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Chapter 1
Introduction

1.1 Prologue

Strong administrative structures are now more important than ever in the hectic educational and business environments of today. Attendance monitoring is one of the most common yet crucial administrative procedures. Conventional techniques, such handwritten authentication, RFID-based systems, and biometric scanners, are frequently laborious, prone to mistakes, and susceptible to unauthorized attendance. These restrictions jeopardize confidentiality of information and operational effectiveness, particularly in big organizations where timely and precise records are essential.

By creating a cutting-edge, online communication time attendance system that puts reliability, rapidity, and user convenience first, our project overcomes these drawbacks. The platform's primary innovation is QR code technology, which allows users to easily record their attendance by utilizing any camera-equipped device to scan a frequently produced QR code. The risk of manipulation or unauthorized entries is greatly decreased because each scan is linked to a distinct user session and evaluated in real time.

They utilized PostgreSQL, a potent hierarchical database framework renowned for its reliability, effectiveness, and support for sophisticated queries, to guarantee safe and dependable handling of information. PostgreSQL is especially well-suited for applications like monitoring attendance where record quality and consistency are crucial because of its organized architecture, transaction control, and strong indexing techniques.

In addition to standard harvesting, the tool offers computerized report production, immediate fashion visualizations, and authorised user access. These solutions expedite decision-making and give administrators insightful information about attendance trends. Cross-device versatility and rollout simplicity are further guaranteed by the totally web-based design, which does away with the requirement for specialist software or hardware.

The ultimate objective of this initiative is to replace antiquated attendance practices with a digital system that is expandable, trustworthy, and proactive. It shows how an apparently straightforward procedure may be rethought to satisfy the changing needs of today's institutions by utilizing cutting-edge web-based technologies and an efficient database environment.

1.2 Motivation

In professional as well as educational environments, precise record keeping of attendance are necessary for efficient managerial supervision, evaluation of accomplishments, and compliance. However, problems including mistakes by humans, regulatory hold-ups, rising costs, and vulnerability to proxy attendance frequently afflict classical presence systems, which range from handwritten counts to biometric technology.

When there are numerous sites, sizable populations, or remote work and learning situations, these inefficiencies become very troublesome. There has never been a more pressing need for a safe, effective, and scalable attendance system as educational institutions embrace automation and digitization.

The need to solve these issues with a technically sound and practically implementable solution is what motivates this effort. We greatly cut down on time and error by humans by doing away with the requirement for manual entry or physical verification by using QR code scanning. While PostgreSQL, a strong and dependable relational database system, offers an organized, safe, and scalable basis for storing and handling enormous amounts of attendance information, real-time data logging guarantees authenticity and openness.

Our objective is to create a system that improves attendance tracking's precision, effectiveness, and usability while conforming to contemporary digital standards. In addition to being flexible and adaptive, the suggested method is also resistant to common weaknesses like manipulation of data and proxies' membership.

The ultimate goal of this project is to transform the organization of attendance through the use of cutting-edge online technologies, secure database facilities including QR-based verification. We see a more intelligent, user-friendly system that enables organizations to concentrate on their primary goals—productivity and education—while guaranteeing dependability, accessibility, and trust via a framework enabled by digital technology.

1.3 Objective

1 To guarantee quick, safe, and effective attendance logging—minimizing mistakes by people, lowering proxy risks, and needing little user intervention—develop a web-based, compact timekeeping system that uses QR code scanning.

2. Use PostgreSQL as your backend database to facilitate systematic, dependable, and extensible handling of information while enabling immediate information logging. This makes it possible to handle big datasets effectively and retrieve them quickly for automated analysis and reporting.

3. Create dynamically updating QR codes that are connected to distinct user IDs and current timestamps to create a safe, impenetrable attendance verification system that avoids fraud or duplicate.

4. Create a simple, easy-to-use online interface that enables supervisors and end users to check on involvement, examine QR codes, and organize attendance files without the need for technical know-how.

5. Deliver immediate time visual analysis into participation developments performance by individuals, and broad institutions participation measures by integrating analytics interfaces and auto-generated statistics.

6. Use role-based access control, also known as RBAC, to provide safe, segregated data entry, allowing executives, instructors, and pupils to view only data that is pertinent to their positions.

7. Encourage ongoing system improvement and an improved user experience by providing user feedback channels that let users voice concerns or recommend improvements.

8. To guarantee correctness, dependability, and efficacy under a range of operational scenarios—including stressful conditions and replicated real-world use cases—conduct thorough system examination and verification.

9. Establish the groundwork for future interaction with external platforms, like Institutional Management Systems (IMS) or Learning Management Systems (LMS), to facilitate corporate expansion and smooth alignment.

1.4 Problem Statement

Mechanical authentication, scanning of fingerprints, and RFID-based systems are examples of traditional participation tracking techniques that are becoming more and more ineffective, prone to mistakes, and vulnerable to abuse through fake attendance. These outdated systems frequently need a high administrative burden, don't offer real-time data, and aren't ideal for large-scale or distant deployments. Furthermore, biometric solutions include physical touch and costly gear, which raises health and hygiene issues in post-pandemic settings. Conversely, manual methods lack visibility and data reliability and are laborious and exhausting. A flexible, easy to use, and secure presence monitoring system that minimizes human error, lowers the possibility of deceit, and provides real-time data accessibility is desperately needed. With the help of PostgreSQL, a powerful relational database renowned for its dependability, speed, and capacity to handle structured data, this project suggests a simplified, web-based attendance system that uses dynamically produced QR codes for identification and current information recording. Through providing a universal, hygienic, affordable, and impenetrable system that improves precision, productivity, and responsibility, the ultimate goal is to transform presence oversight in educational as well as business environments.

1.5 Approach

1. Requirement Analysis and Planning:

- We started by determining the main problems with the current attendance systems, including hardware dependence, proxy entries, manual errors, and scalability concerns.
- We described the system requirements, architecture, and technology stack in light of these discoveries.

2. Technology Stack Selection:

- Web technologies were chosen for their ease of deployment and cross-platform interoperability.
  - Frontend: HTML5, CSS3, Bootstrap, Jinja2 Templates
  - Backend: Python, Flask (for routing, session management, templating)
  - Database: Postgres SQL for scalable, document-based data storage
  - Libraries:

    qrcode – QR code generation

    datetime – Timestamping

    sqlite3 – Database interaction

    io – QR image handling

    werkzeug. security – Password security

3. QR Code Generation and Scanning:

- Each visitor or session generates a different, that are responsive QR code. Through a web interface, users scan this code to start their attendance monitoring process.
- To stop manipulation or reuse, QR codes are verified or dynamically refreshed.

4. User Authentication and Role Management:

- Among executives, educators, and students/employees, an authentication system with access determined by role constraints is put into place.

- This guarantees safe access to information and features pertinent to every function.

5. Real-Time Data Logging with MongoDB:

- Participation information is instantly entered into the database running on PostgreSQL in real time when somebody scans their individual QR code.
- To ensure an accurate record of user activity, each attendance item contains essential fields including the user's individual ID, the date and time, transaction or event records, and, if relevant, device or site characteristics.
- In addition to supporting organized searches for effective data mining, disclosure, and role-based management of access, PostgreSQL's structural design guarantees consistency of data and durability.
- Regarding massive implementations, PostgreSQL's implementation of commitments and constraints facilitates secure, parallel accessibility, avoids repetition, and assists in preserving accurate information.

6. Dashboard and Analytics:

- Administrators can monitor participation statistics, such as total participants, absences, and tardiness measures, visually on a live dashboard.
- For improved understanding, illustrated statistics and convertible analyses (in PDF and CSV formats) are provided.

7. Testing and Validation:

- To guarantee rapidity, precision, and dependability, the infrastructure is extensively tested in a variety of scenarios (structure velocity, gadget kinds, and bulk usage).
- Entry oversight, entry washing, and QR verification reasoning are examples of security methods that are implemented.

8. User Feedback and Iteration:

- Guests may identify defects or make suggestions for changes using the incorporated reporting section.
- Iterative upgrades are expected to continuously enhance efficiency and effectiveness upon user feedback.

1.6 Scope of the Project

- Web-Based Attendance System: creation of a simple, facile to use internet-based program that can be used on several devices without the need for specialist gear and allows precise attendance tracking using QR code scanning.
- Dynamic QR Code Generation: Using dependent on time, session-specific, or protected QR codes to make sure that only those with permission can record their appearance and avoid substitute participation.
- Using PostgreSQL to Log Data in Real Time: Monitor information on attendance in actual time using PostgreSQL, the main relational database system that supports scalable administration of organized information, relationship honesty and and quick retrieval.
- Role-Based Access Control: Developing a safe registration and identity administration platform that gives supervisors, instructors, learners, and others distinct access, each with their own monitor views and functionality.
- Reporting and the Dashboard: Intelligence monitors and automatic reporting tools are integrated to give managers the ability to create reports, track attendance trends, and transfer the information to a variety of formats (such as PDF and CSV).
- Mechanisms for User Interaction and Feedback: incorporating a feedback section into the platform where users can voice concerns or recommend enhancements, encouraging iterative improvement of the usability and functionality of the system.
- Scalability and Accessible: Creating a system design that can accommodate large numbers of consumers, events, and information uploading while maintaining accessible from environments with limited resources or those that are distant
- Testing and Validation: To guarantee correctness, security, and dependability in actual institutional circumstances, comprehensive testing should be carried out, covering unit, system, and overall performance evaluation.
- interface with Institutional Systems: To synchronize attendance data and optimize workflows, plans are being made for possible interface with campus administration channels, HR systems, or instructional managing systems (LMS).
- Ethics and Data Privacy: Upholding institutional regulations and ethical norms for private information while ensuring the safe handling and preservation of user data through cryptography and accessibility controls.

1.7 Organization of the Rest of the Report

To provide a thorough explanation of each QR Code-Based Website Attendance System, the dissertation project is divided into multiple hierarchical sections. The overview of the literature, the approach, system evaluation results and discussions, implications and future plans, and references are the six primary sections of the study.

I. **Literature Review:**

A critical evaluation of current attendance monitoring technologies, such as mechanical records, biometric gadgets, RFID-based infrastructure, and QR code-based substitutes, will be provided in this section. It will draw attention to existing issues like proxy participation and inefficiency and lay the groundwork for the suggested fix. To put the project in perspective and find any technological gaps, pertinent research articles and instances will be examined.

II. **Methodology:**

The internet-based attending organisational's technology stack, system design, and building methodological will all be covered in the Methodology section. It will go over the procedures for creating QR codes, scanning them in real time, and securely logging data with PostgresSql . This part will also go over handling sessions, access control by roles, and how to create a user interface that is simple to use.

III. **Testing of the Model:**

The methodical testing procedure used to assess the established system's effectiveness, safety, and dependability will be described in detail in this section, along with working, share, insertion, and usability evaluations and an analysis of scenarios like networks interruptions, concurrent scanning, and unconstitutional scans, as well as their outcomes and remedial actions.

IV. **Results and Discussion:**

The initiative's functional results will be shown in this part, along with crucial characteristics including real-time monitors, security QR-based registering, and attendance tracking. We'll talk about performance criteria like system speed, accuracy, and dependability. The deployed solution's practical advantages and drawbacks will also be assessed, along with how it affects data integrity and administrative effectiveness.

V. **Conclusions and Future Scope:**

In addition to proposing future improvements like offline performance, facial identification assistance mobile application acceptance, and API-based institutionalized connections the following section will concentrate on the project's key accomplishments and point out how the technology solves conventional registration difficulties. It will additionally discuss its broader significance for incorporated and educational utilization.

