from casual players to competitive teams, can benefit from its features, encouraging wider participation in sports and physical activities.

2.3 The Role of Technology in Addressing the Issue

TurfHub leverages web-based technology to streamline turf bookings and foster community interaction. By providing a centralized platform, it connects turf owners and players, offering real-time turf availability, easy booking, and communication without relying on social media or manual methods. The platform's community page allows teams to find players and vice versa, promoting social engagement.

Additionally, TurfHub includes a marketplace for sports merchandise, supporting the platform financially without charging users. Real-time notifications keep players and turf owners informed, enhancing convenience and efficiency. This technology-driven approach makes turf booking more accessible and organized for everyone in Chittagong.

2.4 The Growing Phenomenon of Turf Sports

Turf sports have become increasingly popular in urban areas like Chittagong, where artificial turfs provide convenient spaces for organized sports. As more people turn to turfs for both recreational and competitive games, there is a growing demand for platforms that simplify the process of finding and booking these facilities. TurfHub taps into this trend by offering a centralized solution that allows players to easily access and book available turfs, promoting greater participation in sports activities.

In addition to providing convenience, TurfHub also fosters community engagement through its features, such as team and player search. This encourages social interaction, teamwork, and the organization of matches, contributing to a more vibrant local sports culture. Through these efforts, TurfHub is set to play a key role in making turf sports more accessible and enjoyable for all.

CHAPTER 3: PROJECT CONCEPT AND VISION

3.1 TurfHub - A Centralized Turf Booking Platform

TurfHub is an innovative web-based platform designed to streamline how players and turf owners engage with turf sports. It bridges the gap between decentralized turf facilities and players seeking to book spaces for recreational or competitive matches. With an easy-to-use interface, TurfHub simplifies the booking process by providing real-time information on turf availability, location, and features, all in one place.

The platform caters to a wide range of users, from casual players looking for a space to enjoy sports with friends, to organized teams seeking regular practice grounds. TurfHub's intuitive design ensures that users of all backgrounds can navigate the site effortlessly, making the booking process straightforward and efficient. By allowing turf owners to list their facilities for free, TurfHub offers an appealing option for those looking to attract more bookings without incurring additional costs.

A key feature of TurfHub is its community-building functionality. The platform allows teams to search for players, and individuals to find teams, promoting social interaction and fostering the formation of new connections within the sports community. This feature encourages teamwork and collaboration, creating a dynamic environment where users can not only book turfs but also engage with other players.

While TurfHub remains free for both turf owners and players, it generates revenue through the sale of sports merchandise. Players can purchase turf-specific kits and sports gear directly from the platform, adding value to their experience while supporting the sustainability of the service. This approach not only keeps the platform financially viable but also provides users with convenient access to necessary equipment.

In summary, TurfHub's vision is to centralize the turf booking process, making it more accessible, organized, and community-focused. By connecting players and turf owners on a single platform, TurfHub simplifies the logistics of sports activities while fostering a vibrant sports culture. Its innovative approach and commitment to offering a free, user-friendly service make it a valuable asset to the sports community in Chittagong and beyond.

3.2 Centralizing Turf Access – The Vision for TurfHub

TurfHub represents a visionary approach to making turf sports more accessible and organized across Chittagong. Instead of focusing on the physical creation of new spaces, TurfHub's mission is to centralize and optimize the existing network of turfs, providing an online platform where players can easily find and book available turfs. This system brings together scattered turf locations into a single, easy-to-navigate space, giving users more options and flexibility when planning sports activities.

The platform's goal is to act as a central hub where players, teams, and turf owners can interact seamlessly. By connecting users directly to turf facilities, TurfHub encourages increased usage of these spaces and enhances the overall sports culture in the city. The platform does this by offering detailed information about each turf—availability, location, amenities—helping players make informed decisions about where to play.

TurfHub is not only about making the booking process easier but also about fostering community engagement. Through the platform's team and player search features, users can

find others to play with, whether they are looking to form a new team or just need additional players for a match. This sense of collaboration is at the core of TurfHub's vision, creating an inclusive sports environment where both casual and competitive players can connect and enjoy their experience.

In conclusion, TurfHub's mission is to centralize and streamline turf access, making sports more accessible, enjoyable, and organized for the entire community. By optimizing existing turf facilities and building a connected sports network, TurfHub inspires players to engage in regular physical activities, supporting a more active and socially connected lifestyle.

3.3 Target Audience

TurfHub is designed for two primary audiences: players aged 15 and above, and turf owners. For players, it provides a convenient way to book turfs, form teams, and organize matches. The platform caters to individuals seeking structured environments for both recreational and competitive sports. Turf owners benefit from a free, centralized platform to list their turfs, manage bookings, and attract more users, maximizing their turf's usage without added costs.

CHAPTER 4: DEVELOPMENT APPROACH

4.1 Agile Scrum Methodology

For TurfHub, we have chosen Agile Scrum Methodology as our development approach due to its flexibility and collaborative nature. This methodology divides the project into short, iterative cycles called sprints, where each sprint focuses on delivering specific features of the platform. Given the dynamic nature of TurfHub—such as integrating real-time booking, community features, and merchandise sales—Agile Scrum allows us to adapt quickly to changing requirements and user feedback.

The flexibility of Agile Scrum is essential for TurfHub as we continuously improve the user experience for both players and turf owners. Throughout the development process, user feedback will be incorporated in each sprint, ensuring that the platform evolves to meet the needs of the community. This iterative approach enables us to deliver functional updates, resolve issues, and introduce new features without disrupting the entire project timeline.

Agile Scrum also emphasizes collaboration between different team members, including developers, designers, and business stakeholders. This is crucial for TurfHub, as our platform not only focuses on the technical aspect of turf booking but also on community engagement and merchandising. The Scrum framework ensures that all stakeholders remain aligned throughout the project's development.

By prioritizing user feedback and allowing flexibility to make changes, Agile Scrum ensures that TurfHub will remain user-centered and responsive, helping us deliver a successful platform for the sports community in Chittagong.

4.2 Team Collaboration and Communication

Team collaboration and Agile Scrum methodology are also central to the success of TurfHub. Our cross-functional team, with expertise ranging from web development to user experience design, ensures all aspects of the turf booking platform are thoroughly covered. Daily stand-up meetings and sprint planning sessions foster clear communication and allow for dynamic task prioritization based on user feedback and evolving needs.

An open feedback culture and sprint retrospectives further enhance our ability to adapt and improve. This collaborative approach helps ensure that TurfHub remains a unified, high-quality product tailored to both players and turf owners, enabling seamless booking and community engagement in Chittagong's turf sports scene.

4.3 Continuous Integration and Deployment with GitHub, Vercel, and Domain Hosting

Along with leveraging GitHub and Vercel for Continuous Integration and Deployment, we have secured a dedicated domain for the TurfHub platform. This domain acts as the primary hub for all user interactions, offering a seamless experience for both web and mobile users. The domain enhances accessibility and ensures that TurfHub remains visible and easily discoverable for the sports community.

4.4 Tools and Techniques

4.4.1 IDE (Visual Studio Code): For TurfHub's development, we used Visual Studio Code (VS Code), a lightweight yet powerful code editor. Its efficiency and customization options make it ideal for managing TurfHub's complex components like bookings, user profiles, and admin functions. VS Code's support for extensions and its seamless integration with Git enhance productivity, allowing our team to

collaborate and streamline workflows effectively. The editor's intuitive interface and flexibility make it an essential tool in the development process.

4.4.2 Frontend Tools and Techniques: The development of the TurfHub website's frontend was powered by a range of tools and technologies that helped create a responsive and user-friendly platform. These include React, Tailwind CSS, React Query, Ant Design (AntD), and Chart.js, among others. These tools were strategically selected to ensure an efficient development process, improve user experience, and manage dynamic data effectively.

4.4.2.1 React: React is the foundation of TurfHub's frontend development. It allows us to create a highly interactive user interface that can dynamically render components and handle user inputs efficiently. Its component-based architecture promotes reusability, meaning we can break down the UI into smaller, manageable pieces, like booking forms and turf details, which can be reused throughout the platform. React also enables fast updates by only re-rendering the components that need updating, enhancing the overall performance and responsiveness of the site.

4.4.2.2 Tailwind CSS: Tailwind CSS is a utility-first CSS framework that was used for styling TurfHub. Its flexibility allowed us to build responsive, consistent layouts quickly without writing extensive custom CSS. Instead of relying on pre-designed components, Tailwind provides utility classes that can be directly applied to HTML elements, offering more control and customization. This resulted in a visually cohesive design across all pages, while keeping the codebase clean and maintainable. It's especially useful in ensuring the site looks great across different devices with minimal effort.

4.4.2.3 Ant Design (AntD): Ant Design is a comprehensive UI component library that helped us create key interface elements like forms, buttons, modals, and navigation menus. These pre-built components are not only visually consistent but also highly customizable, allowing us to tailor them to TurfHub's branding and user needs. Ant Design sped up the development process by eliminating the need to build these UI elements from scratch, all while ensuring the user interface remains intuitive and user-friendly.

4.4.2.4 React Query: React Query was used to manage asynchronous data fetching and server-state management. This tool is crucial for ensuring efficient and real-time data handling for operations like fetching turf availability, booking data, and user information. React Query automates the process of caching and syncing data between the client and the server, making it easier to keep the app in sync with the latest information. It also reduces boilerplate code associated with handling data fetching and updates, improving both the performance and the developer experience.

4.4.2.5 ChartJS: Chart.js was implemented for data visualization, such as displaying booking statistics and usage reports for turf owners. This lightweight charting library allows us to create various interactive graphs (e.g., line charts, bar charts) that present data in a clear and intuitive manner. By visualizing data trends, Chart.js helps both turf owners and admins make data-driven decisions about their operations, offering insights into turf utilization, user activity, and more.

4.4.2.6 Flutter web view & Android Studio: To extend TurfHub functionality to mobile devices, we used Flutter WebView in combination with Android Studio for developing the Android app. Flutter WebView

enables us to integrate web content seamlessly into the mobile app while maintaining a consistent user experience with the web platform. Android Studio served as the primary IDE for building and testing the Android app, allowing us to optimize the app for performance and compatibility across various Android devices. This hybrid approach ensures that TurfHub is accessible to users on both web and mobile platforms.

4.4.3 Backend tools and techniques: The backend development of the TurfHub platform was built using TypeScript alongside a stack of robust technologies to ensure a scalable, secure, and maintainable server-side operation. TypeScript provides static typing, helping prevent runtime errors and making the codebase easier to manage and scale. Here's a breakdown of the main tools and technologies:

4.4.3.1 MongoDB (with Mongoose): MongoDB, a NoSQL database, is used to store user data, turf details, and booking information. We utilize Mongoose to define schemas and interact with the database, making data queries more structured and reliable. TypeScript further enhances this by providing type definitions for database models.

4.4.3.2 JSON Web Token – (JWT): JWT is implemented for secure user authentication and authorization. It allows TurfHub to manage sessions in a stateless, token-based manner, improving scalability and performance for user-related operations.

4.4.3.3 BCRYPT: Bcrypt is used to securely hash user passwords before storing them in the database. This ensures that sensitive information remains protected, even in case of database breaches.

4.4.3.4 NodeMailer: NodeMailer manages the platform's email functionality, sending confirmation emails for bookings, password resets, and other notifications. This integration helps maintain user engagement and communication.

4.4.3.5 Swagger: For API documentation, we use Swagger, with Swagger-jsdoc and Swagger-UI to generate clear, maintainable documentation of the backend services. This makes it easier for developers to understand and interact with the API endpoints.

4.4.3.6 Validation (Jot & Zod): Joi and Zod are used for validating incoming data and ensuring it conforms to the required formats and types. This minimizes errors and enhances security by preventing invalid data from being processed by the server.

4.5 ERD

A MongoDB Schema Diagram is a visual representation of the database structure, showcasing the relationships between collections and their fields. In the Turf Management System, collections such as User, Turf, Booking, Timeslot, Community, and Product represent key entities, each with its own attributes and relationships. For example:

- **User:** Contains information about individuals, including turf owners and players.
- **Turf:** Represents sports turfs, related to User (owner) and having multiple TurfGround and Activity references.
- **Bookings:** Tracks reservations, linking users, turfs, and timeslots.

This diagram provides an overview of how data is organized and related in the system, essential for understanding its structure and flow.

