

TRAINING MANAGEMENT SYSTEM

A PROJECT REPORT

Submitted by

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In partial fulfillment of the requirements for the award of the degree of

MASTER OF COMPUTER APPLICATION



**Changan Kunju Musaliar College of Engineering
Kerala**

DEPARTMENT OF COMPUTER APPLICATION

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DECLARATION

I undersigned hereby declare that the project report on **TRAINING MANAGEMENT**, submitted for partial fulfillment of the requirements for the award of degree of Master of Computer Application of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by me under supervision of **Dr.Nadera Beevi S**. This submission represents my ideas in my own words and where ideas or words of others have been included,I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not previously served as the basis for the award of any degree, diploma, or similar title by any other University.

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CERTIFICATE

This is to certify that the report entitled **TRAINING MANAGEMENT** submitted by **STEFI T** (TKM21MCA2038) to the APJ Abdul Kalam Technological University in partial fulfillment of the Masters degree in Computer Application is a bonafide record of the project work carried out by her under our guidance and supervision. This report, in any form, has not been submitted to any other University or Institute for any reason.

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C E R T I F I C A T E

This is to certify that **Ms. Stefi T**, student of Masters in Computer Applications (MCA) (Reg. No. TKM21MCA-2038) of TKM College of Engineering, Kollam has successfully completed training in C#, ASP.NET, MVC, Web API & SQL Server. As part of training curriculum, she played an active role in developing a live project for Gemini Software Solutions Pvt. Ltd, Technopark, Thiruvananthapuram from 11th January 2023 to 17th May 2023.

During training period her character, conduct and performance were found to be Good.

Harisankar KL
Head – Human Resources



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ABSTRACT

TRAINING MANAGEMENT The Training Management System is an automated solution designed to streamline and enhance the training processes within an organization. This system consists of multiple modules that encompass various aspects of training management. By leveraging this system, organizations can optimize the training experience for their employees, leading to improved efficiency, accuracy, and effectiveness.

The System automates the scheduling and coordination of training programs, simplifying the process of batch management. It centralizes trainee information, providing a comprehensive database that enables efficient trainee management and tracking of their training progress. The system facilitates evaluations and assessments, ensuring consistent and objective evaluations of trainee performance. Additionally, the system includes a fee management module that streamlines the tracking and management of training fees. It simplifies the assignment distribution process, allowing trainers to create, distribute, and monitor assignments seamlessly. The system also enables efficient management of faculties, including their qualifications, availability, and training experience, to ensure optimal allocation of trainers to specific training programs.

Overall, the Training Management System serves as a comprehensive platform for organizations to automate and optimize their training processes. By leveraging this system, organizations can enhance the training experience for their employees, improve efficiency in training management, and ultimately drive the development and growth of their workforce.

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Chapter 1

Introduction

TRAINING MANAGEMENT -Training Management System, a cutting-edge software solution designed to revolutionize the training process for employees within your organization. In today's rapidly evolving business landscape, employee training and development play a crucial role in ensuring organizational success and growth. The Training Management System aims to replace the current manual system employed by your organization, offering a comprehensive, centralized, and automated approach to training management.

The current manual system in place for training management poses several challenges and limitations. It relies heavily on paperwork, spreadsheets, and manual coordination, resulting in a time-consuming and error-prone process. Coordinating batch schedules, managing trainee information, evaluating performance, handling fees, assignments, faculties, and subjects become labor-intensive tasks that hinder productivity and efficiency.

Recognizing these limitations, the proposed Training Management System offers a paradigm shift in training management. By harnessing the power of automation and centralized data management, the system provides a range of advantages that address the shortcomings of the manual system.

One of the key advantages of the system is enhanced efficiency. Automation eliminates the need for manual paperwork, reducing administrative burdens and allowing trainers and administrators to focus on more strategic tasks. Processes such as batch scheduling, trainee registration, evaluation tracking, fee management, assignment distribution, faculty allocation, and subject assignment are streamlined, leading to significant time savings and improved overall productivity.

Another significant advantage is the centralization of data and information. The Training Management System consolidates all training-related data into a unified database, ensuring easy access and seamless integration of information. This centralized approach enables real-time access to critical data, enhances visibility into training activities, and supports informed decision-making. Administrators and trainers gain the ability to retrieve, analyze, and report

on training data, facilitating data-driven insights and actionable recommendations.

Furthermore, the system addresses the limitations of the current manual system by offering improved accuracy and reliability. Manual processes are prone to human errors, data inconsistencies, and delays in information retrieval. With automation, data accuracy is enhanced, reducing the risk of errors and ensuring consistent information across all modules. The Training Management System provides a reliable platform for storing, managing, and analyzing training data, resulting in accurate reporting and informed decision-making.

Additionally, the system offers advanced functionalities for evaluation and performance tracking. It provides a standardized framework for recording and monitoring trainee evaluations, assessments, exams, and performance reviews. This systematic approach enables objective analysis, identification of areas for improvement, and tracking of trainee progress throughout their training journey.

1.1 Company Profile

GEMINI Software Solutions Private Limited is a fully owned subsidiary of the Bahrain based Yusuf Bin Ahmed Kanoo Group of Companies. GEMINI's goal is to maintain and grow a culture of engineering and customer service excellence through a continuous process improvement program. Hence, the philosophies that drive us are based on our vision :”To Deliver Cost Effective Quality IT Solutions On Time. Every Time ” GEMINI specializes in Business Application Software development, in Client/Server and Web Technology and Information Technology Enabled Services. The entire development cycle of a project is driven by pre-defined quality procedures to ensure that each project fully conforms to the requirement specifications, is delivered on time and is cost-effective. These are complemented with high-speed communication links, thus making remote software development and support a reality.

1.1.1 Products

- **GEMCARDS**

GEMCARDS is a comprehensive payment suite which manages and supports end-to-end card issuing and acquiring specific requirements of an organization. Built using high end technologies GEMCARDS offers flexibility, scalability, reliability and ease of use.

- **iStorePRO**

iStorePRO is a state of the art completely modular, configurable, cost effective and easy to use warehouse intelligence system created by bringing together decades of experience in warehousing domain possessed by Storage Solutions and expertise in conceiving, developing and implementing cutting edge warehouse management systems in Middle East markets possessed by Gemini Software Solutions.

- **GEM-SYMPHONY**

The GEM-SYMPHONY is a comprehensive inventory management system catering to multiple business domains and integrating various functional departments like Sales, Purchase, Parts, Service, Accounting and so on.

- **GEM-ARK**

GEMINI Software Solution Pvt. Ltd. introduces GEM-ARK a state - of - the art integrated solution, to empower the shipping agents and optimize their processes and business efficiency, thereby positively impacting their profitability. The solution endeavors to create a viable return of investment for ship agents involved in the shipping cycle. GEM-ARK integrates the operational processes with the accounting procedures, thereby ensuring a seamless and efficient management of relevant data and information.

- **GEM-TABS**

Travel Back Office and Online Booking (GEM-TABS) is a premiere travel agency back office management and accounting system that caters to the entire Travel Industry Spectrum (Corporate, Wholesale, Retail, Leisure, GSA etc). It contains the most flexible and richest set of features, set of useful reports already built into and provision to generate custom reports.

- **GEM-MobileApp Framework**

The GEM-MobileApp Framework standardizes Apps development for mobile phones and it ensures security, scalability and faster 'time to market'.It also provides a unified solution with single source code for minimal platform specific variations. New application modules can be developed easily using the GEM-MobileApp Framework in a very short development timeframe.

1.1.2 Services

- **Turnkey Projects**

Over the years, GEMINI has developed and implemented several products catering to the operational needs of various businesses like Shipping, Travel, Insurance, Finance, Banking, Logistics, General Trading and so on. We understand the Software Product Development Lifecycle and our services are designed to handle every stage of the product development processes.

- **Product Development**

Gemini's business domain and technology experts work in tandem to clearly perceive the business goals of our customers and to choose the most appropriate technology and efficiently design, develop and implement the solutions that cater to the business needs. In addition to application development in Microsoft technologies, Gemini has technology skills, domain knowledge, hands-on experience and effective methodology in developing Mobile Apps in iOS, Android and Windows platforms. Our expertise spans across Native Mobile App Development, Application Consultation, Hybrid App Development, Xamarin iPhone development using .NET, iPhone App UX/UI Design, iPhone Widget/Extension Development, Universal iPhone + iPad App development, iPhone App Support, Maintenance and Optimization and iPhone App Integration with legacy business applications.

- **Support Services**

GEMINI's knowledge processing center provides back office services for Shipping Agents and Travel Agencies. Highly skilled experts in Shipping and Travel domains ensure quick turnaround, at the most optimum cost.

- **Hosting Services**

GEMINI's Hosting Services Division functions with the sole mission of keeping business-critical applications up and running all the time. Our enterprise class data-center delivers secure, high performance services to customers and ensures maximum uptime.

1.2 Existing System

The existing system for training management system is primarily paper/spreadsheet-based and manual. The current system poses several challenges and limitations. It relies heavily on paperwork, spreadsheets, and manual coordination, resulting in a time-consuming and error-prone process. Batch details are recorded and managed using physical documents or spreadsheets. Trainee information, including personal details, training history, and progress, is maintained manually through paper records or digital spreadsheets. Evaluation details, such as test scores, performance assessments, and feedback, are documented manually. Fee details for each batch are managed manually, including recording payments, tracking dues, and generating invoices or receipts. Assignments are distributed and collected through physical documents or email, making it challenging to track submission dates and monitor progress effectively. Faculty information, including their qualifications, availability, and training expertise, is typically stored in paper files or maintained separately in spreadsheets. Subject assignment for each batch is done manually, with trainers and administrators allocating topics based on their knowledge and availability.

Overall, the manual system relies on physical documents, spreadsheets, and manual coordination, which can be time-consuming, prone to errors, and difficult to manage as the organization grows. There may be challenges in tracking and consolidating data, generating reports, and ensuring consistency and accuracy across different training processes.

The existing manual system may lack centralized data management, real-time access to information, automation of repetitive tasks, and robust reporting and analytics capabilities. Transitioning to an automated Training Management System can address these limitations and provide numerous benefits in terms of efficiency, accuracy, and overall effectiveness in managing training programs within the organization.