VI. **References:**

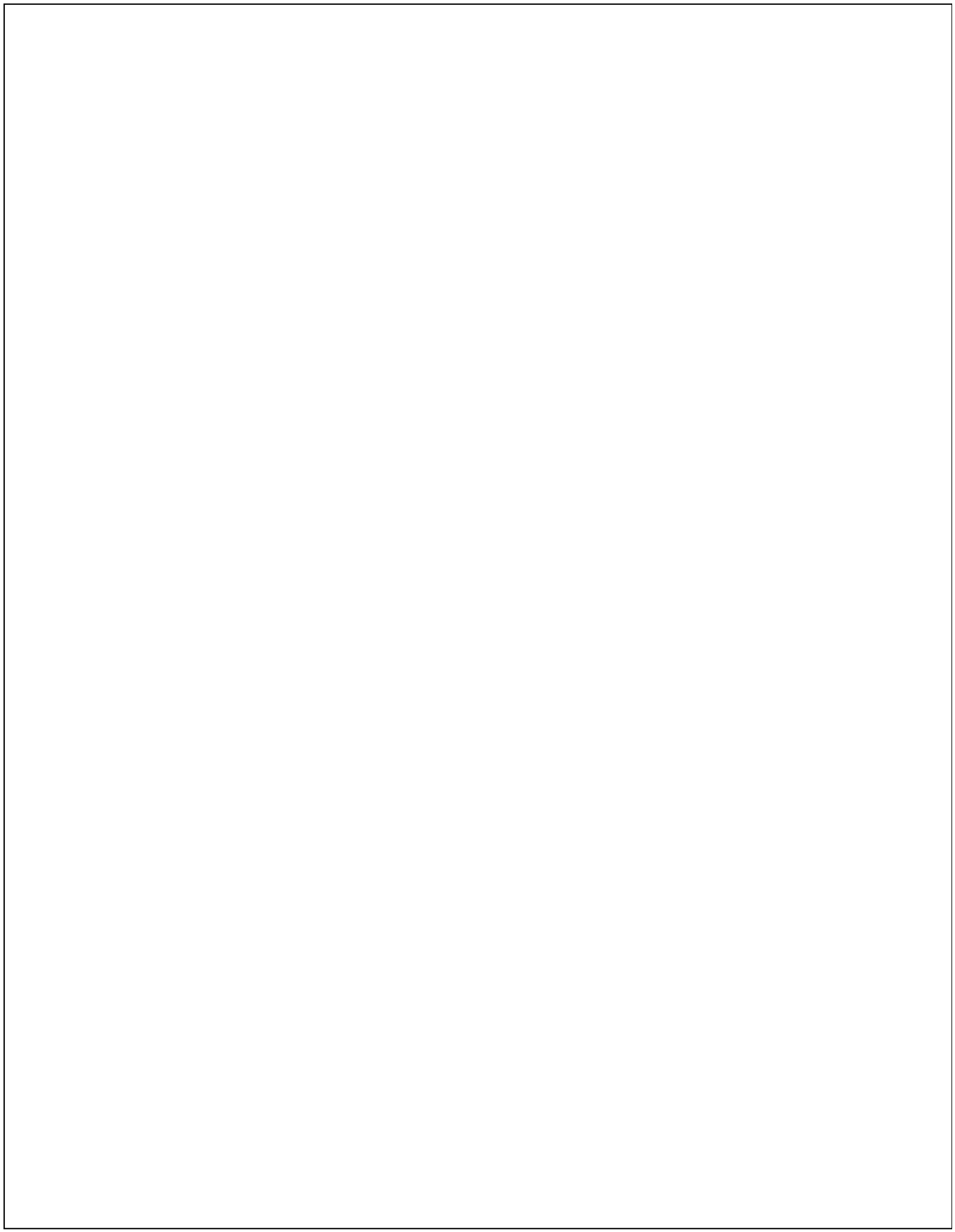
The References section will provide a complete list of all academic papers, web articles, documentation, and tools cited throughout the report. Proper citation formats will be followed to ensure academic integrity and acknowledge prior work.

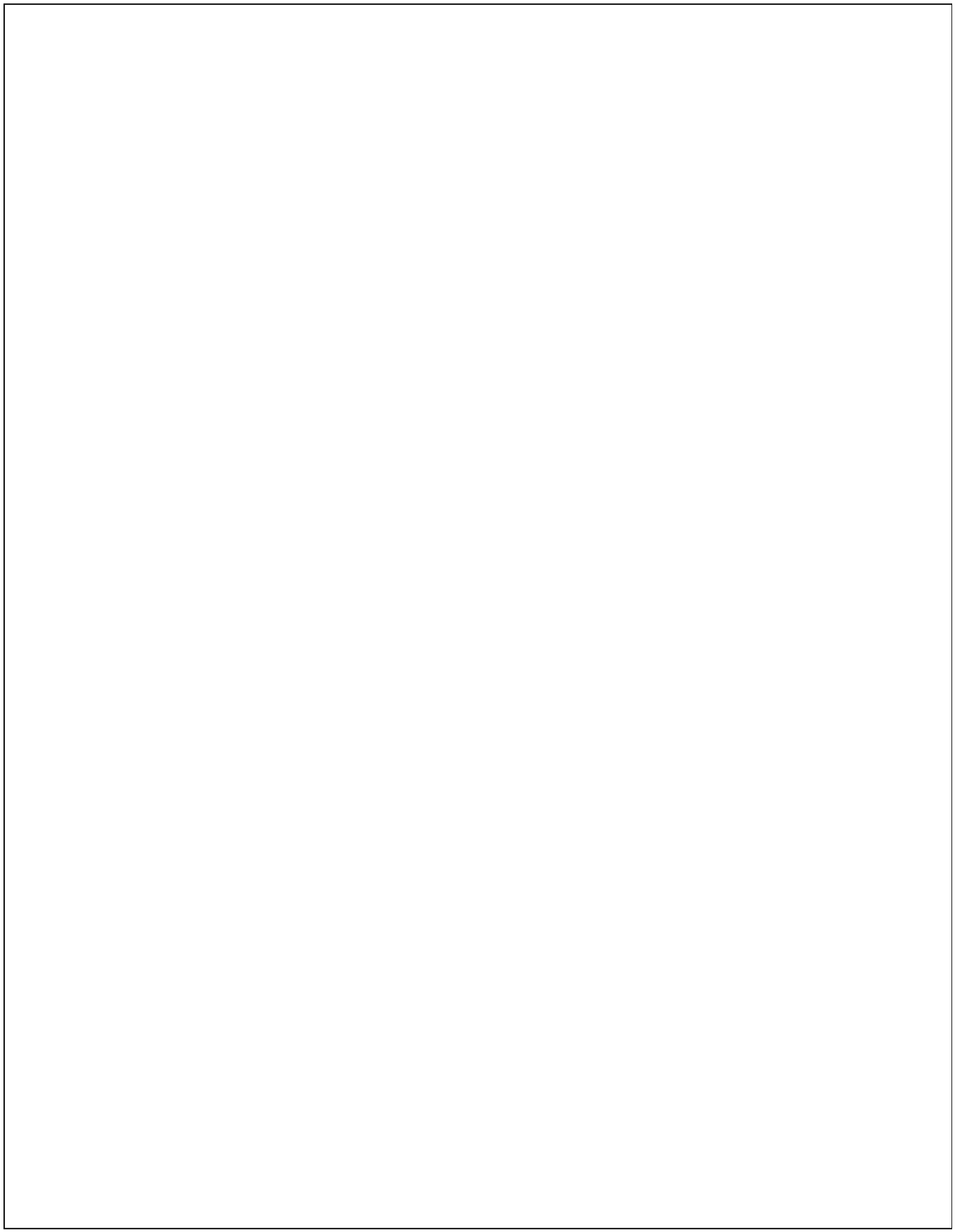
1.8 About the Company

Innovate Intern is a collaborative platform created by experienced engineers to help students bridge the gap between academic learning and real-world industry skills. The company focuses on providing meaningful internship opportunities that emphasize practical exposure, mentorship, and hands-on learning.

Rather than prioritizing profit, Innovate Intern aims to build a community where skill development, innovation, and knowledge-sharing come first. The platform supports young engineers by guiding them through industry-relevant projects and encouraging critical thinking and collaboration.

Through its diverse team and thoughtful approach, Innovate Intern continues to shape future engineers by providing a space where learning and innovation go hand in hand





Chapter 2
Literature Review

2.1 Background

In businesses, educational institutions, and universities, recording attendance has long been a necessary but routine task. Historically, this has been accomplished manually using identification card tests, login sheets of paper, or rolls called. Despite their simplicity, these techniques frequently result in problems including delays, inaccurate documents, and even manipulations (substituted presence). Better solutions are becoming more and more necessary as technology advances, which is why QR code-based presence methods are growing more and more common.

2.2 What Other Systems Have Done

In this Research paper [1], Registration has been automated using a variety of techniques over the years. For instance, because of their speed, RFID-based devices were frequently used in institutions. However, they require additional gear, such as RFID tags and scanners, which can be costly. Although biometric devices, such fingerprint scanners, provide a more secure method of recording attendance, they have drawbacks such as hygienic issues and ongoing device upkeep. QR codes, on the other hand, provide a more straightforward and affordable option. These days, it's relatively simple to generate and scan QR codes because almost everyone has a smartphone. Research such as that conducted by Singh et al. (2022) demonstrates that QR code solutions aren't just affordable but also simple to implement and maintain.

2.3 Recent Improvements in QR Attendance Systems

Challenges including learners providing images of QR codes to assist others in identifying phony participation have been attempted to be addressed by more recent methods. Creating QR codes dependent on time, meaning they alter or disappear within several moments, is one approach to avoid this. For example, Zhang and Lee (2023) developed a system that generates a new QR code every minute. This implies that reusing outdated code will not be successful. [2]

To make sure that only legitimate users in a current transaction could indicate attendance, Joshi et al. (2023) employed a Python Flask backend in another current effort. Such a server-side verification increases the platform's dependability. [3]

This clever concept is also used in your project: each session has a distinct, transient QR code that is only active for a limited period of time. Most simple systems lack this extra degree of security.

2.4 Where QR Codes Are Actually Used

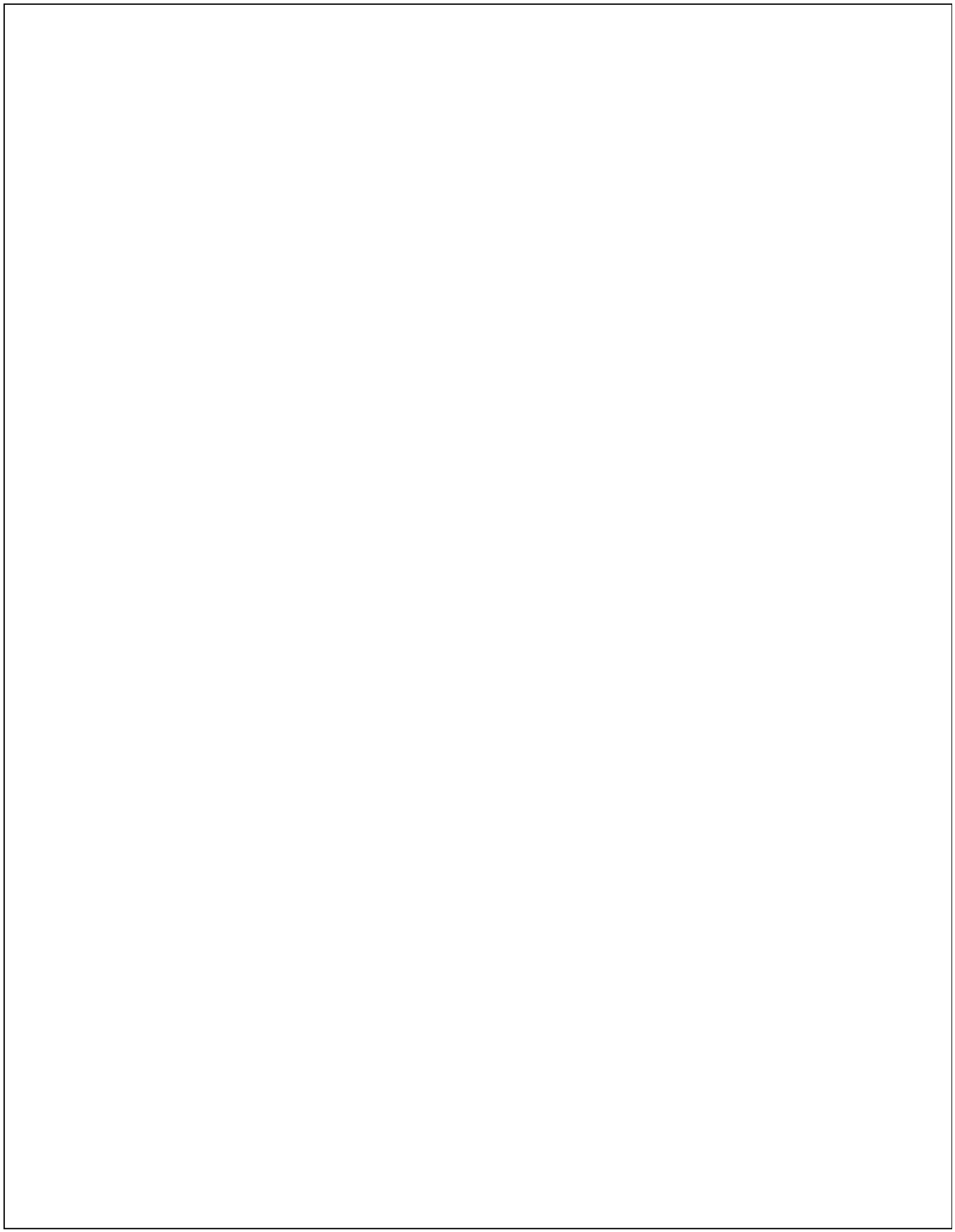
Such structures are being investigated by more than just researchers. QR codes are already widely used by many real-life institutions for updates and presence:

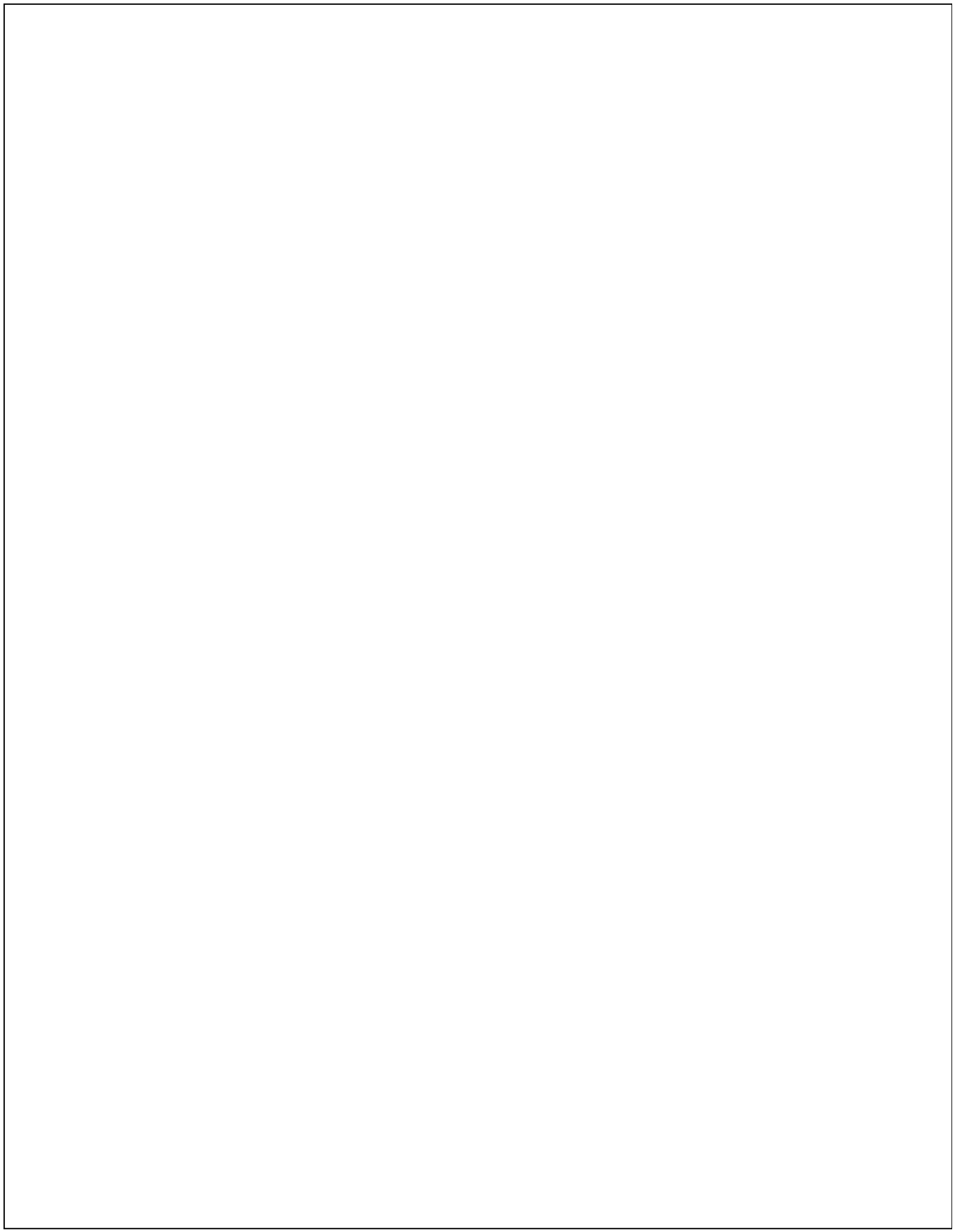
In order to combat participation deceit, Universiti Teknologi MARA (Malaysia) developed an app that updates the QR code every 30 seconds. This demonstrates the effectiveness of that are responsive QR codes. [4]

Higher education institutions frequently use web-based forms that are QR-linked, allowing learners to look up a QR code and enter their information. These, however, are simple to fake or spread. Your system uses account verification and actual time expiration to correct that. [5]

Workers move around office buildings by scanning a QR code, which is used by companies such as Zoho for their human resources management systems. It tracks the duration of work by recording by itself places and times. [7]

QR codes are used for registration in event apps such as Eventbrite. Upon arrival, guests check in by scanning their code. This demonstrates how fast and effectively QR codes can manage situations with excessive traffic. [8]





Chapter 3

Methodology

3.1 Proposed Methodology:

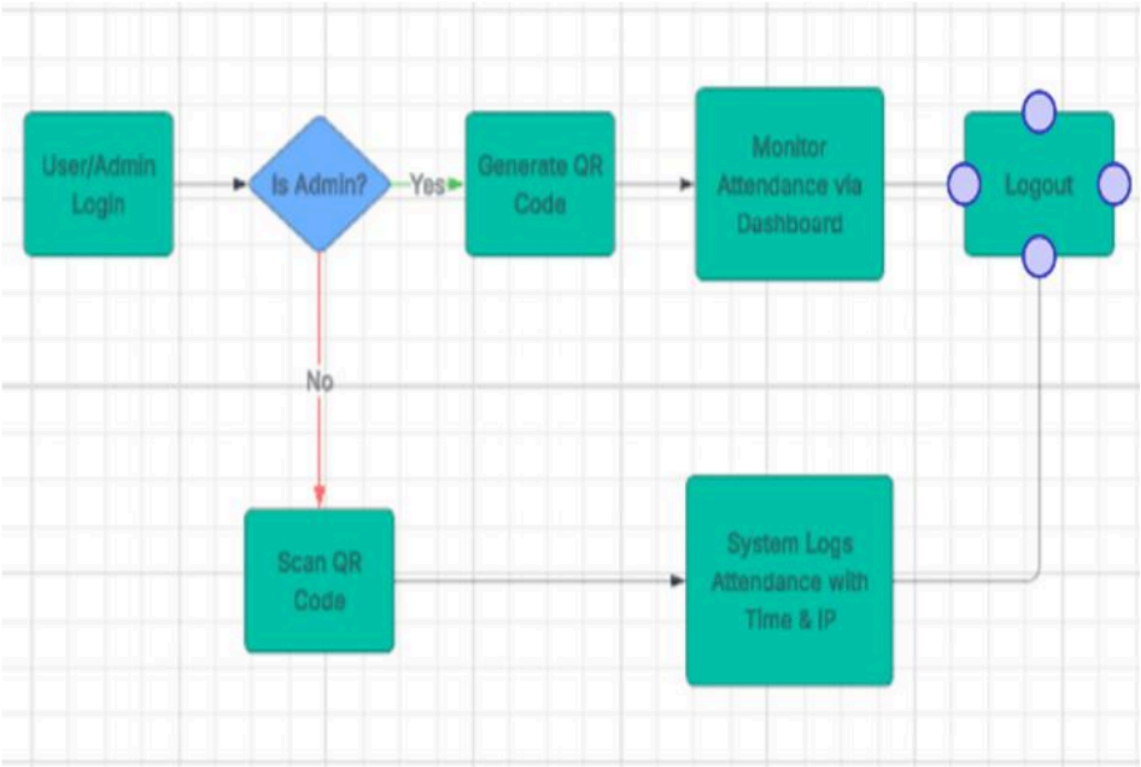


Figure 3.1.1 Methodology

The methodology for the QR Code-based attendance system with real-time data logging, using PostgreSQL as the database, is structured around multiple phases. The following steps outline the approach used for system development, from planning and design to deployment and testing.

1. Requirement Analysis and Planning:

- **Data Collection and Analysis:** In order to identify pain points such as error by humans, substitution enrollment, problems with scaling, and shortcomings related to conventional registration techniques (manual sign-ins, biometric devices, RFID), the first phase entails collecting necessities from consumers (e.g., colleges and universities, administrators) and analyzing current attendance systems.

- **System Design:** The framework's general framework was developed following the requirement analysis. This entails specifying the elements, including the application module for creating QR codes, the user's experience the connection of the PostgreSQL file, immediate participation monitoring, and overall access management based on roles for various users (students, instructors, and managers).

2. System Design and Architecture:

- **QR Code Generation Module:** Create a system that can produce QR codes with variables that are specific to the particular client and period. Time-sensitive and session-specific bar codes are going to be used to stop unwelcome visitor and proxies' attendees.

- **Database Design:** To monitor and store participation, use the relational database PostgreSQL. Columns for individuals (students, instructors, and administrators), attendance records, and session information are all part of the information in the database schema. and create a current tracking software that, when scanning a QR code, quickly changes records in the database for presence, guaranteeing precise and up-to-date participation recording.

- **Role-Based Access Control:** Assign diverse privileges to various user roles, such as administrators, instructors, and students. For instance, although pupils are limited to scanning QR codes to indicate their presence, managers can create reports.

3. Front-End Development:

- **User Interface Design:** Create a flexible, consumer-friendly, and logical internet-based interface for users. Users (teachers, executives, and learners) will be able to engage with the system with ease thanks to the interface. Displays for administrators and academics to examine participation patterns and data will be built into the overall scheme.

- **QR Code Scanning Interface:** To allow an internet-based platforms to interpret such codes using camera input, use JavaScript. In order to accomplish this, an independent software for QR tag reading must be integrated, guaranteeing device interoperability.

4. Back-End Development:

- **Database Integration:** The time spent data is going to be stored in PostgreSQL. To handle queries, control user authentication, record attending timber, and find session-related information, the server side will comprise Flask (The Python programming language) APIs.

- **Real-Time Data Logging:** Whenever the short code is recognized, the device immediately logs information about attendance through PostgreSQL. This comprises information (such as equipment sort), date and time, account identification, and visit Identifier.

- **Role-Based Access Control Implementation:** Make sure the appropriate person can access and carry out particular duties by setting up user authorizations and roles in the server side (faculty can examine reports, administrators can supervise customers, and learners can indicate punctuality).

