


Extreme Programming-Based Fitness Center Application For Customer Progress Tracking And Exercise Schedule Management

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Article Info	ABSTRACT
<p>Keywords: Progress Tracking, Schedule Management, Extreme Programming, Fitness Centers.</p>	<p>This study investigates the implementation of Extreme Programming (XP) in developing a Fitness Center application to track customer progress and manage exercise schedules. The research includes system requirements analysis, architectural design, implementation of key features, and application testing and evaluation. The XP methodology facilitates iterative, collaborative, and adaptive development, resulting in an application responsive to customer needs. The research findings indicate that the application successfully records customer health progress, flexibly manages exercise schedules, and provides reminder notifications. Testing and evaluation demonstrate that the application operates well, is integrated comprehensively, and performs satisfactorily regarding responsiveness, speed, and resource efficiency. User feedback also contributes positively to evaluating user satisfaction with the application. Thus, the use of XP in developing the Fitness Center application has provided an effective and efficient solution for achieving goals related to tracking customer progress and managing exercise schedules in the context of fitness and health.</p>
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INTRODUCTION

The rapid development of information technology has brought significant changes in various aspects of life, including health and fitness (Blocken et al., 2020; Eberth & Smith, 2010a; Fu et al., 2012). Digital solutions such as fitness applications, activity trackers, and online platforms have provided convenience for individuals to monitor and improve their health and fitness. Awareness of the importance of a healthy and active lifestyle is increasing in modern society. Information regarding the benefits of physical fitness, balanced diets, and stress management is increasingly accessible through online resources. This has encouraged many individuals to seek services that support a healthy lifestyle, including comprehensive fitness center facilities (Brandt et al., 2023; Cabitza et al., 2015; Eberth & Smith, 2010b).

Despite a significant increase in demand for fitness center services, operational management must address several challenges. One of them is efficient customer data management and optimal exercise scheduling. Good management in this regard can enhance customer experience and the productivity of fitness center staff. Extreme Programming (XP) is a software development methodology that emphasizes team collaboration, rapid iterations, and

responsiveness to changing requirements (Akhtar et al., n.d.; Bansal et al., 2023; Chen et al., 2020; Fojtik, 2011a, 2011b; Perdignes et al., 2024; Sihombing, 2023; Wood et al., 2013). This approach is suitable for developing fitness center applications that require flexibility and adaptability in addressing customer needs dynamics.

Implementing XP in developing fitness center applications can bring several benefits, such as faster updates, more intensive testing, and better product sustainability (Al-Saqqa et al., 2020; Dingsoeyr et al., 2019; Dingsøyr et al., 2012; Kaur et al., 2023; Leong et al., 2023; Sarhadi et al., 2022; Senabre Hidalgo, n.d.; Serrador & Pinto, 2015; Shrivastava & Rathod, 2014). With this approach, applications can be more easily adapted to customer feedback and the latest technological developments in the fitness industry. Information technology assists in technical aspects and enables fitness centers to provide customers with more personalized and targeted experiences. Through data analysis and the implementation of intelligent algorithms, fitness centers can provide exercise recommendations that align with each customer's goals and abilities.

Adopting information technology allows for a more detailed and accurate collection of customer progress data. This data can measure customer progress over time, evaluate the effectiveness of exercise programs, and provide more specific and timely customer feedback. This research aims to develop a fitness center application integrating XP principles in customer data management and exercise scheduling. Using structured and adaptive development methods is expected to create a solution that better meets the needs and expectations of customers.

Through practical application development, customers are expected to see an increase in the quality of services provided by fitness centers. This can create a more user-friendly environment, increase customer satisfaction, and strengthen fitness center loyalty. By continuously leveraging information technology and appropriate development methodologies, fitness centers are hoped to continue to evolve and provide innovations relevant to customer needs. This will help fitness centers to remain competitive in an increasingly dynamic and competitive market.

METHODS

In this study, the stages are divided into three main phases as show in Figure 1. First, System Requirements Analysis, where an in-depth study of application requirements is conducted through document collection, interviews with stakeholders, and mapping of functional and non-functional requirements. Second, application design and implementation involves application architecture planning, prototype development, and implementation of extreme programming (XP) principles in application development. Finally, Testing and Evaluation, where the application is thoroughly tested with predefined test scenarios and performance and application success are evaluated based on pre-established criteria. These stages aim to produce a responsive, efficient, user-friendly class management and reservation application in fitness centers that meet user needs well.