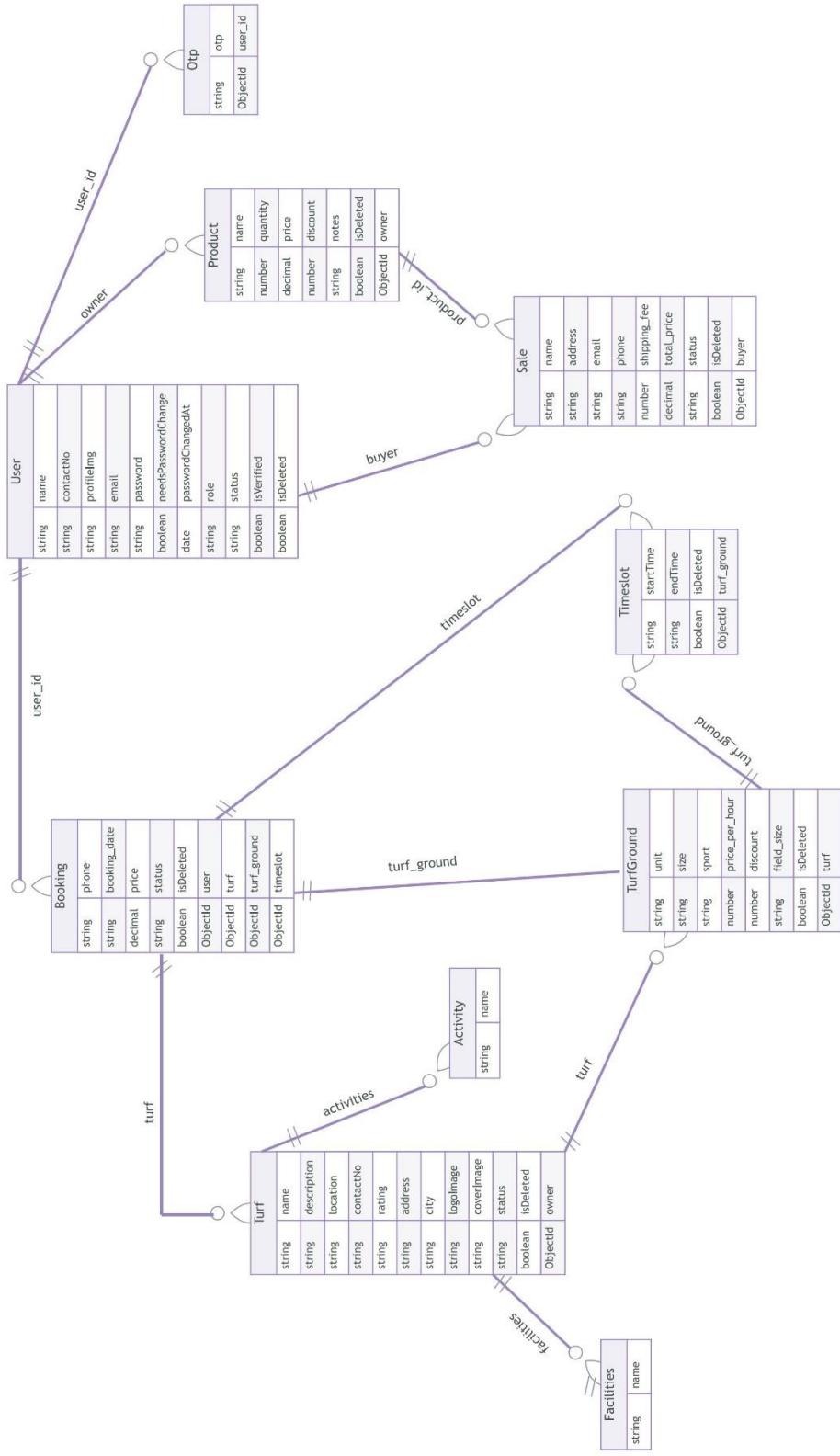


Figure 4.5: MongoDB DB diagram

4.6 Data Flow Diagram

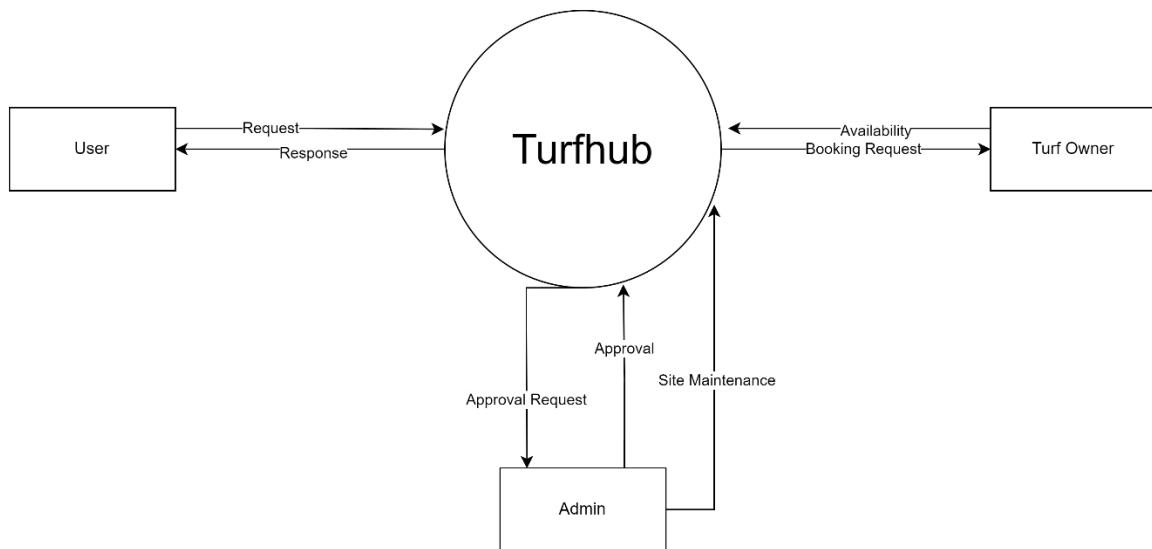


Figure 4.6.1: Level 0 Data Flow Diagram

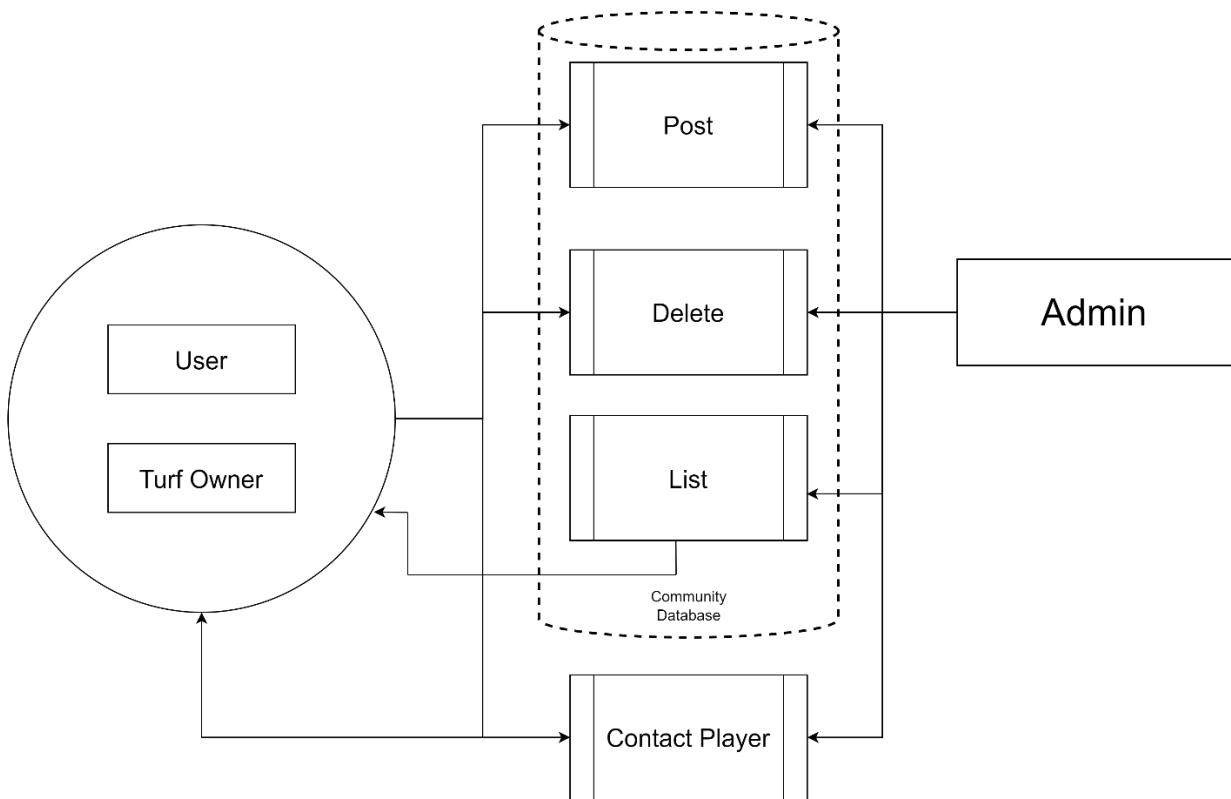


Figure 4.6.2: Level 1 Data Flow Diagram (Community)

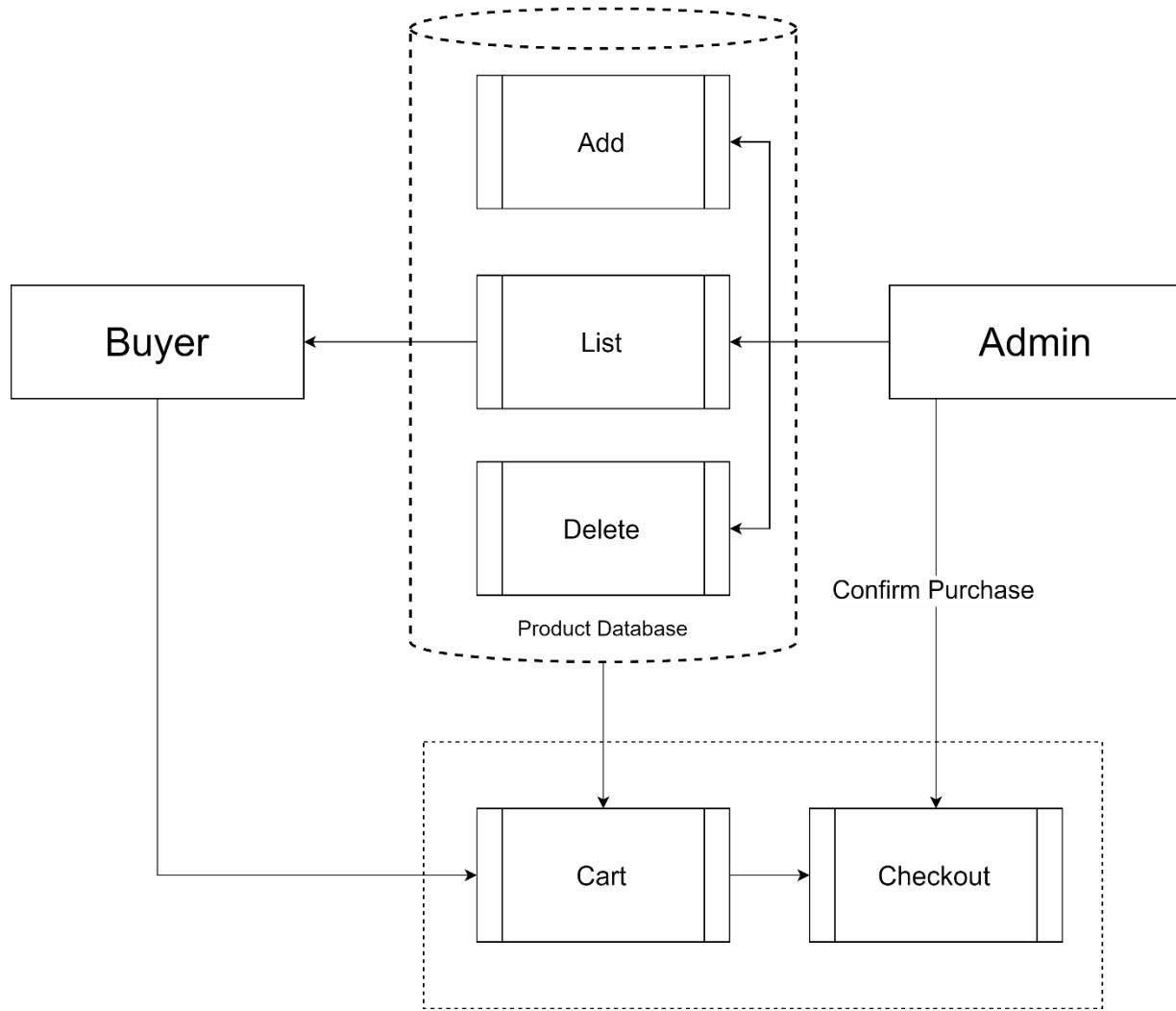


Figure 4.6.3: Level 1 Data Flow Diagram (Shop)

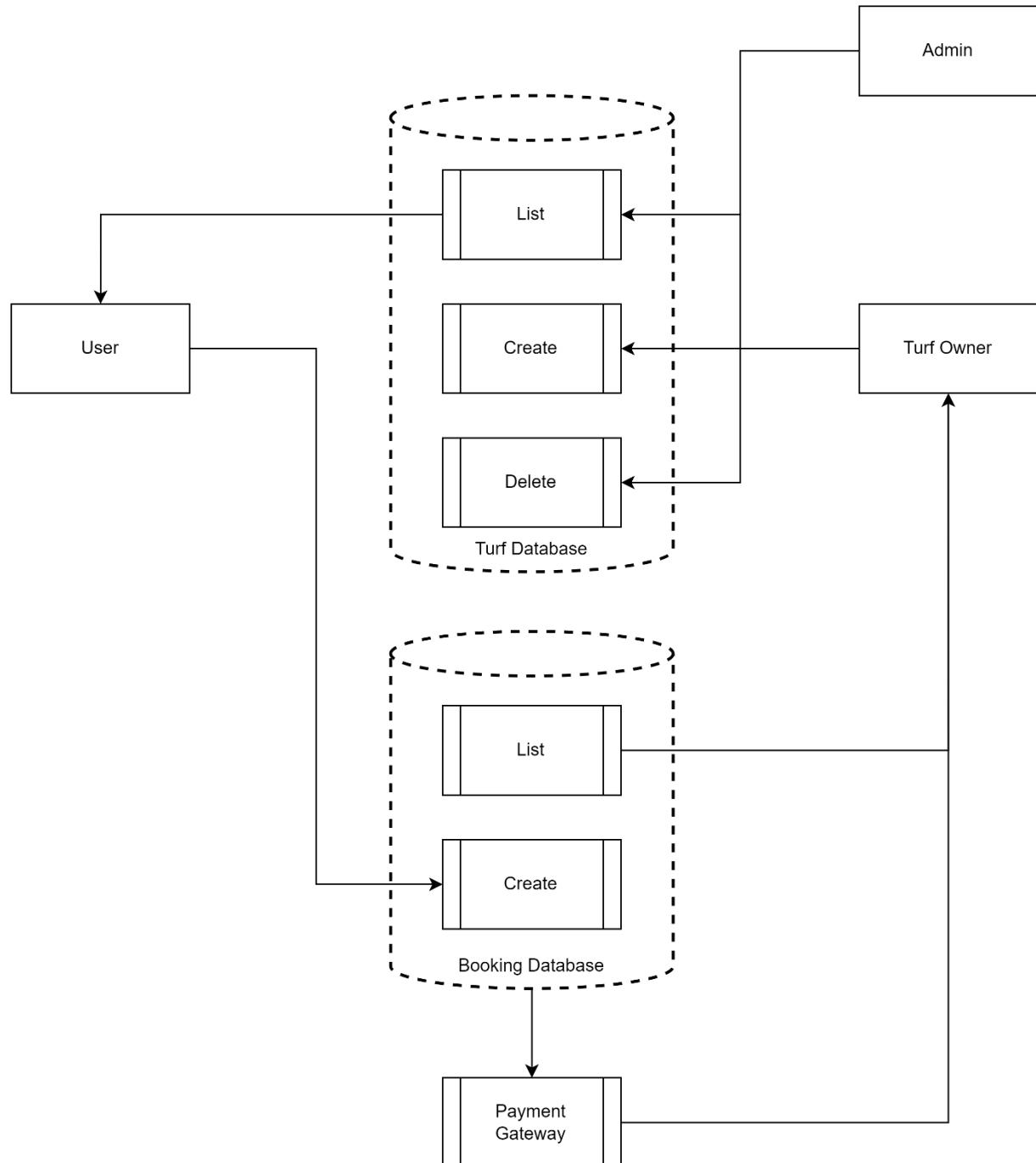


Figure 4.6.4: Level 1 Data Flow Diagram (Booking Turf)

4.7 System Requirements

To ensure smooth development and usage of TurfHub, the following system requirements are defined:

Development Requirements

For Web Application Development:

- **Operating System:** Windows, macOS, or Linux.
- **Node.js:** Version 16.x or higher (for compatibility with Vite and dependencies).
- **Vite:** Used for local development and production builds.
- **Git:** Version control system for collaboration.
- **IDE:** Visual Studio Code is recommended for its integration with development tools and extension support.
- **Storage:** 10GB of available space for project files, dependencies, and database storage.
- **Other Tools:**
 - **React (Version 18.2.0):** Frontend framework for the web app.
 - **Tailwind CSS:** For styling the user interface.
 - **Firebase:** For user authentication and backend services.
 - **Ant Design (AntD):** For UI components and styling.
 - **ESLint & Prettier:** For maintaining code quality and consistency.

