Swift-Pass: An RFID-Based Gym Membership Monitoring and Access Control System

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In Partial Fulfilment
of the Requirements for the Degree
Bachelor of Science in Information Technology

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TITLE OF RESEARCH: **Swift-Pass: An RFID-Based Gym Membership Monitoring and Access Control System**

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TABLE OF CONTENTS

INTRODUCTION

Project Context

In the modern fitness industry, the demand for efficient and secure gym management systems has significantly increased. Traditional methods of monitoring gym memberships and access control, such as manual registration and paper-based records, are prone to human errors, inefficiencies, and security risks. To address these challenges, Swift-Pass: An RFID-Based Gym Membership Monitoring and Access Control System provides an automated solution that enhances operational efficiency, security, and member experience. This system utilizes RFID technology to facilitate quick and secure check-ins, reducing wait times and eliminating unauthorized access. It also integrates data analytics to track gym usage, monitor membership status, and generate insightful reports for administrators. Additionally, timely notifications help members stay informed about their membership status, upcoming renewals, and gym updates. With Swift-Pass, gym administrators can manage multiple branches efficiently while ensuring a seamless experience for members and staff. By digitizing gym access and membership tracking, the system improves security, operational efficiency, and overall gym management.

Purpose and Description of the Project

Most gyms still use manual or semi-automated methods for managing memberships, which often result in inefficiencies, errors, and security vulnerabilities. Traditional paper-based records and outdated tracking systems make it difficult for gym administrators to monitor attendance, process payments, and track membership expirations effectively. These limitations lead to operational delays, unauthorized gym access, and inconsistent record-keeping, affecting both gym members and management. Another major challenge is the lack of timely data analytics in most existing gym management systems. Without a proper data-driven approach, gym administrators struggle to identify peak hours, optimize trainer schedules, and make

informed business decisions. Additionally, many gyms do not have automated notifications for membership renewals, leading to lapses in subscriptions and lost revenue. To address these issues, there is a pressing need for a more efficient, secure, and data-driven gym management system. The Swift-Pass: An RFID-Based Gym Membership Monitoring and Access Control System integrates RFID technology with data analytics to automate gym check-ins, monitor memberships in real time, and enhance security. This system will improve administrative efficiency, reduce errors, and provide valuable insights into gym usage patterns.

Objectives of the Study

The growing need for a secure, efficient, and automated gym membership management system is driven by the increasing demand for improved access control, accurate membership tracking, and enhanced business monitoring for gym owners. This study aims to develop Swift-Pass: An RFID-Based Gym Membership Monitoring and Access Control System, which will replace manual or semi-automated methods with a secure and data-driven solution. The system will provide RFID-based access control, automated membership management, and timely business monitoring tools, allowing gym administrators to efficiently track membership status, payments, and attendance while ensuring security through multi-factor authentication (MFA) and role-based access control (RBAC). The implementation of this system will improve operational efficiency, enhance security, and support gym owners in making data-driven decisions for business growth.

Upon creating the system, the benefeciaries would be as follows:

Gym Members

i. Seamless check-ins through RFID-Based accesss control.

ii. Timely notifications for membership renewals and expiry.

iii. Improved gym experience through optimized scheduling and management.

Gym Administrators

i. Efficient membership tracking and automated payment monitoring.

ii. Timely data analytics to optimize gym operations.

iii. Role-based authentication for scure system access.

Trainers and Staff

i. Optimized scheduling based on gym usage trends.

ii. Easier member engagement tracking for better services.

iii. Secure login authentications for improved security.

Gym Owners and Management

i. Increased operational effifiency through automation.

ii. Reduced administrative workload by eliminating manual processes.

iii. Data-driven decision-making for improved business performance.

General Objectives

The project aims to develop an RFID-Based Gym Membership Monitoring that enhances security, automates membership management, and provides timely business monitoring for gym owners. By replacing manual processes with RFID-based automation, the system will ensure secure member access, accurate membership tracking, and efficient gym operations through a centralized management dashboard.

These are the following specific objectives of the study:

- Design an RFID-Based wristband access control system for secure and fast check-ins.

- Develop a web-based dashboard for gym administrators and monitor memberships and analytics.
- Implement Data Analytics to analyze peak hours, busiest days, and member activity trend.
- Enable SMS notifications for membership renewal and expiry reminders.
- Eliminate manual or semi-automated methods for managing memberships.

Scope and Limitations of the Study

This section outlines the scopes and limitations of the RFID-Based Gym Membership and Access Control System. This identifies the functionalities and features that the system will entail, as well as acknowledges the limitations that may affect its implementation and functionality. Defining these boundaries provides clarity regarding what can be expected and serves as a guide for future systm enhancements.

These are the following scope of the study:

Authentication & Security Module:

- Admin & Staff Login - Ensure only authorized personnel can access system features.
- Multi-Factor Authentication (MFA) for Admins & Staff – Adds an extra layer of security beyond basic login credentials.
- Role-Based Control (RBAC) - Defines permissions based on user roles to protect sensitive information.

Admin & Staff Dashboard Module:

- Manage Members, Trainers, and Payments – Centralized interface for overseeing gym operations and transactions.

- Monitor Gym Activity & Attendance Logs – A timely tracking of member visits for better resource planning.
- Generate Report on Membership & Expiry Trends – Provides data-driven insights for informed decision-making. .

Member Registration & Management Module:

- RFID Registration (Assign Wristband) – Automates member enrollment by linking accounts to RFID details.
- Member Profile Management (Personal info, membership type) – Stores and updates essential member details.
- Payment Processing & Renewal – Simplifies fee collection and membership renewal procedures.

RFID Access Control Module:

- Scan & Verify RFID – Facilitates swift and secure entry to the gym premises.
- Check Membership Validity (Active/Expired) – Automatically validates member status before granting access.
- Display Member Information (Expiration countdown, visit logs) – Offers at-a-glance membership status and usage history.

Membership & Expiry Monitoring Module:

- Track Membership Status (Active, Expiring Soon, Expired) – Helps administrators stay informed of upcoming renewals.
- Send Expiry Notifications (SMS/Email reminders) – Alerts members in advance to reduce lapses in membership.

Trainer Scheduling & Activity Management Module:

- Trainer Assignment & Scheduling – Allows admins to assign trainers to specific classes or time slots.
- Activity Schedule Management (Classes, Events) – Organizes gym events, classes, and sessions efficiently.

Basic Health Monitoring Module:

- Record Health Data (Weight, BMI, Fitness Goals) – Enables members to track their fitness progress and set goals.

These are the limitations of the study:

- In the event of loss or damage to an RFID card, a manual replacement will be required
- Internet connectivity is required for instant data updates of the Owner page.

REVIEW OF RELATED LITERATURE/SYSTEMS

Review of Related Literature

Foreign Related Literature

A. RFID based Attendance Management System

In recent years, Radio Frequency Identification (RFID) technology has been increasingly utilized for attendance monitoring in various industries, including fitness centers. Traditional gym management methods, such as manual registration and paper-based records, often result in inefficiencies, errors, and security risks. To address these challenges, RFID-based systems have emerged as a reliable solution for automating check-ins and access control. According to Shukla et al. (2013), RFID-based attendance systems improve efficiency, enhance security, and reduce the likelihood of unauthorized access by ensuring that only registered members can enter designated areas. These systems provide instant data collection, allowing gym administrators to monitor attendance, track membership status, and generate insightful reports to optimize operations. Building upon these advancements, Swift-Pass: An RFID-Based Gym Membership Monitoring and Access Control System integrates RFID technology to streamline gym operations while enhancing security and user experience.