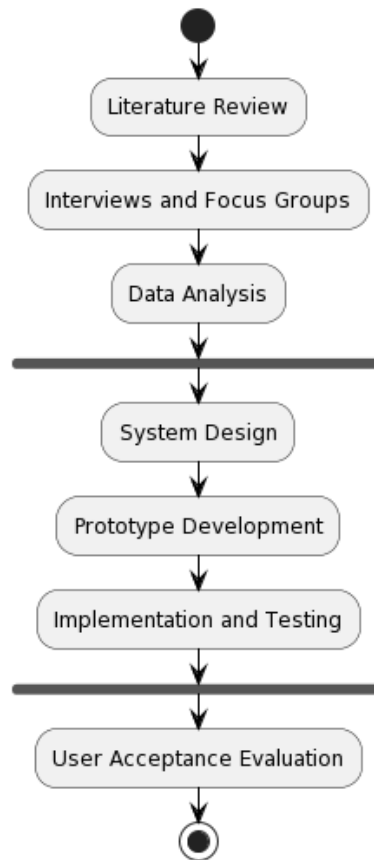


Figure 1. Research Stages

System Requirements Analysis

In the System Requirements Analysis phase, an in-depth study of the requirements for class management and reservation applications in fitness centers is conducted. This begins with gathering relevant documents such as class schedules, registration procedures, and reservation policies and conducting interviews with fitness center management, instructors, and administrative staff. The aim is to understand existing operational processes, identify challenges faced, and establish the functional and non-functional requirements of the application to be developed. The outcome of this phase is a requirement mapping encompassing features such as online reservations, integration with payment systems, class data analysis reporting, and customer data security.

Application Design and Implementation

Once the system requirements are identified, the next phase is Application Design and Implementation. In this phase, application architecture is planned based on the previously mapped requirements. This includes selecting appropriate technologies such as programming languages, frameworks, and databases. Subsequently, prototype development is conducted to test the application's user interface design and core functionality. These prototypes are

then iteratively evaluated based on user and stakeholder feedback. Throughout the development process, XP principles such as pair programming, continuous testing, and code refactoring are applied to enhance the quality and flexibility of the application.

Testing and Evaluation

The final phase is Testing and Evaluation, where the developed application undergoes comprehensive testing. Test preparation involves drafting test scenarios covering various application usage cases and ensuring a test environment that mirrors production conditions. During testing, evaluations are made on functionality, integration with external systems, user interface responsiveness, and data security. Test results are evaluated to identify issues, errors, and improvement areas. Additionally, comparisons are made between test results and pre-established success criteria such as response time, system reliability, and user satisfaction levels.

RESULTS AND DISCUSSION

User Needs Analysis

The outcomes of the System Requirements Analysis phase, particularly the Initial Study, include the collection of documents related to fitness center operations, such as class schedules, registration procedures, payment systems, and reservation policies. Additionally, interviews with fitness center management, instructors, and administrative staff are conducted to gain a deep understanding of existing operational processes and the problems that must be addressed. During the Requirements Mapping phase, a list of functional and non-functional application requirements is created, encompassing features such as online reservations, payment system integration, class data analysis reporting, and customer data security. Furthermore, end-user requirements, including fitness center users, instructors, and customers, are identified and classified based on importance and urgency. In the Additional Requirements Analysis phase, additional needs that may arise from stakeholder interactions, such as integration with wearable devices for performance tracking or direct communication features between instructors and customers, are identified. Thus, these phases provide a solid foundation for developing class management and reservation applications in fitness centers that can effectively meet user needs and address operational challenges faced daily.

Table 1. Data Collection Results

Stakeholder	Key Needs	Challenges Addressed	Expectations and Desires
Fitness Center Management	Improve operational efficiency and class scheduling management	Complex scheduling issues, complicated registration system	Expecting a system that can automate class scheduling and registration efficiently
Instructors	Ease in managing classes and interacting with clients	Difficulty in accessing class data and client communication	Expecting tools that assist in class management and better communication with clients

Stakeholder	Key Needs	Challenges Addressed	Expectations and Desires
Clients	Ease in class reservations and clear information about classes	Difficulty in class reservations and quick access to information	Desiring an intuitive reservation system and accurate information about class schedules
Administrative Staff	Efficient and accurate administrative management	Limitations in the payment system and data reporting	Hoping for a system that simplifies administration and provides comprehensive and timely reporting

The results of this stage are summarized in Table 1, indicating that fitness center management prioritizes operational efficiency and class scheduling management, aiming for a system that can automate the registration and scheduling processes. Instructors seek tools to assist in class management and improve customer interactions, while customers expect an intuitive reservation system and accurate class schedule information. Administrative staff also look for systems to streamline administrative tasks and provide accurate and timely reports. This analysis indicates that application development needs to consider the diverse needs of each stakeholder to create a solution that satisfies all parties involved.