5. Testing and Quality Assurance:

- **Unit Testing:** To make sure they work properly, thoroughly test each component separately, such as inquiries into the database, immediate time harvesting, and QR code creation.

- **System Testing:** To verify that the relational database, the user interface, and backbone of the system all function as a whole, conduct integration evaluations. Make that the PostgreSQL databases have precise immediate time record of attendance recorded.

6. Deployment and Integration:

- **Deployment:** To make sure that the attendance application is adaptable, safe, and available from any location, deploy it on a cloud computing system (such as AWS or Heroku). To guarantee seamless operation and scaling, the entire system will be evaluated in real-world scenarios.

- **Integration with Institutional Systems:** To facilitate the smooth harmonization of participation information with academic databases, potential connection via Learning Management Systems (LMS) or similar university administrative solutions may be investigated.

7. Maintenance and Updates:

- **Continuous Monitoring and Feedback:** The equipment will be checked for problems or defects after deployment. A feedback mechanism will be put in place to gather user recommendations for additional enhancements.

- **Regular Updates:** The software will be updated on a regular basis to improve its efficiency, safety, and usefulness in response to user input and changing needs.

3.2 Flowchart:

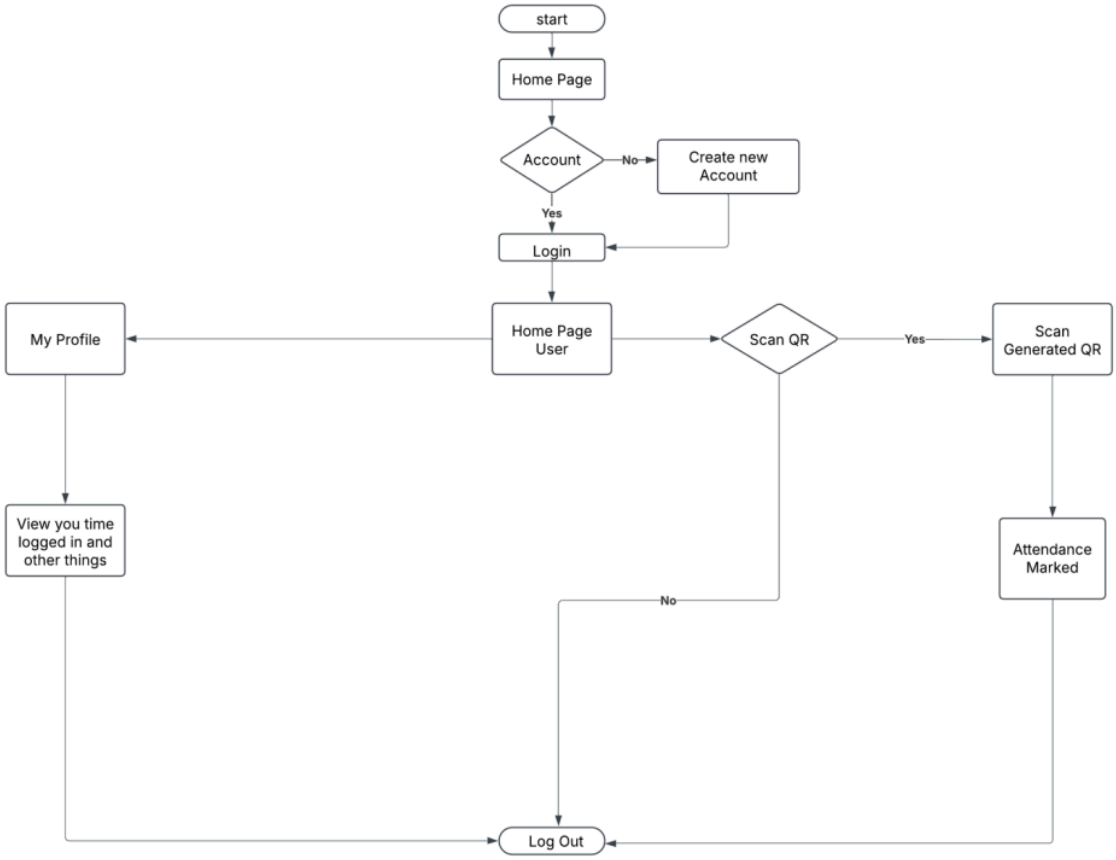


Figure 3.2.1 User Flowchart Diagram for QR Code

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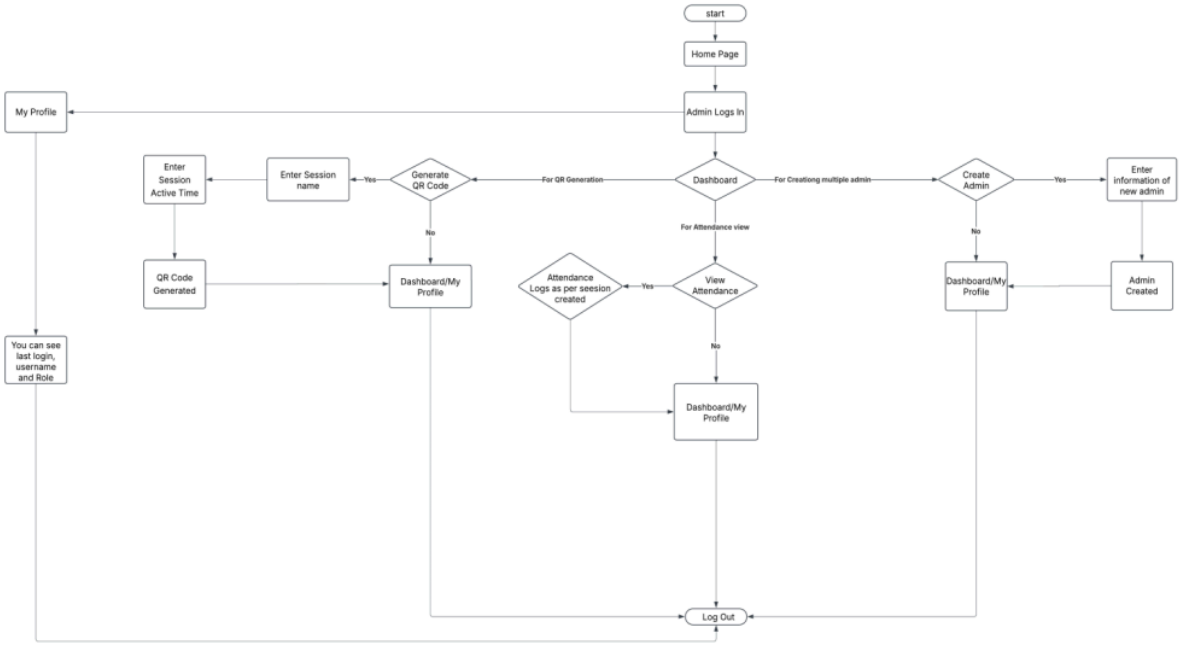

Figure 3.2.2 Admin Flow Chart Diagram

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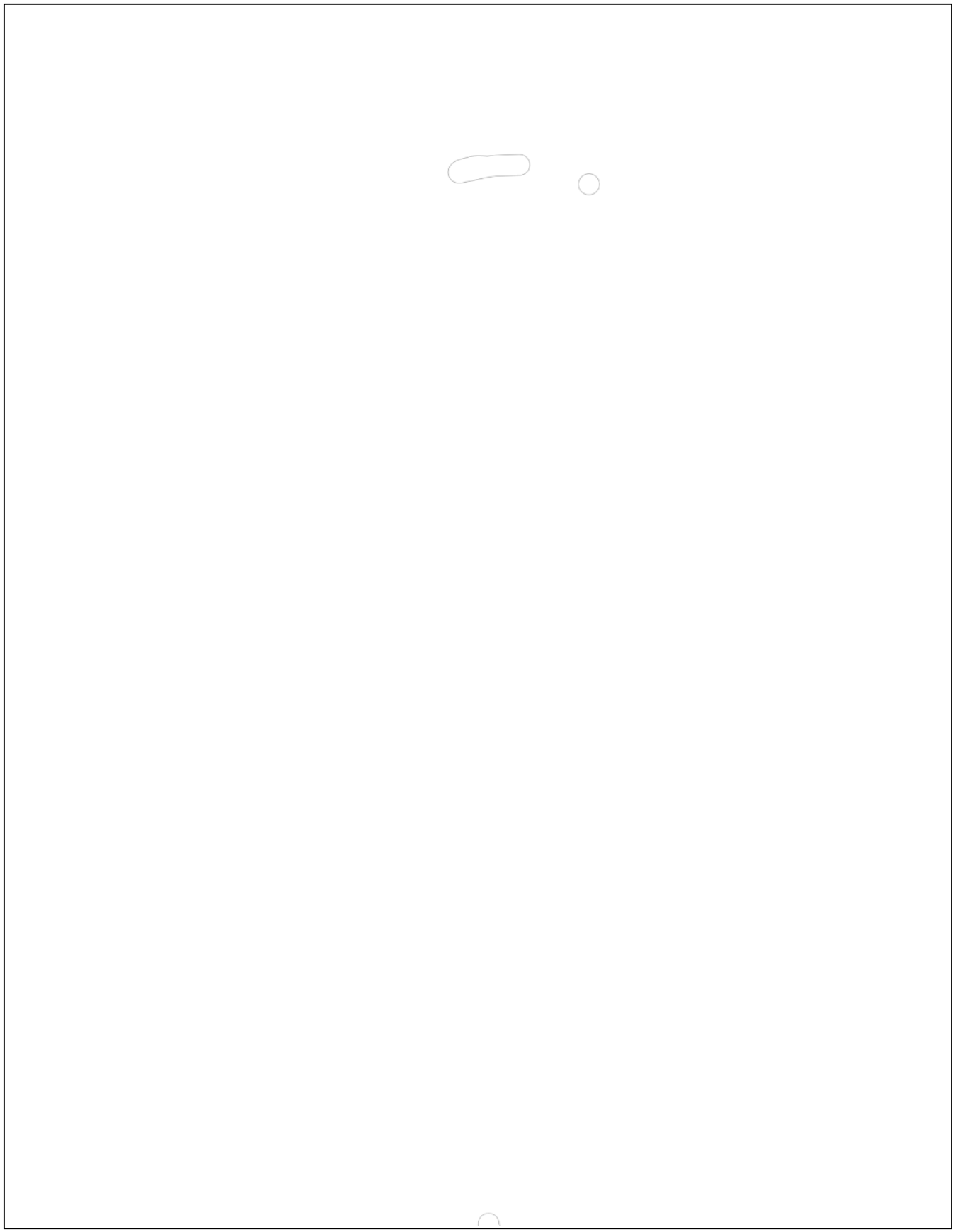