1.3 Proposed System

The proposed Training Management System automates and streamlines the training processes within the organization. It consists of several modules that facilitate efficient management of training programs. One of the key advantages of the proposed system is enhanced efficiency. Automation eliminates the need for manual paperwork, reducing administrative burdens and

allowing trainers and administrators to focus on more strategic tasks. Processes such as batch scheduling, trainee registration, evaluation tracking, fee management, assignment distribution, faculty allocation, and subject assignment are streamlined, leading to significant time savings and improved overall productivity. Another significant advantage of the proposed system is the centralization of data and information. The Training Management System consolidates all training-related data into a unified database, ensuring easy access and seamless integration of information. This centralized approach enables real-time access to critical data, enhances visibility into training activities, and supports informed decision-making. Administrators and trainers gain the ability to retrieve, analyze, and report on training data, facilitating data-driven insights and actionable recommendations. Furthermore, the proposed system addresses the limitations of the current manual system by offering improved accuracy and reliability. Manual processes are prone to human errors, data inconsistencies, and delays in information retrieval. With automation, data accuracy is enhanced, reducing the risk of errors and ensuring consistent information across all modules. The Training Management System provides a reliable platform for storing, managing, and analyzing training data, resulting in accurate reporting and informed decision-making. This systematic approach enables objective analysis, identification of areas for improvement, and tracking of trainee progress throughout their training journey.

1.4 Objectives

Project deliverable includes:

- Automate Training tasks and provide a user-friendly interface.
- Simplify the process of managing and tracking training programs.
- Reduce paperwork, save time, and focus on delivering quality training programs.
- Facilitate evaluation and performance tracking.

Chapter 2

Literature Survey

A literature survey, also known as a literature review, involves analyzing scholarly sources related to a particular subject. Examining the available literature, it provides a comprehensive overview of the state of the field, allowing you to identify relevant theories, approaches, and gaps in the existing body of knowledge. When conducting a literature review from an audit perspective, the main focus is on evaluating the relevant literature. This process covers information that has been published in a specific field of study and sometimes includes information published within a specific time frame. The literature review is an indispensable tool for conducting research and is frequently used as a starting point for delving into a specific subject area. In addition to identifying important theories and concepts, a literature review can also pinpoint gaps in current knowledge and draw attention to areas where further research is necessary. By scrutinizing multiple sources, a literature review can provide a more comprehensive understanding of a given topic or issue. A well-crafted literature review can also enhance the credibility and authority of the author, as it demonstrates their familiarity with the current research and debates in the field. In certain cases, a literature review may include a meta-analysis, which involves analyzing the findings of numerous studies to uncover common patterns or trends. It is important to keep in mind that a literature review is distinct from a research paper or an argumentative essay; it is instead a focused examination of the existing research and literature on a specific topic.

2.1 Purpose of the Literature Review

1. The purpose of a literature review is to provide an overview and analysis of existing research and literature on a particular topic.
2. It aims to identify key theories, concepts, and findings, as well as to evaluate the strengths and weaknesses of previous studies.
3. A literature review can help to identify gaps in the current knowledge and highlight areas

where further research is needed.

4. By examining multiple sources, a literature review can provide a more comprehensive understanding of a particular topic or issue.
5. Additionally, a well-written literature review can help to establish the credibility and authority of the author, as it demonstrates their familiarity with the current research and debates in the field.
6. A literature review can be a standalone piece or part of a larger research project such as a thesis, dissertation, or research paper.

2.2 Related Works

2.2.1 Training Management

The paper investigates the impact of training on employee performance. The authors find that training can have a significant positive impact on employee performance, but that the impact is dependent on a number of factors, including the type of training, the quality of the training, and the employee's motivation to learn. The authors of this paper conducted a meta-analysis of 111 studies that investigated the impact of training on employee performance. They found that training had a positive impact on employee performance, with an average effect size of 0.35. This means that training was associated with a 35 percentage improvement in employee performance. The authors also found that the impact of training was dependent on a number of factors, including the type of training, the quality of the training, and the employee's motivation to learn. For example, training that is more interactive and that is tailored to the individual employee's needs is more likely to be effective. The main objective of this study is to assess and investigate the impact of training on employees' performance in the technology focused academic institution. Methodology: This study used a quantitative approach and the cross-sectional survey was used to collect data from a sample population of administrative employees of Bahir Dar University, Ethiopia who took training in 2019 chosen by simple random sampling. 316 questionnaires were distributed and collected for the study. Data were analyzed using both descriptive and inferential statistics. Findings: Results show that training design, training needs assessment, training delivery style and training evaluation

have significant positive effect on employees' performance. Finally, the study recommended that human resource management should engage in increasing the qualities and quantities of the training program and properly apply the four phases of the systematic training processes to increase the performance of administrative employees of Bahir Dar University, especially the technology institutions[1].

The purpose of this research paper is to provide an overview of how training and development can make an organization resilient to future problems such as competition, low productivity and other organizational challenges. Several research have shown that any organization that relents on equipping its employees with training and developmental expertise runs into hurdles of problems which often lead to organizations running out of business or becoming outdated and unprofitable. The research paper focusing on the benefits of training and development to individuals, teams, organizations and the societies where they are situated. The research will consider multiple literature and different perspectives of research in this field to demonstrate that training and development activities in organizations can produce essential benefits for all stakeholders involved in the organization. The research considers the advantages and the disadvantages of training and development in the fields of cost, effective employees work output, employees' readiness to adapt to new trends and innovations and the abilities and capabilities to foresee the direction of the company in order to be able to proof it from collapse or against any future problems[2].

Learning Management Systems (LMSs) are a vital software platform to deliver education and training courses online. They enable the creation, management and delivery of educational content making it easier for businesses of all sizes and types to administer educational content. Like any system, LMS also needs to be user-friendly and easily usable. Usability is a measure of the degree to which users can use a product or system to effectively, efficiently, and satisfactorily achieve their objectives; this means that users will be trained quickly and efficiently if the degree of usability of LMS is high. This paper attempts to discover the essential usability factors, implementation and adoption issues and the barriers and enablers within the LMS domain, primarily in workplace settings. To achieve these aims, a review of the literature has been carried out by considering 23 research articles published between 2014 to 2018. The discussion highlighted current issues in the field, as well as gaps and possibilities for further research. The paper provides a comprehensive overview of the use of Learning Management Systems (LMSs) in the workplace. The paper begins by defining an LMS and discussing

the different types of LMSs that are available. The paper then discusses the benefits of using an LMS in the workplace, including: Improved employee performance, Reduced training costs, Increased employee engagement, Improved employee retention. The paper then discusses the challenges of using an LMS in the workplace, including: Lack of user adoption, Technical problems, Security concerns. The paper concludes with a discussion of the future of LMSs in the workplace. The paper predicts that the use of LMSs will continue to grow in the future as organizations look for ways to improve employee performance and reduce training costs[3].

The paper argue that training is a critical investment for organizations, as it can help them to improve their performance in a number of ways, including:

- Increased productivity: Training can help employees to develop the skills and knowledge they need to do their jobs more effectively. This can lead to increased productivity and improved quality of work.
- Reduced costs: Training can help organizations to reduce costs by reducing turnover, absenteeism, and accidents. It can also help organizations to save money on recruiting and hiring new employees.
- Improved customer service: Training can help employees to provide better customer service by improving their knowledge of products and services, and by helping them to deal with customer complaints more effectively.
- Increased innovation: Training can help organizations to innovate by providing employees with the skills and knowledge they need to develop new products and services.
- Enhanced employee morale: Training can help to enhance employee morale by making employees feel valued and appreciated. It can also help employees to feel more confident in their abilities and to be more motivated to do their jobs well.

The authors then discuss the different types of training that organizations can offer, including:

- On-the-job training: On-the-job training is a type of training that is conducted in the workplace. It is often delivered by a supervisor or coworker, and it typically focuses on teaching employees how to perform specific tasks.
- Off-the-job training: Off-the-job training is a type of training that is conducted outside of the workplace. It is often delivered by a trainer or instructor, and it typically focuses on teaching employees more general skills, such as problem-solving or communication.
- Blended learning: Blended learning is a type of training that combines on-the-job and off-the-job training. It is often delivered through a combination of online courses, classroom instruction, and on-the-job training.

The authors then discuss the factors that can influence the effectiveness of training, including:

- The needs of the organization: Training programs should be designed to meet the specific needs of the organization. This includes identifying the skills and knowledge that employees need to develop in order to be

successful in their roles. Training programs should also be designed to meet the needs of the learners. This includes considering the learners' learning styles, their prior knowledge, and their motivation. The quality of the training program is also an important factor in its effectiveness. This includes the quality of the materials, the delivery of the training, and the assessment of learning. The support of management is also essential for the success of training programs. This includes providing resources for training, and ensuring that employees have time to attend training sessions. The authors conclude by arguing that training is an important investment for organizations. By providing effective training programs, organizations can improve their performance in a number of ways[4].

The paper found that training and development can have a significant impact on employee performance. The study, which was conducted by researchers at the University of Pennsylvania, found that employees who received training and development were more likely to be promoted, receive raises, and stay with their employer. Training and development can lead to improved employee morale, increased productivity, and reduced turnover. The researchers believe that the positive impact of training and development is due to a number of factors. Training and development can help employees to develop the skills and knowledge they need to do their jobs more effectively. Training and development can help to motivate employees by giving them a sense of accomplishment and by providing them with opportunities to learn and grow. Training and development can help employees to develop the skills they need to advance their careers. The study's findings suggest that training and development is an important investment for organizations. By investing in training and development, organizations can improve employee performance, morale, productivity, and retention. Here are some additional findings from the study: The type of training and development that is most effective depends on the job and the employee's needs. Employees who are more engaged in their work are more likely to benefit from training and development. Organizations that provide a supportive environment for learning are more likely to see positive results from training and development. Overall, the study found that training and development can be a valuable tool for organizations that are looking to improve employee performance[6].

Training is a critical investment for organizations, but it is often not managed effectively. This paper presents a framework for effective training management that can help organizations to improve the return on their training investment. The framework is based on the following key principles: The first step in effective training management is to align training with

organizational goals. Training should be aligned with the organization's strategic goals and objectives. There are a number of ways to align training with organizational goals. One way is to involve senior management in the planning and development of training programs. This ensures that training programs are aligned with the organization's strategic goals and objectives. Another way to align training with organizational goals is to use a needs assessment to identify the skills and knowledge gaps that need to be addressed through training. Identify and assess training needs. Training needs should be identified and assessed on a regular basis. The second step in effective training management is to identify and assess training needs. This means that training needs should be identified and assessed on a regular basis. There are a number of ways to identify training needs. One way is to survey employees to get their feedback on their training needs. Another way is to conduct job analysis to identify the skills and knowledge that employees need to do their jobs effectively. Once training needs have been identified, they can be prioritized and addressed through training programs. It is important to prioritize training needs so that the organization can focus on the most important needs first. The third step in effective training management is to design and deliver effective training programs. Training programs should be designed and delivered in a way that is effective for the learners and the organization. This means that the programs should be relevant to the learners' needs, engaging, and interactive. The programs should also be delivered in a way that is convenient for the learners. For example, some learners may prefer to attend traditional classroom training, while others may prefer to learn online or through blended learning[7].