For Android Application Development:

- **Operating System:** Windows, macOS, or Linux.
- **Android Studio:** IDE for Android app development.
- **Minimum Android Version (for testing):** Android 12 or higher.
- **Emulator/Device:** Android Emulator or physical device running Android 12 or higher for testing.
- **Storage:** 15GB available space for SDKs, emulator files, and dependencies.
- **RAM:** Minimum 8GB for smooth development performance.

Usage Requirements

For Web Application Users:

- **Web Browser:** Google Chrome, Mozilla Firefox, Safari, or Microsoft Edge (latest versions).
- **Internet Connection:** Stable broadband or 4G/5G for real-time booking and interaction.
- **Device:** Any desktop, laptop, tablet, or smartphone with an internet connection.

For Android Application Users:

- **Minimum Android Version:** Android 12 or higher.
- **Storage:** 100MB available space for app installation and data caching.
- **RAM:** Minimum 2GB for smooth app performance.
- **Internet Connection:** Stable broadband or 4G/5G for real-time updates and usage.

Deployment Requirements

For Hosting:

- **Web Hosting:** Vercel for frontend hosting and MongoDB Atlas for the database.
- **Server Specifications:**
 - **Processor:** Minimum 2 vCPUs (4 vCPUs recommended for scalability).
 - **RAM:** Minimum 4GB (8GB recommended for handling more concurrent users).
 - **Storage:** 20GB SSD for application files and databases.

These requirements ensure that both development and user environments are equipped to handle TurfHub's web and Android apps efficiently.

CHAPTER 5: FEATURES OF TURFHUB

5.1 User Features

The user interface (UI) and navigation of TurfHub are thoughtfully designed to offer an intuitive and engaging experience for users. The layout ensures easy access to key features while maintaining a cohesive and visually appealing design, as showcased on the homepage.

- 1) **Homepage and Turf Booking:** Upon landing on TurfHub, users are greeted by a clean, dynamic homepage. The navbar located at the top of the page provides easy navigation to essential sections, including "Home," "Turfs," "Community," "Shop," "Join Us," and "Contact Us." This streamlined navigation menu ensures users can explore the platform effortlessly, whether they are looking to book a turf, browse merchandise, or connect with other players.
- 2) **Turfs by Category:** Users can explore turfs based on specific categories like fitness centers, showers, locker rooms, and more. This section is easily accessible via the homepage and helps users quickly find turfs that meet their preferences.
- 3) **Search Functionality:** The platform provides a search feature for users to filter through the available turfs based on location, turf type, or amenities. The search function is accessible through the navbar for easy access.
- 4) **Turf Detail Pages:** Each turf has a detailed page outlining the facilities, pricing, location, and reviews, allowing users to make well-informed choices before booking a turf.
- 5) **Community Page:** TurfHub includes a community section where users can post if they are seeking teams or if a team needs additional players. This fosters a social connection between players and helps them find others to play with.
- 6) **Shop for Merchandise:** Users can purchase sports merchandise, such as turf-specific kits, directly from TurfHub's integrated shop, making it convenient for players to get gear in one place.

- 7) **Contact Us:** The platform offers a "Contact Us" page where users can easily reach out for inquiries or support.
- 8) **Login and Registration:** The navbar includes a login panel where users can sign in or register for a new account. This allows users to access personalized features such as past bookings and profile management.
- 9) **User Dashboard:** Each user has access to a personal dashboard, where they can view and manage past bookings, update their profile, and track upcoming events.
- 10) **Dark Mode/Light Mode:** TurfHub also offers a feature allowing users to toggle between dark mode and light mode, ensuring a customizable visual experience based on user preference.

5.2 Turf Owner Features

TurfHub provides a dedicated set of features for turf owners or admins, ensuring they have full control over their turf management and bookings through a personalized dashboard. In addition to accessing the same pages as regular users, admins can monitor and manage turfs efficiently with the following key features:

- 1) **Personalized Dashboard:** Turf owners have access to a personalized dashboard that serves as the central hub for managing their turfs. The dashboard includes a visual chart of past orders and bookings, allowing owners to analyze trends, track revenue, and monitor activity over time.
- 2) **Current Bookings Overview:** Admins can easily view current bookings, displaying details such as booking times, turf occupancy, and user information. This real-time view ensures that owners can manage availability and avoid double-bookings.
- 3) **Previous Bookings Management:** The system provides access to previous bookings, allowing owners to maintain a history of turf usage and track any recurring customers or past events. This is useful for data analysis and optimizing future operations.

- 4) **User Management:** Turf owners can also manage the list of users who have interacted with their turfs. This includes viewing customer profiles, contact information, and their past booking history, which can help in providing personalized offers or promotions.
- 5) **Simple Booking Management System:** The dashboard also enables admins to set pricing, list turf availability, and apply special promotions or discounts. Admins have full control over adjusting these settings at any time, keeping the platform dynamic and competitive.
- 6) **Enhanced Feedback Loop:** Just like for regular users, the iterative development of the admin dashboard is aligned with feedback from turf owners, ensuring the features provided meet their operational needs. This constant improvement helps TurfHub maintain a balance between simplicity and functionality.
- 7) **Deep Analytics:** TurfHub provides a robust analytics dashboard, allowing turf owners to monitor key metrics such as revenue, booking trends, customer retention, and slot popularity. With visual tools like heatmaps and charts, owners can optimize turf availability, improve customer loyalty, and increase revenue, making data-driven decisions easier and more effective.

5.3 Superadmin

TurfHub's superadmin role is designed to have full control over the platform, allowing the superadmin to manage all aspects of the site, including admins, users, events, turfs, and the shop. Below are the key functionalities available to the superadmin:

- 1) **Admin Data Management:** The superadmin can create, update, and remove admin profiles, controlling access and permissions across the platform. This feature ensures the integrity of the system, enabling the superadmin to assign roles and responsibilities to specific administrators.
- 2) **User Data Oversight:** The superadmin has complete oversight of all user data, with the ability to perform Create, Read, Update, and Delete (CRUD) operations

on user profiles. This allows the superadmin to address user concerns, manage profiles, and maintain trust and security within the community.

- 3) **Event Information Mastery:** The superadmin can manage all event-related information, including the creation, updating, and removal of events. This functionality helps keep the platform dynamic and engaging by ensuring that upcoming tournaments, special matches, and events are updated in real time.
- 4) **Turf Data Customization:** With full authority over all turf listings, the superadmin can perform CRUD operations on turfs. This ensures that turf information, such as pricing, availability, and amenities, is accurate and up-to-date.
- 5) **Turf Booking Management:** The superadmin can also directly manage turf reservations, streamlining the booking process and ensuring seamless interactions between users and turf owners.
- 6) **Shop Management:** The superadmin has the ability to manage the entire shop, including adding or removing merchandise, setting prices, and managing inventory. This ensures that the shop is kept relevant and stocked with the items users want.

The superadmin's ability to control and oversee all key aspects of TurfHub ensures that the platform runs smoothly, while also allowing for quick adjustments to meet the evolving needs of both users and admins.

CHAPTER 6: DESIGN AND IMPLEMENTATION

6.1 Introduction

System design is a crucial stage in the software development lifecycle that provides the technical foundation for building reliable, scalable, and efficient software solutions. For TurfHub, system design outlines the architecture, components, data management, and user interactions necessary to deliver a seamless user experience for players and turf owners. This phase transforms the functional requirements gathered during the initial stages into a detailed technical blueprint that guides the development and implementation processes. It defines how TurfHub will be structured and organized to ensure smooth operation, effective performance, and future scalability.

6.2 Tools and Techniques

6.2.1 Architectural Style: TurfHub employs a monolithic architecture with a modular design pattern, which organizes the system into separate modules like booking, user management, and the shop. This architectural style ensures that all components interact seamlessly within a unified structure, promoting simplicity in development and deployment while maintaining the flexibility to scale individual modules.

6.2.2 Components and Modules: TurfHub's design is centered around modular components. Each component, such as the turf booking module, user profile module, and admin dashboard module, is responsible for specific functionality. This modular approach supports code reusability, maintainability, and efficient testing, allowing for the independent evolution of each part of the system.

6.2.3 Data Management: Data management in TurfHub is handled through MongoDB, a NoSQL database. This includes managing user profiles, bookings, turf details, and transaction records. Mongoose is used for data modeling and schema definitions, ensuring data integrity. Efficient data access patterns are designed to optimize retrieval and storage, critical for handling booking requests and turf availability in real-time.

6.2.4 User Interface (UI) Design: The UI design of TurfHub is focused on delivering a responsive and intuitive user experience. Using React for the frontend and Tailwind CSS for styling, the system ensures that both desktop and mobile users have a smooth, visually appealing experience. User interactions, such as booking turfs, viewing reviews, and managing profiles, are simplified for ease of use.

6.2.5 Interoperability and Integration: TurfHub integrates with external services such as email services (Nodemailer) for notifications. The system's API endpoints are well-documented using Swagger, ensuring clear communication between the frontend and backend components, and facilitating future integrations with other services or platforms.

6.2.6 Scalability and Performance: Scalability is a critical aspect of TurfHub's design. The use of React Query for efficient server-state management and load balancing strategies in the backend ensures that the platform can handle increasing user demand. Caching mechanisms and data optimization techniques help improve performance during peak usage, such as during high booking periods.

6.2.7 Security: Security is paramount for TurfHub, particularly in protecting user data and transaction information. Bcrypt is used for password encryption, while JWT (JSON Web Token) is employed for secure authentication. Security

measures also include input validation with Joi and Zod to prevent unauthorized access and ensure data integrity.

6.2.8 Error Handling and Logging: Effective error handling and logging mechanisms are incorporated to identify, diagnose, and resolve issues promptly. The backend is equipped with error-handling middleware in Express, while logging systems track errors and performance metrics, ensuring that any disruptions to service can be addressed efficiently.

6.2.9 Deployment Strategy: TurfHub's deployment strategy leverages Vercel for both frontend and backend hosting. Continuous integration and deployment (CI/CD) pipelines are set up using GitHub Actions, allowing for seamless updates and improvements without interrupting user access to the platform.

6.2.10 Testing and Quality Assurance: To ensure the reliability of TurfHub, automated testing is a part of the development process. Unit tests, integration tests, and end-to-end tests are implemented to verify the functionality of various components. Prettier and ESLint are used for code quality assurance, ensuring that the codebase remains clean and consistent.

6.2.11 Documentation: Comprehensive documentation of the system architecture, components, and API endpoints is provided using Swagger and internal wikis. This documentation is essential for current and future development, aiding in the maintenance, onboarding of new developers, and future enhancements of the platform.

6.2.12 User Experience (UX) Design: The UX design of TurfHub focuses on ensuring that users can easily navigate the platform, whether they are booking turfs, managing their profiles, or organizing tournaments. Attention is given to

usability and accessibility, ensuring that the system is inclusive and easy to use for a wide range of users. Feedback loops are built into the system to continually improve the UX based on user input.

