Computerized System to Manage Business Functionalities for a Gymnasium

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ABSTRACT

Sri Lanka as a still developing country must keep up with modern technologies. Computers in this advanced world are more and more famous and turning essential to our way of life. In these modern days, people are very much concerned about their health and diet, also they are looking for a gym. This Gymnasium management system is a combination of wellness centers designed to deal with customers easier and more efficiently. A gymnasium is a must-go place for any person who loves to live a fit and healthy bodybuilding lifestyle. This system is developed for Fitness Factory Gymnasium located in the Galle district in Sri Lanka. The gym is equipped with all modern machinery and other supporting items to provide better service to its customers. So, the number of members is increasing day by day and the gym management has decided to move to an IT solution to handle the increasing volumes. Improvement was finished after distinguishing client needs utilizing different information assortment innovations. Because of the prerequisites, the product was planned and created with an iterative and steady advancement technique. The system was created determined to supplant the ongoing manual framework utilized in the fitness center. The framework expresses that the fitness center's assets ought to be effectively available to its individuals while engaging the fitness center's administration cycle. Key functions such as trainer's membership management, customer management, workout plans management (workout management), Customer workout schedule management, Nutrition plan management (Customer meal management), trainer leave management, Q & A management, BMI Calculator, memo and reminder management, inquiry management and report generation were identified. Access control is achieved with a username and password to the admin, trainer, and customer. The system can suggest the best workout schedules for the members. Researchers' primary goal in developing this system is to make things that were previously done manually in the gym easier. Researchers expect that all system users will benefit from a better service.

Keywords-- BMI Calculator, Body Building, Body Building Center, Diet, Exercise Center, Gym, Gymnasium, Gym Management, Healthy, Innovations, Lifestyle, Maintenance Management, Modern Machinery, Nutrition Plan, Q & A Management, Technologies, Technique, Trainer, Wellness, Workout Management

I. INTRODUCTION

Everyone knows that health is precious. Even if people have beautiful houses, comfortable cars, and all other facilities, it doesn't matter if people don't have a good healthy life. The main thing everyone should recollect is a Healthy way of life. Most of the time, people must live a healthy and strong life to do them well without any hindrance. Also, by being strong and healthy and facing any problem, there is an ability to win any challenge well. We all know that personal health is the most important thing and staying healthy is the first thing we must keep in mind. If we are there, we can do anything, anywhere if we are healthy and fit. Health is greatly important for a calm life. True wellness includes diet, exercise, and rest. Each person eats an appropriate diet, does appropriate exercise, and get appropriate rest for an exciting life. These three things are common non-communicable factors which are important for free living. Everyone should be smart about their health and valid life and the fact that life is very valuable. A day has become exceptionally important and valuable. Refers to a contemporary framework used in the past. The fitness center is physically demanding. While the current structure takes time, expensive as it requires a lot of paperwork to effort the manual treatment of exercise. The center frame was an annoying mistake. However, today's computing provides better efficiency at a lower cost as a reduction in the burden of documents, and time has been freed up for executives to report details from every part and worker, the design required reports without any problems. The purpose of this project is to design and build a mechanical frame up because there are many hurdles to overcome in the structure which is difficult and expensive. The framework is not expert. Similarly, there is a burden of paperwork as

everything is kept in an isolated place. Therefore, the ideal opportunity for recording the fine notes of each part and the employee is huge. Report generation is also general.

The user should be able to maintain gym details. Information should be included the following, Gym name, Location, Fee, Number of trainers, Area, Number of members, Number of equipment, opening hours, closing hours, gym phone number, and gym website, If entered the gym combo, if the name and location do not exist, then a new gym record must be created, and one already exists then the information in the other fields should be updated based on what the user inputs.

At the computerized system to manage business functionalities for a Gymnasium, clients, trainers, client meal plans, employee leave requests, and exercise tracking are the main manual duties which are still performed. The existing gym management has generated several problems in terms of efficiency, time wastage, and difficulties in managing members and personnel. A proper administration system was needed for the gymnasium. From simple tasks like exercise planning to important tasks like personnel management, we have taken the initiative to design a gym administration system to solve these problems and complications of doing manual work. Trainers, customers, and owners will use the system as system administrators. The functions of the system are divided into several categories, including managing members, trainers, workouts, member meal plans, member workout schedules, and employee vacations.

