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Luka Gym Pass: A Mobile-Based Automated QR Code Login and Logout System for Membership Attendance Management

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Abstract

This study developed Luka Gym Pass, a mobile-based automated QR code login and logout system designed to improve membership attendance monitoring and recording at Luka Gym. Traditional manual attendance methods often lead to inaccurate records, delays, and difficulties in monitoring member activity. To address these challenges, the researchers designed and implemented a mobile-based system that utilizes QR code technology to automate the login and logout processes of gym members. The system includes features such as member registration, QR code–based attendance tracking, an administrative dashboard for monitoring membership activity, and automated notifications for membership updates. The system was developed using the Agile methodology and evaluated using the ISO/IEC 25010 Software Quality Model and the USE Questionnaire. Evaluation results revealed that the system received very high ratings in terms of system features, software quality, usefulness, satisfaction, ease of use, and ease of learning. The findings indicate that the developed system is efficient, reliable, and suitable for improving gym attendance management and membership monitoring.

Keywords: *QR Code System, Gym Membership Management, Attendance Monitoring, Mobile Application, Automated Attendance System.*

1. Introduction

Technology has significantly transformed operational processes across various industries, including fitness centers, by enabling faster, more accurate, and user-friendly management of organizational tasks and records [1], [2]. Digital systems have replaced many traditional manual processes, improving operational efficiency and reducing administrative workload. Despite these technological advancements, some fitness facilities such as Luka Gym still rely on manual attendance systems, including logbooks, which may lead to delays, inaccurate entries, and misplaced records [5]. Manual monitoring methods can also make it difficult for administrators to track member attendance and membership status efficiently.

To address these limitations, QR code technology has been increasingly adopted in gym management systems to facilitate efficient attendance monitoring and membership tracking [2], [3]. QR-based systems allow members to quickly scan their digital passes for check-in and check-out transactions, enabling real-time attendance recording, reduced human error, and secure data storage through centralized databases. Studies have shown that automated attendance systems improve operational efficiency and enhance the accuracy of monitoring member participation in fitness facilities [3].

The purpose of this study is to design, develop, and evaluate a mobile-based QR code membership attendance system for Luka Gym. The proposed system aims to automate login and logout processes, enable real-time attendance tracking, incorporate role-based authentication for secure data management, and provide an administrative dashboard for monitoring gym activity. Additionally, automated notifications will inform members of membership updates and

expirations. The implementation of such automated systems is expected to improve operational efficiency, enhance data accuracy, and increase overall user satisfaction in gym management environments [4].

1.1 Objective of the Study

General Objective:

To design, develop, and evaluate a mobile-based automated QR code login and logout system for Luka Gym membership attendance management.

Specific Objectives Develop a mobile-based automated attendance management system for Luka Gym which:

1.1 Collects, processes, and securely stores member registration data through a role-based authentication and authorization mechanism.

1.2 Generates and validates unique QR code-based digital gym passes for automated login and logout transactions.

1.3 Records, timestamps, and synchronizes member attendance data in real time using a centralized cloud-based database architecture.

1.4 Provides an administrative dashboard capable of monitoring attendance activities, managing membership validity, and generating analytical reports.

1.5 Integrates an automated notification module that delivers alerts regarding pass expiration, membership status updates, and official gym announcements.

2 Determine the quality of the developed system using an established software quality evaluation framework (e.g., ISO/IEC 25010 or McCall's Software Quality Model), focusing on functionality, reliability, efficiency, security, maintainability, and usability.

3 Evaluate the usability and user acceptance of the developed system using a standardized usability assessment instrument (e.g., USE Questionnaire or System Usability Scale), measuring perceived usefulness, ease of use, satisfaction, and overall system performance.