The Paper discusses the importance of training needs assessment and provides a framework for conducting a needs assessment. The paper begins by defining training needs assessment and discussing the different types of needs that can be assessed. The paper then discusses the steps involved in conducting a needs assessment, including:

Identifying the need for training: The first step in conducting a needs assessment is to identify the need for training. This can be done by conducting a performance analysis, which involves identifying the gaps between the current and desired levels of performance. Performance analysis can be conducted through interviews, focus groups, surveys, and observation.

Defining the scope of the needs assessment: Once the need for training has been identified, the next step is to define the scope of the needs assessment. This involves determining the specific areas of performance that need to be improved and the level of detail that is needed.

Gathering data: The next step is to gather data about the performance problems that have been identified. This data can be gathered through interviews,

focus groups, surveys, and observation. Analyzing the data: Once the data has been gathered, it needs to be analyzed to identify the root causes of the performance problems. This analysis can be done by using a variety of tools and techniques, such as root cause analysis and force field analysis. Developing recommendations: The final step in conducting a needs assessment is to develop recommendations for improving performance. These recommendations should be based on the findings of the needs assessment and should be tailored to the specific needs of the organization. It is important to note that training needs assessment is an ongoing process. As the organization changes, so too will the needs of its employees. Therefore, it is important to conduct needs assessments on a regular basis to ensure that the organization is providing its employees with the training they need to be successful [8].

The pandemic makes it difficult for the teaching and learning process to be conducted freely using all learning modes due to the limited interaction between teachers and students by distance. Therefore, teachers must creatively utilize various learning models to ensure students are properly taught during the pandemic. In this regard, this study aims to elaborate on the relationship between training management, effectiveness, and its impact on the teaching creativity of public teachers from kindergarten to upper secondary level. This is an online quantitative survey with a sample of state-funded teachers consisting of civil, honorary, and contract teachers. These three types of teachers were included in the category of teachers of the State Civil Apparatus. The accidental sampling technique was used to obtain data from 405 respondents through the questionnaire distribution for a month. This was greater than the initial target of 200 people as a condition for the eligibility of the number of respondents when using structural equation modeling (SEM)—AMOS analysis. A total of four hypotheses were proposed in this study, with three accepted and one rejected. The result showed that training management contributed significantly to training effectiveness but had a minimal contribution to increasing teachers teaching creativity during the pandemic. Furthermore, training effectiveness had a significant contribution to the invention of teaching teachers and was a full mediator. This study also found the lack of references about management training and the relationships built. Proper management is a key factor in encouraging the effectiveness of activity, but it is unable to improve the creativity of teaching teachers directly. The role of training effectiveness was significant because it increases the contribution of training management to teacher teaching creativity. This research also showed that the training carried out on ASN only be successful with good management. The effectiveness of teachers teaching

creativity can only be increased through training, especially during a pandemic. The paper explores the relationship between training management, training effectiveness, and teaching creativity in the context of the COVID-19 pandemic. The study found that training management has a significant impact on training effectiveness, but a minimal impact on teaching creativity. However, training effectiveness has a significant impact on teaching creativity. The study also found that training management is a key factor in encouraging the effectiveness of training, but it is unable to improve the creativity of teaching teachers directly. The role of training effectiveness is significant because it increases the contribution of training management to teacher teaching creativity. The study was conducted using an online quantitative survey with a sample of state-funded teachers consisting of civil, honorary, and contract teachers. A total of 405 respondents were surveyed. The study used structural equation modeling (SEM)—AMOS analysis to analyze the data. The study found that training management has a significant impact on training effectiveness. This is because training management is responsible for planning, organizing, and implementing training programs. Effective training management ensures that training programs are well-designed, delivered, and evaluated. This leads to more effective training programs, which in turn, leads to more effective teachers. The study also found that training effectiveness has a significant impact on teaching creativity. This is because effective training programs provide teachers with the knowledge, skills, and confidence to be more creative in their teaching. When teachers are more creative in their teaching, they are more likely to engage students and help them learn more effectively. The study's findings suggest that training management is an important factor in improving the effectiveness of training programs. However, training management is not enough to improve teaching creativity. In order to improve teaching creativity, it is also important to ensure that training programs are effective [13].

2.2.2 JSON Web Token (JWT)

A RESTful web service acts as a medium that provides access to the data for those who have permission, improving the data's accessibility. Any user eligible by the web service can use the Universitas Klabat Information System data to develop a mobile or another web application without making another similar database, thus eliminating the redundant process of making a duplicate database. A JSON Web Token is also used in this web service to ensure that the person accessing the web service is authorized to access the specific data. The agile method is

used to develop this application. In conclusion, the web service can create, read, update, delete operation regarding the student database and provide it to the user that is authorized with a valid JSON Web Token. The paper presents a method for improving the security of JSON Web Token (JWT) authentication in software-defined networking (SDN). The method is based on the use of a nonce, which is a random number that is generated for each JWT token. The paper first describes how JWT authentication works. JWT is a type of token-based authentication that is becoming increasingly popular. JWT tokens are small, self-contained, and easy to use. They are also more secure than traditional session-based authentication. The paper then describes how nonces can be used to improve the security of JWT authentication. Nonces make it more difficult for attackers to replay JWT tokens. The paper concludes by discussing the implications of the research for JWT authentication in SDN. The paper argues that nonces can be used to significantly improve the security of JWT authentication in SDN. The paper recommends that JWT authentication in SDN should use nonces[5].

The security and privacy of user sensitive data are critical in practically every organisation. In terms of computer technology, it's a method of securing data and making it impossible for human to interpret and allowing access only to certain users with authorized privilege. Passwords, access tokens, private keys, which are required for authenticating and authorizing access, are the most crucial examples of user sensitive data. Because storing these information in a database is inefficient and insecure. Tokens are created to handle sessions and store user information. JSON Web Token is one of the most used stateless tokens. The process of improving traditional JSON web token usage and implementation is discussed in this paper. JWT is a popular method for authenticating users and systems in SDN. However, JWT tokens can be vulnerable to attacks, such as man-in-the-middle attacks and replay attacks. The proposed method addresses these vulnerabilities by using a combination of JWT and other security measures, such as: HMAC: HMAC is a cryptographic hash function that can be used to verify the authenticity of a JWT token. TLS: TLS is a cryptographic protocol that can be used to secure the communication between a client and a server. OAuth 2.0: OAuth 2.0 is an authorization framework that can be used to grant users access to resources without having to share their passwords. The proposed method has been evaluated in a simulation environment and has been shown to be effective in improving the security of JWT authentication in SDN[11].

2.2.3 SQL Server

Database integrity is an important research content of database security, triggers can enforce the more complex referential integrity, and this paper studies the approach of using DML triggers to implement SQL Server referential integrity. First, studies the working principle of DML triggers; Second, researches and creates DML triggers, focusing on explained the Transact-SQL creating parameters based on the illustration of DML triggers created; Finally, shows the achieve methods through many-many relationship examples, designs the database logical structure and physical structure, and achieves deleting trigger and modifies trigger. This content provides a concrete method to use the SQL Server database software development implement referential integrity, and it has broad application prospects. Referential integrity is a property of a relational database that ensures that the values in one table are consistent with the values in another table. For example, if a table has a foreign key that references a primary key in another table, then the values in the foreign key column must be present in the primary key column of the referenced table. Referential integrity is important for a number of reasons. First, it helps to ensure the accuracy of data in a database. If a value in a foreign key column is not present in the primary key column of the referenced table, then it is likely that the value is incorrect. Second, referential integrity helps to prevent data loss. If a value in a foreign key column is deleted from the referenced table, then the corresponding value in the foreign key column will also be deleted. This helps to ensure that data is not lost when changes are made to a database. SQL Server triggers are stored procedures that are executed when a particular event occurs in a database. For example, a trigger can be executed when a row is inserted, updated, or deleted. Referential integrity constraints can be enforced by using SQL Server triggers. For example, a trigger can be used to check if a value that is being inserted or updated into a foreign key column is present in the primary key column of the referenced table. If the value is not present, then the trigger can prevent the insert or update from happening.[9]

2.2.4 ASP.NET Core

The work with a large number of repositories (program components used for a connection between the applications and databases) leads to a program code repetition for any separate repository. The opportunity to load them from overall repository container can reduce the code amount. In this work, we present an improved approach of using data storage services

by Repository pattern and Unit of work in Entity Framework (ASP.NET Core). The paper presents an improved approach for using data storage services in ASP.NET Core. The approach is based on the use of a service container, which is a software component that manages the dependencies of an application. The service container is responsible for loading the data storage services and making them available to the application. This makes it easier to use data storage services in ASP.NET Core and it makes the application more modular. The approach has been implemented and tested in a real-world environment. The results of the evaluation showed that the approach is effective in improving the usability and efficiency of using data storage services in ASP.NET Core. The approach is easy to use and it makes it easier to manage the dependencies of an application. The approach is a promising tool for developers who need to use data storage services in ASP.NET Core. The approach is easy to use and it makes it easier to manage the dependencies of an application[10].