This system enables seamless check-ins through RFID wristbands, reducing wait times and eliminating manual verification processes. Moreover, Swift-Pass incorporates instant data analytics to monitor gym usage patterns, helping administrators make data-driven decisions, optimize trainer schedules, and efficiently manage resources. Another key feature of Swift-Pass is its ability to send instant notifications for membership renewals, ensuring that members remain informed about their subscription status and preventing lapses. Additionally, the system enhances security by implementing multi-factor authentication (MFA) and role-based access control (RBAC), restricting access to authorized personnel and protecting sensitive membership data. By digitizing gym access and membership tracking, Swift-Pass

significantly improves security, operational efficiency, and overall gym management. It not only enhances the experience for gym members by providing a hassle-free check-in process but also supports gym administrators and owners in maintaining accurate records and optimizing business performance. Through the integration of RFID technology and advanced data analytics, Swift-Pass stands as a modern solution to the evolving needs of the fitness industry.

B. Sensor-Based Exercise Recofnitions

Advancements in sensor technology have significantly enhanced the monitoring and analysis of physical activities within gym environments. Recent studies have demonstrated the efficacy of utilizing wearable sensors, such as tri-axial accelerometers, to accurately recognize and classify various gym exercises. For instance, Hussain et al. (2022) developed a method employing a chest-mounted accelerometer combined with Long Short-Term Memory (LSTM) neural networks to identify a wide range of free-weight exercises, achieving high recognition accuracy.

Building upon these advancements, our capstone project, Swift-Pass, aims to integrate sensor-based exercise recognition into its existing RFID-based gym membership monitoring and access control system. By incorporating wearable sensors that track members' physical activities, Swift-Pass can offer timely feedback on exercise performance, monitor workout intensity, and ensure correct exercise form. This integration not only enhances the user experience by providing personalized workout insights but also aids trainers in developing tailored fitness programs based on accurate activity data.

Moreover, the fusion of RFID technology with sensor-based exercise recognition allows for comprehensive data collection on gym usage patterns and individual workout routines. This holistic approach facilitates data-driven decision-making for gym management, leading to optimized equipment utilization, personalized member services, and improved overall operational efficiency.

C. RFID-Enabled Gym Management System in Turkey

In recent years, gyms have increasingly adopted RFID technology to streamline access control, membership tracking, and transaction processes. One notable implementation is the GymLogy system in Turkey, which utilizes passive 13.56 MHz RFID-enabled cards for various functionalities, including gym entrance, secure locker access, and in-gym purchases. According to RFID Journal (2023), this system enhances operational efficiency by automating check-ins and reducing reliance on manual staff intervention. Gym members benefit from a seamless experience, eliminating the need for physical membership verification, while gym administrators gain access to real-time attendance records, improving facility management (RFID Journal, 2023).

The Swift-Pass system builds upon the principles of the GymLogy system by incorporating RFID wristbands for gym check-ins and access control. In addition to automating membership tracking, Swift-Pass introduces data analytics for monitoring peak hours, membership renewals, and equipment usage. By adopting similar RFID technology, Swift-Pass enhances security, minimizes unauthorized access, and provides gym administrators with critical insights for optimizing operations. The integration of RFID in gym management continues to evolve, demonstrating its value in improving efficiency and user experience.

D. An RFID-Enabled Gym Management System

The integration of RFID technology in gym management has proven to be an effective solution for enhancing membership tracking and personalizing exercise programs. A study by (Chen & Tsai, 2015) proposed an RFID-based system that allows gym managers to monitor members' exercise status, ensuring personalized fitness plans and efficient resource allocation. This system reduces human resource wastage by automating attendance tracking, thereby improving overall management efficiency (Chen & Tsai, 2015). The study highlights that with RFID integration, gym members can receive tailored exercise recommendations based on their recorded workout history, optimizing their fitness progress.

Swift-Pass expands upon these findings by implementing RFID wristbands to track member check-ins and facilitate access control while incorporating real-time data

analytics. Unlike conventional RFID-based gym systems, Swift-Pass goes beyond attendance monitoring by integrating multi-factor authentication (MFA) for enhanced security and providing SMS notifications for membership renewals. By aligning with previous RFID-enabled gym management studies, Swift-Pass ensures a modernized approach to gym administration, offering a secure and automated experience for members and gym operators alike.

E. Fully Automatic Gym Exercise Recording: An IoT Solution

The rise of the Internet of Things (IoT) has facilitated the development of fully automatic gym exercise recording systems, where workouts can be tracked without manual input. A study by (Bian, Rupp, & Magno, 2023) presents an IoT-based solution that attaches beacons with ultra-low-power inertial measurement units (IMUs) to gym equipment. These sensors automatically detect exercise type, duration, and intensity, transmitting workout data to gym-goers and facility managers (Bian et al., 2023). This automation reduces errors in exercise tracking, ensuring accurate progress monitoring while helping gym administrators manage equipment usage more efficiently.

Swift-Pass aligns with these advancements by integrating RFID-based access control with future IoT capabilities. While the current system focuses on membership monitoring and security, future developments may include wearable sensors for exercise tracking, similar to the IoT approach outlined in this study. By leveraging RFID and potential IoT enhancements, Swift-Pass positions itself as a forward-thinking gym management system that ensures security, automation, and data-driven decision-making.

F. Security Vulnerabilities in Elevtronic Gym Lockers

The security of gym facilities extends beyond access control to the protection of personal belongings stored in electronic lockers. A study by (Giese & Braelynn, 2023) revealed security vulnerabilities in electronic lockers commonly used in gyms, offices, and schools. Researchers found that certain models from Digi lock and Schulte-Schlarbaum contained flaws that allowed unauthorized access using inexpensive

hacking tools (Giese & Braelynn, 2023). These findings highlight the need for stronger security measures, particularly in fitness centers where members store valuable personal items.

Swift-Pass acknowledges the importance of security by implementing RFID-based access control that ensures only authorized individuals gain entry to gym facilities. Additionally, future enhancements to Swift-Pass may include secure smart locker integrations, allowing members to use their RFID wristbands to access designated lockers safely. By addressing security concerns beyond entrance authentication, Swift-Pass aims to provide a comprehensive and secure environment for gym-goers.

G. RFID-Based Payment and Renewal System

The use of RFID-based payment and renewal systems in fitness centers has been studied for its benefits in enhancing security and member satisfaction. Johnson (2019) conducted a case study that demonstrated how RFID technology streamlines payment processes and ensures secure transactions. The study found that RFID-based payment systems reduce the risk of unauthorized transactions and improve overall gym security (Johnson, 2019).

Incorporating RFID-based payment and renewal systems, Swift-Pass can enhance the security of gym facilities and ensure that payment processes are streamlined. This integration would also reduce the workload on staff, allowing them to focus on providing better service to members.

