

# 1. Introduction

## 2. Design Concept

The diagram illustrates the system architecture, centered around the **Coach/Management side**. This central hub connects to five main functional areas: **Personnel management**, **Equipment management**, **Course management**, **Exercise management**, and **Sports coach**. Additionally, it connects to a **Handheld devices** interface and a **System management** module.

**Personnel management** includes **RFID personnel management** (with sub-functions: Student identity, Access control) and **Coach side** (with sub-functions: Equipment, Course, Student information, Student information review).

**Equipment management** includes **Equipment use statistics**, **Student equipment query**, **Equipment status query**, **Exercise data analysis**, **Exercise data statistics**, and **Exercise history**.

**Course management** includes **Course review**, **Curriculum**, **Course participants adaptive**, and **Exercise history**.

**Exercise management** includes **Exercise videos manage**, **Exercise Q&A manage**, and **Exercise consultation manage**.

**Sports coach** includes **Equipment use query** and **Equipment connection query**.

**Handheld devices** interface connects to **Equipment management** (Equipment booking, Equipment use query), **Exercise history** (Exercise data calculate, Exercise volume statistics), **Course management** (Course booking, Course booking query, Course information query), and **Sports coach** (Exercise videos, Exercise Q&A, Exercise consultation).

**System management** connects to **Equipment management** and **Sports coach**.

The **Coach/Management side** also connects to the **Exercise history and equipment management system**.

1

### 3. Technical Development

This mobile app is composed of four primary functions: equipment reservation, exercise profile, class information, and trainer information. All the data are stored using cloud computing technology. Information regarding the functions and operation procedures are as follows:

#### (1) Equipment reservation

The user can connect to the Internet and open the mobile app designed by our team to reserve equipment and classes at any time and any location.

#### (2) Exercise profile

The system connects the spin bike to smart phones, and a sensor collects data and sends the data to a server for analysis. These data are then sent to the user's cell phone as diagrams, providing users with information regarding the amount of calorie consumed during the exercise and the exercise profile.

#### (3) Class information

Weekly class timetables are displayed. The user may view the classes available each week and click on a desired class to enter the equipment reservation page, where class introductions containing information about the class and reservation function are presented. This function provides class information to the user instantly; thus, users can understand the differences between beginner, intermediate, and advanced classes, and choose the appropriate class accordingly.

#### (4) Trainer information

This function contains information about instructors' teaching methods. Users may choose trainers based on exercise intensity and the available session times.

### 4. Technological Competitiveness

Compared with the other sports management systems currently available on the market, the mobile app developed by the research contains several innovative features:

#### (1) Receives data from the sensor instantly

Currently, few Web pages and mobile app systems connect to fitness equipment. Using our application, the sensor on the fitness equipment collects physiological data, and then the management system provides instant feedback to the user. The user may regulate the pace of exercise and breathing by consulting the physiological information presented on the screen.

#### (2) Integrates Web page system and mobile app software

Currently, few systems provide both a Web page system and mobile app software, and even fewer systems provide data synchronisation between the two platforms. This system does not require separate updating, increasing the convenience for both the user and manager and enabling them to experience an improved management system. In addition, through this system, users can receive information from multiple channels and instantly make reservations online.

#### (3) Provides a personal profile for exercise volume management

The research has developed a personal profile function for the user to examine their weekly exercise volume by using the mobile app or the Web page system. The data are presented as curve diagrams, allowing the user to understand the nature of each type of exercise and schedule classes accordingly.

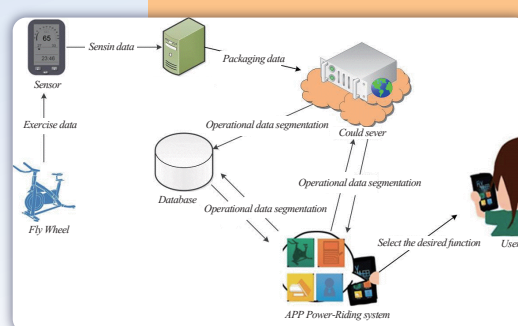


Figure 2 Operating system architecture flowchart

#### (4) Exercise and physiological data analysis

The research has consulted sports health experts on relevant formulae for converting physiological data to ensure that the system analyses data accurately. The data are provided to users as references or to managers for research purposes.

#### (5) Design that meets industrial demands

The research collaborated with fitness equipment manufacturers, who reviewed our developed system, to further our understanding of the functions necessary for current commercial systems, and determine the direction of R&D efforts.

### 5. R&D Result

The objective of planning, developing, and building this system is to construct a product that meets industrial demands. The functions and design of the system are the outcomes of numerous discussions with professional fitness instructors and equipment manufacturers. This system records exercise profiles and possesses numerous features:

- (1) It provides reminder and equipment reservation functions.
- (2) Users can retrieve exercise history records, which are presented as curve diagrams that are easy for users to understand and evaluate their current states.
- (3) The fitness equipment is equipped with sensors, enabling users to examine their physiological conditions and calorie expenditure after using the equipment. These data are recorded to ensure that the users understand their physical status.
- (4) It provides class information and details.
- (5) It provides information on trainers and enables users to select trainers according to their preferences.

In future, we intend to continue to develop this management system and extend its use to other sports activities to realise the application and building of a physical fitness cloud. The technology and development results of this project will be used in business models and shared with collaborating enterprises and manufacturers. Finally, this system will be promoted to gym and fitness equipment agencies, thereby creating a considerably amount of business opportunities.

### Acknowledges

We thank the donate and efforts of Magtoinc Technology Co., Ltd, Professor Hsu-Yang Kung Department of Management Information Systems and Dr. Jer-Yi Wu.



*Figure 3* Regular meetings with the company