When the need arises to add Bluetooth support to existing applications, the solution often comes down to third party libraries. When developing .Net Core Web APIs however that support is strangely absent. By using a desktop-oriented library and a set of BLE devices an API was developed to assess real time access to them and provide proof of concept that data gathering is possible. The processed data is then provided to other apps using the restful API methods, developed under the .Net Core framework. Said data can then be used to supply dashboards, data analysis tools, or other fitness and wellness related applications. The API developed ultimately provided proof that it was possible to communicate with Bluetooth devices using asynchronous communication in a web application while repurposing a desktop application-oriented library. Further developments can increase the number of compatible sensors of the developed API for it to be able to use a broader number of devices, support more profiles and services and thus increasing its initial range. The API was developed in response to the need for a way to gather data from nearby BLE fitness-related sensors. The API uses a desktop-oriented library to communicate with BLE devices, and the processed data is then provided to other apps using the RESTful API methods. The API was developed using the .Net Core framework, and it is compatible with a wide range of BLE devices. The paper begins by providing an overview of BLE technology. BLE is a short-range wireless technology that is used to connect devices over short distances, typically within a few meters. BLE is commonly used in fitness trackers, smart watches, and other wearable devices. The paper then discusses the challenges of developing a BLE API for a .Net Core web application. One of the

challenges is that there is no built-in support for BLE in the .Net Core framework. Another challenge is that BLE communication is asynchronous, which can make it difficult to develop a reliable API. The paper then describes the steps that were taken to develop the BLE API. The first step was to select a desktop-oriented library for communicating with BLE devices. The library that was selected was the BlueZ library. The next step was to develop a RESTful API that would expose the functionality of the BlueZ library. The API was developed using the .Net Core framework, and it uses the HttpClient class to communicate with the BlueZ library. The paper then provides an overview of the API. The API consists of a set of RESTful methods that can be used to connect to BLE devices, read and write data to BLE devices, and discover BLE devices. The API also provides a way to subscribe to notifications from BLE devices. The paper concludes by discussing the benefits of using the BLE API. The API provides a simple and easy way to communicate with BLE devices in a .Net Core web application. The API is also compatible with a wide range of BLE devices.[12]

2.2.5 JQuery

The world is moving towards Web. People are more connected now. Web Services are acting the core component for Web 2.0 and related technologies. JQuery is the new industry standard that has redefined ways of client side programming. Programmers writing multiple lines of code in JavaScript, now can really unleash the power of JQuery with few lines of code. Also they can make use of Ajax calls and JSON support in invoking of web services. JQuery is now acting as an industry standard as big top IT companies are supporting JQuery in their product(s). JQuery also helps in removing biggest problem of multiple page post backs through client side scripting. Through this any web developer can use the Ajax based update of the page which can partially update the page asynchronously without any post back. This will help in reducing the number of calls to the server and ultimately improving the bandwidth. Postbacks are the process of reloading an entire web page when a user interacts with it, such as clicking on a link or submitting a form. This can be a slow and inefficient process, especially on pages with a lot of content. JQuery Ajax calls allow developers to update parts of a web page without reloading the entire page. This can be done by sending an asynchronous request to the server for the updated content. The server then sends the updated content back to the client, which can then be displayed without reloading the page. The paper argues that using JQuery Ajax calls can significantly reduce the number of postbacks required on web pages. This can improve the

performance of web pages and make them more user-friendly. The paper also discusses the use of a trust-based framework to improve the security of jQuery Ajax calls. The paper concludes by providing a set of recommendations for developers who want to use jQuery Ajax calls to improve the performance of their web pages.[14].

2.2.6 MVC

The recurrent usage of web-based applications has an important part in our daily life. MVC (Model View Controller) architecture is used as an alternative architectural style to encode the user interface. It divides the parts of a user interface into three components with clear roles. This makes applications easy to test and evolve. The maintainability of web applications plays a crucial role in satisfying end-users. In this paper, we try to enhance the maintainability of web applications using a new MVC architecture. Our architecture is an extension of this architectural style. To improve maintainability, several metrics have been used such as complexity and coupling. This paper presents a methodical refinement and mapping of the maintainability to a set of metrics for good design. Our research is evaluated through an empirical study that shows the difference in maintainability between a web application that practices the traditional MVC architecture and the same one that uses our new architecture. The paper begins by discussing the importance of maintainability in web applications, and then goes on to describe the MVC architecture and how it can be used to improve maintainability. The paper then presents an empirical study that compares the maintainability of web applications that use the traditional MVC architecture to those that use the extensible MVC architecture. The study found that the extensible MVC architecture resulted in a significant improvement in maintainability. The paper concludes by discussing the implications of the study and suggesting future research directions[15].

Chapter 3

Methodology

TRAINING MANAGEMENT is a platform that helps organizations to plan, deliver, and track training programs. The system can help organizations to improve employee performance and increase productivity.

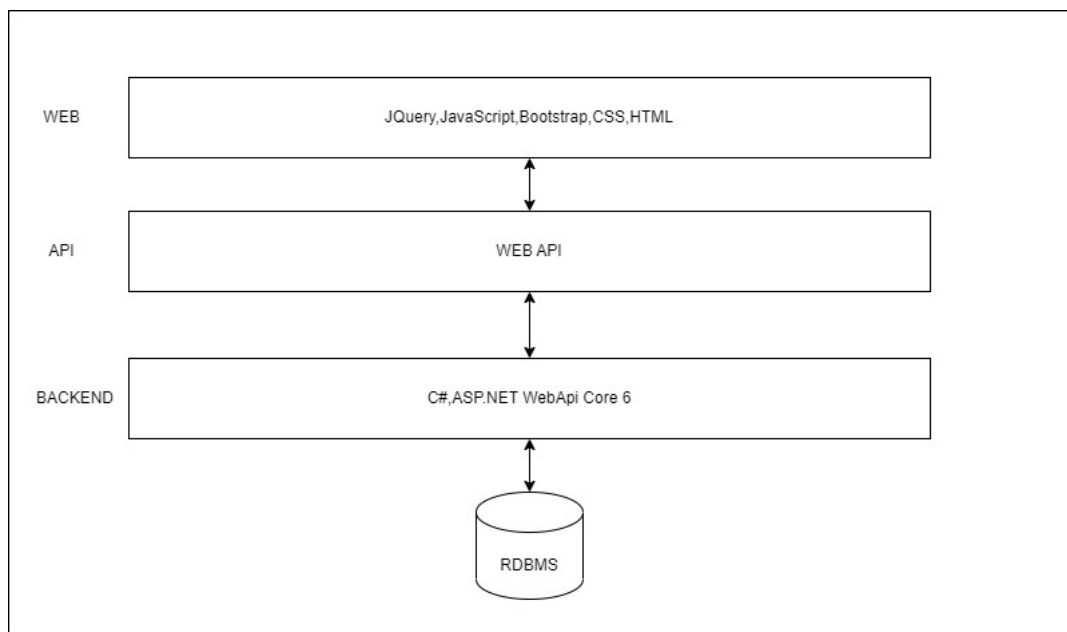


Figure 3.1: System Model

The Figure 3.1 depicts the system architecture of the Training Management project. The System is developed using a web API backend and MVC (Model-View-Controller) front-end architecture, following a three-layer architecture in .NET Core. This architecture ensures a separation of concerns, modularity, and scalability. Here are the key components and their roles within the methodology:

- **Presentation Layer:** The presentation layer is built using the MVC pattern, which provides a structured approach to user interface design. It includes views that present the data to the user, controllers that handle user interactions and manage the flow of data, and models that represent the data and business logic.

- **Business Layer:** The business layer acts as an intermediary between the presentation layer and the data layer. It contains the business logic and rules that govern the training management system’s functionalities. This layer handles processes such as user authentication, validation, data manipulation, and overall system behavior.
- **Data Layer:** The data layer is responsible for managing the system’s data persistence and retrieval. It interacts with the underlying database or data storage system to store and retrieve data related to training batches, trainees, evaluations, fees, assignments, faculties, and subjects. The data layer ensures the integrity, security, and efficiency of data operations.

The web API backend provides a RESTful interface for communication between the front-end and the server-side components. It exposes endpoints that allow client applications to interact with the system, perform CRUD (Create, Read, Update, Delete) operations, and retrieve data via HTTP requests. The API endpoints are responsible for handling the business logic and processing data.

By adopting this architecture, the Training Management System benefits from modularity, code reusability, and maintainability. It allows for easy integration with different front-end technologies and provides a scalable foundation for future enhancements and modifications. The three-layer architecture ensures a clear separation of concerns, making it easier to develop, test, and maintain the system.

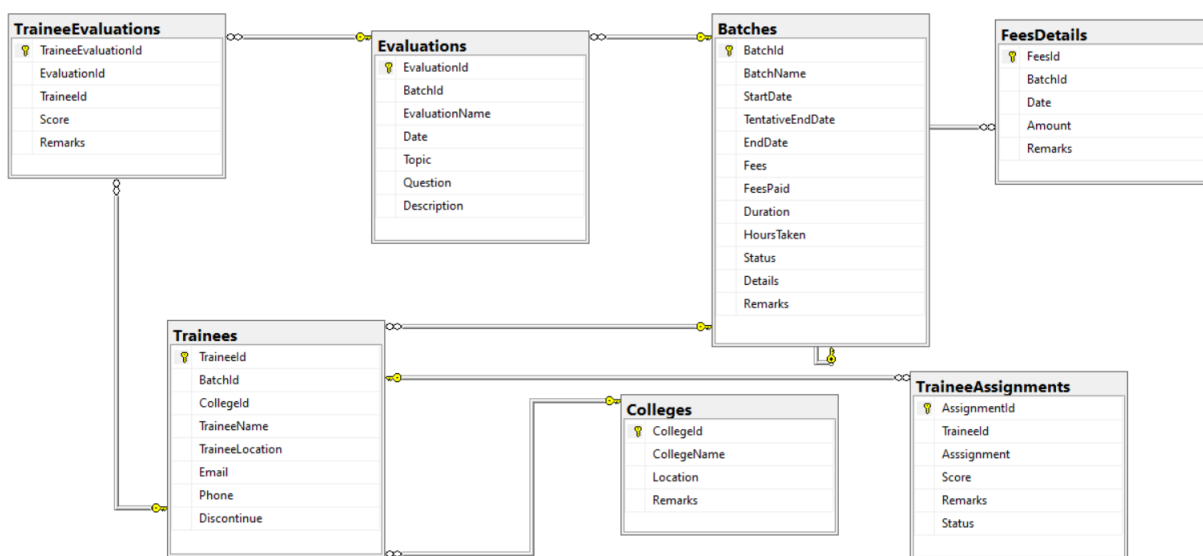


Figure 3.2: Database Diagram

The Figure 3.2 is the visual representation of the database. It shows the tables, columns, and relationships between tables in the project. The modules of the Training Management System seamlessly integrate with the chosen methodology, leveraging the power of web API backend and MVC front-end architecture in a three-layer structure. The presentation layer effectively interacts with the business layer, allowing for a user-friendly interface that follows the MVC pattern. The business layer encapsulates the system's logic, ensuring smooth data flow and enforcing business rules. Meanwhile, the data layer interacts seamlessly with the chosen database or data storage system, enabling efficient data management and retrieval. The web API backend serves as a reliable communication bridge, facilitating seamless interaction between the front-end and server-side components. Overall, this well-structured methodology empowers the system to deliver a robust and scalable training management solution.

3.1 Key Features of Training Management System

- DevExtreme Datagrid for displaying tables.
- JWTTokens Based Authentication
- Change Password functionality.
- Forgot password functionality.
- Use of browser security feature CORS(Cross-Origin Resource Sharing)

3.2 Module Description

3.2.1 Admin Module

The Admin Module in the Training Management System is designed to provide comprehensive control and management capabilities to the system administrator, who is typically the HR manager or the training head of the organization. This module empowers the administrator with the necessary tools and functionalities to efficiently manage and oversee the training programs within the organization.

3.2.2 Trainees Module

The Trainees module is specifically designed to handle all relevant information about the individuals participating in your training programs. It provides a comprehensive database of trainee profiles, capturing essential details such as personal information, job roles, and training histories. This allows you to have a complete overview of each trainee's progress, enabling accurate tracking and evaluation throughout their training journey.