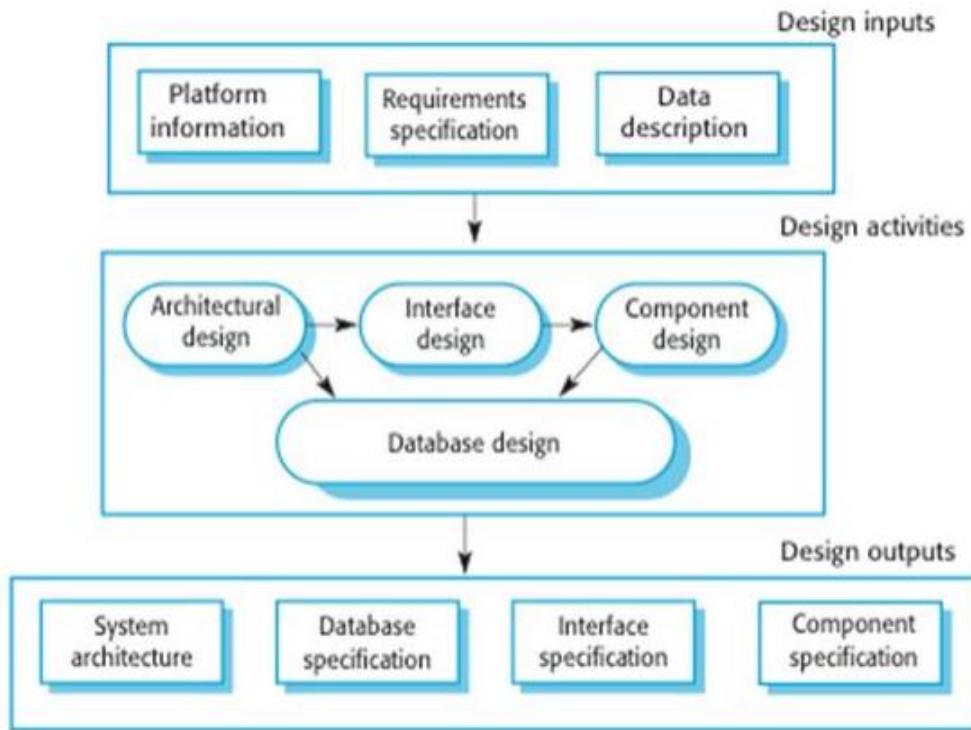


Figure 6.2.1: Designing a System

Screenshots

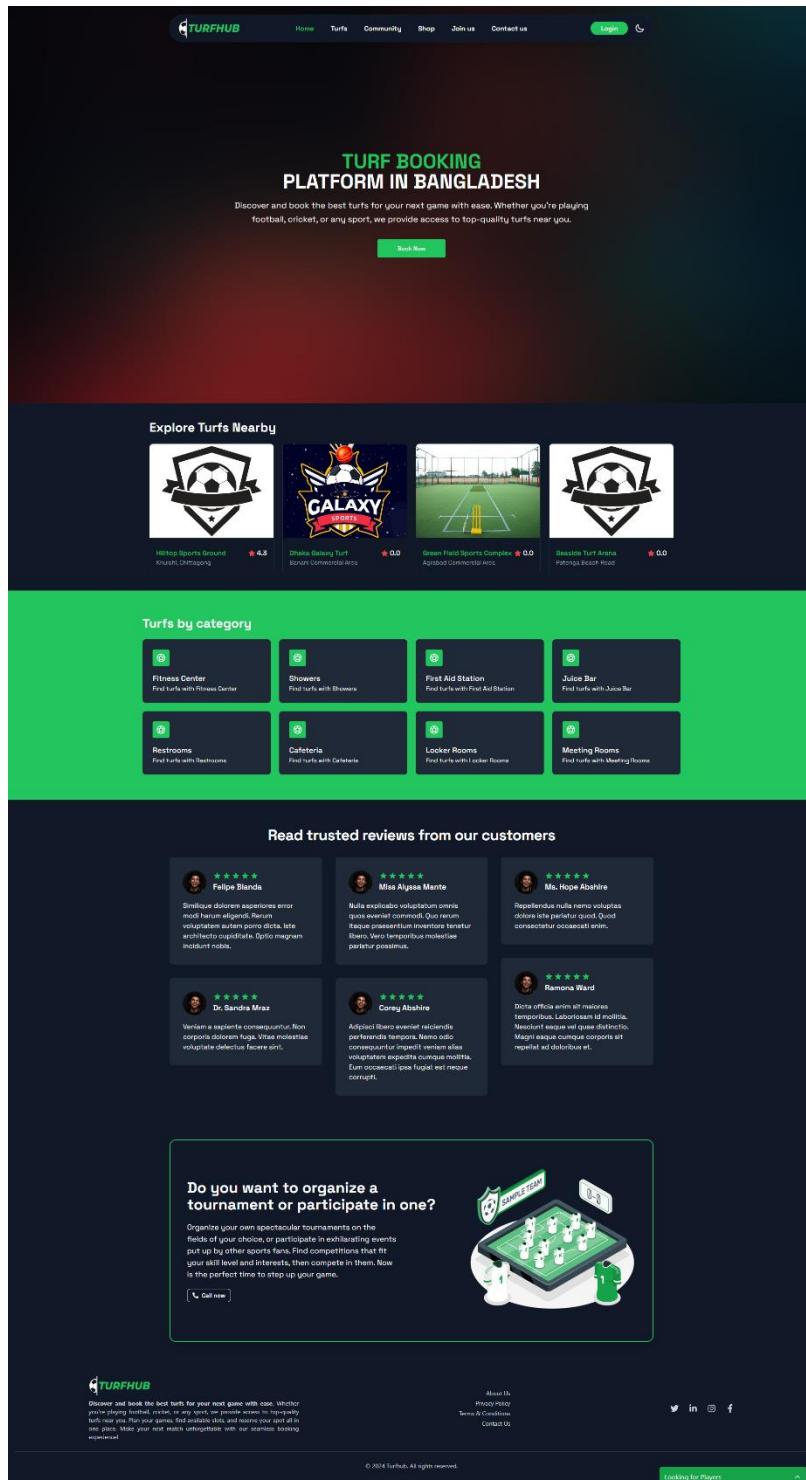


Figure 6.2.2: Landing page (Dark Mode)

The screenshot shows the TurfHub website's landing page in Light Mode. At the top, there is a navigation bar with links for Home, Turfs, Community, Shop, Join us, Contact us, Login, and a language selector. Below the navigation is a large banner featuring a stadium at night with the text "TURF BOOKING PLATFORM IN BANGLADESH" and a "Book Now" button.

Below the banner, there is a section titled "Explore Turfs Nearby" with four cards showing turf facilities: Hilltop Sports Ground (Khulna, Chittagong), Dhaka Galaxy Turf (Dhaka Commercial Areas), Green Field Sports Complex (Rajshahi Commercial Areas), and Seaside Turf Arena (Patenga Beach Road). Each card includes a logo, name, location, and a star rating (4.5, 0.0, 0.0, 0.0 respectively).

Underneath this is a green section titled "Turfs by category" containing six categories with icons: Fitness Center, Showers, First Aid Station, Juice Bar, Restrooms, Cafeteria, Locker Rooms, and Meeting Rooms. Each category has a link to "Find turfs with [category]."

Below this is a section titled "Read trusted reviews from our customers" with five review cards. Each card includes a user profile picture, a 5-star rating icon, the user's name, and a short testimonial. The users are: Mr. Steve Blanda, Ms. Alyssa Marte, Ms. Hope Abshire, Dr. Banira Miraz, and Corey Abshire.

At the bottom of the page is a dark call-to-action box with the text "Do you want to organize a tournament or participate in one?". It includes a brief description of the service, a "Call now" button, and an illustration of a soccer field with players.

The footer contains the TurfHub logo, a copyright notice ("© 2024 Turfhub. All rights reserved."), and links for About Us, Privacy Policy, Terms & Conditions, and Contact Us. It also features social media icons for Twitter, LinkedIn, and Facebook, and a search bar with the placeholder "Looking for Players".

Figure 6.2.3: Landing page (Light Mode)

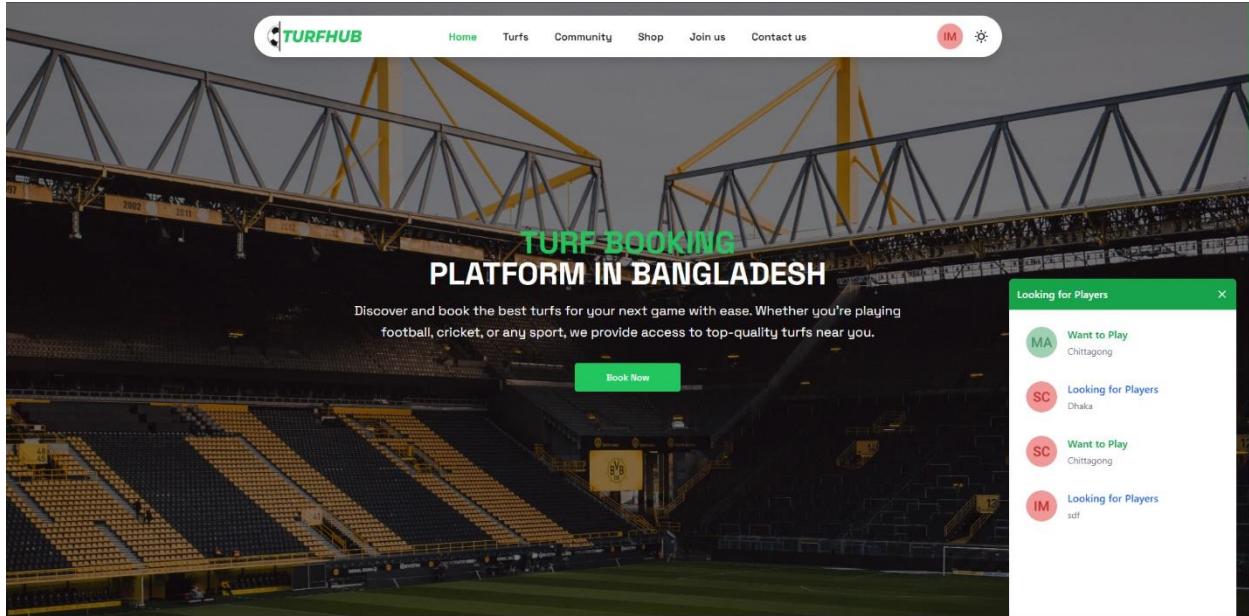


Figure 6.2.4: Easy player lookup

The screenshot shows the 'All Turfs' section of the Turfhub website. It features a grid of eight turf options with the following details:

Turf Name	Location	Rating
SB Sports Valley	Dharmundi	★ 0.0
Dhaka Galaxy Turf	Banani Commercial Area	★ 0.0
Green Field Sports Complex	Agrabad Commercial Area	★ 0.0
Hilltop Sports Ground	Kulish, Chittagong	★ 4.3
El Clasico Turf	Uttara, Dhaka	★ 0.0
Seaside Turf Arena	Pateriya Beach Road	★ 0.0
Port City Sports Hub	Badarghat, Chittagong	★ 0.0
Victory turf	Uttara Commercial Area	★ 0.0

The screenshot shows the footer area of the Turfhub website. It includes the Turfhub logo, a brief description of the service, links to About Us, Privacy Policy, Terms & Conditions, and Contact Us, as well as social media icons for Twitter, LinkedIn, Instagram, and Facebook. At the bottom, it says '© 2024 Turfhub. All rights reserved.'

Figure 6.2.5: All turfs

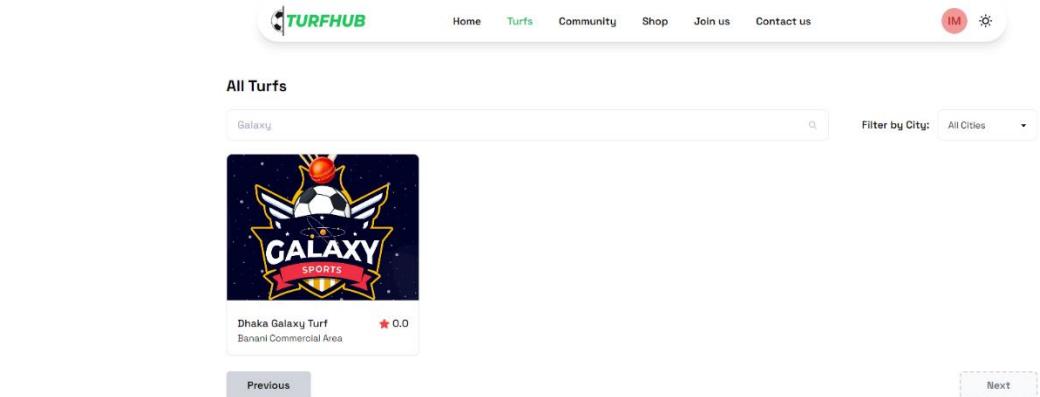


Figure 6.2.6: Search Turf

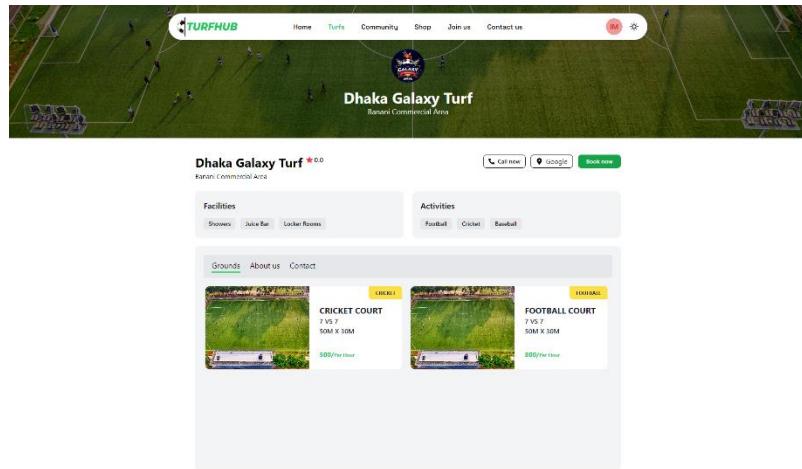


Figure 6.2.7: Individual Turf Page

Turf Booking

Enter your information below

Full name	Mobile no.	Date
Mohammad Sakib Chowdhury	01760886380	2024-10-17

Select City: Chittagong

Select Turf:

Sesside Turf Arena	Green Field Sports Complex	Port City Sports Hub	Hilltop Sports Ground
0.0	0.0	0.0	4.3

Select Ground:

Football Court 7 vs 7 Football	Cricket Court 7 vs 7 Cricket
800 Per Hour	500 Per Hour

Available Timeslots

No timeslots available.

Review Your Booking

Please review your selections before proceeding.