Design and Implementation

The outcomes of the Design and Implementation phase encompass several crucial aspects. Firstly, in Architecture Planning, the application architecture design is conducted, covering security, scalability, and integration with existing systems. Furthermore, selecting appropriate technologies, such as programming languages, frameworks, and databases, is critical for efficient application development. In the Prototype Development stage, application prototypes are created to test user interface design, navigation, and key features, with rapid iterations based on user and stakeholder feedback. Finally, in Functional Development, focus is given to developing core application features such as class scheduling management, customer registration, payment systems, and class performance analysis dashboards. Additionally, the implementation of Extreme Programming (XP) principles such as pair programming, continuous testing, and code refactoring is also carried out to enhance the quality and flexibility of the application. Thus, this phase is a strong foundation for developing a responsive, efficient, and user-centric application.

Table 2. Features

Feature	Function
Online Reservation	Allows customers to make class reservations online through the application, with easy access to available class schedules.
Payment Integration	Enables customers to pay online or integrates the payment system with the application for transaction convenience.
Schedule Management	Allows instructors to manage class schedules, add or modify schedules as needed, and update class information.

Feature	Function
Notifications	Provides notifications to customers about class schedules, schedule changes, or other important information via text messages or email.
Performance Analysis Dashboard	Displays class performance analysis data such as participant numbers, attendance rates, and customer feedback for evaluation and improvement.
Customer Management	Allows administrative staff to manage customer information, register members, set membership packages, and contact information.
Instructor-Customer Communication	Provides a means of direct communication between instructors and customers, such as messages or notifications about schedule changes or class information.

Table 2 presents essential features of class management, reservation applications in fitness centers, and their respective functions. With these features, the application can provide a better user experience and help improve operational efficiency in the fitness center.

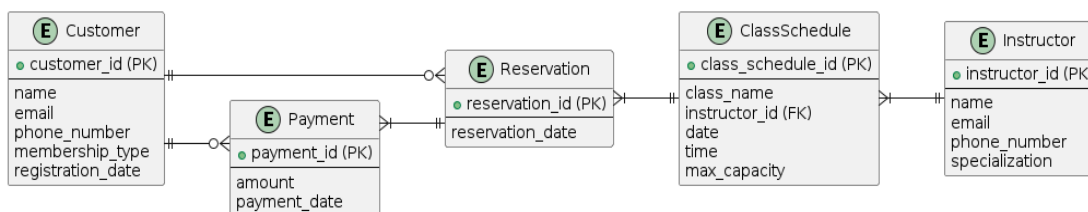


Figure 2. ERD

The entity-relationship Diagram (ERD) in Figure 2 depicts the fitness center's data structure for class management and reservation applications. The main entities include Customer, Reservation, Payment, Class Schedule, and Instructor, each with corresponding attributes. Relationships between entities are established through clear connections, such as one-to-many relationships between Customer and Reservation and Payment and many-to-one relationships between Reservation and Class Schedule. Primary keys such as Customer ID, Reservation ID, Payment ID, and Class Schedule ID serve as unique identifiers for each entity. In contrast, foreign keys such as Customer ID and Class Schedule ID link data between related entities. Thus, this ERD provides a solid foundation for developing an efficient application to manage reservation, Payment, and class scheduling processes in the fitness center and facilitate accurate and structured data analysis.

User Acceptance Evaluation

Firstly, preparation is done by drafting test scenarios covering various application usage cases, such as class reservations, payments, searching for classes based on time or instructor, and issue reporting. The testing environment is also meticulously prepared to reflect production conditions, thereby minimizing the risk of undetected errors. Subsequently, comprehensive functional testing of the application is conducted. This includes testing integration with external systems, user interface responsiveness across various devices, and data security. During the testing process, every issue that arises is detailed, tracked, and prioritized for follow-up. Feedback from users and stakeholders is also collected to identify further areas of

improvement. Finally, the test results are comprehensively evaluated. Analysis is performed to identify failures, errors, and areas requiring improvement. Comparisons are made between test results and pre-established success criteria, such as response time, system reliability, and user satisfaction levels. Based on these evaluation results, appropriate improvement measures are then taken to ensure the application runs optimally when launched to users.

CONCLUSION

Based on the research conducted on the development of class management and reservation applications in the fitness center using Extreme Programming (XP) methodology, it can be concluded that the use of XP provides significant benefits in terms of system requirements, application design, and implementation, as well as testing and evaluation. Careful system requirements analysis ensures the unambiguous identification of functional and non-functional requirements while implementing XP principles such as pair programming and continuous testing, which enhances application quality. Comprehensive functional testing ensures application responsiveness and security, and performance evaluation helps identify areas for improvement. Thus, using XP in this application development can create an effective solution that meets user needs and positively contributes to the operational efficiency of the fitness center and overall user experience.

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