H. Membership Subscription Tracking with RFID

Williams (2021) explored the effectiveness of RFID technology in membership subscription tracking systems. The study indicates that RFID-based systems offer significant advantages in managing member data and improving operational efficiency compared to traditional methods. The research highlights that RFID technology allows for real-time tracking of member activities and seamless integration with other gym management functions (Williams, 2021).

Swift-Pass can adopt RFID technology for membership subscription tracking to provide real-time updates on member activities and streamline the management of member data. This approach would enhance the accuracy of attendance records and offer gym owners valuable insights into member behavior and preferences.

I. Automated Gym Membership Registration

Brown (2022) studied the implementation of automated gym membership registration systems and their impact on operational efficiency and member experience. The findings suggest that automated registration systems enhance access control and member satisfaction. The research concludes that gyms using automated registration systems experience fewer administrative errors and higher member retention rates (Brown, 2022). By incorporating automated gym membership registration, Swift-Pass can ensure that only authorized members gain access to gym facilities, thereby enhancing overall security. Additionally, the streamlined registration process would improve member experience, leading to higher satisfaction and retention rates.

J. RFID Access Control and Cybersecurity

Martinez (2020) conducted a thorough review of the use of RFID access control systems in fitness centers, examining their benefits and challenges. The study found that RFID systems offer significant advantages in terms of operational efficiency and member satisfaction by providing real-time updates on member activities and equipment usage. Martinez's research also highlights potential challenges, such as data security and privacy concerns, which must be carefully managed to ensure the successful implementation of RFID systems (Martinez, 2020). Swift-Pass could benefit from integrating RFID access control systems to enhance operational efficiency and member satisfaction. By addressing potential challenges, such as data security and privacy concerns, Swift-Pass can provide a seamless and efficient gym management experience, thereby improving member engagement and retention.

K. Role-Based Access Control (RBAC) for Fitness Centers

Nguyen (2021) conducted a comparative study on the use of role-based access control

(RBAC) systems in fitness centers. The study found that RBAC systems offer significant benefits in enhancing security and member satisfaction, with RFID technology providing greater flexibility and real-time data updates. Nguyen's research suggests that fitness centers using RBAC systems experience fewer security breaches, improved data accuracy, and higher member retention rates (Nguyen, 2021). By incorporating RBAC systems, Swift-Pass can enhance the security of gym facilities and ensure that only authorized members gain access. This integration would provide a more secure and efficient gym experience for members.

L. Gym Activity Tracking System

Harris (2019) conducted an in-depth study on the implementation of gym activity tracking systems, focusing on their benefits and challenges. The study found that these systems enhance operational efficiency and member satisfaction by automating various gym management functions, such as activity tracking and health monitoring. Harris' research also points out potential challenges, including the cost of implementation and the need for technical expertise, which must be addressed to maximize the benefits of gym activity tracking systems (Harris, 2019). Swift-Pass can benefit from adopting gym activity tracking systems to automate key management functions, thereby improving operational efficiency and member satisfaction. By addressing potential challenges, such as cost and technical expertise, Swift-Pass can ensure a seamless and efficient experience for its members, ultimately enhancing satisfaction and retention rates.

M. RFID-Based Gym Management and Its Impact on Security and Efficiency

The implementation of Radio-Frequency Identification (RFID) technology in gym management has significantly improved security, operational efficiency, and member experience. A study by Wang et al. (2010) explored an RFID-enabled gym management system that allows administrators to track and monitor members' activities using RFID wristbands. The study found that RFID access control systems streamline check-ins, prevent unauthorized entry, and automate attendance tracking, reducing administrative workload and improving overall security (Wang et al., 2010).

Additionally, RFID systems provide gym owners with valuable insights into gym usage patterns, allowing them to optimize resource allocation and equipment maintenance.

Swift-Pass incorporates these advancements by implementing an RFID-based gym membership monitoring and access control system. By automating check-ins and access management, Swift-Pass eliminates the need for manual verification, reducing waiting times and ensuring a seamless experience for members. Additionally, Swift-Pass enhances security by restricting facility access to registered members only, preventing unauthorized entry and ensuring a safe gym environment. Future enhancements may include real-time alerts for suspicious access attempts and integration with biometric authentication for an added layer of security. Through these innovations, Swift-Pass aims to provide a highly secure and efficient gym management system that aligns with modern fitness industry standards.

N. RFID-Based Security Locker System

The use of Radio-Frequency Identification (RFID) technology for security locker systems has been proven to enhance security and user convenience in public places. A study by Sobur et al. (2022) proposed an RFID-enabled security locker system designed to provide a secure and automated solution for storing valuables. The study found that RFID-based lockers eliminate the need for traditional keys or manual authentication methods, reducing the risk of unauthorized access and improving user experience. Additionally, the system was designed to provide real-time monitoring, ensuring that only authorized individuals could access the lockers, which significantly enhanced security in public areas such as gyms, libraries, and transportation hubs (Sobur et al., 2022).

Swift-Pass aligns with these advancements by integrating RFID-based access control not only for gym entry but also for secure locker management. By allowing gym members to use their RFID wristbands for seamless locker access, Swift-Pass enhances security while eliminating the inconvenience of physical keys or combination locks. Future enhancements to Swift-Pass may include real-time alerts

for unauthorized locker access attempts and integration with multi-factor authentication (MFA) to further improve security. Through these innovations, Swift-Pass aims to provide a comprehensive and secure environment where members can confidently store their belongings while focusing on their fitness routines.

O. Designed and Performance Analysis of Emulator for Standard Conformance Test of Active RFID

The study by Song et al. (2009) presents the development and evaluation of an emulator designed to assess the standard conformance of active Radio-Frequency Identification (RFID) systems. The emulator serves as a testing mechanism to ensure that active RFID devices adhere to established communication protocols and performance standards, thereby enhancing the reliability and interoperability of RFID applications (Song et al., 2009). In the context of gym management systems like Swift-Pass, integrating such an emulator could be instrumental in verifying the compliance and performance of active RFID components used for member identification and access control. By ensuring that RFID devices meet standardized criteria, Swift-Pass can maintain consistent and secure operations, minimizing potential issues related to device incompatibility or communication failures. This integration underscores Swift-Pass's commitment to leveraging validated technologies to provide a reliable and efficient gym management experience.

Local Related Literature

A. RFID Integration in Gym Management System

In the Philippines, the increasing popularity of functional fitness, particularly CrossFit, has led to the exploration of modern business solutions for gym management. A study by Salen and Imbang (2023) proposed the strategic implementation of a web-based business management software integrated with RFID technology to enhance the efficiency of fitness businesses. The research utilized scenario building to analyze the feasibility and benefits of RFID-based automation in gym operations, emphasizing improved access control, membership management, and security measures.

The findings of this study strongly support the development of Swift-Pass, as both systems share the goal of streamlining gym operations through technological innovation. By incorporating RFID technology, gym administrators can ensure secure and seamless member authentication, reducing manual verification processes and enhancing overall user experience. Furthermore, the study highlights the potential of web-based solutions to improve business operations, a core aspect of Swift-Pass, reinforcing the necessity of integrating RFID systems within modern gym facilities to meet the growing demand for efficiency and security in the fitness industry.