Name:	Mohammad Sakib Chowdhury
Phone:	01760886380
Date:	Thu, 17 Oct
Slot:	Not provided
city:	Chittagong
Turf:	Port City Sports Hub
Ground:	Not selected
Players:	0
Total Cost:	0Tk

Confirm

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Figure 6.2.8: Booking a Turf

Full name: Mohd Chowdhury

Mobile no.: 01760886380

Date: Thu, 17 Oct

Select City: Chittagong

Select Turf:

Seaside Turf Arena	Green Field Sports Complex	Port City Sports Hub	Hilltop Sports Ground
0.0	0.0	0.0	4.3

Select Ground:

Unit-1 7 vs 7 Football	Unit-2 7 vs 7 Football
1000 Per Hour	2500 Per Hour

Available Timeslots

12:00 PM - 02:00 PM	01:00 PM - 02:00 PM
---------------------	---------------------

Date: Thu, 17 Oct
Slot: 01:00 PM - 02:00 PM
city: Chittagong
Turf: Seaside Turf Arena
Ground: Unit-1
Players: 14
Total Cost: 1000
Confirm

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Figure 6.2.9: Individual Turf time slot

The screenshot shows the TURFHUB Turf Booking interface. At the top, there is a navigation bar with links for Home, Turfs, Community, Shop, Join us, Contact us, and a user icon. Below the navigation is a search bar with placeholder text "Enter your information below". The main form is titled "Turf Booking" and contains fields for Full name (Mohammad Sakib Chowdhury), Mobile no (01760896390), and Date (2024-10-17). A "Select City" dropdown is set to Chittagong. Under "Select Turf", "Seaside Turf Arena" is selected with a green checkmark. Other options include Green Field Sports Complex, Port City Sports Hub, and Hilltop Sports Ground. Under "Select Ground", "Unit-1 7 vs 7 Per Hour Football" is selected with a green box around it, and "Unit-2 7 vs 7 Per Hour Football" is also listed. The "Available Timeslots" section shows two options: "12:00 PM - 02:00 PM" and "01:00 PM - 02:00 PM", with the latter being highlighted in green. On the right side, a "Review Your Booking" summary box displays the following details:

Review Your Booking	
Please review your selections before proceeding.	
Name:	Mohammad Sakib Chowdhury
Phone:	01760896390
Date:	Thu, 17 Oct
Slot:	01:00 PM - 02:00 PM
City:	Chittagong
Turf:	Seaside Turf Arena
Ground:	Unit-1
Players:	14
Total Cost:	1000

A green "Confirm" button is located at the bottom right of the review box.

Figure 6.2.10: Finalizing Booking

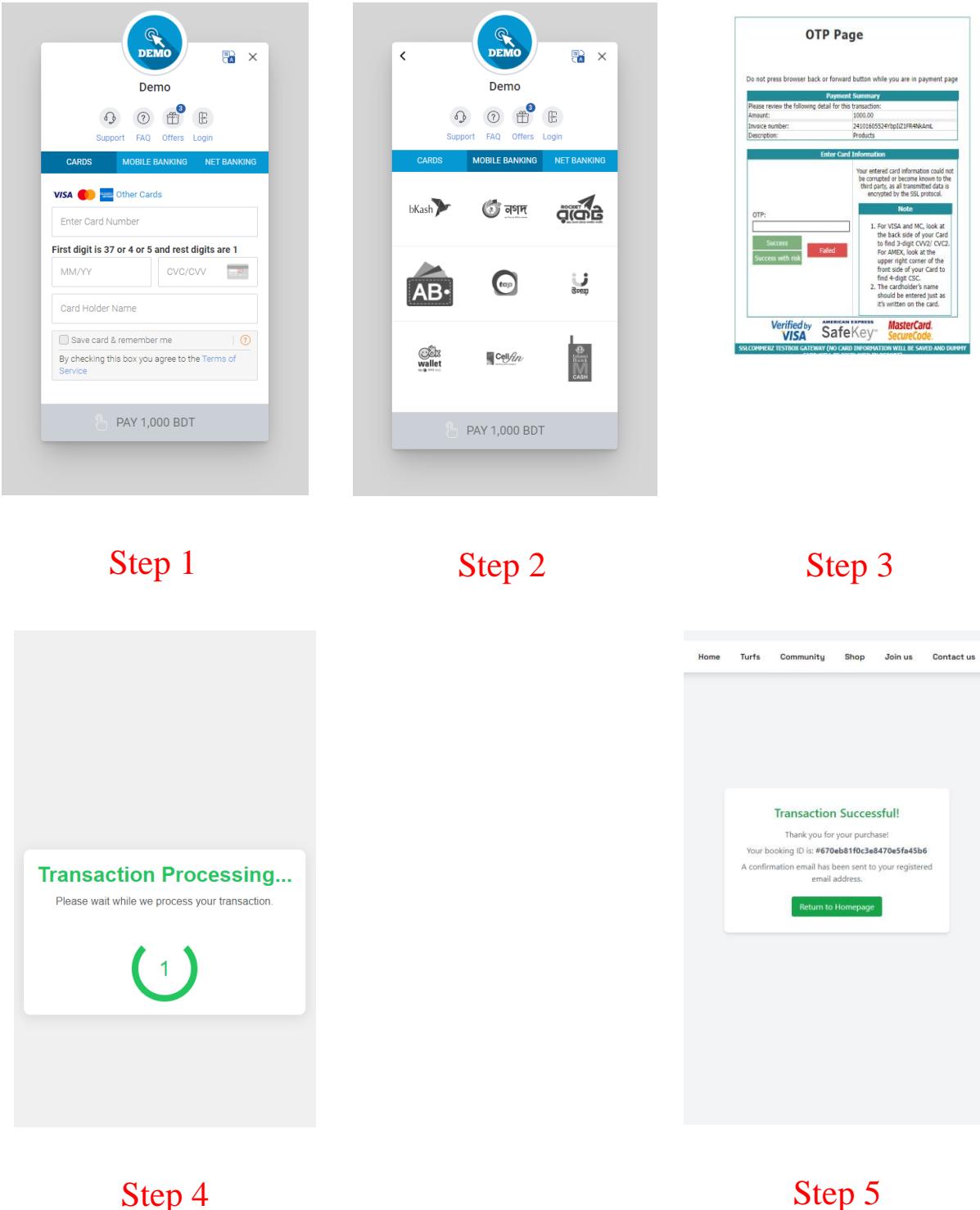


Figure 6.2.11: Payment Gateway

The screenshot displays the Turfhub Community page. At the top, there's a navigation bar with links for Home, Turfs, Community (which is the active tab), Shop, Join us, and Contact us. A user icon with initials 'MS' and a sun-like icon is also present.

Create Post

Form fields include:

- Select Category
- What's on your mind? (with a character counter 0/500)
- Location
- Tags (comma-separated)
- Post button

Want to Play

Post by MOHAMMED ASHRAFUJJAMAN HERA | Oct 15, 2024, 10:29 PM

I want play football in Chittagong.

Location: Chittagong

Contact Player button

Looking for Players

Post by Sakib Chowdhury | Oct 15, 2024, 08:40 PM

Need 10 players for play football.

Location: Dhaka

Tags: #football #need-player

Contact Player button

Want to Play

Post by Sakib Chowdhury | Oct 13, 2024, 08:52 PM

I am Jubair, wants to play football but i dont have any money to pay.

Location: Chittagong

Tags: #poor, #onek_gorib

Contact Player button

Looking for Players

Post by Ittikhar Mahmud | Oct 12, 2024, 10:55 AM

sfdedf

Location: sdf

Tags: #sfd

Contact Player button

Player Lookup

- MA Want to Play Chittagong
- SC Looking for Players Dhaka
- SC Want to Play Chittagong
- IM Looking for Players sdf

Community Events

- 2024-09-01 Summer Beach Getaway Enjoy the sun and sand.
- 2024-09-05 Mountain Hiking Adventure Climb to the highest peaks.
- 2024-09-10 City Lights at Night Explore the city nightlife.
- 2024-09-15 Cultural Food Festival Taste dishes from around...
- 2024-09-18 Art Gallery Exhibition See beautiful art and...

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Social media icons: Twitter, LinkedIn, Instagram, Facebook

Figure 6.2.12: Community Page

Create Post

Select Category

Select Category
Looking for Players
Want to Play

0/500

Location Tags (comma-separated)

Post ↗

Want to Play

MOHAMMED ASHRAFUJJAMAN HERA | Oct 15, 2024, 10:29 PM

This screenshot shows the 'Create Post' interface on a mobile device. At the top, there's a dropdown menu labeled 'Select Category' with 'Want to Play' selected. Below it is a text input area with the placeholder 'Want to Play'. To the right of the text area are 'Location' and 'Tags' fields. A large 'Post' button is at the bottom right. Below the input area, a preview of the post is shown with the title 'Want to Play', the author 'MOHAMMED ASHRAFUJJAMAN HERA', and the timestamp 'Oct 15, 2024, 10:29 PM'.

Figure 6.2.13: Posting in Community page (step 1)

Create Post

Looking for Players

Wants to play match at 20th October, need 5 players

51/500

Chittagong football, players

Post ↗

This screenshot shows the 'Create Post' interface on a mobile device. At the top, there's a dropdown menu labeled 'Looking for Players'. Below it is a text input area with the placeholder 'Wants to play match at 20th October, need 5 players'. To the right of the text area are 'Location' and 'Tags' fields. A large 'Post' button is at the bottom right. The location is set to 'Chittagong' and the tags are 'football, players'.

Figure 6.2.14: Posting in Community page (step 2)

Looking for Players

Mohammad Sakib Chowdhury | Oct 16, 2024, 01:17 AM

Wants to play match at 20th October, need 5 players

📍 Chittagong

#football #players

Contact Player

Player Lookup

- MS** Looking for Players
Chittagong
- MA** Want to Play
Chittagong

Looking for Players

Wants to play match at 20th October, need 5 players

📍 Chittagong

#football #players

Contact Player

Figure 6.2.15: Posting in Community page (Post processing)

TURFHUB

Home Turfs Community Shop Join us Contact us

BUY MORE, SAVE MORE
Festival Sale On Now!

Kits for you!
Begin an exciting shopping journey with exclusive deals!

Sort by: Default

0 Sports shoe Ad omnis vel ipsum Sold Out	2 Air Jordan 4 (Black Cement) This AJ 4, also known as "Black Cement 4," comes with a black upper plus grey... Add to cart	9 Air Jordan 1's (Royal Blue) This sneaker reignites the iconic Jordan 1 colorway with a fresh material... Add to cart	4 Arsenal FC Football & Goalkeeper Gloves Official AFC size 4 football & goalkeeper glove set. Ball with club crest & text... Add to cart
10 Scotland Football & Goalkeeper Gloves Ball with club crest & text print; ball supplied deflated. Scotland crest & tex... Add to cart	11 Manchester City FC Football & Goalie Gloves Ball with club crest & text print; printed signatures include Laporte, Mahrez &... Add to cart	18 Air Jordan 4 (Retro red) This AJ 4, also known as "Black Cement 4," comes with a black upper plus grey... Add to cart	16 Air Jordan 1's (Obsidian) There Air Jordan 1 Retro High Obsidian UNC 2019 arrives this summer with its... Add to cart

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T-SHIRT DESIGN FOR FOOTBALL FANS

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Figure 6.2.16: Merchandise Shop

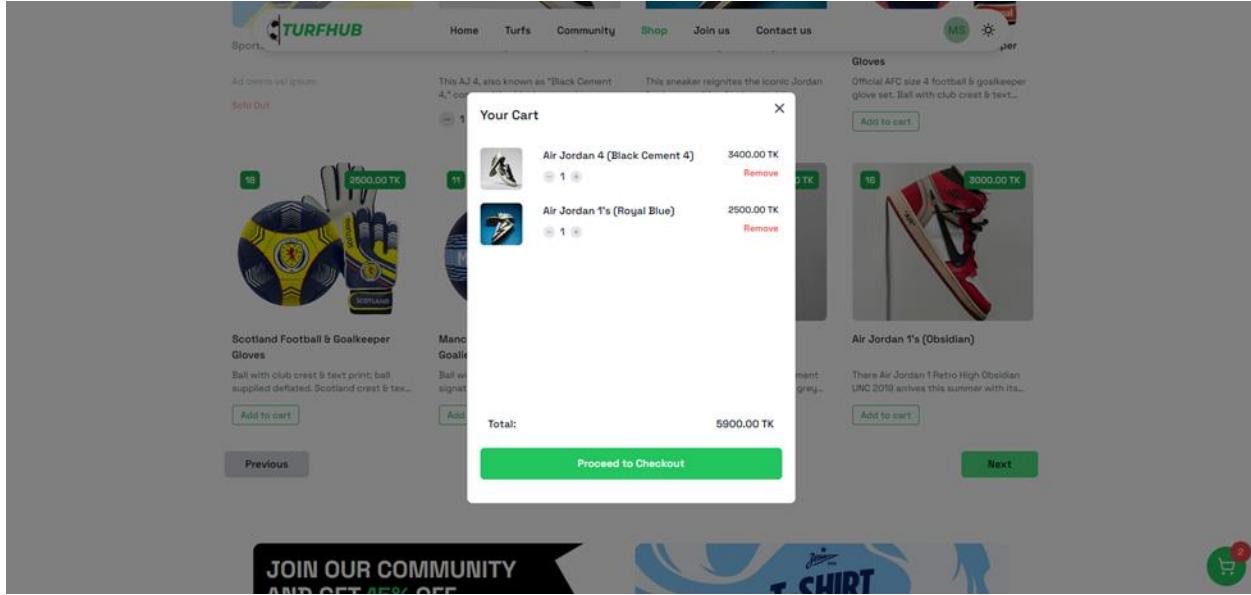


Figure 6.2.17: Adding to cart on Shop

Contact

Email: [Input field]

Delivery

Full Name: [Input field]
Address: [Input field]
Apartment, suite, etc. (optional): [Input field]
City: [Input field] Postal code (optional): [Input field]
Phone: [Input field]

Shipping method

Inside Chattogram: ₹70.00
 Outside Chattogram: ₹130.00

Payment

All transactions are secure and encrypted.

Cash on Delivery (COD)
 Online Payment (Coming Soon)

Order Summary

Item	Quantity	Price
Air Jordan 4 (Black Cement 4)	1	₹3400.00
Air Jordan 1's (Royal Blue)	1	₹2500.00
Total		₹5970.00

Price Details

Subtotal	₹5900.00
Shipping	₹70.00
Total	₹5970.00

Complete order

Figure 6.2.18: Confirming Purchase

TURFHUB DASHBOARD
MANAGE YOUR TURF EFFICIENTLY

Simplify your turf management with Turfhub.