2. Methods

The research study of the project entitled "Luka Gym Pass: A Mobile-Based Automated QR Code Login and Logout System for Membership Attendance Management" employs a Developmental Research Design and utilizes the Agile Methodology, which is an iterative and incremental software development approach that allows continuous improvement and flexibility throughout the system development process. Agile methodology enables developers to deliver functional components of the system in small increments while allowing frequent evaluation and feedback from stakeholders to ensure that the developed system meets user requirements. Several studies have shown that integrating QR code technology in gym management systems significantly improves attendance tracking, monitoring, and member engagement [6].

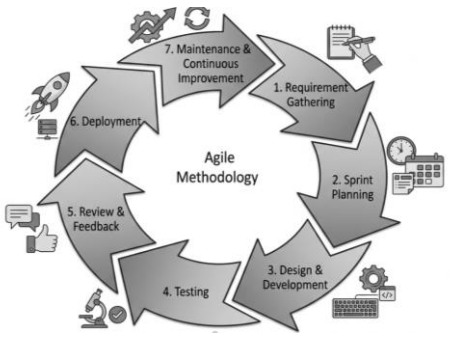

Fig.1 Agile Method

Phase 1. Requirement Gathering

In this phase, the researcher collaborated with gym personnel to identify the existing challenges in managing gym member attendance and monitoring activities. Through interviews and observations, the researcher gathered the necessary requirements for the development of the system. Important features requested include QR code check-in and check-out, attendance monitoring, member information management, and administrative monitoring. These requirements served as the foundation in defining the objectives, scope, and functionalities of the Luka Gym Pass mobile application. Previous studies highlight that QR-based gym monitoring systems help improve operational efficiency and tracking of member participation in fitness facilities [3].

Phase 2. Sprint Planning

After identifying the system requirements, the project was divided into smaller development cycles called sprints. Each sprint focused on specific system features and prioritized development tasks. The sequence of development included Login and Logout authentication, QR Pass generation, attendance tracking, attendance history viewing, and administrative monitoring. This phase allowed the researcher to organize the workflow and ensure efficient task management during system development.

Phase 3. Design and Development

In this phase, the Luka Gym Pass mobile application was designed and developed with a focus on usability, responsiveness, and security. UI wireframes guided the layout and navigation to ensure an intuitive experience for both gym administrators and members. The frontend was built using React.js with Tailwind CSS for responsive styling, optimized through Vite for fast builds. Backend services were managed via Base44, providing secure database management, authentication, and file storage.

QR code technology was integrated to automate member attendance, using qrcode.react for QR generation and html5-qrcode for scanning. This enables real-time check-in and check-out, accurate attendance tracking, and streamlined membership management. The design ensures compatibility across devices and supports secure storage of member information and attendance logs. Similar systems have shown that combining QR technology with centralized databases significantly improves monitoring efficiency and operational accuracy [2].

Phase 4. Testing

Testing was conducted after every sprint to ensure that each developed feature functions correctly. Functional testing was performed to identify bugs, errors, and system inconsistencies. The researcher also evaluated the system based on recognized software quality standards such as the ISO/IEC 25010 Systems and Software Quality Model, which assesses system characteristics including functionality, usability, reliability, performance efficiency, and security [6]. Additionally, the usability of the system was evaluated using the USE Questionnaire, which measures usefulness, satisfaction, ease of use, and ease of learning [7].

Phase 5. Review and Feedback

In this phase, the developed system features were presented to selected users and stakeholders for evaluation. Feedback from gym personnel and potential users was gathered to determine whether the system meets their needs and expectations. The feedback collected during this phase was used to refine the system and improve its features before the final deployment.

Phase 6. Deployment

After completing the development and testing phases, the final version of the Luka Gym Pass application was prepared for deployment. Necessary software and hardware requirements were configured to ensure that the system operates smoothly. The application was made accessible through supported devices and browsers, allowing gym administrators and members to utilize the system efficiently.

Phase 7. Maintenance and Continuous Improvement

The final phase involves monitoring the performance of the deployed system and implementing necessary updates and improvements. Based on user feedback and system performance evaluation, modifications and enhancements may be applied to improve security, functionality, and overall user experience. Continuous maintenance ensures that the Luka Gym Pass application remains reliable and adaptable to future system requirements.