The most significant advantage of the project is the design and construction requirements which are easy to understand, easy to use and have an efficient Automatic frame. The problem should be created to destroy the information redundancy associated with a precise and adaptable situation as well as to leave the computer system program. It should also be organized to deal with the security of information core information through operational logins and passwords. The reason or goal of this framework is to digitize and create a computerized framework. The frame will perform the same task of adding or removing a new section to the gym part or instalment record keeping and other essentials in dealing with the gym as appropriate. The status of a gym is a record archive handwriting on a document on paper. Physically, each administrative work is completed.

At the Fitness Factory, clients, trainers, client meal plans, employee leave requests, and exercise tracking are the main manual duties still performed. These writers expect that all system users will benefit from a better service.

II.   LITERATURE REVIEW

In today's world computers are becoming more

popular in global culture. Everyone can use computers almost anywhere, and they are very useful in their daily life. People can learn now about anything in the world with a simple click on many websites. As a result, researchers left to create a gym-themed website for people who want to keep their health and fitness checked daily. Gym user information about the management system can be saved the food, the employees, and the people at the gym, Gym equipment, and so on [3]. This software program allows you to save all information about a gym. A newly constructed gymnasium website is preferable to a manual database as it offers features like huge storage capacity, high speed, high accuracy, and increased security. (Jojo2, 2012)

The "COMPUTERIZED GYM MANAGEMENT SYSTEM" has been successfully designed and developed to meet requirements established in the time needs analysis process, like the system is very user-friendly, model level validation and implementation of field level validation are in very good condition. It had several shortcomings in the old manual system [1]. The current project has been developed to meet the aspirations outlined in the modern era. (Nayeem, 2016)

The researchers carefully examined the problems faced by the owner of the gym management system while operating this gym management system manually. Researchers carefully analyzed how to create a massive recruiting framework so that gymnasium owners don't need a system to take benefit of different types of clients relying on them for different opportunities as well as disappointments. It will manage all primary and secondary nuances such as adequate and genuine database security for the customer. The gym owner needs the protocol to do such. All data about the customers, trainers, agents, money, receipts, gym machines and all trades and activities that take place in the gym needs to be stored with backup. The online rec center administration framework is an easy-to-understand app [9]. This mechanical frame is all used simply for both owners and customers. It is very basic in planning and execution. Those framework requirements are less. The frame assets and framework can work in practice in all settings. (shakoor, et al., 2018)

It became increasingly difficult to use the old manual method. Because the entire organization had to be hands-on, the path to keeping, and retrieving information was tedious and long. There are many difficulties in coordinating trade with a particular environment. If any information could be found, it was expected to encounter a lot of documents containing records that have nothing to do with the age of the record. While entering and retrieving records, there will often be a waste of time. The explanation for that is that a package of information needs to be kept and recalled during the business. For this explanation, researchers have given features the current structure is

usually computerized, the actual existing system is tolerated as one requirement [11]. It is better to enter the same information in three places. (Vazhacharickal, et al., 2017).

The recreation center (Rec / Gymnasium / Gym) administration framework is designed with progress and designed to meet the requirements, and as known in the exam part of the requirement, the framework is unimaginably easy to use, type–level approval and field–level approval land unit plays significantly fast. The framework brings fast recovery of data which is essential for the progress of any association. Costs are limited if there is to be a fixed event [10]. Whenever the exchange takes place, there is no compelling reason to record it in many physical places, so the burden of manual work is reduced. (Utkarsh Krishak, 2018, p. 8).

Everyone knows that health is a valuable resource. The first thing we should remember is to stay healthy. Without a good strong healthy life, any facility is ineffective. Because our attitudes are largely determined by how we feel. Being healthy and fit gives us the strength to accomplish anything. Physical fitness is essential for leading a healthy and stress-free life. Diet, exercise, and sleep all contribute to fitness [7]. These three essential items are important in everyone's life, and everyone should be sensitive about them for a good existence. (Monir and Jannatun, 2016).