[Register your turf](#)

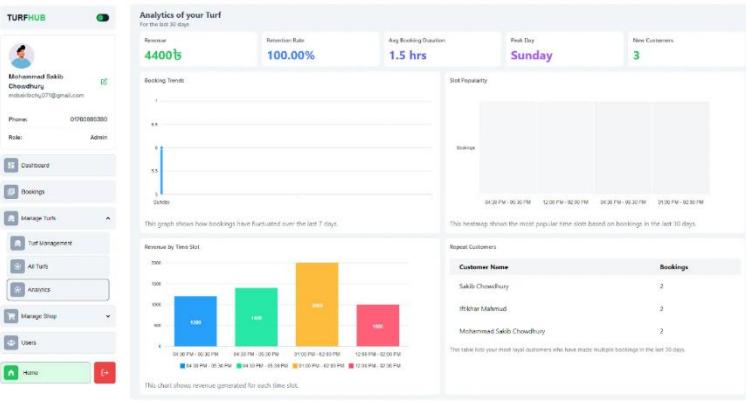


Your Turf Finances Simplified

Say goodbye to manual accounting headaches. Go Turf provides comprehensive financial reports, so you can effortlessly track bookings, revenue, and expenses, ensuring financial clarity and peace of mind.

GET FULL CONTROL OF YOUR TURF

It allows owners to manage their turf operations seamlessly, including booking tournaments, tracking schedules, and overseeing player activity. With easy-to-use tools and features, Turfhub helps maximize the utilization of the turf, increase bookings, and ensure efficient management—all from a single, centralized dashboard.



TURFHUB

Discover and book the best turfs for your next game with ease. Whether you're playing football, cricket, or any sport, we provide access to top-quality turfs near you. Plan your games, find available slots, and reserve your spot all in one place. Make your next match unforgettable with our seamless booking experience!

About Us
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Figure 6.2.19: Join us page for Turf owners

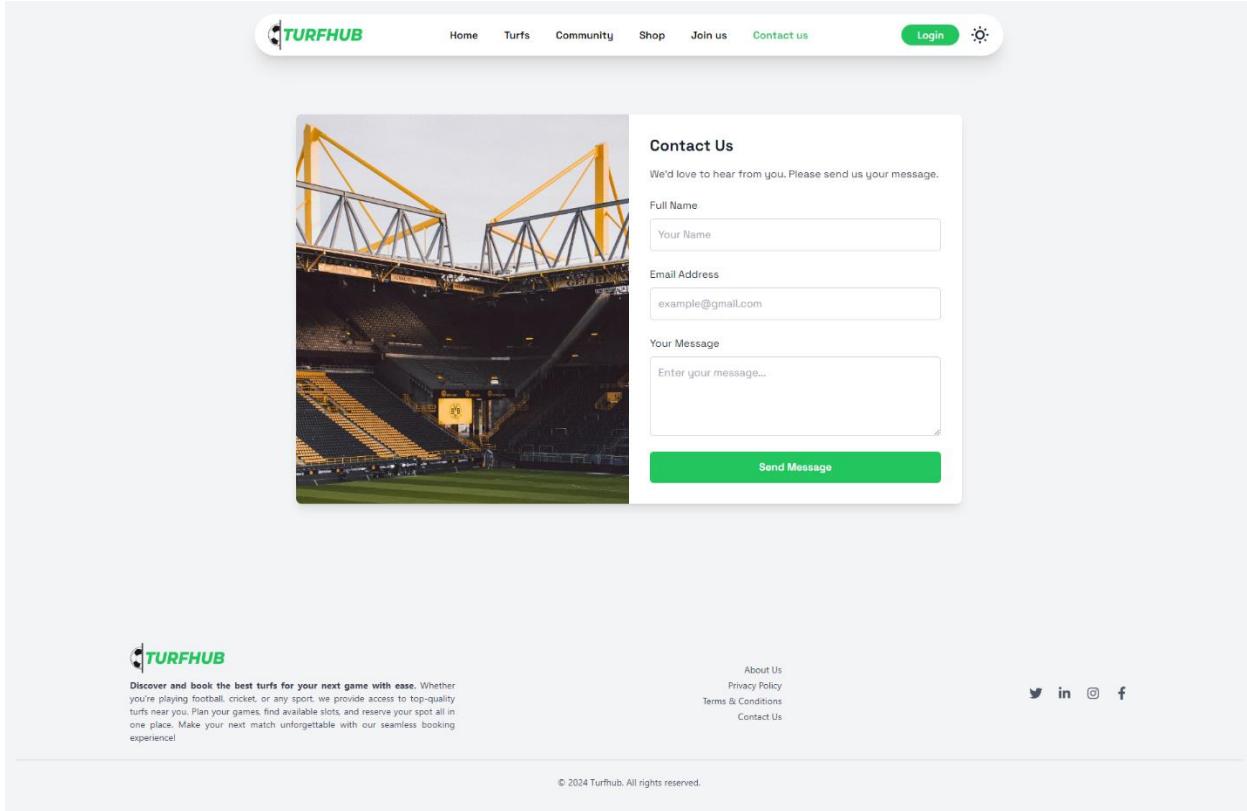


Figure 6.2.20: Contact us

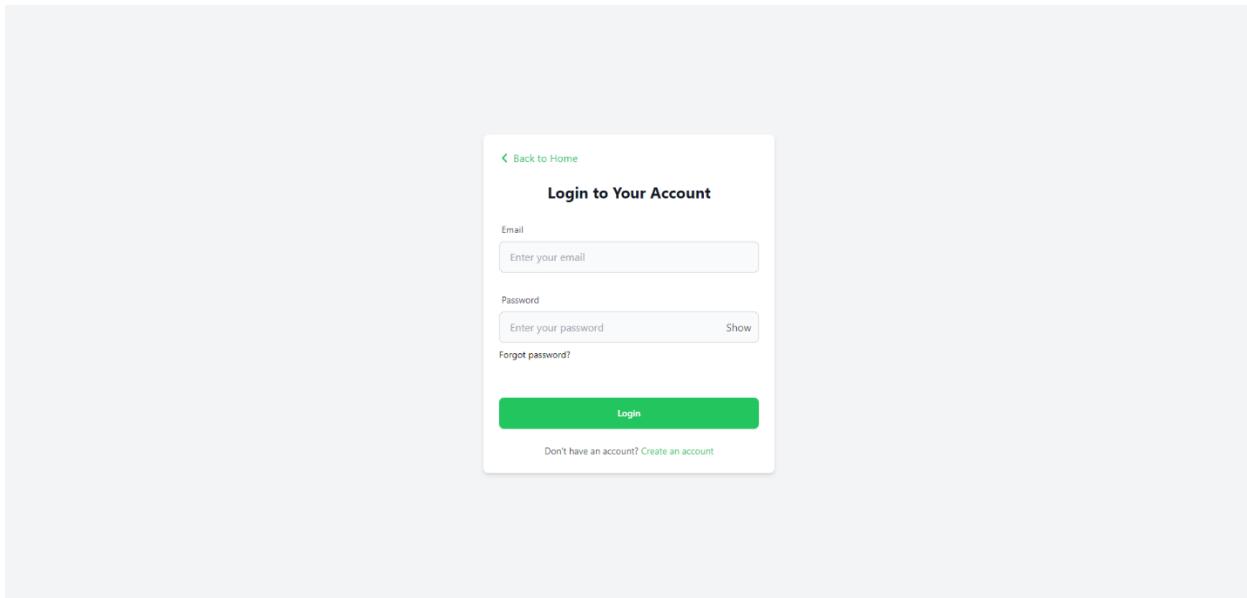


Figure 6.2.21: Login

The image consists of two screenshots of a mobile application interface.

Top Screenshot (User Registration):

- Header:** A green back arrow icon and the text "Back to Home".
- Title:** "Sign Up" in bold black font.
- Fields:**
 - Name: "Iftikhar Mahmud"
 - Email: "iftikhar.mahmud4@gmail.com"
 - Contact No: "12345678"
 - Password: "....." with a "Show" link next to it.
- Buttons:** A large green "Sign up" button at the bottom.
- Text:** "Already have an account? [Login](#)" at the bottom right.

Bottom Screenshot (OTP Verification):

- Title:** "Verify OTP" in bold black font.
- Text:** "Enter the OTP sent to your email/phone."
- Inputs:** Six empty input fields for entering the OTP digits.
- Buttons:** A green "Verify OTP" button at the bottom.

Figure 6.2.22: User Registration & OTP Page

The Player Dashboard for TURFHUB shows a sidebar with navigation links: Dashboard, Bookings (selected), Manage Turfs, Community Post, Manage Shop, and Users. The main area displays a table of bookings with columns: SL., USER, PHONE, DATE, START TIME - END TIME, TURF, PRICE, STATUS, ACTION, and INVOICE. A message at the bottom says "Total bookings: 9".

SL.	USER	PHONE	DATE	START TIME - END TIME	TURF	PRICE	STATUS	ACTION	INVOICE
1	Mohammad Sakib Chowdhury	01760886380	Sat, 19 Oct	01:00 PM - 02:00 PM	Seaside Turf Arena	1000TK	Confirmed	Delete	See Invoice
2	Mohammad Sakib Chowdhury	01760886380	Thu, 17 Oct	01:00 PM - 02:00 PM	Seaside Turf Arena	1000TK	Confirmed	Delete	See Invoice
3	Abrar	123123123122	Thu, 17 Oct	12:00 PM - 02:00 PM	Green Field Sports Complex	321TK	Confirmed	Delete	See Invoice
4	MOHAMMED ASHRAFUJJAMAN HERA	01866331540	Wed, 30 Oct	12:00 PM - 02:00 PM	Seaside Turf Arena	1000TK	Confirmed	Delete	See Invoice
5	MOHAMMED ASHRAFUJJAMAN HERA	01866331540	Fri, 18 Oct	04:30 PM - 05:30 PM	Surf the Turf	1200TK	Confirmed	Delete	See Invoice
6	Tauhidul Islam	01915984611	Wed, 16 Oct	04:30 PM - 05:30 PM	Saudi Turf	1200TK	Confirmed	Delete	See Invoice
7	Tauhidul Islam	01915984611	Thu, 24 Oct	01:00 PM - 02:00 PM	Green Field Sports Complex	900TK	Confirmed	Delete	See Invoice
8	Sakib Chowdhury	01987221921	Wed, 16 Oct	01:00 PM - 03:00 PM	Surf the Turf	700TK	Confirmed	Delete	See Invoice
9	Sakib Chowdhury	01987221921	Fri, 18 Oct	01:00 PM - 03:00 PM	Saudi Turf	700TK	Confirmed	Delete	See Invoice

Total bookings: 9

Figure 6.2.23: Player Dashboard

The Super Admin Dashboard for TURFHUB shows a sidebar with navigation links: Dashboard, Turf Management, Bookings, Manage Shop, Manage Blogs, Users, Home, and Logout. The main area has four cards: 5 Active (Current Bookings: 30% This month), 7500 Total Players (25% This month), 35 Total Matches Played (75% This month), and 52 Product Sold (20% This month). It also features a line chart showing bookings over the last 10 days and a table of last 10 days bookings.

SL.	USERNAME	PHONE	DATE	TURF	PRICE	ACTION
1	Rasheed25	426-248-4406	3/13/2072	Incredible Frozen Pants	186.00TK	Delete
2	Alejandra.OReilly	560-302-2466	10/25/1992	Intelligent Cotton Table	903.00TK	Delete
3	Bernard_Poulos	844-461-8934	2/26/1990	Licensed Wooden Chicken	832.00TK	Delete
4	Austen_Bergnaum	874-859-9355	10/13/2018	Ergonomic Fresh Towels	432.00TK	Delete
5	Emmy_Wisoky40	307-936-8042	1/31/2016	Bespoke Plastic Computer	896.00TK	Delete