Chapter 4

Result And Discussion

4.1 Web Deployment Results:

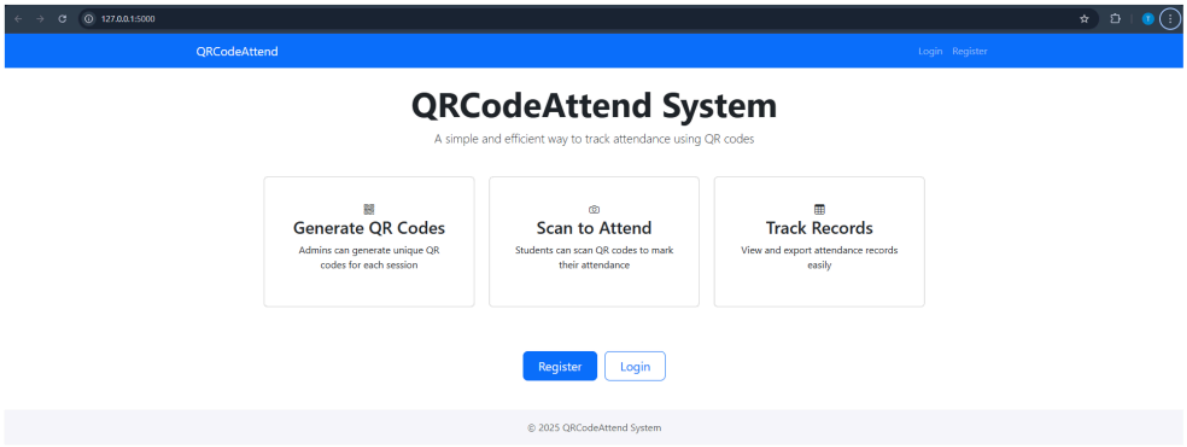

Figure 4.1.1 Home page without any user

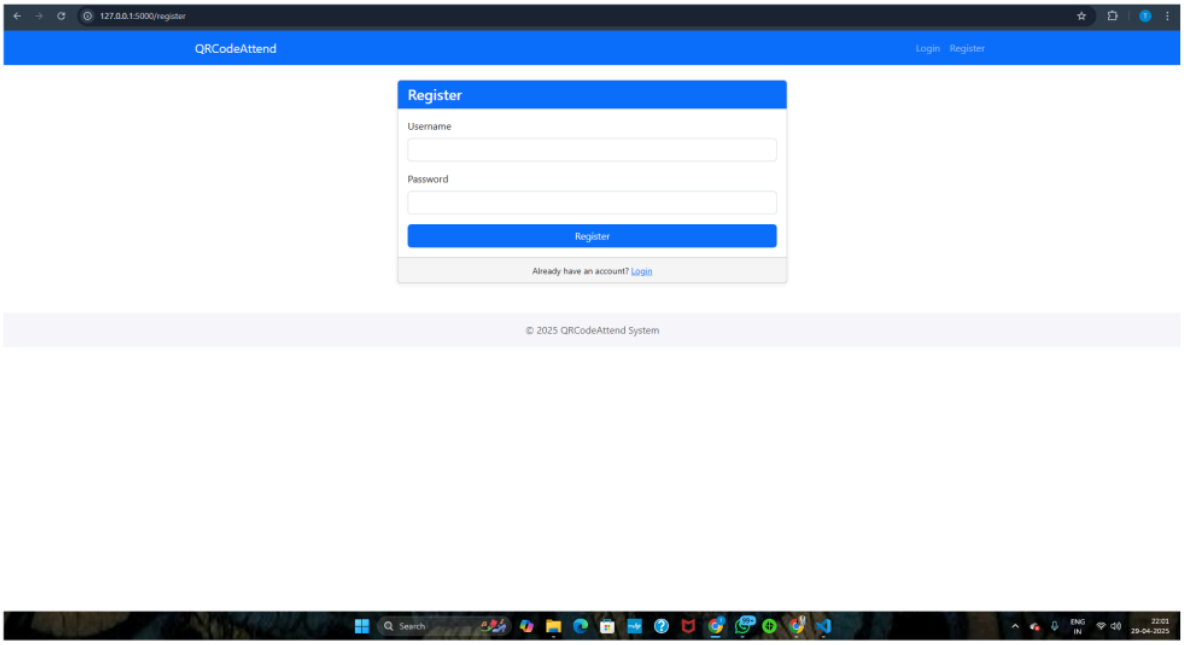

Figure 4.1.2 User Registration Page

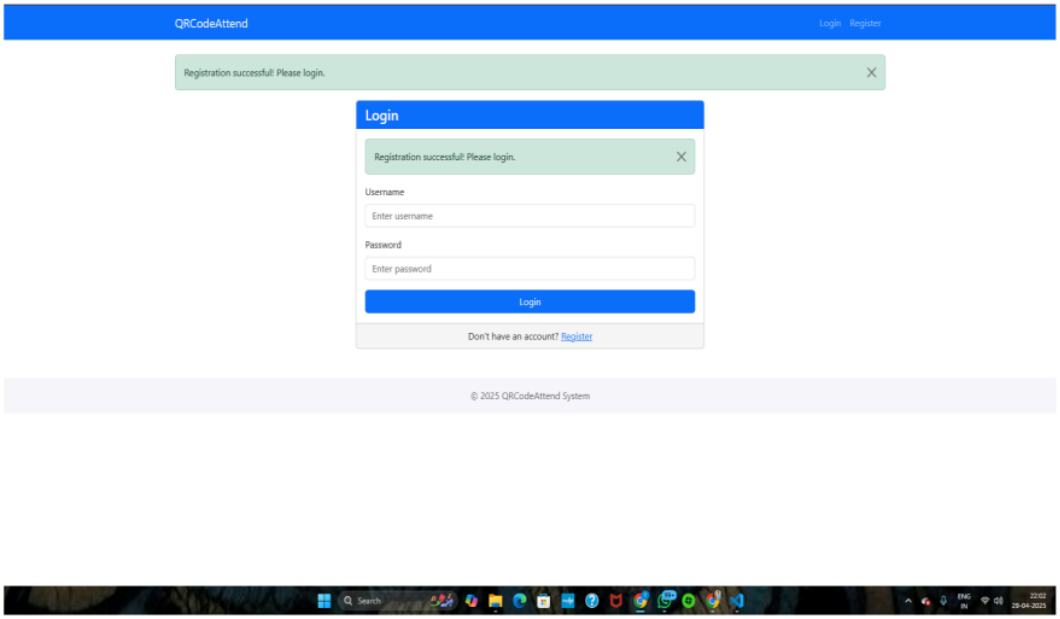

Figure 4.1.3 User Registration completed

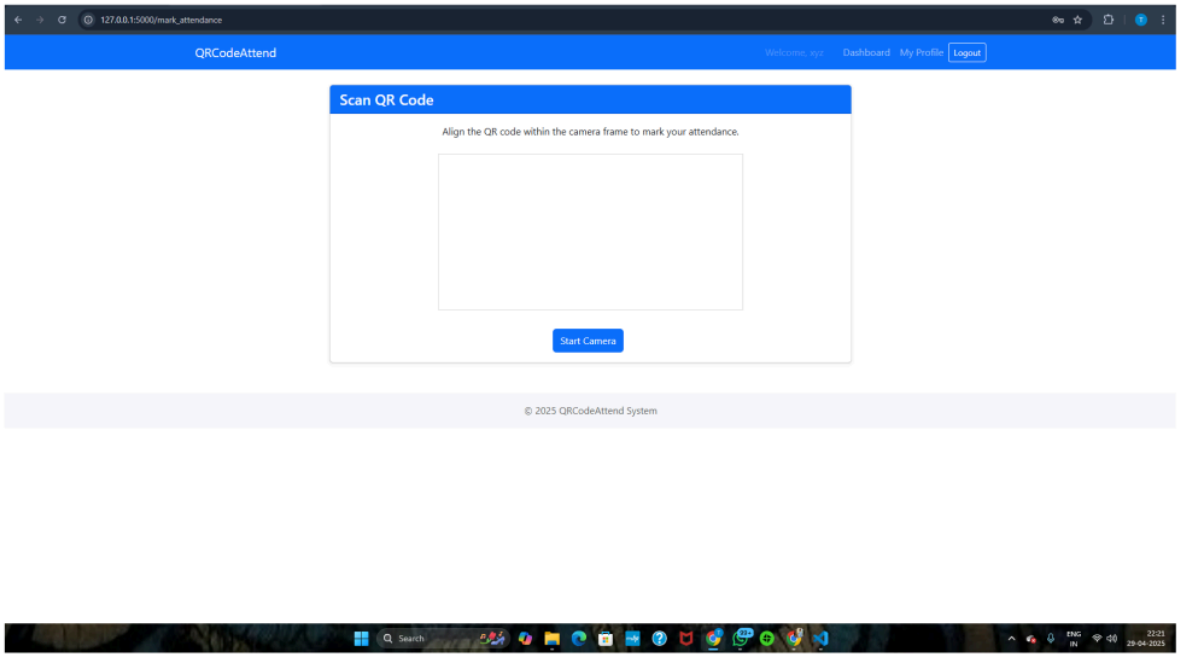

Figure 4.1.4 User Home Page

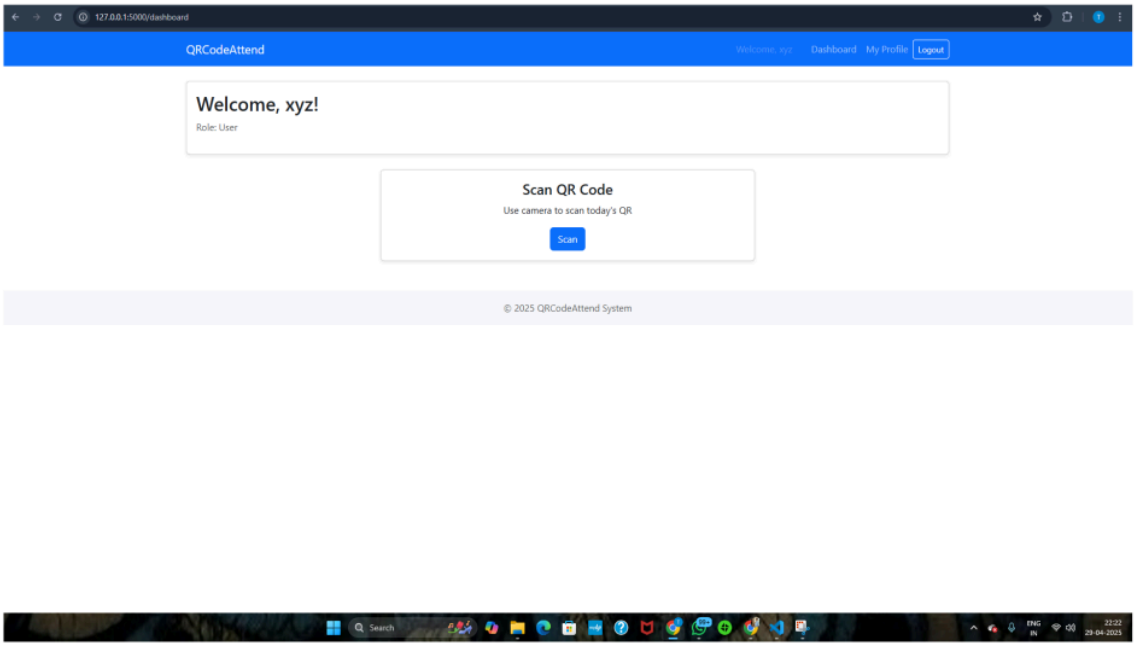

Figure 4.1.5 User Dashboard