The Gym Management System (GMS) is a web-based application. This project helps to reduce time and record complete details of Gym subscribers. This is a complete process initiated for the member's physical statistics. This project requires data storage of members, employees, products, payroll information, and any record changes [8]. The gym management system is a fitness facility management system that makes it easy to manage members. The administrator has access to all members of the fitness center as well as their personal information. The basic module of the system is as follows. This project is an online platform where gym members, private and administration run. The system also maintains the client's information to provide valuable reports on the gym member's progress. (Rahman, 2020).

A smart digitalized gym management system for those who run the company suggested to the gym before doing anything, to do some research on the basic problems faced by gym operators. Researchers have other responsibilities for different people based on their memory of how to develop a massive system within their privileges and security. The administration needs to treat them conveniently from the gym and provide all the necessary services based on security and user database [4]. The gym is required to keep data on members who have received transactions. Each is an internet application with a user–friendly administrative structure. This facilitates the automation of system owners and other features. (Kumar, et

al., 2020).

An administrative database is built in the physical wellness centers of schools, universities, and public places, and the data collection methods and data categories are different in each school, university, and public gymnasium. Accordingly, manual system is widely used. The related frameworks in this article can coordinate a wide range of executive capabilities. It includes agency administration, executive clients, board placement, the cost to executives, and the board framework. In the long term, these capabilities are coordinated into the framework, and they can also exchange information and data [2]. Depending on the different characters of the client the framework gives them different advantages and improves the general cycle of the overall framework. (Babu, et al., 2019).

The gym management system project has been developed to eliminate the time required by the previous system as all the paperwork was there and the records were not secured if the papers were misplaced all the records would be lost so all this could be avoided. According to these problems, this gym management system project has been developed. Through these, all records are maintained and secured [6]. The gym management system requires a system that handles details easily and security according to the user. It also requires software that stores data about staff and people. This is a very useful system. (Mahima, et al., 2019).

In this gym management system, all the data in the automated system and all the manual field data should be fully computerized. And a back - up should be maintained. There is an in-built software that can detect errors instantly. This is a completely designed system that will support the management of the gym, so making a mistake is not an option, because it will manifest itself in a big way later. It requires software to track employees, merchandise (machines), and contacts or transactions made in the gymnasium [5]. This is a very useful system as it records and maintains all the information related to the people in the gymnasium. (Kumar, et al., 2019).

In adapting to today's demanding lifestyle, people must be fit and healthy. A daily exercise routine is essential for a healthy life. Still, some people have taken this fact for granted it is a given that they must have some physical activity daily. Although some people are willing to work, their motivation is lost, or not have enough guidance, so researchers develop a system for "Computerized gym" virtual gym management, a gym that can register to the system online and people can access their workouts or trainer and diet counselling at the best schedule and the best place for them. For user interaction with coaching or mentoring, the system provides text chats. After when a certain period ex: - A certain amount of data is entered into the database and the system will automatically recommend the user for exercise and diet by reporting their profiles.

(Dinesh Kumar, 2020)

A. Scientific Fitness

Scientific Fitness belongs to the category of sports science. It is multifaceted, on the fitness exercise. Therefore, people can better understand and grasp its essence to promote overall fitness exercise and development in the National Fitness Program, with the increase in the health needs of people, there is the concept of scientific fitness. Little by little recognized and understood. In this survey, when asked if they want to decide their fitness plan based on personal health status, 49.41% of respondents chose "must be". And 43.87% of the respondents chose "hopeful". About the question, "Are you looking for personal fitness plans? Which should be scientifically guided", the response "Look forward to" was selected by 41.5% of the respondents and 48.62% of respondents select "wait". It was revealed that 90% of respondents seek scientific guidance. (simulation, 2019)
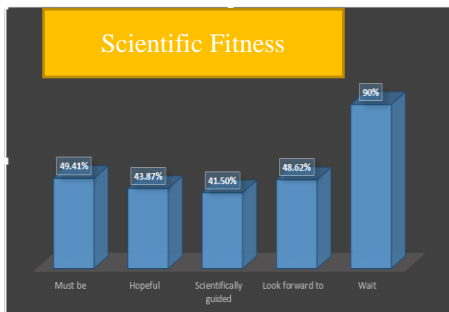
Figure 2.1: Scientific Fitness graph