1 2 3 4 5 6 7 8 9 10

Figure 6.2.24: Super Admin Dashboard

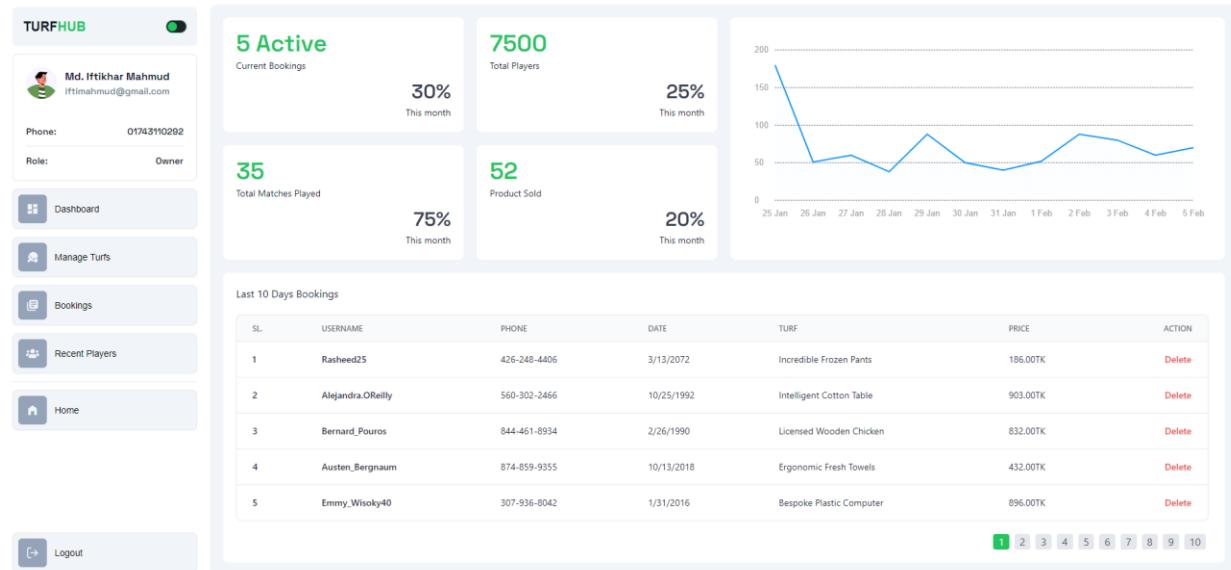


Figure 6.2.25: Turf Owner Dashboard

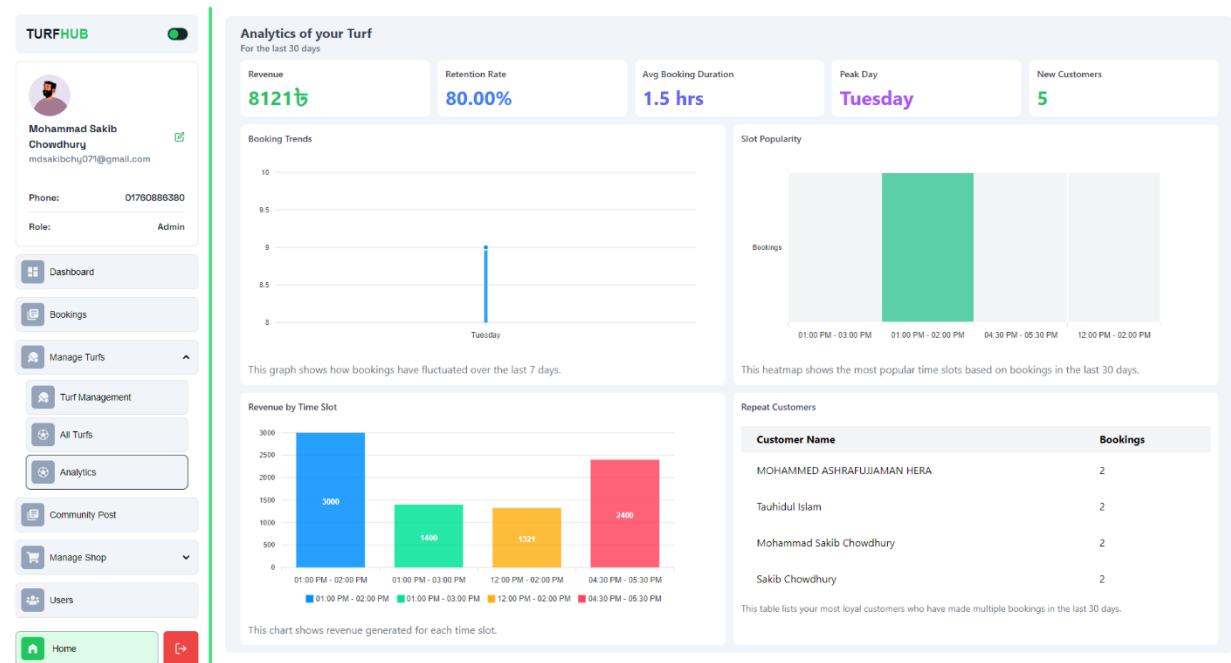


Figure 6.2.26: Turf Owner Analytics

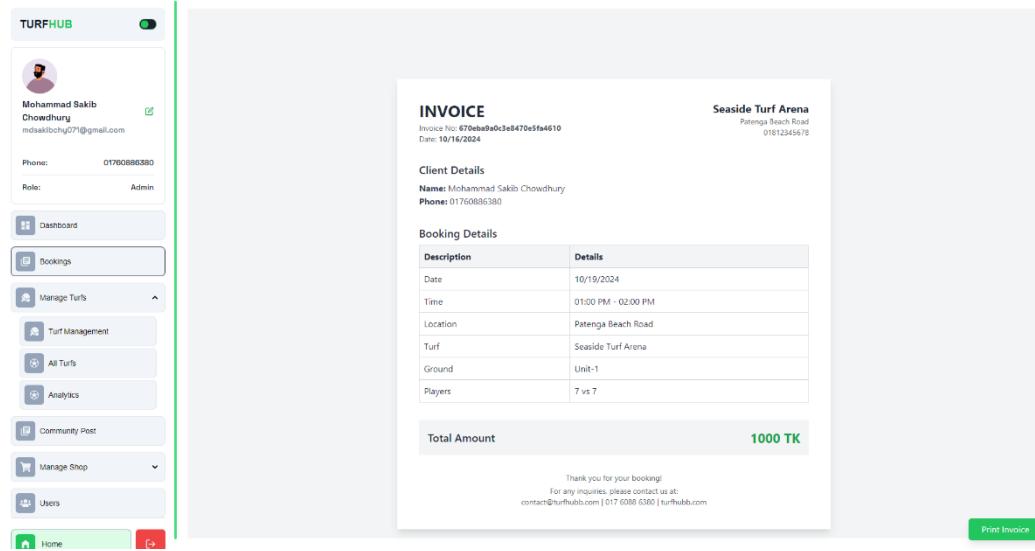


Figure 6.2.27: Invoice Page

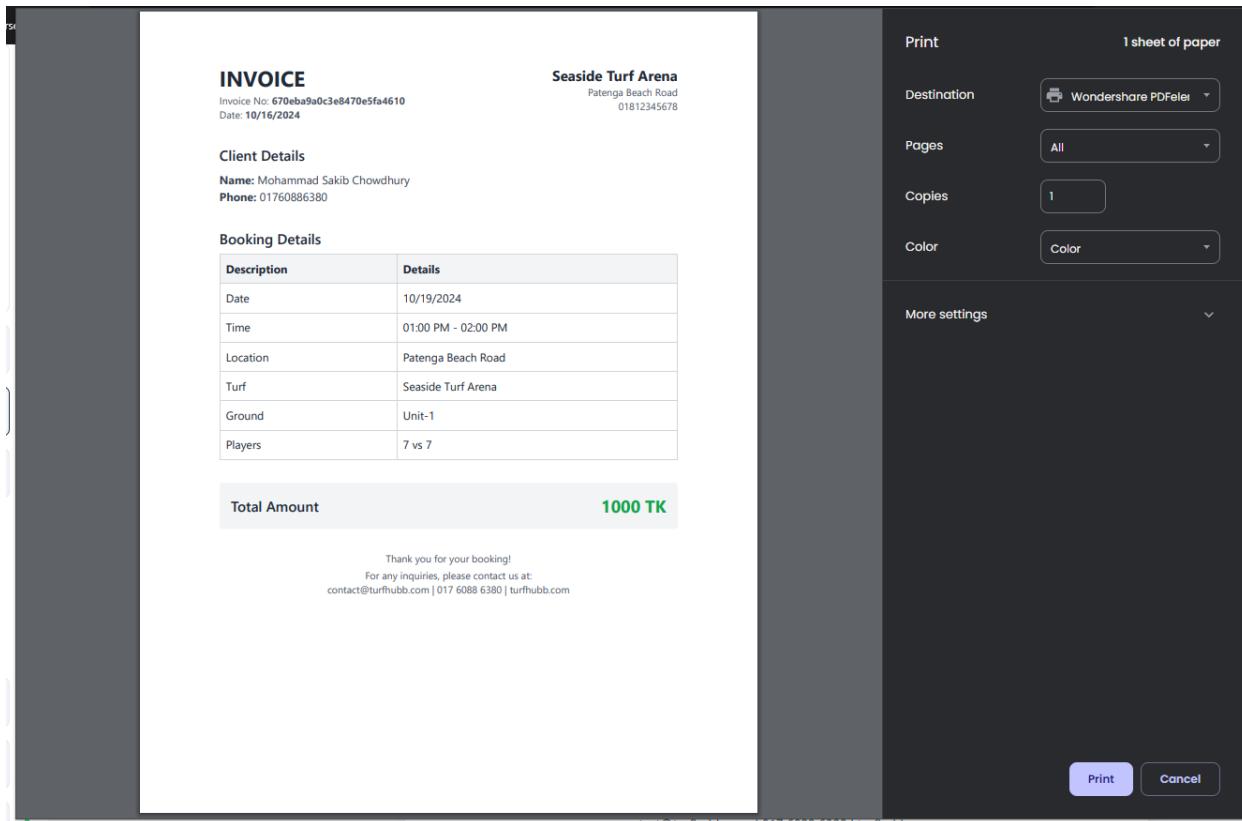


Figure 6.2.28: Print Invoice

Screenshots (Android App)