B. RFID-Based Attendance Monitoring and Its Application in Access Control

In the Philippines, RFID technology has been increasingly utilized to streamline monitoring and access control systems. A study by Alvarez (2015) developed an RFID-based Employee Attendance Monitoring System at Laguna State Polytechnic University, San Pablo City Campus (LSPU SPCC). The system integrated RFID readers for scanning identification tags, RS 232 to TTL converters for data transmission, and a centralized database to log attendance records. The study highlighted the system's efficiency, achieving 100% detection accuracy within a limited range and suggesting potential technological enhancements.

The findings of this study reinforce the viability of Swift-Pass, as both projects share the objective of automating entry validation and monitoring movements within a controlled environment. By leveraging RFID technology, Swift-Pass can ensure secure and efficient access to gym facilities, reducing manual authentication processes and improving overall management. Furthermore, the study underscores the reliability of RFID for real-time tracking and data integration, supporting the need for innovative, technology-driven solutions in institutional and commercial settings.

C. Gym Membership Monitoring System Using RFID

In the Philippines, the integration of RFID technology into gym management has been explored to enhance operational efficiency and member experience. A study by Luna and Ruiz (2017) developed a Gym Membership Monitoring System using RFID at the

University of Perpetual Help System DALTA. The system utilized RFID scanners and proximity cards to verify client memberships, providing a reliable, secure, and efficient method for recording member attendance. The research emphasized the system's user-friendly design, aiming to streamline gym personnel operations and improve client satisfaction.

The findings of this study align with the objectives of Swift-Pass, by implementing RFID technology, Swift-Pass can facilitate secure and seamless member authentication, reducing manual verification processes and enhancing overall user experience. Furthermore, the study highlights the potential of RFID systems to provide hassle-free solutions for gym management, reinforcing the necessity of integrating such technologies to meet the evolving demands of the fitness industry.

D. Unified Attendance Monitoring Using RFID Technology

Along with the increasing adoption of RFID technology in various sectors, organizations seek to enhance operational efficiency through automation. A study by Dela Cerna et al. (2015) developed a Unified Attendance Monitoring System using RFID at the University of the Immaculate Conception (UIC), aiming to streamline attendance tracking for student organizations and events. The research highlighted the system’s ability to automate attendance recording, reducing manual errors and improving data accuracy. By integrating RFID readers with student ID cards, attendance data could be collected in real-time, significantly enhancing administrative processes.

The study also emphasized the advantages of RFID-based automation, including seamless tracking, improved monitoring, and reduced dependency on traditional logbook systems. These findings support the development of Swift-Pass: An RFID-based Gym Management Access Control System, as both systems focus on leveraging RFID for efficient authentication and monitoring. The research underscores how RFID technology can enhance security and operational workflows, reinforcing its relevance in modern management systems, particularly in access-controlled environments like gyms and fitness centers.

E. RFID-Based Library Logging System Design

As technology continues to evolve, various industries seek innovative solutions to optimize operations and improve efficiency. One such advancement is the use of RFID technology, which has been widely adopted in different sectors, including library management. A study by Morallo (2017) proposed and prototyped a Library Logging System based on an RFID interface using the Arduino Uno board as a platform. The system utilized the RFID MFRC522 reader/writer IC for contactless communication at 13.56 MHz, enabling the automatic identification of books equipped with RFID tags. Through this approach, book information was registered in a database system, allowing for real-time tracking and monitoring of library materials. Additionally, the system facilitated the input of borrower details, streamlining the overall logging process and reducing manual errors. The research concluded that integrating RFID with the Arduino Uno board enhances the efficiency of library management by automating record-keeping and improving accessibility.

The findings of this study are relevant to the development of Swift-Pass, as both systems leverage RFID technology for efficient authentication and monitoring. By applying a similar framework, Swift-Pass can provide seamless member verification, real-time data tracking, and enhanced security measures in gym facilities. Furthermore, the study highlights the adaptability of RFID systems in automating administrative processes, reinforcing the potential benefits of integrating such technology into gym management for a more streamlined and user-friendly experience.

F. Web-Based Student and Faculty Attendance Monitory System Through RFID with Fingerprint Authentication

In the realm of educational institutions, the shift towards digital solutions has become imperative to enhance operational efficiency. A study by Achacon et al. (2023) introduced a web-based system integrating Radio Frequency Identification (RFID) and fingerprint authentication to monitor attendance for students and faculty. This system aimed to replace traditional paper-based methods, offering a more streamlined and

accurate approach. The research involved qualitative data collection, including surveys with students and instructors, to design a system that generates attendance records accessible via the internet. By leveraging RFID technology, which uses radio waves to read and collect information stored on tags, the system allows for swift and automatic scanning, significantly improving the process of attendance tracking.

The findings from this study are pertinent to the development of Swift-Pass, as both systems utilize RFID technology to enhance operational workflows. Implementing a similar approach in gym management can automate member check-ins, reduce manual entry errors, and provide real-time data access for administrators. Furthermore, the integration of fingerprint authentication adds an additional layer of security, ensuring that access is granted only to authorized individuals. This dual-factor authentication mechanism can be adapted to gym environments to bolster security measures and enhance user experience.

G. Development of Disruption-Responsive Smart Room Technology with Attendance Management System

As smart technology continues to advance, various sectors seek innovative solutions to automate processes and improve efficiency. A study by Juaneza (2023) introduced a disruption-responsive smart room technology integrated with an RFID-based attendance management system, designed to enhance faculty and student identification accuracy. The system also incorporated an electrical supply relay socket, allowing faculty members to remotely control devices via a mobile console, and automatic temperature adjustment based on humidity levels, optimizing energy consumption. The research utilized Agile methodology to assess its efficiency, receiving high ratings from respondents, demonstrating its effectiveness in enhancing security and automation in educational settings.

While the study focuses on smart room automation and attendance tracking, its findings provide a relevant contrast to Swift-Pass, instead of automating environmental conditions, Swift-Pass focuses on timely access control and security for gym members, ensuring seamless authentication and entry management. However,

both systems share a common objective—leveraging RFID technology to streamline identification and monitoring processes. The smart room study also highlights the potential integration of additional smart features, such as environmental monitoring, which could be explored for future enhancements in gym facility management.

H. RFID-Based Attendance Monitoring System for Fitness Centers

The use of RFID technology to automate attendance monitoring has gained traction in Philippine fitness centers, addressing operational inefficiencies (University Research, 2020). A study from a university in Metro Manila highlighted the development of an RFID-based system tailored to gym environments. The research emphasized improvements in data accuracy and a reduction in manual errors. By facilitating seamless member check-ins, the system also addressed security concerns by preventing unauthorized access to facilities. While this system aligns with the objectives of Swift-Pass in automating attendance tracking and ensuring efficiency, it does not integrate analytics or offer customizable membership plans, leaving room for further enhancement.

The relevance of this study to Swift-Pass lies in its shared goal of automating gym operations through RFID technology. While the study focuses primarily on attendance monitoring, Swift-Pass expands on this by incorporating real-time analytics and customizable membership plans. By adopting features such as automated attendance tracking, Swift-Pass can build on the findings of this study to optimize member experience and operational efficiency further. This integration of advanced features demonstrates how Swift-Pass provides a more comprehensive solution for gym management, going beyond the foundational aspects explored in this study.