3.2.3 Faculties Module

The Faculties module focuses on managing the faculty members responsible for training employees. It maintains a comprehensive database of faculty profiles, including their qualifications, expertise, and availability. This module enables efficient faculty allocation, ensuring the right trainers are assigned to the appropriate training programs and batches.

3.2.4 Batches Module

The Batches module serves as the core component of the Training Management System. It acts as a central repository for all the information related to training batches conducted within your organization. This includes details such as batch schedules, locations, and available resources. By centralizing this information, the system simplifies batch management, allowing you to efficiently plan, schedule, and organize training programs.

3.2.5 Subjects Module

The Subjects module facilitates the management of subjects or topics covered in each training batch. It allows you to assign specific subjects to faculties, ensuring a balanced distribution of topics and expertise. This module ensures that training programs cover all necessary subjects and that the right faculty members are equipped to deliver effective training in their respective areas of specialization.

3.2.6 Evaluations Module

The Evaluations module plays a critical role in assessing the performance and progress of trainees. It allows you to record and track evaluation details, including assessments, exams,

and performance reviews. By maintaining a systematic record of trainee evaluations, the system facilitates objective analysis and helps identify areas of improvement. This module contributes to effective decision-making regarding trainee progression and further training opportunities.

3.2.7 Assignments Module

The Assignments module streamlines the assignment process within training programs. It enables the creation, distribution, and tracking of assignments given to trainees. By centralizing assignment details, deadlines, and submissions, this module simplifies the management and assessment of trainee assignments, fostering an organized and structured learning environment.

3.2.8 Fee Details Module

The Fee Details module ensures the efficient management of training fees associated with each batch. It provides a platform to record and track fee-related information, such as payment schedules, amounts, and payment statuses. With this module, you can effortlessly manage financial aspects of training, ensuring transparency and accuracy in fee management.

3.3 System Specifications

The software and hardware specifications recognized for the system on the basis of their requirements are specified in this section.

3.3.1 Hardware Requirements

- Processor: Minimum 1 GHz (Recommended 2GHz or more)
- Hard Drive: Minimum 100 MB (Recommended 6 GB or more)
- Memory (RAM): Minimum 1 GB (Recommended 4 GB or above)
- Internet connection

3.3.2 Software Requirements

- Front End-JQuery, Javascript, Bootstrap, CSS, HTML

- Back End-C#,ASP.NET Web API core 6
- Database -MS SQLServer
- Windows, Mac, Linux, Any - OS
- Mozilla Firefox, Microsoft Edge, Any - Browser

3.3.3 Software Description

- **ASP.NET Web API Core:** It is a framework for building HTTP services that can be consumed by various clients, including web browsers, mobile devices, and other servers. ASP.NET Web API Core is a part of the .NET Core framework and is designed to be lightweight, flexible, and cross-platform. It follows the principles of REST (Representational State Transfer) architecture, which emphasizes the use of standard HTTP verbs (GET, POST, PUT, DELETE) and URLs to interact with resources. Web API Core allows developers to create APIs that return data in various formats, such as XML or JSON, making it easy to integrate with different client applications. It provides robust support for content negotiation, allowing clients to specify the desired format for data exchange. The framework leverages the MVC (Model-View-Controller) pattern to structure the API code.
- **C#:** It is a modern, object-oriented programming language developed by Microsoft. It is designed to be a simple, efficient, and versatile language for building a wide range of applications on the .NET platform. One of the core features of C# is its support for object-oriented programming (OOP) concepts. It provides features such as classes, objects, inheritance, and polymorphism, allowing developers to structure their code in a modular and reusable manner. With OOP, C sharp enables the creation of complex systems by organizing code into self-contained objects that interact with each other.
- **JQUERY:** It is a fast, lightweight, and feature-rich JavaScript library designed to simplify the client-side scripting of HTML. It provides a wide range of utilities and functionalities that make it easier to manipulate HTML documents, handle events, create animations, and interact with the server. jQuery aims to simplify the process of writing JavaScript code by providing a concise and intuitive syntax. It abstracts complex tasks and provides a unified interface across different web browsers, ensuring consistent behavior and

eliminating the need for browser-specific code. One of the key features of jQuery is its powerful DOM manipulation capabilities. It allows developers to select and manipulate HTML elements on a web page easily. With jQuery, you can traverse the DOM, modify the content, attributes, or styles of elements, add or remove elements dynamically, and perform animations.

- **JavaScript:** It is a high-level, interpreted language that runs in the browser. It allows developers to manipulate and modify web page content, respond to user interactions, and communicate with servers. JavaScript can be embedded directly into HTML documents using `<script>` tags or stored in external JavaScript files and linked to HTML documents. This separation of code helps maintain clean and modular codebases. The language provides a wide range of built-in objects and functions that extend its capabilities. These include objects for manipulating the Document Object Model (DOM), working with arrays, strings, dates, and handling mathematical operations.
- **Bootstrap:** Bootstrap is a popular front-end framework used for building responsive and mobile-first web projects. It provides a collection of CSS and JavaScript components and tools that simplify the process of creating consistent and visually appealing web designs. Bootstrap provides a wide range of pre-designed CSS classes that can be applied to HTML elements to style them quickly. These classes enable developers to add typography styles, buttons, forms, navigation bars, alerts, and other UI components without writing custom CSS from scratch. This saves development time and ensures consistency across different parts of the application.
- **CSS:** Cascading Style Sheets, is a powerful styling language used to control the presentation of HTML documents. It separates the content of a web page from its visual design, allowing developers to apply styles consistently across multiple pages. With CSS, you can target specific HTML elements using selectors and apply various properties to modify their appearance. Properties include attributes such as color, font, size, margin, padding, and border. By assigning values to these properties, you can customize the look and feel of your web pages. In addition to basic styling, CSS supports advanced features like transitions, animations, and transformations. These allow you to create dynamic and interactive elements on your web pages. For example, you can apply smooth transitions between states, animate properties over time, and transform elements in 2D or 3D space.

- **HTML:** HTML, short for Hypertext Markup Language, is the standard markup language used for creating web pages. It provides structure and meaning to the content of a web page, allowing browsers to interpret and display it correctly. HTML documents are built using a hierarchical structure of elements. Elements are defined using tags, which are enclosed in angle brackets (< >). Tags consist of an opening tag, content, and a closing tag. HTML, short for Hypertext Markup Language, is the standard markup language used for creating web pages. It provides structure and meaning to the content of a web page, allowing browsers to interpret and display it correctly. HTML documents are built using a hierarchical structure of elements. Elements are defined using tags, which are enclosed in angle brackets (< >). Tags consist of an opening tag, content, and a closing tag. HTML offers a wide range of elements that define different types of content, such as headings, paragraphs, lists, tables, images, links, forms, and more. These elements provide semantic meaning to the content, allowing browsers and assistive technologies to interpret it correctly and provide appropriate functionality.
- **MS SQL Server:** Microsoft SQL Server is a relational database management system (RDBMS) developed by Microsoft. As a database server, it is a software product with the primary function of storing and retrieving data as requested by other software applications—which may run either on the same computer or on another computer across a network (including the Internet). Microsoft markets at least a dozen different editions of Microsoft SQL Server, aimed at different audiences and for workloads ranging from small single-machine applications to large Internet-facing applications with many concurrent users. SQL Server is a popular choice for both small and large businesses. It is known for its scalability, reliability, and security. SQL Server is also a good choice for businesses that need to integrate with other Microsoft products, such as Microsoft Office and Microsoft Azure.

3.4 System Design

The system design phase effectively bridges the gap between the issue area and the current system, addressing the solution area - specifically, "how to implement?" During this stage, the SRS documentation is converted into an effective implementation format that also outlines the system's operation. The complex task of system development is broken down into manageable

sub-activities that work together to achieve the ultimate goal of system development. A good design enables the production of efficient code and minimizes implementation size based on the application and project requirements.

System design comprises two levels: logical design and physical design. Logical design provides an abstract illustration of the system’s inputs, outputs, and data flow, meeting user needs in describing inputs (sources), outputs (destinations), databases (data storage), and processes (data flows). Logical design is crucial for the successful implementation of a corporate database. An inadequate logical design may require costly modifications to data collection, storage, and security later on. A sound preliminary design simplifies database development and evaluation, contributing to successful execution. The system analyst specifies user requirements in detail, essentially dictating the information flow into and out of the system and the necessary data sources during logical system design.

When developing a system’s logical design, the system analyst specifies user needs with enough detail to determine how information enters and leaves the system and the required data sources. Diagrams of data flow and E-R diagram modeling are used. Additionally, the input/output media is specified, the database is designed, and backup procedures are established. Finally, system implementation is planned.

3.4.1 Entity Relationship Diagram

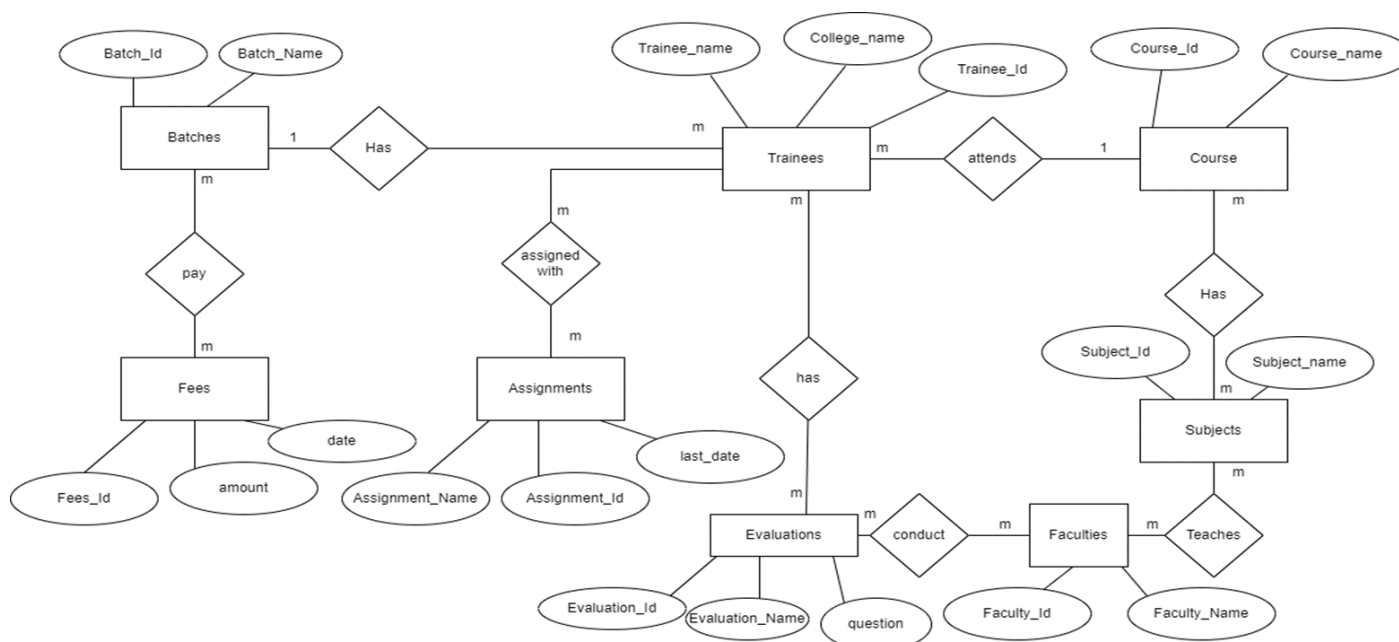


Figure 3.3: ER Diagram

The Figure 3.3 is the ER diagram of the Training Management System. It depicts the logical structure and relationships between the essential entities or tables within the system's database. It provides a visual representation of how the data is organized and connected, offering insights into the system's data model.