B. Exercise Prescription

This concept of "exercise prescription" was first proposed by the American physiologist Karpovish in 1954 and gradually created a new discipline. The exercise prescription can be introduced meal plan, diet plan, or nutrition plan likewise.

"Exercise prescription" means by a rehabilitation physician or physiotherapist according to medical examination data (including exercise test and physical strength test), physical exercise or the therapist prescribes exercise in a manner its health, physical strength, and according to the prescription cardiovascular functional status. The role of exercise prescription in fitness has been confirmed to varying degrees by many scholars. The systematic and multi-dimensional concept of physical introductory education and systematic exercise prescription favor school physical education to improve students' health and their quality of life.

Mascio, RS, and Tanaka, H recommended to be implemented by healthcare professionals design interventions for educational programs and guide older people should participate in regular exercise therapy and improve their health of the elderly. Researchers such as

Chong - Jin, and BAE have proposed in their study an exercise prescription model for older adults 65 years of age. Ardic and Fusun discussed the principle of exercise prescription and FITT's specifications (frequency, intensity, time, type, etc). Li Ganlin created an exercise prescription management system based on cloud storage technology, by selecting Microsoft Sky Drive as a cloud storage medium, designed and developed a desktop client using Microsoft.net technology, completed a personalized exercise prescription system, and mobile terminals were used to display prescription drugs. (simulation, 2019)

C. Smart Fitness

With the rapid development of communication technology and the mobile internet era, design platforms or fitness networking available systems, Intelligence, and digitization have gradually become research areas of scholars' research fields. Research and planning smart wearable devices, sports fitness monitoring systems, Internet-based interactive health promotion platform ITIHP, networked digital fitness in the gym system, and smart fitness equipment have laid the foundation to further develop smart fitness. The ITIHP platform established a communication link between fitness equipment and smart devices via Bluetooth technology, and fitness data was uploaded to the cloud database, and then the cloud management system and health experts can analyze the system's historical exercise data to develop a personalized workout program for the user. Using a mobile device for exercise tracking based on this personalized exercise prescription studied by Kang and Seungae. Used by individual users' mobile devices to send their body-based important information, then all information will be collected by the Fitness center. Then the sports expert provides customized prescriptions to the Fitness center database based on aggregated information and feeds data. The Fitness center system will provide the best automatically personalized exercise prescription linking content providers. (simulation, 2019)

D. Fitness Prescription Module

Three sections are included in the fitness recipe module. Data management of fitness personnel, Fitness prescription database, and Prescription generation. The Fitness prescription module can provide fitness guided by the data provided by the body recognition system, combined with the experience of a medical specialist and fitness instructor. More and more Precautions and activity of the substance of the fitness project are detailed, more favorable it is a synthesis of synthetic prescriptions, and it also helps to encode the contents of the material library computers. The fitness project is more detailed, too more conducive to fitness prescription synthesis, and basic for coding the content of fitness projects into the computer. (simulation, 2019)
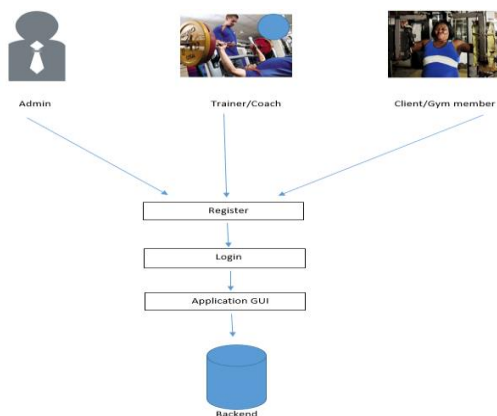
III. METHODOLOGY

Figure 3.1: Overall Architecture of the Gym system

The purpose of this study is to identify and assess problems with the current gym management system. And introducing a smart computerized gym management system to solve and increase problems improves efficiency and automatic solution functional techniques by replacing the present manual system with a computer-based system, increasing behavioral efficiency management functions. The main disadvantages of the solution were identified as the high cost of development implementation including a user-friendly design conducting system and end-user training.