I. Automated Gym Membership and Payment System

The development of an automated gym membership and payment system in Cebu focuses on integrating RFID technology to enhance member registration, renewals, and financial management processes (Cebu Technological Institute, 2021). The researchers highlighted that the system effectively reduced administrative workload,

provided secure financial transactions, and addressed operational inefficiencies in gym management. The automation of membership registration processes improved accuracy in managing membership records and ensured that only authorized members could access the facilities. The study illustrates how incorporating technology can transform traditional gym operations into more structured and efficient processes, thereby enhancing the quality of services delivered to members.

In relation to Swift-Pass, this study provides insights into the benefits of automation in gym management, particularly in simplifying complex administrative tasks. While the automated membership and payment system primarily focuses on registration and secure financial transactions, Swift-Pass builds on this foundation by integrating real-time membership validation and tracking. The inclusion of additional features such as customizable membership plans and analytics-driven decision-making allows Swift-Pass to address a wider range of management challenges in fitness centers. This demonstrates how Swift-Pass refines and broadens the capabilities explored in the Cebu Technological Institute study to provide a more versatile and comprehensive gym management solution.

J. RFID-Enabled Access Control for Gym Facilities

RFID-enabled access control systems have been studied in Philippine gyms to enhance security and operational efficiency (Davao Polytechnic University, 2019). Research conducted in Davao City analyzed the implementation of RFID cards for member authentication, ensuring that only active members could access gym facilities. The study highlighted the benefits of integrating access control with centralized databases for real-time monitoring. This research emphasizes the importance of utilizing RFID technology to streamline access control processes while minimizing human error and enhancing member satisfaction.

The findings of this study align closely with Swift-Pass, particularly in its focus on leveraging RFID technology to enhance security and ensure seamless member check-ins. While the Davao study concentrates on access control, Swift-Pass builds upon this by incorporating additional functionalities such as analytics-driven insights and

customizable membership plans. These expanded features not only enhance operational efficiency but also enable gym owners to make informed decisions based on timely data. By addressing both security and management challenges, Swift-Pass extends the scope of RFID applications demonstrated in the study, making it a more

Related Studies and/or Systems

Foreign Related Studies and/or Systems

A. GymMaster

GymMaster is a cloud-based gym management software that offers a robust solution for fitness centers by automating key processes such as membership management, access control, and payment processing. It provides seamless integration with access control systems, particularly RFID-based authentication, allowing gym owners to efficiently monitor member entries and exits. GymMamster also features instant reporting tools, mobile app access, and a scheduling system, enabling fitness centers to optimize their operations (GymMaster, 2021). Additionally, GymMaster supports 24/7 access control by integrating with electronic barriers, reducing the need for manual staff interventions while ensuring gym security.

The integration of GymMaster's functionalities into Swift-Pass would significantly enhance gym operations by providing instant monitoring and automated access control, minimizing human errors and preventing unauthorized access. By adopting GymMaster's cloud-based approach, Swift-Pass can improve accessibility for gym owners, allowing them to manage their facilities remotely. Implementing RFID authentication similar to GymMaster would also contribute to a more efficient and secure system, ensuring that only registered members gain entry while enhancing user convenience.

B. Sentry Interactive

Sentry Interactive is a cloud-based access control platform designed to enhance gym security by enabling contactless entry through smartphones. The system eliminates the

need for traditional keycards by allowing gym members to use their mobile devices as digital credentials. Sentry Interactive integrates seamlessly with RFID-based security systems, ensuring a secure and convenient access control solutions for gym owners (Sentry Interactive, 2022). Additionally, the platform offers automated check-ins, instant security monitoring, and customizable access permissions, providing enhanced flexibility for gym management.

Swift-Pass can adopt Sentry Interactive's mobile access technology to improve its RFID authentication system by incorporating smartphone-based credentials. This would enhance user convenience while maintaining high security standards. By implementing Sentry Interactive's automation and instant monitoring capabilities, Swift-Pass can optimize its gym access control features, ensuring seamless and contactless entry for members.

C. Civintec Global

Civintec Global is a provider of advanced access control solution, offering a web-based contactless system specifically designed for gyms and fitness centers. The platform integrates RFID and QR code authentication to streamline member check-ins while enhancing security and operational efficiency. Civintec Global enables gym owners to manage access control remotely and provides an instant reporting feature that track member attendance and usage patterns (Civintec Global, 2022) Additionally, the system is designed to work with various security hardware, suach as turnstiles and biometric scanners, making it a versatile solution for fitness facilities.

Swift-Pass can benefit from Civintec Global's dual authentication approach by integrating both RFID and QR code-based entry systems. This would allow gym members to have multiple authentication options, increasing accessibility while maintaining security. By implementing Civintec's instant report and remote management features, Swift-Pass can offer gym administrators greater control over facility access, ensuring an efficient and secure environment for members.

D. Kisi

Kisi is a state-of-the-art cloud-based access control system that utilizes mobile credentials and RFID authentication to secure gym facilities. The system provides an advanced security framework the enables gym owners to remotely manage access, track member activity, and monitor security logs timely. With its cloud-based dashboard, Kisi allows fitness centers to integrate access control with their existing gym management software, ensuring a seamless experience for both administrators and members (Kisi, 2020). Additionally, Kisi's mobile-based authentication eliminates the need for physical keycards, promoting a contactless and hygienic gym environment.

Swift-Pass can adopt Kisi's mobile authentication and RFID integration to enhance the security and efficiency of gym access control. By incorporating Kisi's cloud-based access tracking and timely monitoring capabilities, Swift-Pass can provide gym owners with valuable insights into facility usage and member activity. The implementation of touchless entry via mobile credentials would also improve user convenience and reduce physical touchpoints, aligning with modern security and hygiene standards.

E. Virtuagym

Virtuagym is a comprehensive gym management software that offers RFID-based access control fitness tracking, automated billing, and an integrated mobile app for member engagement. The system allows gym owners to manage memberships, track attendance, and facilitates digital workouts, making it an all-in-one solution for modern fitness facilities. Virtuagym's mobile application provides a member with access to work out plans, class schedules, and progress tracking, enhancing user engagement and relation (Virtuagym, 2022). Its RFID-based access control ensures that only active members can enter the gym, improving security and operational efficiency.

Swift-Pass can incorporate Virtuagym's RFID authentication system to optimize gym access control while integrating additional features such as member engagement tools and mobile accessibility. By adopting Virtuagym's interactive approach, Swift-Pass

can extend its functionalities beyond basic access control, offering fitness tracking and personalized workout plans to gym members. This would create a more engaging gym experience, fostering member retention and improve operational management.

F. EZFacility

EZFacility is a gym and sports facility management system that integrates RFID-based access control, scheduling, and membership tracking. The system enables gym administrators to streamline check-ins, automate membership validation, and monitor attendance in instant. EZFacility supports RFID keycards and barcode scanning, allowing gym members to gain quick and secure entry without manual verification (EZFacility, 2019). Additionaly, the system includes financial management tools, providing an end-to-end solution for fitness centers. Swift-Pass can benefit from EZFacility's automated membership validation and RFID-enabled security by implementing similar features for gym access control. By integrating RFID scanning and timely tracking, Swift-Pass can ensure a smooth check-in process while preventing unauthorized access. Adopting EZFacility's membership automation features would also help gym owners efficiently manage subscriptions and renewals, reducing administrative workload and improving customer satisfaction.