2.1 Mobile Application

The system was developed using a modern web-based technology stack, leveraging React.js as the frontend framework alongside Tailwind CSS for responsive and utility-first styling. Vite was employed as the build tool to optimize development performance and asset bundling. The application was hosted and managed through Base44, a Backend-as-a-Service (BaaS) platform that provides built-in database management, authentication, and file

storage capabilities. Client-side QR code generation and scanning were implemented using the qrcode.react and html5-qrcode libraries, respectively, enabling real-time member identification and attendance tracking directly through the browser without requiring native mobile application installation.

Figure 2: Luka Gym Pass Icon on Mobile Apps Representing the System's Fitness Oriented Identity.

The figure 2 shows the Luka Gym Pass application icon as displayed on a mobile device interface. The icon incorporates visual elements associated with strength training and physical fitness, reflecting the system's core purpose of supporting gym operations and user engagement. Its presence on the mobile home screen highlights the system's accessibility and integration into users' daily routines. The design reinforces the application's role as a digital platform for membership management, QR code-based check-in, and attendance monitoring, thereby promoting convenience and efficient fitness tracking

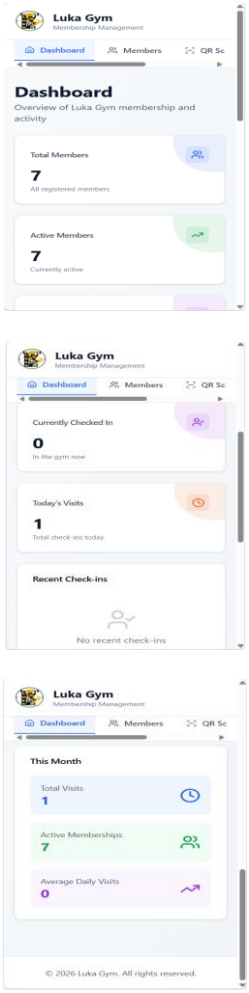

Figure 3: Dashboard Overview

Figure 3 presents the main dashboard interface of the developed system. The dashboard provides a real-time overview of key membership metrics, including the total number of registered members, active memberships, daily check-ins, and monthly attendance trends. It serves as the central control panel for administrators, enabling quick monitoring of gym activity without navigating through multiple screens.

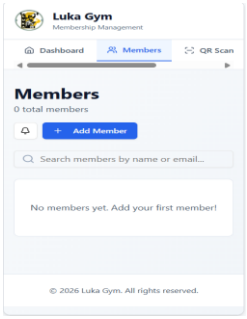

Figure 4: Member Management Overview

Figure 4: Member Management Overview illustrates the Member Management module of the system, which serves as a centralized interface for managing all registered gym members. It displays key information including profile photo, full name, membership type, membership status (Active, Expired, or Suspended), and expiration date. The module supports full CRUD operations, allowing administrators to add new members, update existing records, view individual QR codes, and delete member profiles efficiently. A search bar is also provided for quick retrieval of member information. In line with the system objective of integrating automated notifications, this module also supports monitoring of membership status updates, pass expiration, and announcement-related data, which serve as the basis for automated alerts delivered to gym members.