The ER diagram showcases the main entities involved in the system, such as Batches, Trainees, Evaluations, Fee Details, Assignments, Faculties, and Subjects. These entities represent key aspects of the training process and their relationships with each other.

For example, the Batches entity represents the different training batches conducted within the organization. It is connected to other entities such as Trainees, Evaluations, Fee Details, Assignments, Faculties, and Subjects, indicating the associations and dependencies between these entities.

The Trainees entity represents the individuals undergoing training, while the Evaluations entity stores information related to trainee assessments. The Fee Details entity manages the financial aspects of each batch, tracking the fees paid by trainees. The Assignments entity stores details about the assignments given to trainees, and the Faculties entity manages information about the trainers or instructors involved in the training process. Lastly, the Subjects entity represents the various subjects offered in each batch, with associations to the Faculties entity for subject assignment.

By examining the relationships and cardinalities depicted in the ER diagram, it becomes easier to understand how the entities are interconnected and how data flows between them. This helps in identifying the key data attributes and their associations, facilitating the design and implementation of the database schema for the Training Management System.

Chapter 4

Result and Discussion

TRAINING MANAGEMENT provides a reliable and efficient solution for tracking and managing training programs. The system captures real-time data, including participant progress, course completion rates, and training feedback. This real-time data allows administrators and trainers to have up-to-date information on the training activities and make informed decisions regarding the program. With the system's ability to capture and store trainee's data, organizations can easily track the progress of individual trainees and the overall success of the training program. By analyzing the data, admins can identify areas of improvement, assess the effectiveness of training materials, and make data-driven decisions to enhance the training experience. The token based authentication in the system provide secure access to authorized users. The system's ability to collect and store user data, such as training history and participant feedback, allows organization to generate comprehensive reports and analytics. These reports provide insights into the performance of the training program, participant engagement, and areas that require further attention or improvement.

Overall, the implementation of the training management system has proven to be successful in providing a streamlined and efficient approach to tracking and managing training programs. The real-time data capture, trainee's progress tracking, and training management capabilities have enhanced the effectiveness and impact of the training initiatives, resulting in improved training outcomes and increased participant satisfaction.

4.1 Testing Methods

Software testing is the process of evaluating and verifying that a software product or application does what it is supposed to do. The benefits of testing include preventing bugs, reducing development costs and improving performance.

4.1.1 Unit Testing

Unit testing involves the testing of each unit or an individual component of the software application. It is the first level of functional testing. The aim behind unit testing is to validate unit components with its performance. Unit testing will be conducted to verify the functionality of individual components and modules within the system. Test cases will be designed to cover different scenarios, including validating inputs, handling edge cases, and verifying internal logic.

In order to ensure the quality and reliability of the Training Management System, I have diligently conducted unit testing as a crucial part of the development process. Unit testing involves testing individual units or components of the software to verify their functionality and identify any potential issues or bugs. Throughout the project, I have employed various unit testing techniques and practices to validate the behavior and performance of different modules.

Specifically, I have implemented unit tests for each major functionality within the system. This includes testing the user registration and login process, batch creation and management, trainee information handling, evaluation tracking, fee details management, assignment handling, faculty management, and subject assignment. By systematically creating and executing unit tests, I have been able to verify the correctness and robustness of these components, ensuring that they function as intended.

Furthermore, I have used established unit testing frameworks and libraries to streamline the testing process. These frameworks provide powerful tools for writing and executing tests, enabling me to assess the behavior of individual methods, classes, and modules in isolation. By carefully designing test cases and considering various scenarios, I have been able to cover different code paths and uncover any potential issues early in the development cycle.

Test Cases

- Test the user registration process: Verify that a new user can successfully register with valid information and their details are stored correctly in the database.
- Test the login functionality: Ensure that a registered user can log in with the correct username and password and gain access to their account.
- Test batch creation: Validate that a new batch can be created with the necessary details and saved in the system.

- Test trainee information handling: Verify that trainee details can be added, edited, and retrieved accurately from the system.
- Test evaluation tracking: Ensure that evaluation details for each trainee can be recorded and updated correctly.
- Test fee details management: Validate the ability to add, modify, and retrieve fee details for each batch accurately.
- Test assignment handling: Verify the functionality of creating, assigning, and tracking assignments for trainees.
- Test faculty management: Ensure that faculty details can be added, edited, and assigned to specific batches appropriately.
- Test subject assignment: Validate that subjects can be assigned to respective batches and faculties accurately.

4.1.2 Integration Testing

The goal of integration testing is to check the correctness of communication among all the modules. It was performed to validate the interaction and interoperability of different modules and components within the training management system.

In addition to unit testing, I have also conducted integration testing as a crucial aspect of the development process for the Training Management System. Integration testing focuses on verifying the proper interaction and collaboration between different modules or components of the system. This ensures that the integrated system functions correctly as a whole.

During integration testing, I have systematically combined the individual modules, such as batches, trainees, evaluations, fee details, assignments, faculties, and subjects, and tested their interactions and data flow. By simulating real-world scenarios and inputs, I have evaluated the system's behavior when these modules work together.

Specifically, I have designed and executed integration test cases to verify the seamless integration of various functionalities. For example, I have tested the integration between the trainee module and the batch module to ensure that trainees are correctly assigned to the appropriate batches. I have also examined the interaction between the faculty module and the subject module to confirm that faculties are assigned the relevant subjects for each batch.

By conducting integration testing, I have been able to identify and resolve any issues related to data flow, communication, or compatibility between different modules. This comprehensive testing approach has ensured that the Training Management System functions cohesively and meets the desired requirements.

Integration testing has played a crucial role in validating the overall functionality and performance of the system. By verifying the smooth integration between modules, I have ensured that the system delivers a seamless user experience and effectively manages the training process within the organization.

Test Cases

- Test the integration between trainee and batch modules: Verify that trainees are correctly assigned to the respective batches they belong to.
- Test the integration between faculty and subject modules: Ensure that faculties are assigned the appropriate subjects for each batch.
- Test the integration between evaluation and trainee modules: Validate that evaluation details are correctly associated with the respective trainees.
- Test the integration between fee details and batch modules: Verify that fee details are accurately linked to their corresponding batches.

4.1.3 Performance Testing

Performance testing, a non-functional testing technique performed to determine the system parameters in terms of responsiveness and stability under various workload. Performance testing measures the quality attributes of the system, such as scalability, reliability and resource usage.

As part of the development process for the Training Management System, I have also conducted performance testing to evaluate its responsiveness, scalability, and efficiency under different workloads and conditions. Performance testing focuses on assessing how the system performs in terms of speed, stability, and resource utilization.

To conduct performance testing, I have employed various techniques and tools to simulate realistic usage scenarios and stress the system. By generating a significant number of concurrent users or high volumes of data, I have evaluated the system's performance and identified potential bottlenecks or areas for optimization.

During performance testing, I have monitored key performance metrics such as response time, throughput, CPU and memory usage, database performance, and network latency. By analyzing these metrics, I have been able to identify any performance issues, such as slow response times or resource exhaustion, and take appropriate measures to address them.

Based on the performance testing results, I have optimized the system by fine-tuning the code, improving database queries, optimizing resource usage, and implementing caching mechanisms where applicable. This iterative process of testing, analyzing, and optimizing has resulted in a system that delivers optimal performance and can handle the expected load efficiently.

By conducting performance testing, I have ensured that the Training Management System performs reliably and meets the performance requirements of the organization. It allows for smooth user experiences, quick response times, and the ability to handle a large number of users and data without compromising system stability.

Test Cases

- Test system response time under various user loads: Measure the system's response time when a specific number of users simultaneously perform tasks such as login, batch creation, or trainee information retrieval.
- Test system scalability: Assess the system's ability to handle an increasing number of users or data records without significant performance degradation.
- Test database performance: Measure the database query execution time for operations such as retrieving trainee details, generating reports, or calculating evaluation statistics.
- Test system resource utilization: Monitor the system's CPU and memory usage during peak load scenarios to ensure efficient resource management.

4.1.4 User Acceptance Testing

User acceptance testing is used to determine whether the product is working for the user correctly. Specific requirements which are quite often used by the customers are primarily picked for the testing purpose. This is also termed as End-User Testing. Test scenarios were designed to mimic real-world usage scenarios, allowing users to perform common tasks, such as creating courses, enrolling trainees, generating reports, and accessing training materials.

During UAT, I have collaborated closely with end-users, such as HR personnel, training heads, and other stakeholders, to define test scenarios and evaluate the system's performance. By involving the actual users of the system, I have gained valuable insights and feedback regarding its usability, intuitiveness, and alignment with their specific needs. Feedbacks from these users were collected to identify any usability issues, bugs, or areas for improvement. This feedback was used to refine and enhance the system's user experience.

Test Cases

- Test user registration and login: Verify that users can successfully register, log in, and access the system with their assigned roles and permissions.
- Test functionality based on user roles: Validate that different user roles, such as HR personnel or training heads, can access and perform their designated tasks within the system.
- Test usability and intuitiveness: Evaluate the user interface for ease of use, intuitive navigation, and overall user experience.
- Test specific functionalities: Conduct test cases that align with the users' requirements and expectations, such as creating batches, managing trainee information, or generating reports.

4.2 Output Screens and Results

1. Login Page

User can login using username and password.