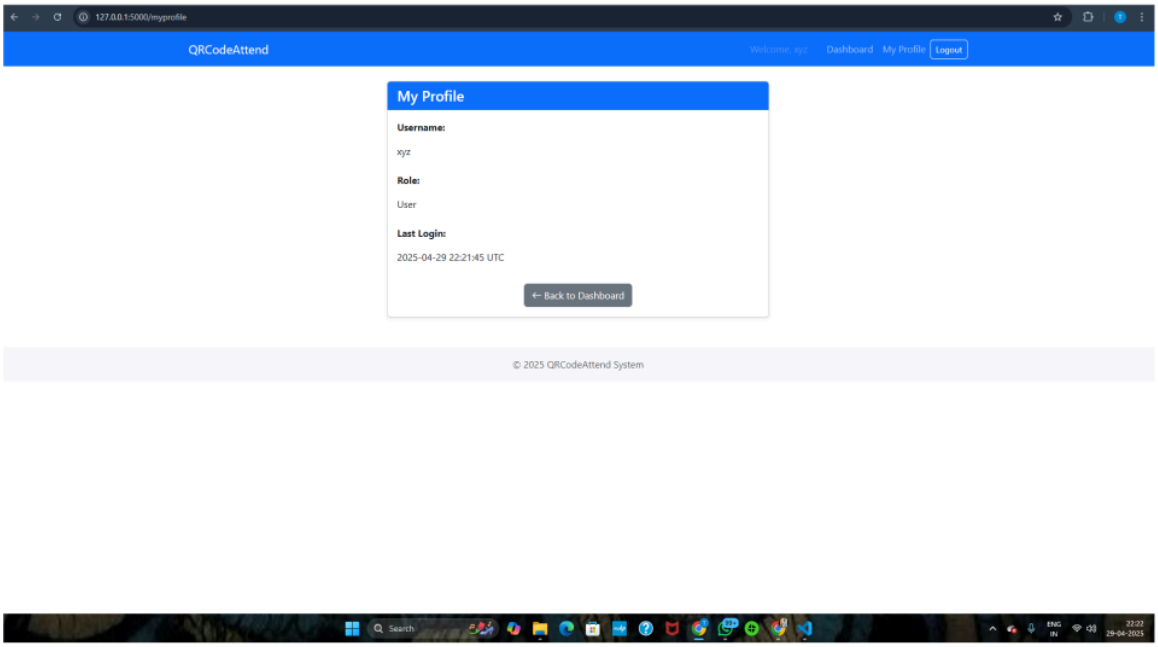

Figure 4.1.6 User My Profile Page

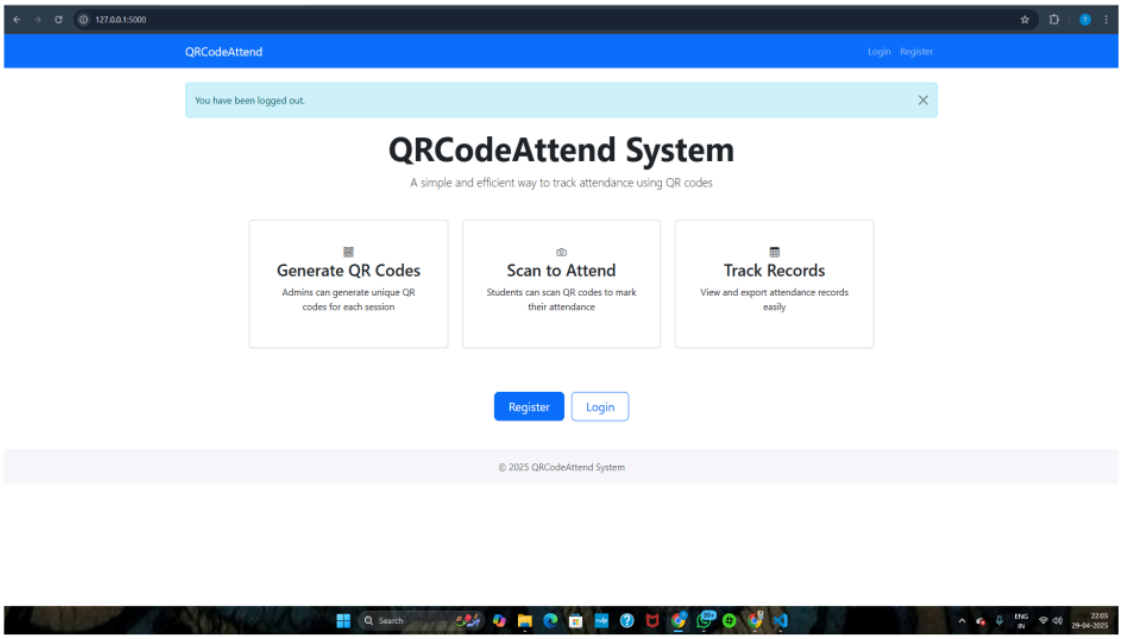

Figure 4.1.7 User Logout Successful

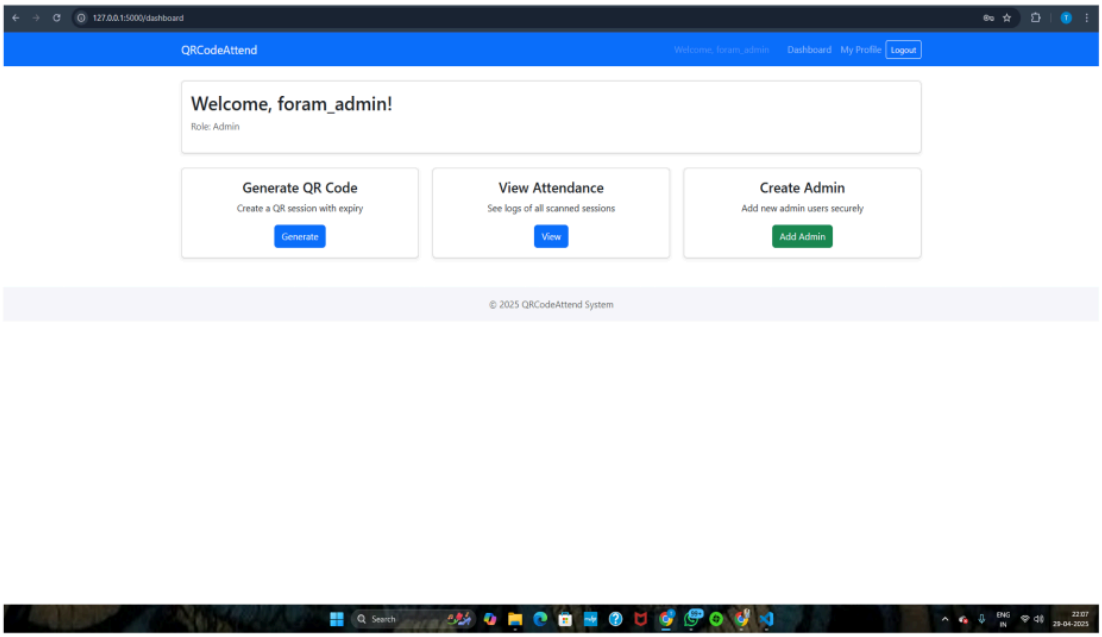

Figure 4.1.8 Admin Home Page

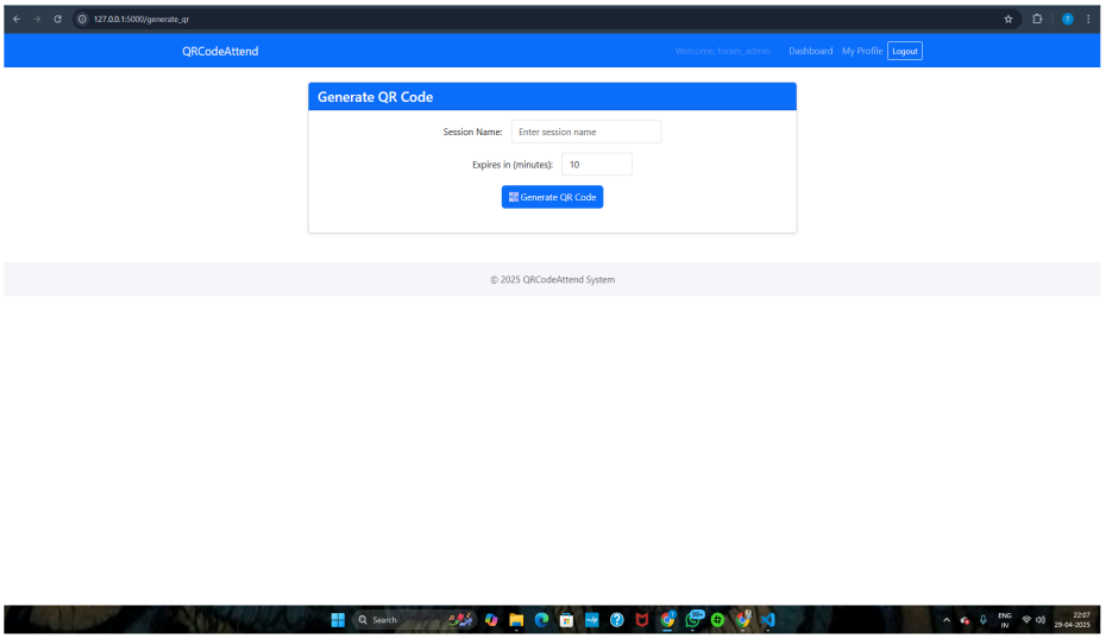

Figure 4.1.9 Admin Can Generate QR Page

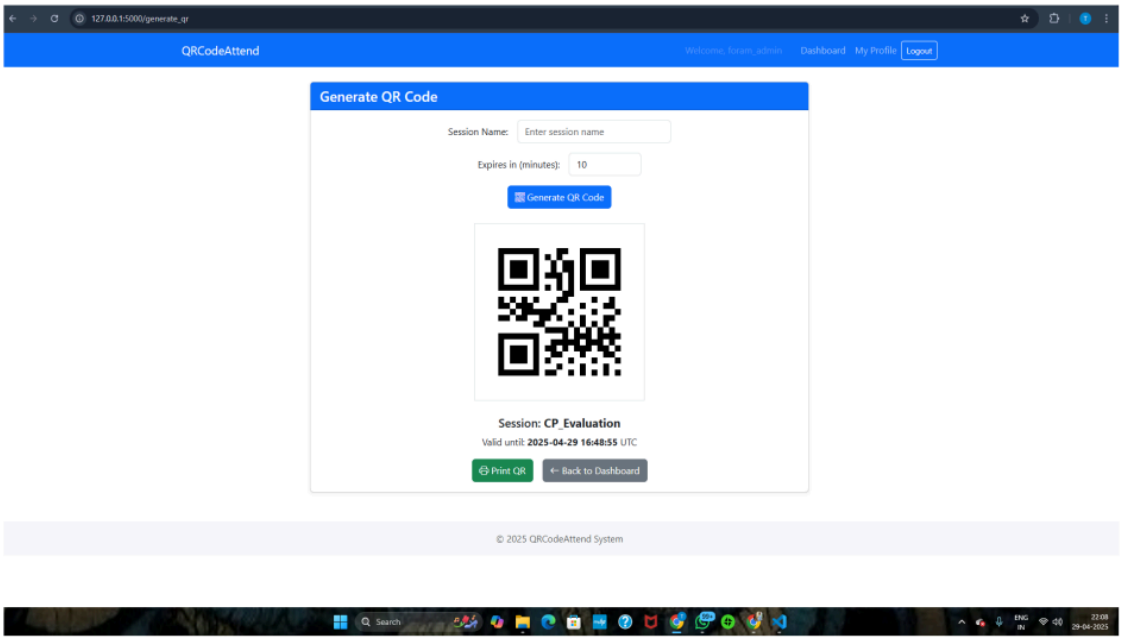

Figure 4.1.10 Lung Image upload QR code generated with session name and time by an Admin