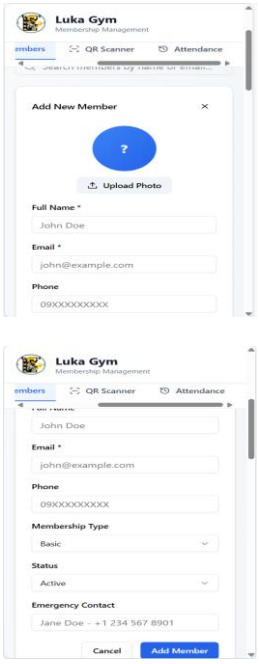

Figure 4.1. Member Registration Interface

Figure 4.1 presents the member registration interface of the system. To enroll a new gym member, the administrator initiates the process by selecting the "Add Member" button located on the Member Management page. Upon activation, a modal form dialog is rendered, requiring the administrator to supply the following member details: full name, email address, contact number, membership type (Basic, Weekly, Monthly, or Yearly), membership start date, account status, emergency contact information, and an optional profile photograph. Upon form submission, the system performs two automated backend operations. First, a unique QR code identifier is generated and permanently assigned to the newly registered member, serving as their primary credential for all subsequent check-in and check-out transactions. Second, the system automatically computes the membership end date by calculating the appropriate expiration period based on the selected membership type — one week for Weekly, one month for Monthly, and one year for Yearly memberships. All submitted data is then persisted to the database and immediately reflected in the Member Management interface, confirming successful registration.

Figure 4.2. Member QR Code Display Interface

Figure 4.2 presents the QR Code display functionality within the Member Management module. Each registered member's card contains a dedicated "View QR" button that, when selected, triggers a modal dialog presenting the member's unique QR code in a scannable format. The QR code displayed serves as the member's sole digital credential for all gym entry and exit transactions. It is algorithmically generated at the time of initial member registration and is permanently and exclusively associated with that member's record for the entire duration of their membership. The code encodes a unique identifier that the scanner module uses to instantly retrieve and validate the corresponding member profile upon each scan.This design ensures that each member possesses a distinct, non-transferable access credential, thereby maintaining the integrity of attendance records and preventing unauthorized access. The QR code remains unchanged throughout the membership lifecycle, providing a consistent and reliable identification mechanism for both the member and the system administrator.

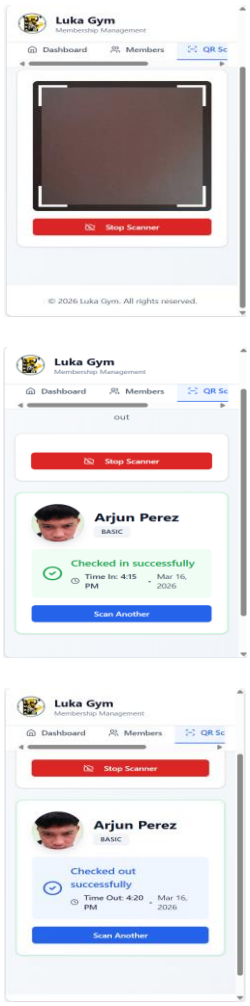

Figure 5. QR Code Scanner Interface for Member Check-In and Check-Out

Figure 5 presents the QR Code Scanner module of the developed system. This interface serves as the primary point of interaction between gym members and the attendance tracking system. It enables authorized personnel to initiate member check-in and check-out transactions through real-time QR code recognition using the device's built-in camera.

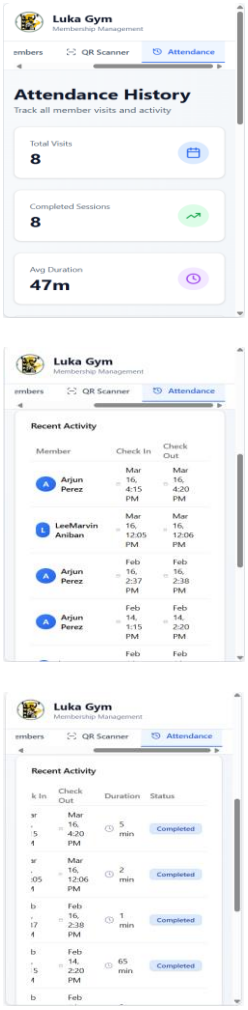

Figure 6. Attendance Monitoring and Activity History Interface

Figure 6 presents the Attendance module of the developed system. This interface provides a comprehensive overview of member visit records and activity tracking. It displays key metrics such as total visits, completed sessions, and average session duration, allowing administrators to quickly assess overall gym usage. Additionally, the Recent Activity section lists individual member check-in and check-out logs, including timestamps, session duration, and status. This functionality enables efficient monitoring of member attendance patterns and supports accurate record-keeping for gym operations.