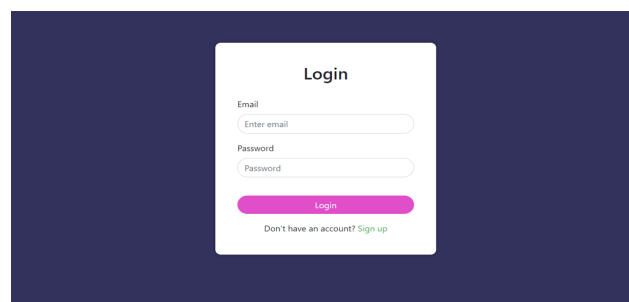


Figure 4.2.1: Login Page

2. Faculty Details Page

Page for Viewing the Faculty details in the system.

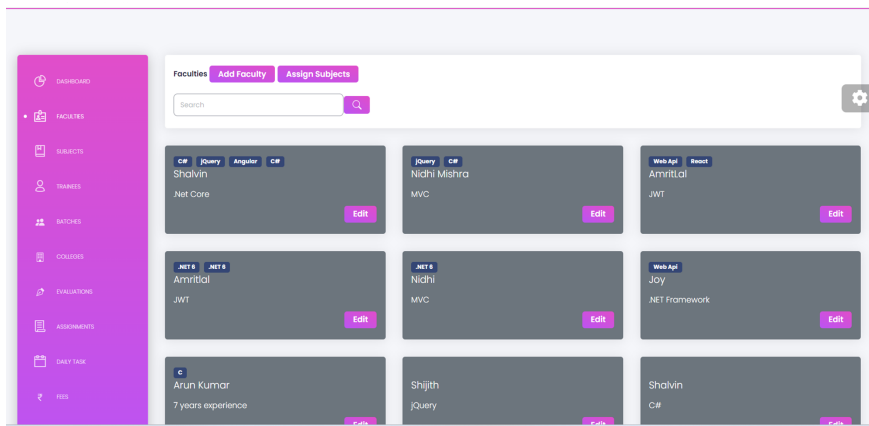


Figure 4.2.2: Faculty Details Page

3. Trainee Details Page

Page for Viewing the Trainees in the system.

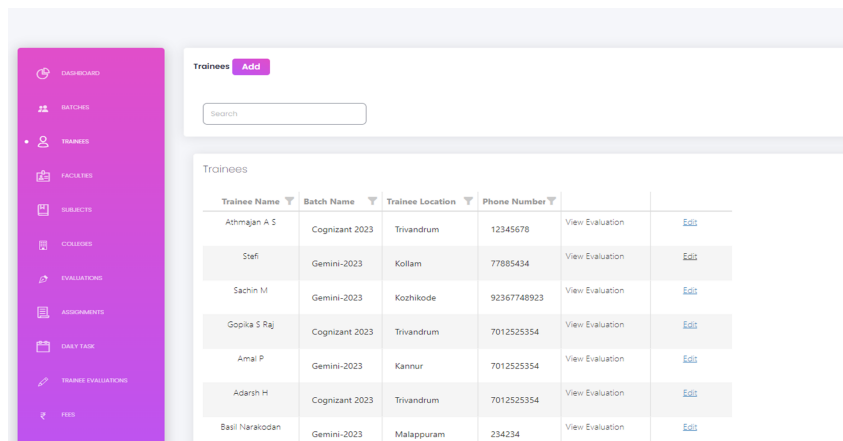


Figure 4.2.3: View Trainees Page

4. Batch Details Page

Page for Viewing the different batches in the system.

Batch Name	Start Date	End Date	Fees	Fees Paid	Duration	Status		
Gemini-2023	23-Mar-22	23-Jan-10	7800	10595	7	Not Started	View Details	Edit
Cognizant 2023	23-Feb-24	23-Feb-24	10000	2010	80	Upcoming	View Details	Edit
Aspire	23-Mar-28	23-Mar-23	5	1001	8	Ongoing	View Details	Edit
Federal	23-Mar-16	23-Feb-26	5	190	6	Not Started	View Details	Edit
Tata elisi	23-Mar-16	23-Feb-26	7	100	7	Not Started	View Details	Edit
TCS	23-Mar-13	23-Feb-26	8	102	99	Ongoing	View Details	Edit
Infosys	23-Feb-26	23-Feb-20	5	15	5	Ongoing	View Details	Edit

Figure 4.2.4: View Batch Details Page

5. View Daily Task Details Page

A page for viewing daily task details of each batches in the system.

Batch Name	Date	Hours Taken	Topics Taken	Remarks
Gemini-2023	14-Mar-2023	2	sql	sql
Cognizant 2023	13-Mar-2023	2	angular	angular
Federal	22-Mar-2023	3	Project Evaluation	Final Evaluation

Figure 4.2.5: View Daily Task Details Page

Chapter 5

Conclusion

The **TRAINING MANAGEMENT** is a powerful and efficient solution that automates and streamlines the training processes within an organization. By implementing the Training Management System, organizations can benefit from increased efficiency, accuracy, and effectiveness in their training initiatives. The system centralizes data management, simplifies administrative tasks, and enhances overall productivity. It allows trainers and administrators to focus on strategic aspects of training rather than spending valuable time on manual paperwork and repetitive tasks. In conclusion, the Training Management System revolutionizes the training management process, making it more efficient, organized, and impactful. Its automation and comprehensive features empower organizations to deliver high-quality training programs, enhance employee development, and drive organizational growth. By implementing this system, organizations can optimize their training initiatives and achieve their strategic objectives effectively.

5.1 Future Enhancement

A significant future enhancement for the Training Management System would be the integration of attendance tracking directly within the application. Although attendance tracking may already exist within the company, incorporating this functionality into the Training Management System offers several advantages. By integrating attendance tracking within the app, organizations can centralize all training-related data and streamline their processes. Organizations will no longer need to use separate attendance tracking systems or devices, as everything will be conveniently accessible through the Training Management System.

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Appendix

Screenshots

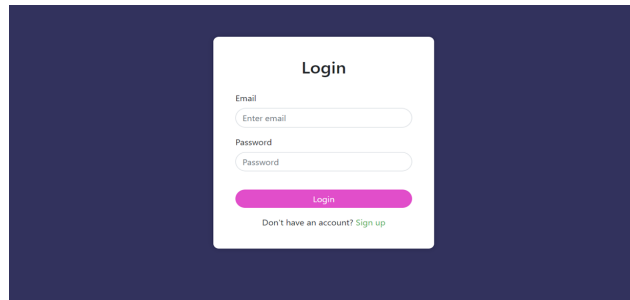


Figure A.1: Login Page

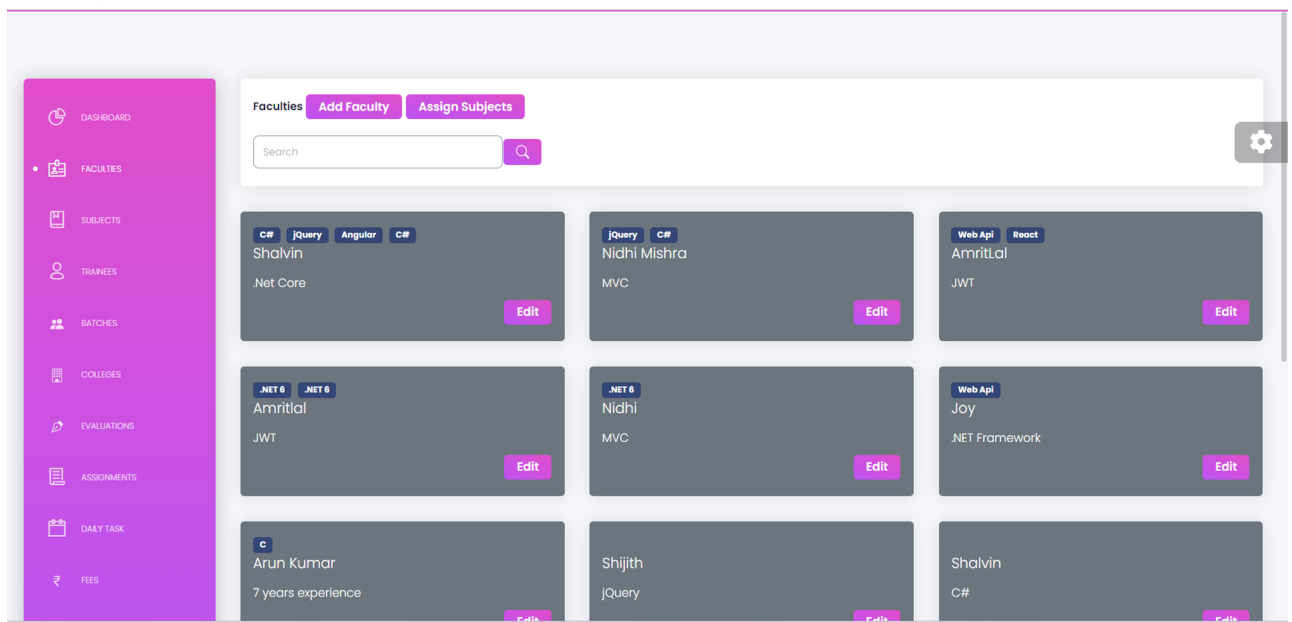


Figure A.2: View Faculty details Page

Trainees [Add](#)

Trainees

Trainee Name	Batch Name	Trainee Location	Phone Number		
Athmajan A S	Cognizant 2023	Trivandrum	12345678	View Evaluation	Edit
Stefi	Gemini-2023	Kollam	77885434	View Evaluation	Edit
Sachin M	Gemini-2023	Kozhikode	92367748923	View Evaluation	Edit
Gopika S Raj	Cognizant 2023	Trivandrum	7012525354	View Evaluation	Edit
Amal P	Gemini-2023	Kannur	7012525354	View Evaluation	Edit
Adarsh H	Cognizant 2023	Trivandrum	7012525354	View Evaluation	Edit
Basil Narakodan	Gemini-2023	Malappuram	234234	View Evaluation	Edit

Figure A.3: View Trainee Details page

Batches [Add](#)

Batches

Batch Name	Start Date	End Date	Fees	Fees Paid	Duration	Status		
Gemini-2023	23-Mar-22	23-Jan-10	7800	10595	7	Not Started	View Details	Edit
Cognizant 2023	23-Feb-24	23-Feb-24	10000	2010	80	Upcoming	View Details	Edit
Aspire	23-Mar-28	23-Mar-23	5	1001	8	Ongoing	View Details	Edit
Federal	23-Mar-16	23-Feb-26	5	190	6	Not Started	View Details	Edit
Tata elxsi	23-Mar-16	23-Feb-26	7	100	7	Not Started	View Details	Edit
TCS	23-Mar-13	23-Feb-26	8	102	99	Ongoing	View Details	Edit
Infosys	23-Feb-26	23-Feb-20	5	15	5	Ongoing	View Details	Edit