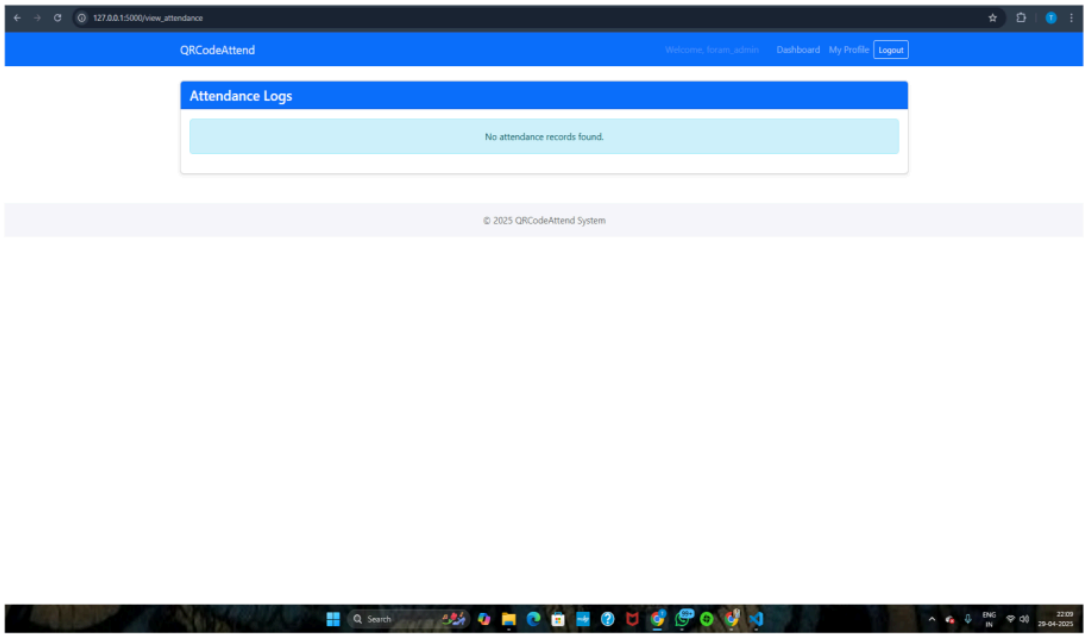

Figure 4.1.11 Admin Can see All Attendance here

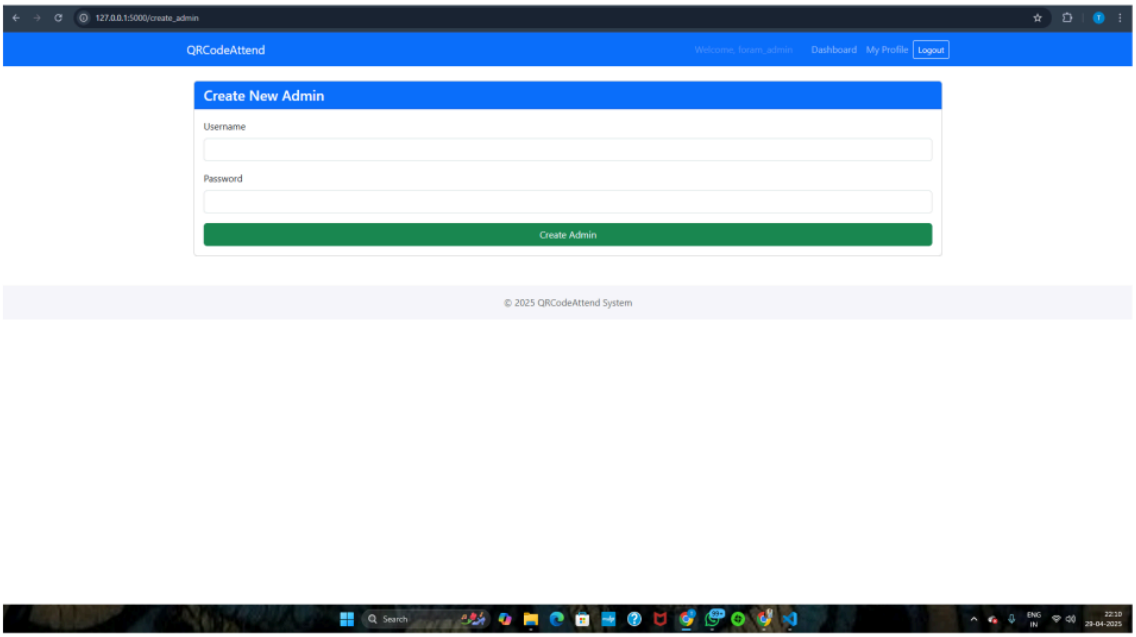

Figure 4.1.12 Admin can create one or more admin from here

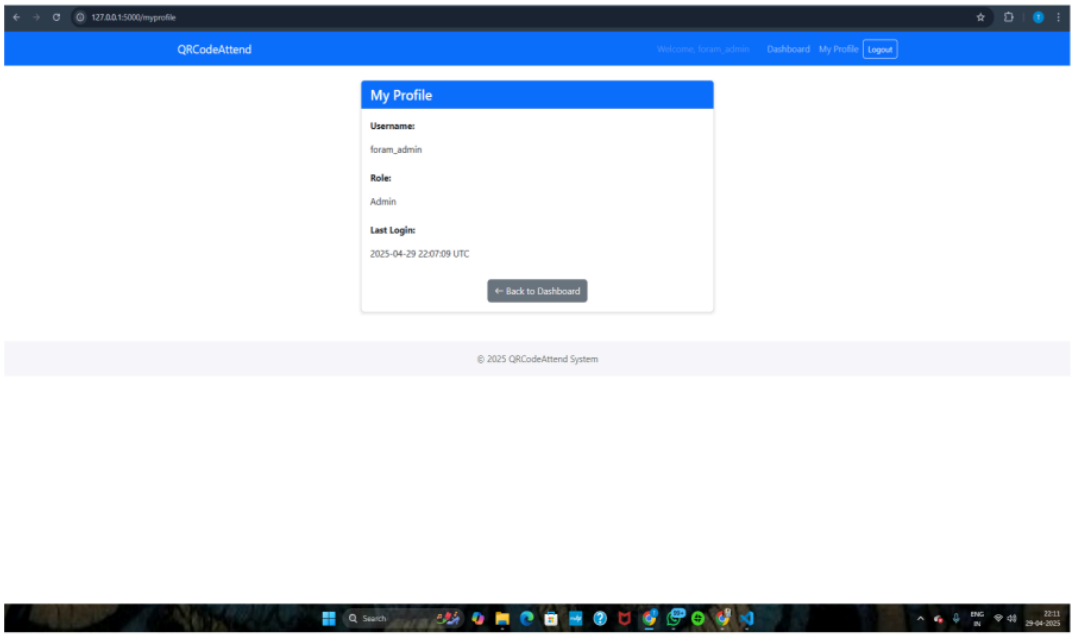

Figure 4.1.13 Admin My Profile

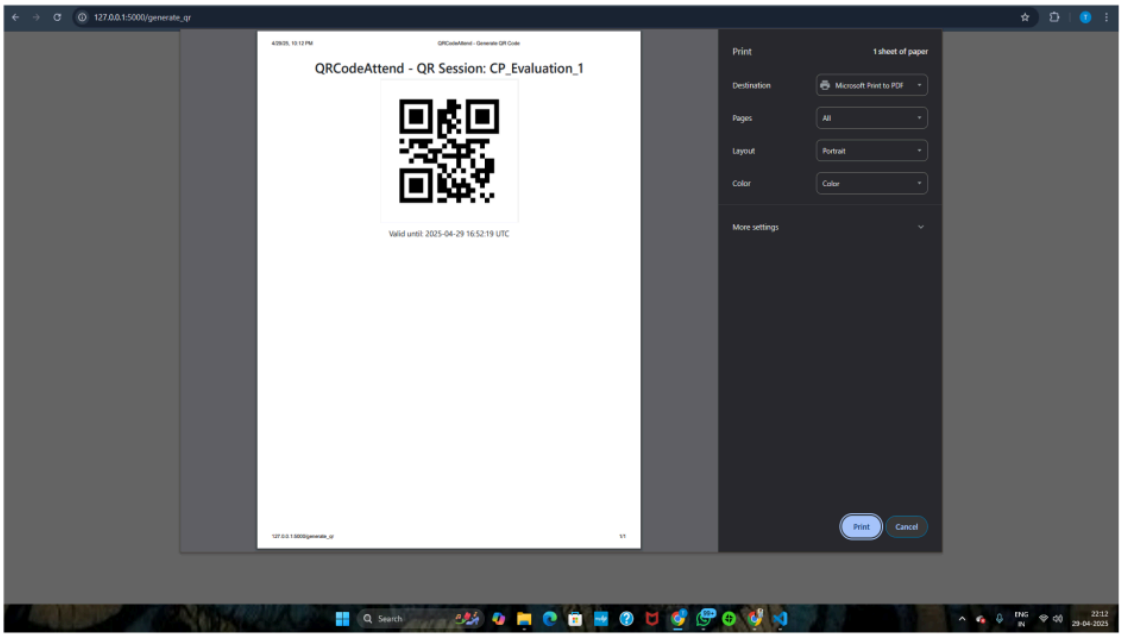

Figure 4.1.14 Admin can print QR if required

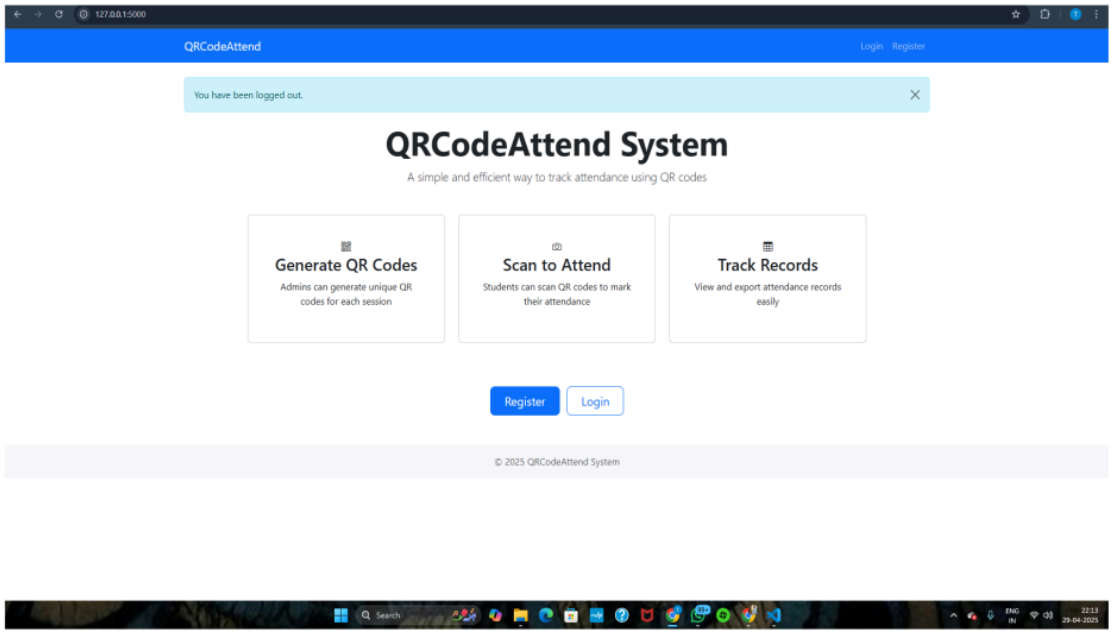

Figure 4.1.15 Admin Log out Successfully

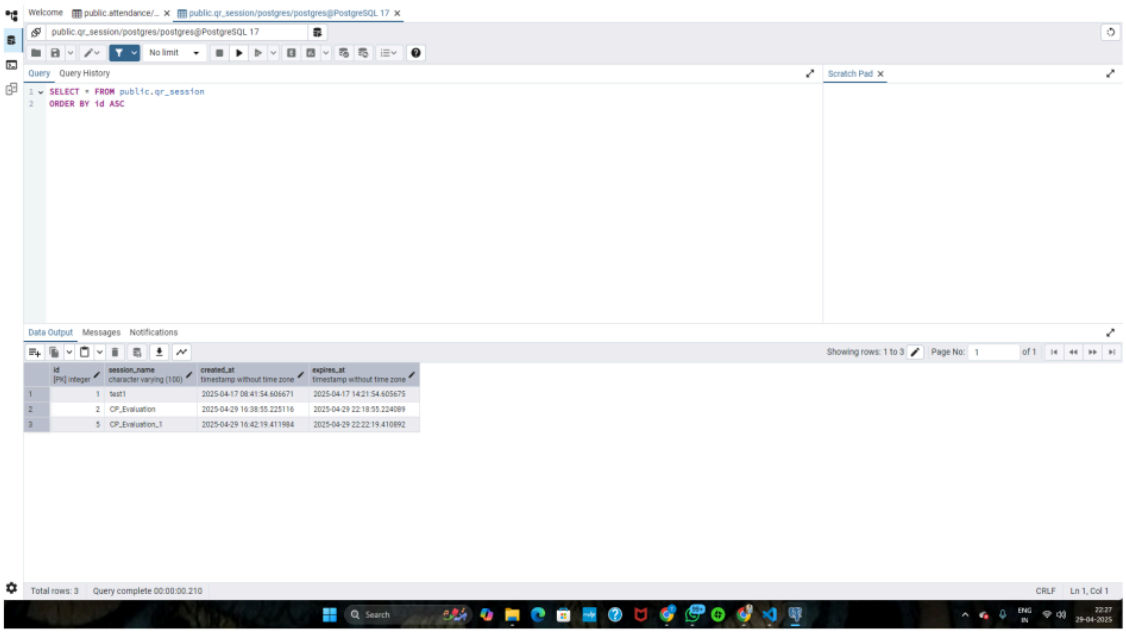

Figure 4.1.16 QR Code session generation

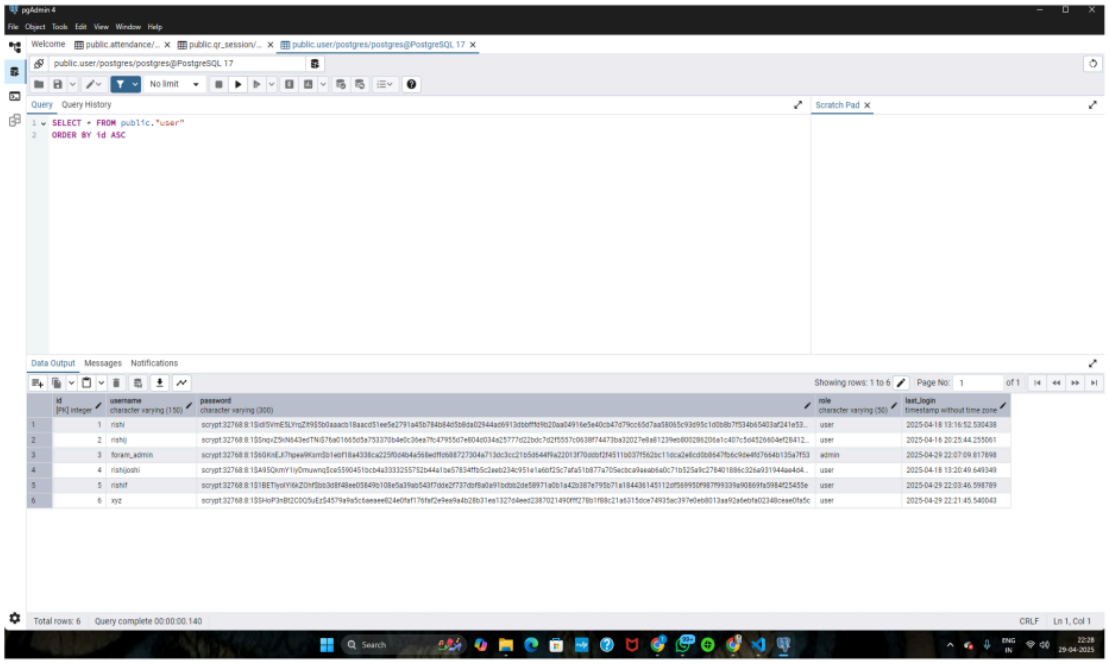

Figure 4.1.17 User Created Dataset

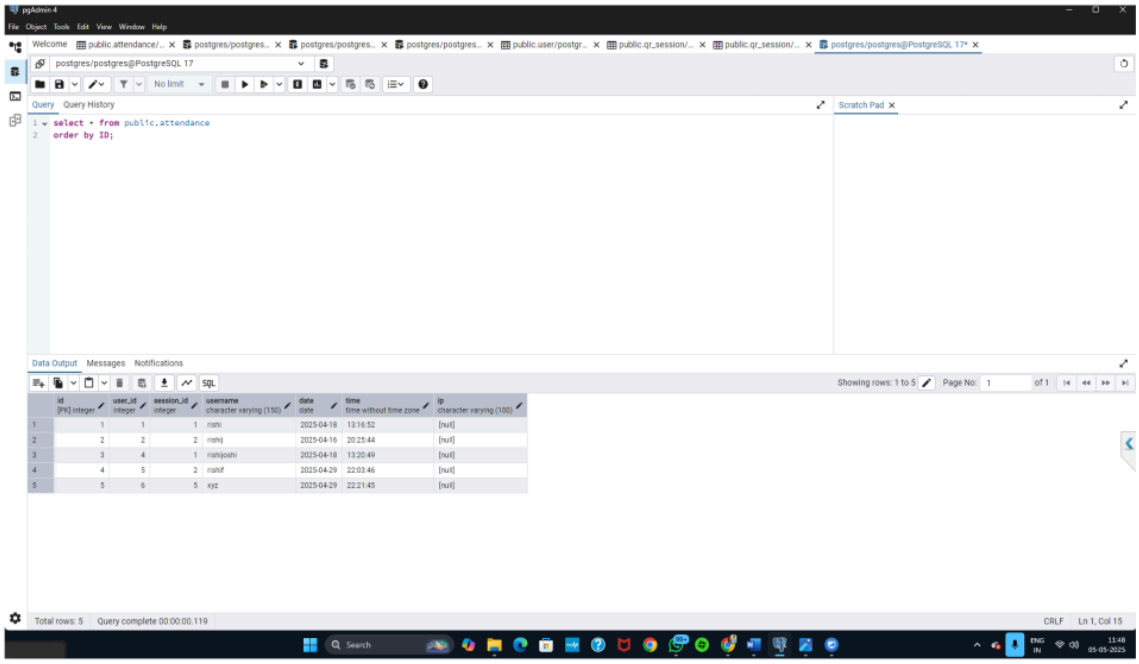

Figure 4.1.18 Attendance marked data can be seen here in the dataset

Chapter 5

Conclusion And Future Scope

5.1 Conclusion:

Through creating a web-based program that makes use of the technology of QR codes and immediate information gathering using PostgreSQL, this endeavor effectively offers a contemporary, effective, and secure substitute for conventional attendance monitoring systems. The solution tackles the major drawbacks of by hand, fingerprinting, and RFID-based attendance techniques, including error by employees, substitute participation, facility expenses, and hygienic issues. It provides a platform that is easy to use, device-independent, and tamper-resistant, allowing for quick and precise attendance recording with little technological obstacles. The method guarantees safe identification and lowers the possibility of forged data by including periodically produced, restricted in time, distinct QR codes. The efficiency of analytical and reporting capabilities is improved by the organized, flexible, and quick recovery of logs of attendance made possible by the use of PostgreSQL, a strong relational database. Its operational usefulness and flexibility are further reinforced by features like role-based management, live visualizations, automatic disclosure, and surveys. Potential expansion was considered in the platform's architecture to ensure that it would continue to align with organizational goals and changing technology needs.