2.2 System Architecture

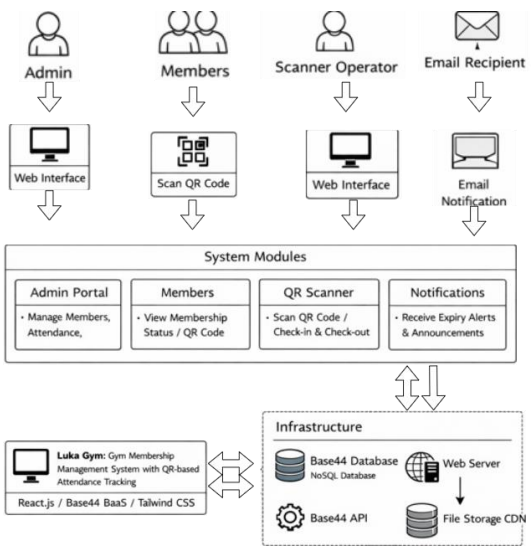

Figure 7. System Architecture of Luka Gym Pass

The figure 7 illustrates the system architecture of *Luka Gym Pass* is designed using a layered and modular approach that ensures efficient interaction, real-time processing, and scalable infrastructure. The architecture identifies four primary actors Admin, Members, Scanner Operator, and Email Recipient who interact with the system through dedicated interfaces such as web applications, QR code scanning, and email notifications. These interactions feed into the centralized System Modules layer, which comprises the Admin Portal for managing members, attendance, and notifications; the Members module for accessing membership status and QR codes; the QR Scanner module for handling real-time check-in and check-out processes; and the Notifications module for delivering alerts and announcements. The System Modules communicate bidirectionally with the Application Layer, which encapsulates the core system built using React.js for the frontend, Tailwind CSS for styling, and Base44 Backend-as-a-Service for backend logic and integration. Supporting this is the Infrastructure Layer, consisting of a Base44 NoSQL database for data storage, a Base44 API for handling data transactions, a web server for hosting and request management, and a file storage CDN for efficient content delivery. Data flows seamlessly from user interactions down through the

application logic to the infrastructure, where it is processed, stored, and retrieved in real time, before being returned to users, ensuring system consistency and responsiveness. This architecture highlights a clear separation of concerns, promotes maintainability, and leverages modern web technologies to support a reliable and scalable gym management solution.

3. Results

Table 1. presents the evaluator's feedback regarding the system features of the Luka Gym Pass: A Mobile-Based Automated QR Code Login and Logout System for Membership Attendance Management

Feature	Mean	Interpretation
Member Registration & Data Security	4.72	Very High
QR Code Attendance	4.78	Very High
Attendance Tracking	4.74	Very High
Administrative Dashboard	4.78	Very High
Notifications & Alerts	4.89	Very High
Total	**4.78**	**Very High**

Table 1 shows the evaluator's feedback regarding the usefulness of the system based on member registration and data security, QR code attendance, attendance tracking, administrative dashboard, and notifications and alerts. These features are all rated Very High, with notifications and alerts receiving the highest rating among the features. The overall evaluation garnered an average total mean of 4.78, which has a verbal interpretation of Very High. This only means that the evaluators were highly satisfied with the features integrated into the application which support efficient gym membership management and attendance monitoring. Furthermore, the system enables gym administrators to effectively track member attendance, manage membership records, and monitor gym activities through the automated QR code-based system, thereby improving the overall management and operational efficiency of the gym.

Table 2. In terms of the characteristics set in ISO 25010 Software Quality Model

Quality Characteristic	Mean	Interpretation
Functional Suitability	**4.67**	Very Good
Performance Efficiency	**4.60**	Very Good
Compatibility	**4.70**	Very Good
Usability	**4.80**	Very Good
Reliability	**4.67**	Very Good
Security	**4.40**	Very Good
Total	**4.64**	**Very Good**

Table 2 shows the result of the evaluator's feedback in determining the quality of the developed application based on the characteristics set in the ISO 25010 Software Quality Model. Among the characteristics, it is the usability that was rated with the highest which is 4.64, which means Very High. It implies that the developed application is highly usable. The average score of all the characteristics is 4.64 which means Very High.