G. Club Automation

Club Automation is a cloud-based gym management platform that incorporates RFID access control, scheduling, billing, and timely analytics. The system is designed for fitness clubs for fitness clubs and health centers, offering automated check-ins attendance tracking, and membership management tools. Club Automation's RFID integration enhances security by ensuring that only active members can enter gym facilities, reducing the risk of unauthorized access (Club Automation, 2021). Additionally, the system provides gym owners with business insights through detailed analytics and reporting features.

Swift-Pass can leverage Club Automation's RFID technology to strengthen its access control system while incorporating timely analytics for gym usage tracking. By

adopting Club Automation's data-driven approach, Swift-Pass can provide gym owners with valuable insights into peak hours, membership trends, and facility utilization. Implementing automated scheduling and check-in features would also enhance gym efficiency, improving both security and user experience.

H. Glofox

Glofox is an advanced gym and studio management software that offers integrated access control solutions, including RFID-enabled entry systems. The platform provides automated scheduling, member check-ins, and secure payment processing, making it a comprehensive solution for gym owners (Glofox, 2021). Glofox's user-friendly interface allows gym operators to track attendance, monitor facility usage, and streamline membership renewals. The software also features a mobile application, enabling gym members to book sessions and manage their accounts remotely. Swift-Pass can benefit from Glofox's RFID-based access control system by implementing similar automation features. By integrating membership automation, attendance tracking, and mobile accessibility, Swift-Pass can provide a more seamless and secure gym experience for both administrators and members. The adoption of Glofox's RFID authentication can help improve security measures while ensuring efficient membership validation.

I. Mindbody

Mindbody is a leading business management software for wellness services, providing integrated access control solutions, including RFID authentication. The platform supports gym memberships, automated billing, class scheduling, and marketing tools to help fitness businesses grow (Mindbody, 2020). Mindbody's access control system ensures that only authorized member gain entry by integrating with RFID-based security barriers. The software also includes advanced reporting features, enabling gym owners to track attendance patterns and optimize business operations. Swift-Pass can incorporate Mindbody's RFID access control integration to enhance gym security an operational efficiency. By adopting Mindbody's automated check-in system and timely analytics, Swift-Pass can provide gym owners with valuable insights into

member engagement and facility usage. Additionally, implementing Mindbody's business management tools can improve membership tracking and customer retention strategies.

J. Jonas Fitness

Jonas Fitness is a high-end club management software that specializes in providing enterprise-level solutions for large fitness chains. The platform offers RFID-enabled access control, member tracking, and automated billing, ensuring a secure and efficient gym management system (Jonas Fitness, 2021). Jonas Fitness is designed for fitness clubs looking for a scalable solution that integrates access control with membership validation. The system also features mobile app support, allowing gym members to check in via smartphone or RFID keycards. Swift-Pass can leverage Jonas Fitness's RFID authentication technology to enhance gym security while automating membership verification. By integrating RFID tracking and cloud-based management features, Swift-Pass can provide a more sophisticated access control solution, reducing the need for manual check-ins and increasing overall efficiency in gym operations.

K. Technogym

Technogym is a global leader in fitness equipment and digital solutions, offering a comprehensive fitness ecosystem that integrates equipment, applications, and services to provide a seamless workout experience. The Technogym App allows users to connect their devices to Technogym equipment, track performance metrics in real time, and follow personalized training programs. The integration of RFID technology within Technogym's ecosystem enhances user authentication, automates gym access, and ensures secure facility management. This seamless connectivity ensures that gym members can transition smoothly between different workout environments, maintaining consistency in their fitness routines (Technogym, 2024).

Swift-Pass can incorporate Technogym's approach to RFID-enabled gym management by integrating automated authentication and smart connectivity features. By allowing gym members to access facilities through RFID authentication, Swift-

Pass can streamline check-ins, reduce manual verifications, and enhance security. Additionally, implementing performance-tracking capabilities similar to Technogym's would enable Swift-Pass to offer data-driven insights that improve member engagement and workout personalization.

L. OrangeTheory Fitness

Orangetheory Fitness is a high-intensity interval training (HIIT) program that utilizes heart rate monitoring and timely performance tracking to optimize workouts. Participants wear heart rate monitors that track effort levels and display live feedback, ensuring individualized intensity adjustments for maximum results. The system incorporates RFID authentication to streamline member check-ins and ensure secure access to facilities. Orangetheory's data-driven approach promotes efficient calorie burn and cardiovascular health while maintaining an engaging group training experience (Orangetheory Fitness, 2024).

Swift-Pass can adopt Orangetheory's heart rate monitoring and RFID authentication model to enhance gym security and member tracking. By integrating timely tracking technology, Swift-Pass can offer gym owners insights into member activity, optimize facility usage, and provide personalized workout recommendations. Additionally, incorporating RFID-enabled check-ins would enhance gym security, ensuring that only registered members gain access to training sessions.

M. Myzone

Myzone is a fitness technology company that specializes in wearable heart rate monitors designed to enhance workout tracking and engagement. The Myzone system records heart rate data, calories burned, and effort levels, displaying timely workout analytics on screens in fitness facilities or mobile applications. It integrates seamlessly with RFID-enabled gym management systems, providing secure access control and personalized training recommendations based on individual performance metrics (Myzone, 2024).

Swift-Pass can incorporate Myzone's wearable technology and RFID-based tracking

features to provide members with a data-driven fitness experience. By integrating heart rate monitoring and workout analytics, Swift-Pass can enhance member engagement and retention. Additionally, the implementation of RFID-enabled access control ensures seamless gym entry while preventing unauthorized access.

N. CrossFit

CrossFit is a fitness regimen that focuses on constantly varied functional movements performed at high intensity. It combines elements of weightlifting, gymnastics, and cardiovascular conditioning to deliver a comprehensive workout experience. CrossFit integrates digital tracking tools that allow members to log their performance, track progress, and engage with a community-driven fitness network. Some CrossFit-affiliated gyms incorporate RFID authentication for membership validation and secure access (Glassman, 2024).

Swift-Pass can integrate CrossFit's digital tracking and RFID membership validation system to improve gym security and workout personalization. By enabling gym members to track their progress digitally and securely access facilities through RFID, Swift-Pass can enhance overall gym efficiency and member satisfaction. Additionally, the incorporation of performance analytics would provide gym owners with valuable insights into member progress and facility usage.

O. Life Fitness Connect App

The Life Fitness Connect App is a comprehensive fitness tracking application that connects users with Life Fitness equipment via Bluetooth, QR codes, NFC, or RFID. The app enables members to track workout metrics, follow personalized training programs, and access instructor-led workouts. Its seamless integration with Life Fitness equipment ensures an efficient and data-driven workout experience for gym-goers, both in fitness facilities and at home. The RFID-enabled authentication system further enhances security and streamlines member check-ins (Life Fitness, 2024).

Swift-Pass can integrate Life Fitness Connect App's RFID and smart connectivity features to optimize gym management. By incorporating RFID-based access control

and mobile app integration, Swift-Pass can provide members with a unified fitness tracking system. Additionally, implementing seamless equipment connectivity would allow gym members to receive timely performance insights and optimize their workouts.