5.2 Future Scope:

The following are conceivable future project scopes:

1. **Integration with Institutional Systems (LMS/IMS/HRM):** Regarding smooth operations, the computer system could be expanded to link information regarding attendance with learning management systems (LMS), human resource management systems (HRMS), or school control programs.

2. **Mobile Application Development:** Enhanced accessibility, send alerts, delayed scans, and GPS-based validation for distant education and employment situations might all be provided via an exclusive mobile application for apple and Android as well.

3. **Biometric & Facial Recognition Hybrid Integration:** The equipment could use alternative biometrics or facial detection modules as supplementary identification methods in order to improve safety.

4. **AI-based Anomaly Detection:** Responsibility may be improved by using algorithms based on machine learning and AI to identify suspect participation trends (such as repetitive checks from a single gadget or place).

5. **Scalability for Large Institutions:** Because of its flexibility and organized design, PostgreSQL can be expanded in the future to accommodate a huge number of clients spanning various educational institutions or business locations.

6. **Multilingual and Accessibility Features:** Acceptance among a variety of user bases may be boosted by providing multilingual assistance and usability improvements for those with visual impairments.

7. **Encrypted QR and End-to-End Security:** To better encrypt critical record-keeping and private info, future upgrades might incorporate entirety confidentiality of information and encoded coded QR codes.
8. **Advanced Reporting & Analytics Dashboard:** Improving the overview to incorporate reusable representations, departmental comparison accounts, and statistical analysis would facilitate more intelligent making choices.

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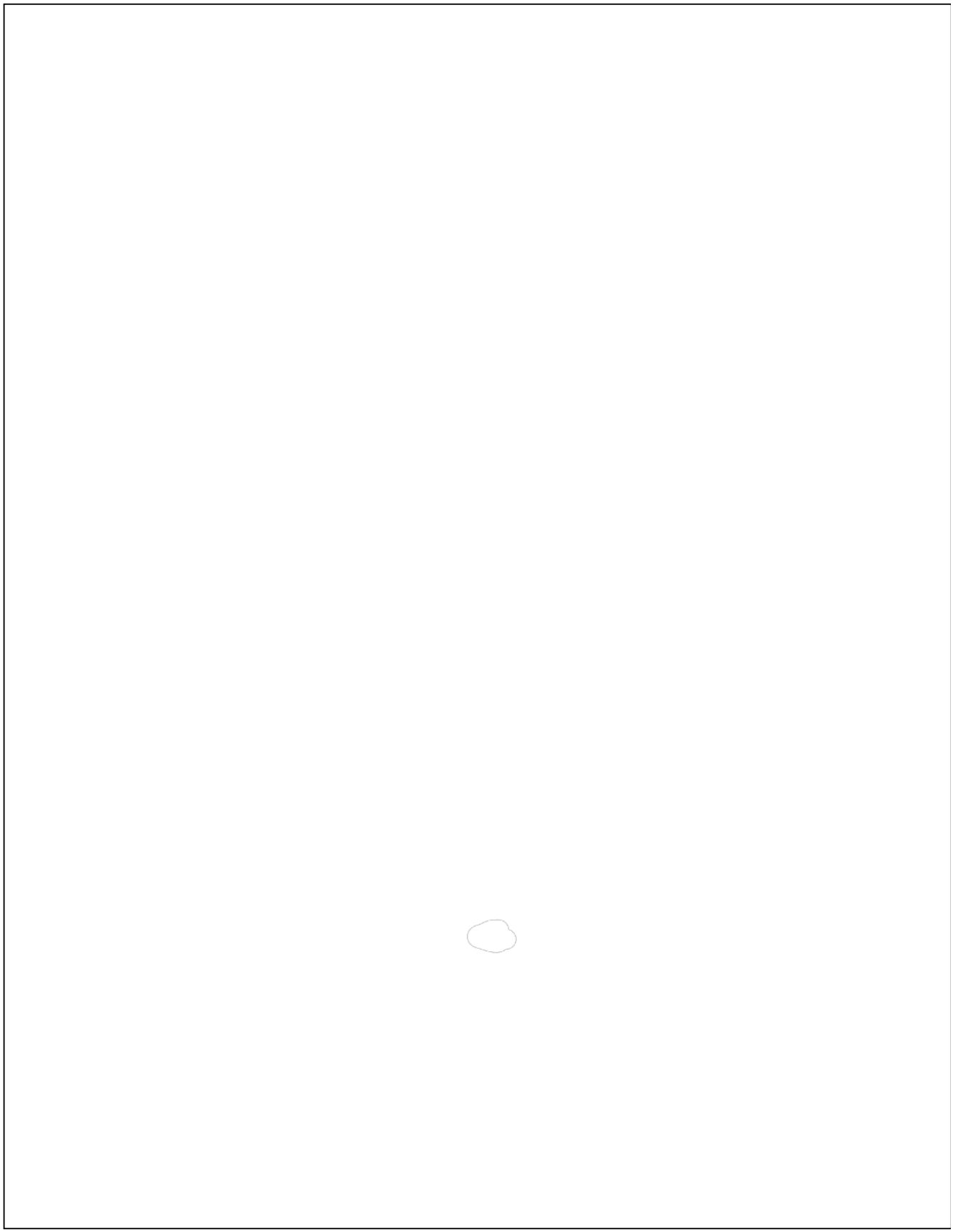

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