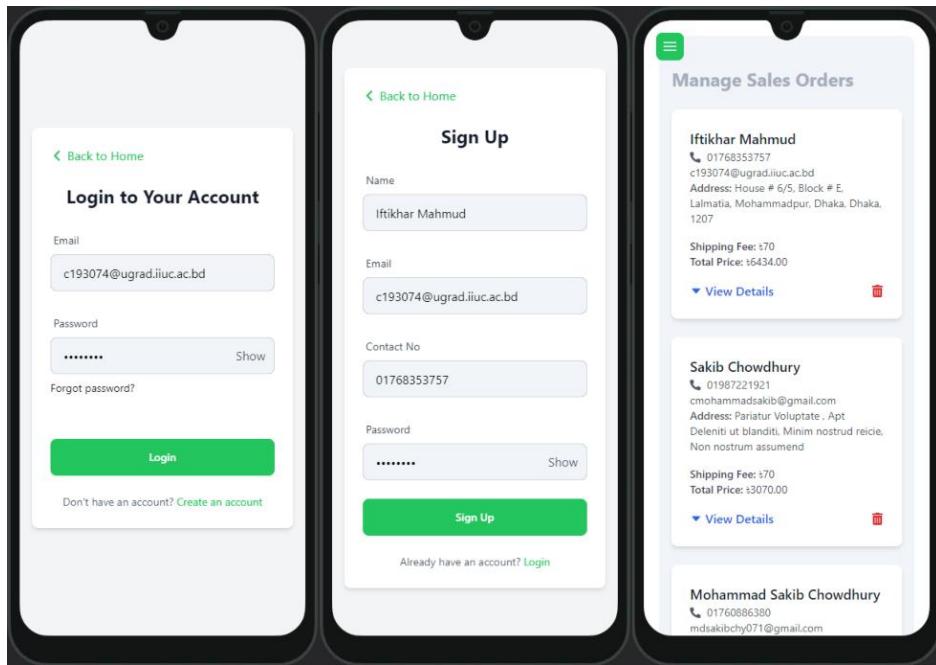


Figure 6.2.29: Android view 01

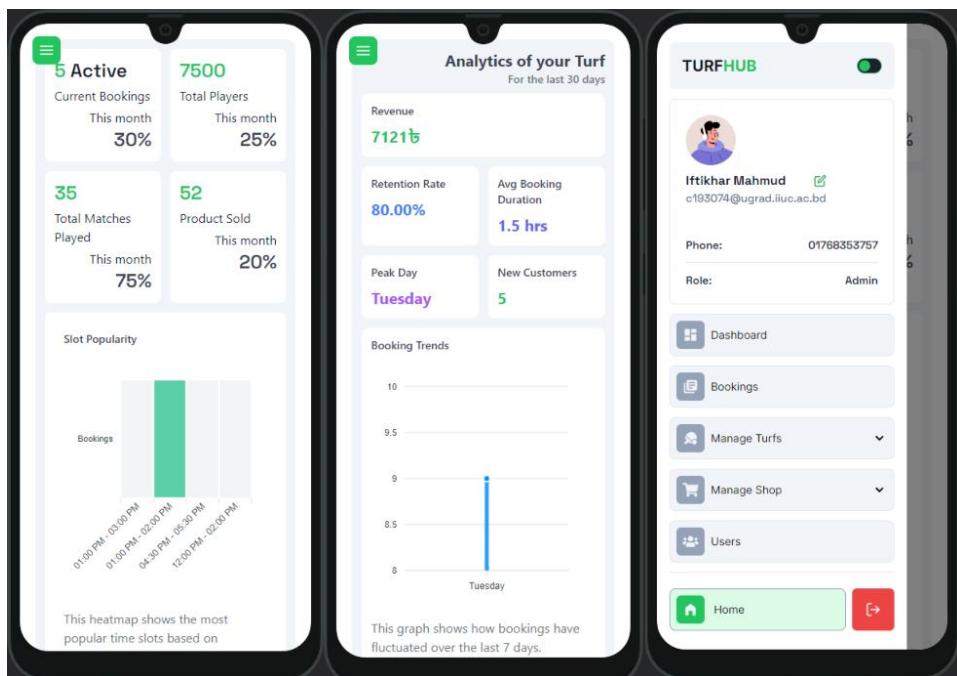


Figure 6.2.30: Android view 02

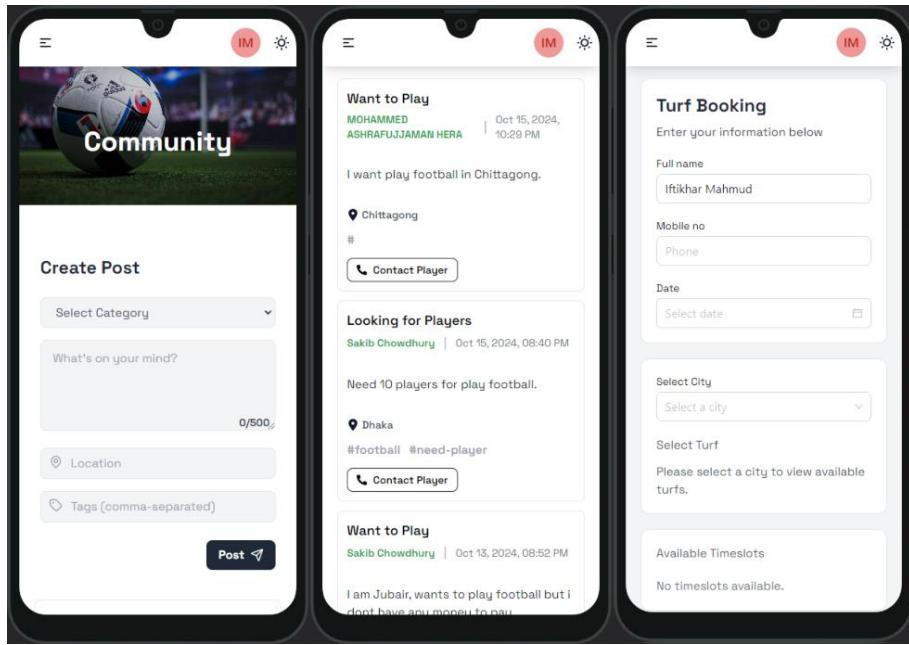


Figure 6.2.31: Android view 03

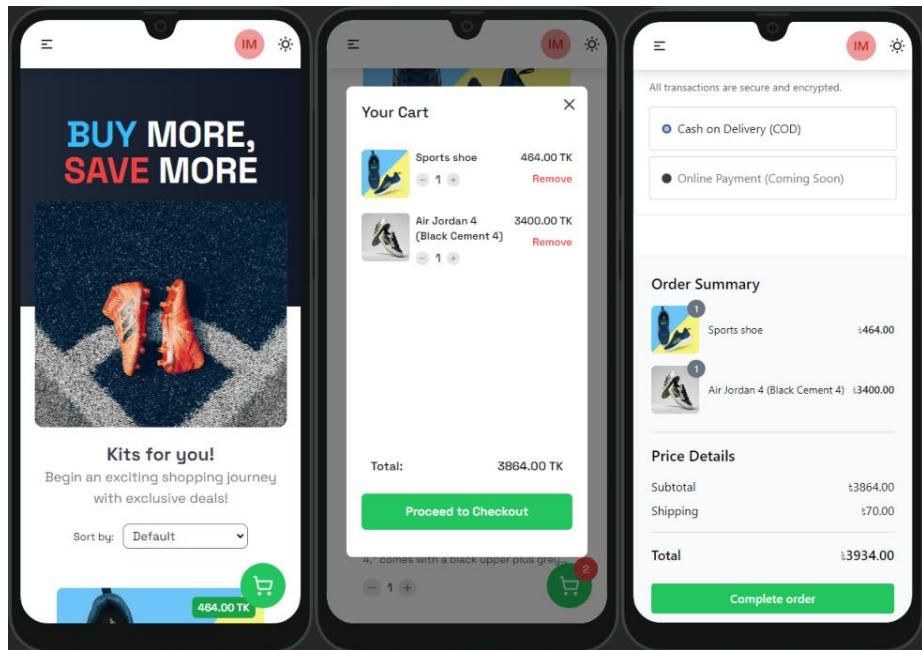


Figure 6.2.32: Android view 04

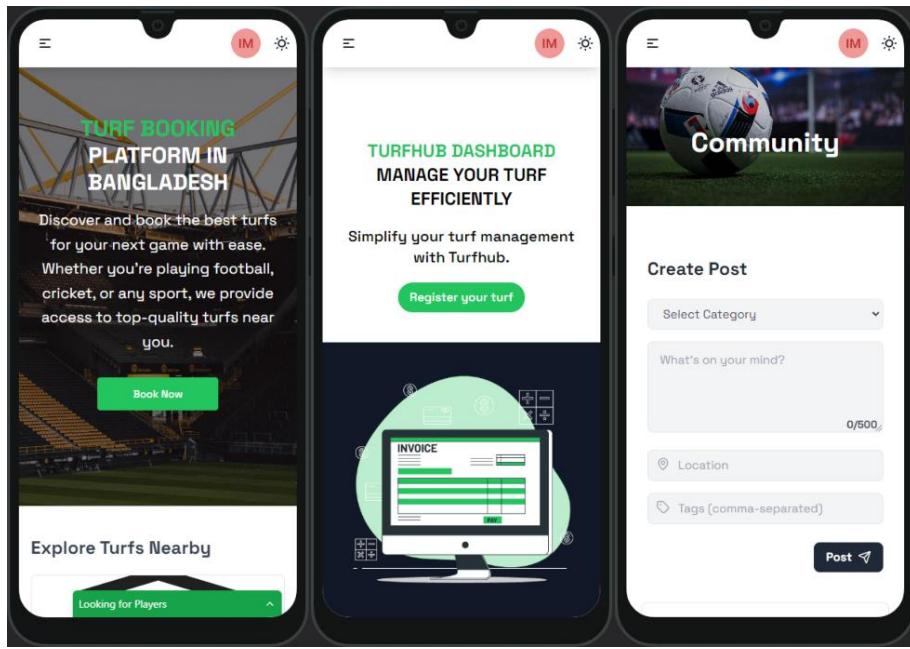


Figure 6.2.33: Android view 05

API Auth									
	API Names	URL	ADMIN	TURF_OWNER	PLAYER	PUBLIC		PRODUCTION	
1	GET All facilities	((turf-local-api))/facilities	null	null	null	1=enable		DONE	
2	DELETE facilities	((turf-local-api))/facilities/65a1be2e1c2c0521564e5dea	1=enable	1=enable	null	0=disable		DONE	
3	CREATE facilities	((turf-local-api))/facilities/	1=enable	1=enable	null	0=disable		DONE	
4	UPDATE facilities	((turf-local-api))/facilities/65a134b8980cff3d03ee9db9	1=enable	1=enable	null	0=disable		DONE	
5	GET All activity	((turf-local-api))/activity	null	null	null	1=enable		DONE	
6	DELETE activity	((turf-local-api))/activity/65a1be2e1c2c0521564e5daa	1=enable	1=enable	null	0=disable		DONE	
7	CREATE activity	((turf-local-api))/activity/	1=enable	1=enable	null	0=disable		DONE	
8	UPDATE activity	((turf-local-api))/activity/65a134b8980cff3d03ee9db9	1=enable	1=enable	null	0=disable		DONE	
9	GET All turf by city name	((turf-local-api))/turf?searchTerm=Chittagong	null	null	null	1=enable		DONE	
10	GET All turf by facility name	((turf-local-api))/turf/filter_by_facilities?searchTerm=First%20Aid%20Station	null	null	null	1=enable		DONE	
11	GET All turf	((turf-local-api))/turf	null	null	null	1=enable		DONE	
12	GET single turf	((turf-local-api))/turf/6f6fc63fe38f692504cf8f6e	null	null	null	1=enable		DONE	
13	GET all timeslot BY turfID	((turf-local-api))/turf/timeslot/66f59da156387d73a7090f7	null	null	null	1=enable		DONE	
14	DELETE turf	((turf-local-api))/turf/65e4a4d4dc0f088fbcc0b6bef	1=enable	1=enable	null	0=disable		DONE	
15	CREATE turf	((turf-local-api))/turf/create-turf	1=enable	1=enable	null	0=disable		DONE	
16	UPDATE turf	((turf-local-api))/turf/65e4a4d4dc0f088fbcc0b6ef8	1=enable	1=enable	null	0=disable		DONE	
17	GET admin turf owner analytics	((turf-local-api))/dashboard/analytics	1=enable	1=enable	null	0=disable		DONE	
18	GET turf owner dashboard	((turf-local-api))/dashboard/turf_owner/66f59af5ac1e207b45eb9a0a	0=disable	1=enable	null	0=disable		DONE	
19	GET admin dashboard	((turf-local-api))/dashboard/admin/66f5904a3cbf75fd844ecfb	1=enable	0=disable	null	0=disable		DONE	
20	GET all sales	((turf-local-api))/sales	1=enable	0=disable	null	0=disable		DONE	
21	GET single sales	((turf-local-api))/sales/66f3438f8a2ff6b81d34d2bc	1=enable	0=disable	null	0=disable		DONE	
22	DELETE sales	((turf-local-api))/sales/66f343748a2ff6b81d34d2c3	1=enable	0=disable	null	0=disable		DONE	
23	CREATE sales	((turf-local-api))/sales/create-sales	null	1=enable	null	1=enable		DONE	
24	UPDATE sales	((turf-local-api))/sales/66f3439f8a2ff6b81d34d2bc	1=enable	0=disable	null	0=disable		DONE	
25	GET all product	((turf-local-api))/product	null	null	null	1=enable		DONE	
26	GET single product	((turf-local-api))/product/66f3327c07410f9a48afeecd	null	null	null	1=enable		DONE	
27	DELETE product	((turf-local-api))/product/66f32787b34d2b6a31973a3	1=enable	0=disable	null	0=disable		DONE	
28	CREATE product							DONE	
29	UPDATE product							DONE	
30	DELETE product							DONE	
31	GET all community							DONE	
32	GET single community							DONE	
33	DELETE community							DONE	

Figure 6.2.34: API Authentication

CHAPTER 7: TESTING AND VALIDATION

7.1 Testing Process

The TurfHub testing process is an organized series of activities designed to ensure the platform's reliability, functionality, and performance. Testing is vital to identify and resolve any defects or vulnerabilities early, ensuring that the platform meets the specified requirements and operates as expected. This systematic approach ensures that TurfHub provides a seamless experience for both users and administrators by delivering a high-quality, secure, and efficient platform. Proper testing also enhances customer satisfaction, saves time, and reduces costs by catching and fixing bugs before the final deployment.

7.2 Testing Techniques

Testing techniques for TurfHub include both static and dynamic testing approaches, which are crucial for identifying issues during development and post-deployment. These techniques ensure that the system functions smoothly and adheres to performance expectations.

7.2.1 Static Testing: Static testing involves reviewing the code, documents, and requirements without executing the program. This process helps in identifying flaws early in development and ensures that the platform's design aligns with its objectives.

- Inspection: the code is reviewed systematically to identify potential issues, ensuring it meets the platform's specifications.
- Technical reviews: focused on ensuring that the code adheres to technical standards and guidelines.
- Informal reviews: involve fewer formal checks where team members review each other's code and provide feedback.

7.2.2 Dynamic Testing: Dynamic testing focuses on executing the code and observing its behavior during runtime. This helps verify the system's actual performance under real-world conditions.

7.2.2.1 White Box Testing: White box testing involves testing internal structures or workings of the platform. In TurfHub, this method ensures that the backend systems, including data flow and internal APIs, function correctly.

7.2.2.2 Black Box Testing: Black box testing focuses on testing the functionality of TurfHub without examining its internal code structure. For example, when a user books a turf, the expected output (confirmation) is tested to ensure proper functionality without looking into the backend logic.

7.3 Validation Process

Validation plays an essential role in ensuring that the data entered into TurfHub is accurate, consistent, and adheres to the required formats, preventing potential errors. Validation also enhances the system's integrity and reliability.

7.3.1 Email Validation for TurfHub: In TurfHub, email validation is performed using Zod for server-side validation, ensuring that user-entered email addresses are correctly formatted. On the frontend, React Hook Form ensures strict validation of input fields, including email fields, enhancing accuracy and reducing errors during registration and login processes. We also handle email validation in the forgot password workflows. Additionally, OTP is used for handling new registrations and forgot password processes, providing an extra layer of security.

7.3.2 Submission validation for TurfHub: Submission validation in turfhub ensures that all form data (e.g., turf bookings, user registration) is accurate and consistent:

- **Field validation:** each input field is checked for data type, length restrictions, and required fields.
- **Data integrity:** user inputs are sanitized to prevent vulnerabilities like sql injection.
- **Error handling:** users are provided with clear error messages to guide them in correcting submission issues.
- **Server-side validation:** in addition to frontend validation, backend checks are essential for preventing bypassing of client-side validations.
- **User feedback:** feedback is provided to users upon successful or failed submissions, ensuring clarity and a smooth experience.

By implementing strict validation mechanisms, turfhub ensures a reliable, secure, and user-friendly platform for all its users.

CHAPTER 8: CONCLUSION

8.1 Conclusion

The TurfHub project successfully addresses the need for a centralized platform that simplifies turf booking, facilitates team management, and enhances community engagement in sports activities. By integrating modern technologies and a user-friendly interface, TurfHub has streamlined the process for players to find available turfs and for turf owners to manage their operations effectively. Throughout its development, the project has demonstrated how technology can create a more accessible and organized environment for turf-based sports.

The platform's core features, such as real-time bookings, community interactions, and merchandise sales, have established a solid foundation for future growth. TurfHub not only meets the current demands of players and turf owners but also positions itself as a valuable tool for fostering collaboration and competition within the local sports community.

8.2 Future Scope

Testing Looking ahead, there are numerous opportunities to enhance and expand **TurfHub's** functionality. Some key areas for future development include:

1. **AI-Powered Matchmaking:** Incorporating AI algorithms to automatically match players with teams or available turfs based on location, availability, and player preferences would make the platform more personalized and efficient.
2. **Event Management and Tournaments:** Expanding the platform to offer full event and tournament management capabilities, including registration, bracket management, and real-time scoring, would encourage larger-scale sports events and boost user participation.

3. **Social Media Integration:** Adding features to share bookings, team updates, and tournament results across social media platforms will increase community engagement and raise awareness of turf-based sports events.
4. **Geolocation and Multi-City Expansion:** As TurfHub grows, integrating geolocation features will allow users to search for turfs based on their location. This will facilitate the platform's expansion to new cities, enabling players in other regions to access TurfHub's features.

These future enhancements will enable **TurfHub** to continue evolving into a comprehensive platform for managing turf sports, promoting community engagement, and providing turf owners with valuable tools to enhance their business operations. By embracing these developments, TurfHub will solidify its position as a leader in the turf sports management industry.

References:

1. Chowdhury, J. (2024, February 22). Competition heats up as Ctgs's artificial turf business expands. *The Business Standard*. <https://www.tbsnews.net/bangladesh/competition-heats-ctgs-artificial-turf-business-expands-797054>
2. Elsborg, P., Nielsen, G., Klinker, C. D., Melby, P. S., Christensen, J. H., & Bentsen, P. (2019). Sports-based recreation as a means to address social inequity in health: why, when, where, who, what, and how. *BMC Public Health*, 19(1). <https://doi.org/10.1186/s12889-019-7428-3>
3. Garcia, L., Mendonça, G., Benedetti, T. R. B., Borges, L. J., Streit, I. A., Christofolletti, M., Silva-Júnior, F. L. E., Papini, C. B., & Binotto, M. A. (2022). Barriers and facilitators of domain-specific physical activity: a systematic review of reviews. *BMC Public Health*, 22(1). <https://doi.org/10.1186/s12889-022-14385-1>
4. Hoque, T. (2024, January 2). The evolving sports scene in Chattogram. *The Daily Star*. <https://www.thedailystar.net/supplements/chattogram-excelling-academically/news/the-evolving-sports-scene-chattogram-3509506>
5. Straw, C. M., McCullough, B. P., Segars, C., Dahir, B., & Patterson, M. S. (2021). Reimagining Sustainable Community Sports Fields of the Future: a Framework for Convergent Science-Stakeholder Decision-Making. *Circular Economy and Sustainability*, 2(3), 1267–1277. <https://doi.org/10.1007/s43615-021-00115-z>
6. Wolbring, L., Schmidt, S. C. E., Niessner, C., Woll, A., & Wäsche, H. (2022). Community networks of sport and physical activity promotion: an analysis of structural properties and conditions of cooperation. *BMC Public Health*, 22(1). <https://doi.org/10.1186/s12889-022-14383-3>

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