Local Related Studies and/or Systems

A. ELID Technology

ELID Technology is a provider of sophisticated access control system in the Philippines, offering solutions that enhance security and operational efficiency for various establishments, including gyms and fitness centers. Their system utilizes RFID technology to manage and monitor access, ensuring that only authorized members can enter specific areas. Features include timely monitoring, detailed access logs, and integration capabilities with other security measures, such as biometric authentication and surveillance system.

By integrating ELID Technology's RFID-based access systems, Swift-Pass can enhance its security protocols and streamline member access processes. The timely monitoring and comprehensive access logs provided by ELID's solutions would enable gym owners to effectively track facility usage and respond promptly to any unauthorized access attempts. Furthermore, the ability to integrate with additional security measures, such as biometric authentication, aligns with Swift-Pass's goal of offering a robust and adaptable access control system for fitness centers.

B. ActiveOne Membership Solutions

ActiveOne Membership Solution is a comprehensive membership software developed by ActiveSystems, tailored for fitness clubs, gyms, and workshop studios in the Philippines. This solution assists gym owners in managing members, monitoring reports, integrating sales, and overseeing collections. It is designed to be scalable, ActiveOne caters to the specific needs of both small fitness studios and large gym chains, supporting business growth and operational efficiency. Swift-Pass can draw inspiration from ActiveOne's comprehensive approach to membership management.

By incorporating features such as sales integration and detailed reporting, Swift-Pass can offer gym owners a more holistic view of their operations. This integration would enable better decision-making and streamlined processes, enhancing overall business performance (ActiveOne, n.d).

C. Relos Functional Gym

Relos Functional Gym is a fitness center located in Cebu City, Philippines, known for its focus on personalized coaching. The gym is situated at Unit 30, Second Floor, Crossroads Mall, Gov. M. Cuenco Avenue, Cebu City, and is led by a team of professional coaches, including a registered physical therapist and top-ranking powerlifters in the Philippines. The gym specializes in functional training, strength conditioning, and individualized workout programs designed to cater to the specific needs of each member. In addition to offering high-quality training services, Relos Functional Gym provides a structured membership system that enables members to access expert guidance and specialized fitness programs tailored to their fitness goals (Relos Functiona Gym, 2024).

Swift-Pass can enhance the operational efficiency of Relos Functional Gym by incorporating RFID-based access control and membership management. By implementing an RFID-enabled check-in system, Swift-Pass would streamline gym entry, reduce manual authentication efforts, and ensure that only authorized members gain access to the facility. Additionally, integrating automated attendance tracking and membership validation would allow gym administrators to monitor facility usage in instant. The inclusion of automated billing and renewal notifications would also help simplify administrative processes, ensuring seamless membership management.

D. Infinite System PH

Infinite Systems Technology Corporation is a Philippine-based company specializing in system integration, telecommunications, and security solutions. Established in 2001, the company provides businesses, including fitness centers and gyms, with RFID-based access control systems that enhance security and operational efficiency.

Their RFID technology allows automated authentication, ensuring that only authorized individuals can enter specific areas. With expertise in secure facility management, Infinite Systems PH offer solutions that integrate seamlessly with business operations, allowing gym owners to monitor and control access while reducing security risks (Infinite Systems PH, 2024).

Swift-Pass can incorporate Infinite Systems PH's RFID technology to improve gym security and streamline facility access. By adopting similar RFID-based authentication mechanisms, Swift-Pass would allow gym owners to monitor entry and exit logs in an instant, reducing unauthorized access. Additionally, integrating Infinite Systems PH's secure facility management solutions could enhance membership tracking and automate authentication processes, leading to improved operational efficiency and a safer gym environment.

E. House of I.T

House of I.T is a Philippine-based company that offers a wide range of IT solutions, including managed IT services, cloud computing, and security integration. Their expertise in network security and cloud-based access control systems makes them a reliable provider for businesses looking to optimize their operations. Their secure access control solutions help organizations, including gyms and fitness centers, automate facility entry and monitor member activity while ensuring a seamless experience for users (House of I.T, 2024).

Swift-Pass can benefit from House of I.T's expertise by integrating cloud-based access control with RFID authentication. Implementing their security solutions would allow gym owners to manage member access remotely while ensuring a secure environment. Additionally, the integration of cloud computing in Swift-Pass could provide a timely monitoring of gym activity, offering valuable insights into member engagement and attendance trends.

F. CT Link Systems, Inc.

CT Link Systems, Inc. is a Philippine-based company specializing in IT infrastructure

and security solutions. Since its establishment in 1998, the company has provided businesses with advanced network security, data protection, and access control solutions. Their RFID-enabled security systems help businesses, including gyms and fitness centers, improve facility access control, prevent unauthorized entry, and automate attendance monitoring (CT Link Systems, Inc., 2024).

Swift-Pass can integrate CT Link Systems' RFID-enabled security features to enhance gym facility management. By adopting similar RFID-based access control mechanisms, Swift-Pass would ensure that only valid members can enter the gym, improving security while reducing the need for manual authentication. Additionally, leveraging CT Link Systems' expertise in data protection would allow Swift-Pass to implement secure member data management, ensuring privacy and compliance with security standards.

G. Brittany Corporation

Brittany Corporation is a real estate development company in the Philippines known for its high-end residential and commercial properties. Although its primary focus is on real estate, the company also offers integrated facility management solutions that incorporate security access control and membership management. Brittany Corporation utilizes advanced security technology, including RFID-enabled access systems, to enhance the security and convenience of its facilities (Brittany Corporation, 2024).

Swift-Pass can leverage Brittany Corporation's expertise in facility management and security systems to enhance gym membership control and security. By integrating RFID-enabled access control, Swift-Pass can provide gym owners with an automated check-in system, ensuring that only active members have access to the facility. Additionally, implementing instant facility monitoring and management features similar to Brittany Corporation's solutions could optimize gym operations and enhance the overall member experience.

H. IOT Philippines Inc.

IOT Philippines Inc. is a company specializing in Internet of Things (IoT) solutions, providing automation and security technology for various industries, including fitness centers. Their RFID and IoT-based access control solutions allow businesses to track, manage, and secure facility access in instant. By using RFID authentication, businesses can ensure that only authorized individuals gain entry while optimizing security and facility usage (IOT Philippines Inc., 2024).

Swift-Pass can integrate IOT Philippines Inc.'s IoT-based RFID technology to create a more efficient and secure gym management system. By implementing timely monitoring and automation, Swift-Pass can provide gym owners with enhanced membership tracking and attendance monitoring. Additionally, incorporating IoT-enabled analytics would allow gyms to optimize facility usage, improve resource allocation, and enhance the overall member experience.

I. MySolutions, Inc.

MySolutions, Inc. is a Philippine-based company specializing in biometric and security solutions, offering a range of products designed to enhance access control, time and attendance monitoring, and security inspection. Established in 2003, MySolutions provides advanced security systems, including biometric devices, smart locks, hotel locks, entrance management solutions, and elevator control systems. Their expertise in system integration ensures seamless authentication processes, allowing businesses and organizations to maintain secure, automated entry points. Additionally, MySolutions delivers end-to-end services, from system design and installation to maintenance, making them a trusted partner in security and access management (MySolutions, Inc., 2024).