Figure A.4: View Batch Details Page

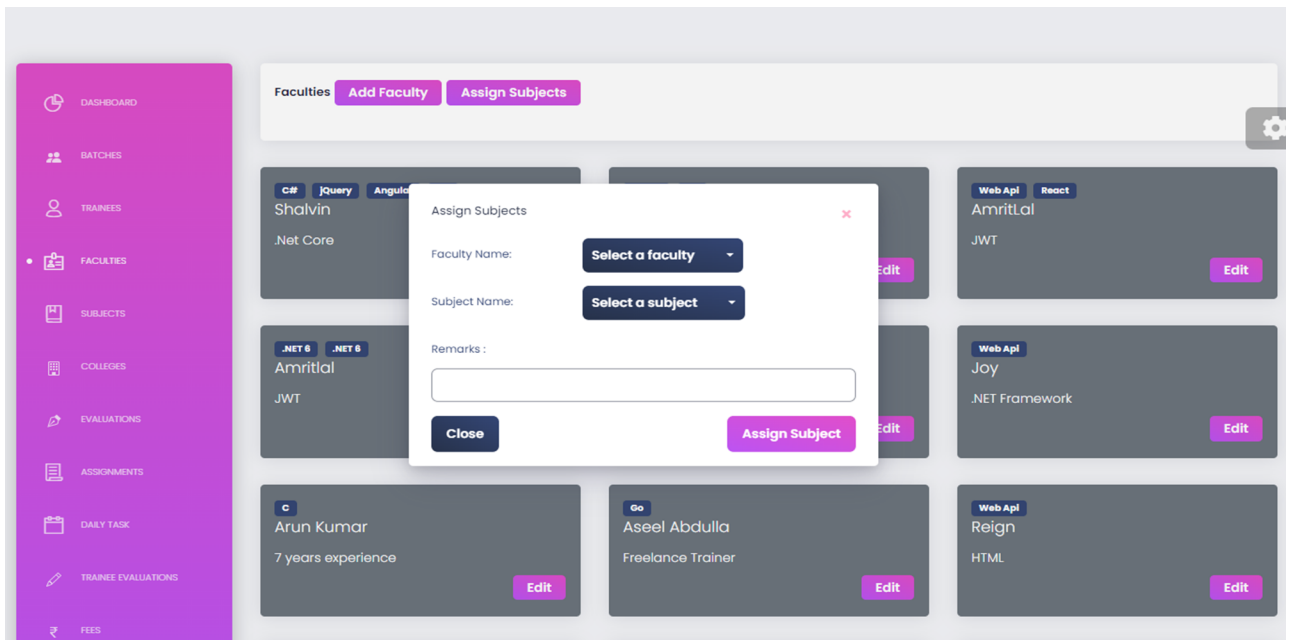


Figure A.5: Assign Subjects to Faculties Page

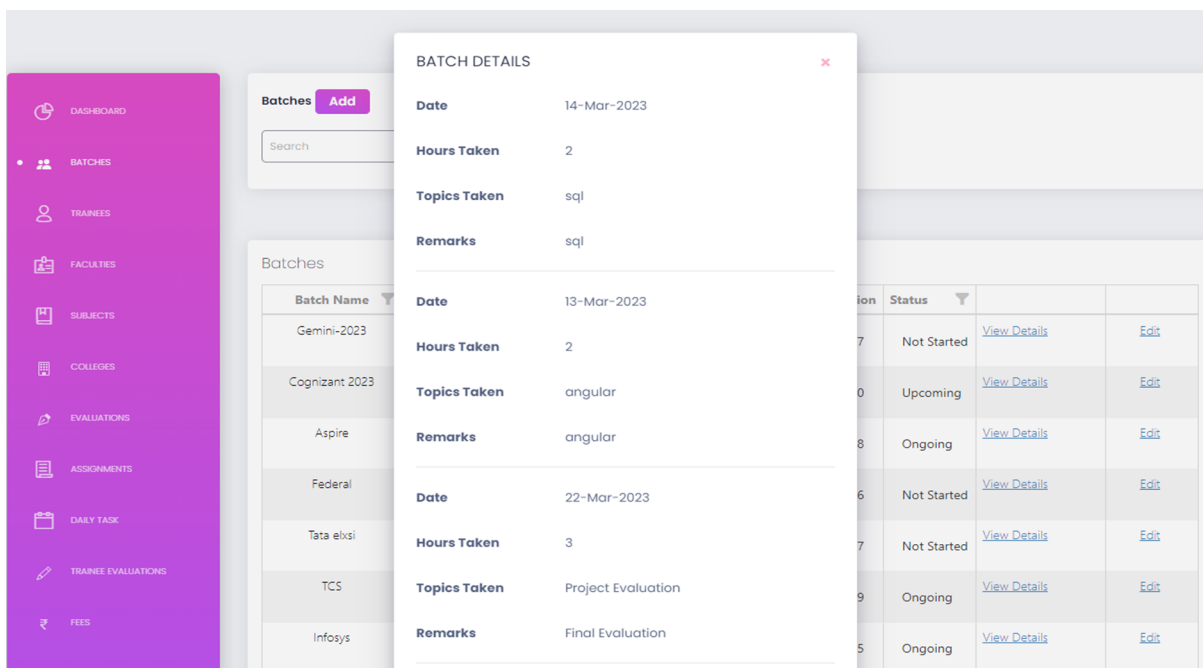


Figure A.6: View Daily Task Details of Batches Page

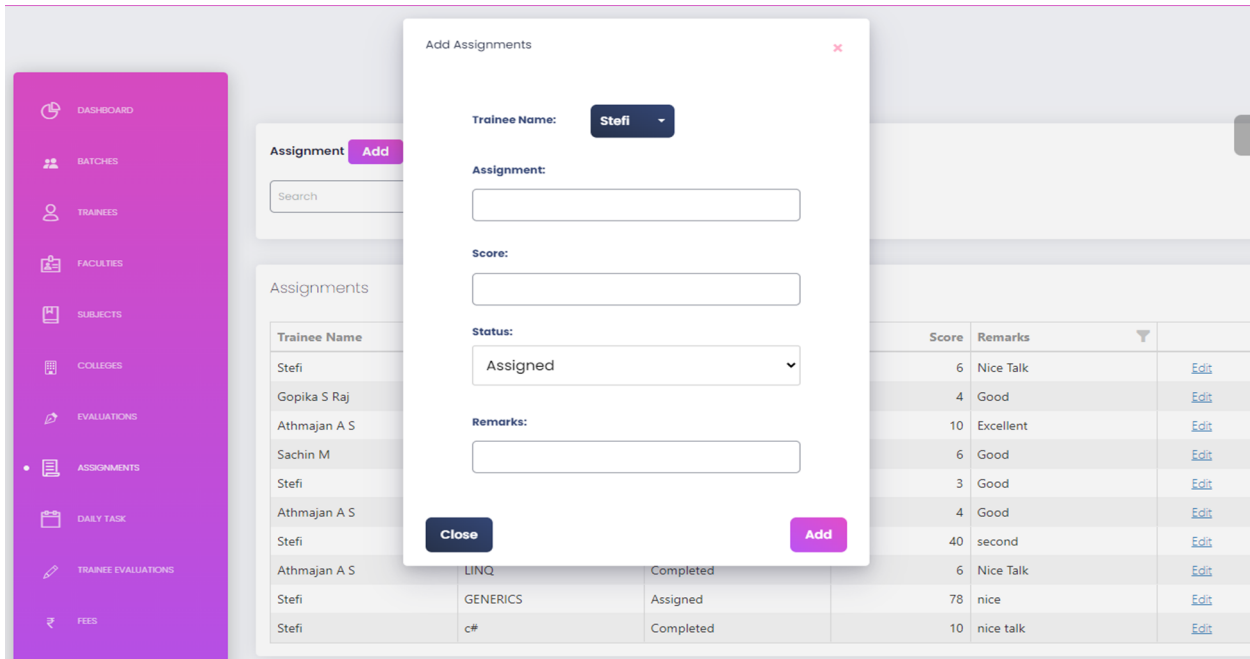


Figure A.7: Add Assignments for Trainees Page

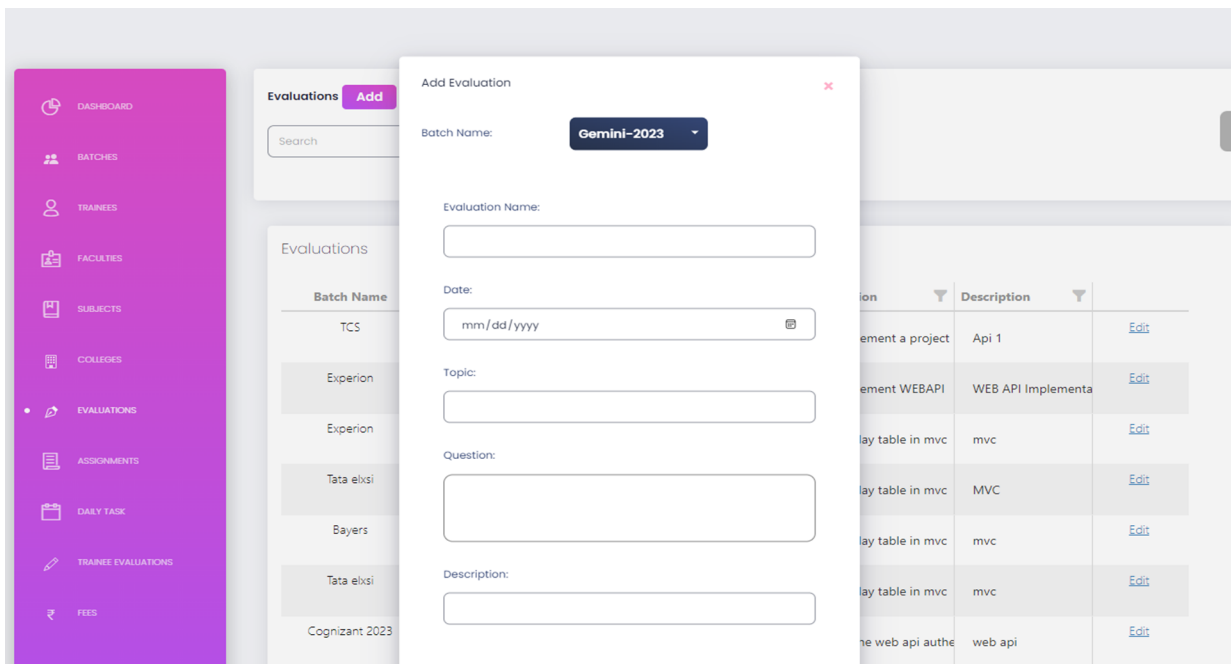


Figure A.8: Create Evaluations for Batches Page