Table 3. In terms of usefulness, satisfaction, ease of use and ease of learning of the application

Criteria	Mean	Verbal Interpretation
Usefulness	4.87	Very High
Satisfaction	4.50	Very High
Ease of Use	4.60	Very High
Ease of Learning	4.70	Very High
Total	**4.67**	**Very High**

Table 3 shows the result of the evaluator's feedback in determining the usability, satisfaction, ease of use and ease of learning the application where it was rated with an overall score of 4.67 which means Very High. Among other factors, it is the usefulness that was scored the highest which implies that the developed application is really useful. add a discussion related on this Table 1 presents the evaluators feedback regarding the system features of the Luka Gym Pass: A Mobile-Based Automated QR Code Login and Logout System for Membership Attendance Management

4. Discussion

The findings of this study indicate that the Luka Gym Pass: A Mobile-Based Automated QR Code Login and Logout System for Membership

Attendance Management achieved very high ratings in terms of system features, usability, and overall effectiveness.

1.System Features: The evaluators rated the system with an overall mean score of 4.78 (Very High), reflecting strong satisfaction with features such as member registration, data security, QR code attendance, attendance tracking, administrative dashboard, and notifications. These results align with previous studies demonstrating that QR-based systems enhance operational efficiency and improve accuracy in gym attendance monitoring [2]. In addition, the implementation of an administrator approval mechanism contributed to system security by ensuring that only verified users can access the platform, thereby maintaining data integrity and controlled usage. This approach minimizes unauthorized access and enhances the reliability of attendance records within the system.

2.Attendance Monitoring and Membership Management: The system's ability to track gym member attendance and maintain organized records received a Very High rating. The QR code scanning feature simplifies check-in and check-out processes, enabling real-time monitoring. Similar studies have shown that integrating QR code technology in gym management reduces errors, streamlines member tracking, and increases overall user engagement [3].

3.Administrative Dashboard and Reporting: Evaluators rated the administrative dashboard very highly, indicating that it effectively presents key information such as total members, active memberships, attendance activity, and visit statistics. This supports decision-making and operational oversight, consistent with findings from prior research emphasizing the importance of centralized dashboards in fitness management systems.

4.Software Quality (ISO/IEC 25010): The system achieved an average score of 4.64 (Very High) across functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. This demonstrates that the application meets recognized software quality standards, consistent with best practices in developing automated attendance and management systems.

5.Usability (USE Questionnaire): The system scored 4.67 (Very High) for usefulness, satisfaction, ease of use, and ease of learning. Evaluators found it user-friendly, effective, and easy to navigate, supporting the notion that well-designed mobile applications improve adoption and operational efficiency in gym environments.

5. Conclusion

The study developed the Luka Gym Pass: A Mobile-Based Automated QR Code Login and Logout System for Membership Attendance Management to improve gym membership management and attendance monitoring. The evaluation results revealed that the system obtained Very High ratings in terms of system features, software quality based on the ISO/IEC 25010 Software Quality Model, and usability factors including usefulness, satisfaction, ease of use, and ease of learning.

The application successfully automates member registration, QR code-based attendance tracking, and administrative monitoring, allowing gym administrators to efficiently manage membership records and monitor gym activities. Previous studies also highlight that QR-based gym systems improve attendance tracking accuracy and operational efficiency in fitness facilities [2].

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Appendix A: System Application Access via QR Code

This appendix provides access to the Luka Gym Pass application through a QR code. Users can scan the code using a mobile device to directly access the system. This allows evaluators and users to conveniently explore the system's features, including QR code-based attendance tracking, member management, and administrative monitoring.

Figure A.1. QR Code for Luka Gym Pass Application Access

System URL:
https://luka-gym-pass-f1607d51.base44.app

Note: Administrator approval may be required before full access to the system is granted.