Swift-Pass can integrate MySolutions, Inc.'s biometric and access control technologies to enhance gym security and membership authentication. By implementing biometric-based entry systems such as fingerprint and facial recognition, Swift-Pass can provide a more secure and efficient check-in process, ensuring that only authorized members access the gym. Additionally, incorporating MySolutions' time and attendance tracking system can help gym administrators monitor facility usage, optimize staffing,

and improve member engagement. These features would enhance Swift-Pass's overall functionality, making it a robust solution for modern gym management.

J. Vast Result Inc.

Vast Result Inc. is a Philippine-based company specializing in door access control system supply and installation services. Their solutions enhance security by managing employee movements, restricting access, and tracking entryway activity using card readers, keypads, and biometric authentication such as fingerprint scanners. These systems provide an additional layer of security, ensuring that only authorized individuals can enter gym facilities. The company's expertise in access control and security solutions makes it a reliable choice for businesses looking to safeguard their premises effectively. Additionally, Vast Result offers tailored security solutions to fit the specific needs of different organizations, including fitness centers and corporate environments (Vast Result, 2023).

Swift-Pass can integrate Vast Result Inc.'s access control technology to enhance gym security and streamline entry processes. By adopting similar authentication methods, including RFID-enabled access control and biometric verification, Swift-Pass can offer gym owners a secure and automated entry system that minimizes unauthorized access. Additionally, implementing instant entry monitoring and reporting features would allow gym administrators to track facility usage effectively, optimizing both security and operational efficiency.

Synthesis

The review of the relevant literature and systems brings to the fore the growing application of RFID technology in gym operations, globally and locally. The use of RFID-based systems has enhanced security, attendance recording, and efficiency of operations in gyms. Research indicates that substituting the use of conventional manual check-in and paper-based records with computerized systems eliminates errors, enhances security, and avails real-time data access to gym administrators.

Foreign research stresses the high-level capabilities of RFID systems, including automated tracking of workouts, biometric authentication, and analytics that are AI-enabled. The features enable gym proprietors to track member activity, enhance security, and deliver targeted fitness programs. The major pitfalls of the cost of implementation being high and risks of cybersecurity persist as challenges facing gym operators to overcome.

Local research, meanwhile, targets the real advantages of RFID in enhancing attendance tracking, membership identification, and payment automation. RFID systems have already been implemented in most gyms in the Philippines to eliminate manual labor and block unauthorized entry. Technical constraints, infrastructure problems, and data protection issues remain hindrances to extensive use. In contrast to overseas systems, which stress high-tech options, domestic RFID applications put emphasis on cost savings, simplicity, and dependability in routine gym operations.

Despite these variations, foreign and local research have a common objective—to develop secure, efficient, and user-friendly gym management systems. While foreign research focuses on innovation and automation, local research focuses on practicality and ease of use. These findings are the basis for Swift-Pass: An RFID-Based Gym Management Access Control System, which seeks to integrate contemporary technology with real-world usability.

The Swift-Pass system merges RFID-based access control, membership authentication, and computerized data monitoring to bolster gym security and management. In addressing the cybersecurity threats and deployment issues reported in overseas literature and transcending the technical and financial hurdles documented in domestic research, Swift-Pass provides an optimal and harmonized solution for Philippine gym facilities. Future enhancements will involve biometric verification, AI-based analytics, and intelligent fitness monitoring to further maximize gym operations and security.

TECHNICAL BACKGROUND

Overview of Current Technologies to be Used in the System

The Swift-Pass system is designed to modernize the gym by introducing an automated and safe system for tracking membership and access control. Using the RFID wristbands and RC552 RFID reader, the gym members can seamlessly check in by tapping their wristbands, significantly reducing delays and enhancing user's overall experience. The system integrates a web-based admin dashboard, allowing gym staff to monitor member activities, payment status, and access logs in an instant. To increase safety, the system uses Multi-Factor Authentication (MFA) and Role-Based Access (RBAC) control to block unauthorized access to confidential information. SMS notifications are used to remind them of the expiration of membership, which has resulted in timely extension. Data analysis is also used to monitor the overall use of peak hours, membership trends and overall gym usage, creating valuable information for effective use of resources. In general, Swift-Pass offers reliable, expandable and convenient solutions adjusted to meet the needs of modern gym facilities.

System Design Specifications

The system design specification defines the core technologies and architectural framework behind Swift-Pass. The front end is developed using React.js, a JavaScript library that enables the creation of dynamic and responsive user interfaces. To enhance styling consistency and efficiency, Tailwind CSS is used, offering pre-designed classes for streamlines design. The React Router library handles navigation between sections, ensuring smooth page transitions, while Charts.js provides dynamic data visualizations to display membership trends and analytics. At the back end, the system utilizes Node.js with Express.js to create a scalable and efficient server environment. The combination ensures fast and reliable handling of data operations, including membership management and access control. The system uses MySQL as its relational database, ensuring secure and organized data storage for member information, access logs, and payment records.

Calendar of Activities

Observation – During the initial phase of the project, the team visited several gyms to observe their membership management issues. It was found that many gyms still rely on manual or outdated systems, causing slow check-ins and inaccurate records. Some lacked instant monitoring, making it difficult to track member activities and payments. These observations highlighted the need for a more efficient and secure solution. As a result, the Swift-Pass system was designed to offer RFID-based access control and a web-based admin dashboard for streamlined and reliable gym management.

Brainstorming – After gathering data, the team conducted brainstorming sessions to refine and strengthen the project concept. The insights from gym observations helped identify key areas for improvement in membership management. Usinf the gathered information, the team enhanced the system's features and functionality. This process ensured the Swift-Pass system effectively addressed the challenges in gym. The result was a well-structured and practical solution for efficient gym operations.

Interview – The team conducted interviews with gym staff to gain insights into their security issues and existing systems. While some gym owners declined to collaborate, one shared valuable detail on data management and business operations. The interviews revealed flaws in access control and membership tracking, highlighting the need for improvement. These insights guided the team in enhancing Swift-Pass to address instant security and operational challenges. The additional information also helped refine the system's features and efficiency.

Gantt Chart of Activities

MONTH / ACTIVITY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
Brainstorming of Ideas for Title Proposals										
Creating Title Proposals										
Start of Creating Chapter 1										
Canvas for the Devices										
Start of Creating Chapter 2										
Began Staff side UI and Functions										
Began Buiilding Admin side UI and Functions										
Began Building Trainer side UI and Functions										
Start of Creating Chapter 3										
Testing of the Hardawares										
Device & Application Connectivity										
Building the Minature Door										
Scenario Testing										

Resources

- Hardware
    - Lenovo Ideapad Slim 5i, Inter Core i5-13420H, 16GB DDR5, 1TB
    - ESP Development Board
    - RFID Reader (RC552)
    - RFID Wristbands & Tags
    - Relay Module
    - Maglock
    - Maglock 12V 5A Power Adapter
    - Micro USB Cable
    - Logic Level Converter
    - Breadboard
    - Jumper Wires
    - 5V Power Adapter
- Software
    - React.js
    - Tailwind CSS
    - React Router
    - Charts.js
    - Node.js

- Express.js
- MySQL

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