Researchers used this system to be created in MERN Stack. Their database was created by Mongo DB. What is the MERN stack? The MERN stack is a collection of technologies that enable rapid application development. It is used by developers all over the world. The main purpose of using the MERN stack is to develop applications using only Java Script. This is because all four technologies that make up the technology stack are based on Java Script. MERN is a full stack, following the traditional three-tier architectural pattern, including a front–end display layer (React.js), an application layer (Express.js and Node.js), and a database layer (Mongo DB).

Forty people had been selected as gym goers there were sample and semi-structured interviews held with them. People selected as registered members of the sample were attending the gym for more than three months with good attendance reports. Interviews were conducted by four and were reserved by ten candidates for each interview. Before conducting the interviews, the candidates started working towards certification. The candidates are focused and were not tired increasing the quality and validity of the answers provided to them. In this unit, the results were interpreted for analysis. The researchers interviewed forty members of the gym. While interviewing them the future developments were highlighted during the interview. Also, the researchers

will investigate some features of a gymnasium management system that should be in place for development in the future. Among them, it has been selected some features which are most useful for response-based gymnasium management system users. 40% responses from gymnasium members like to use meal management, 30% responses from gymnasium members like to use workout management, 10% responses from gymnasium members like to use workout schedule management, and 20% responses from gymnasium like to use Q & A management for this system.
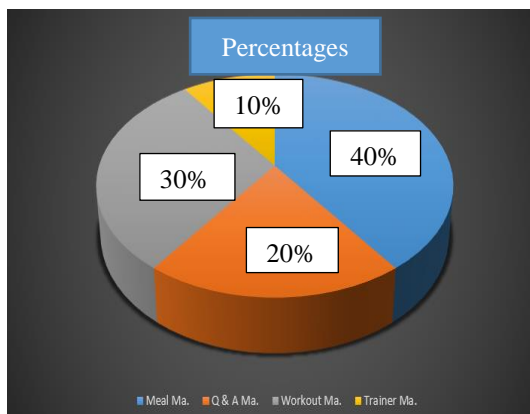
Figure 3.2: Pie chart of the interview.

Admin or Trainer or Customer should register and after that, he/she can log in to this system. And after login, they can continue their work from this system. This system can do membership management, customer meal management, workout management, Customer workout schedule management, trainer leave management, manage memos and reminders and Q & A management. The fitness module is the carrier for the user fulfillment of scientific aptitude. Which is a prerequisite for achieving physical fitness.

IV. PROPOSED SYSTEM

To overcome shortcomings and work more accurately with the system as the volume of business increased, it was decided to automate the management of the gym processes. Management has identified the following areas as key areas to automate with the new system. They are,

1. Admin / Trainer (Coach) / Customer Registration.
2. Admin / Trainer (Coach) / Customer Login.
3. Admin / Trainer (Coach) / Customer Profiles.
4. Admin / Trainer (Coach) / Customer Edit Profile.
5. Admin / Trainer (Coach) / Customer Dashboards.
6. Meal Management.
7. Memo and reminders management
8. Workout Management.

After entering the required values, the admin needs to click on the "submit" button to save the entered data. If creating the trainer account is successful, it will show a success message. Otherwise, it will show an error message.

Figure 6.3: Customer register page.

To create a trainer profile, the admin is required to enter the name, date of birth of the trainer from the calendar, NIC, gender from the dropdown menu, telephone, address, and email, create a password, and confirm the password, height, weight, and registration date from the calendar. BMI will be auto filled after entering the height and weight. And admin needs to click the "upload" button to upload a profile picture from the device. After entering the created password, the system will check whether the confirmed password is matching with the created password. Otherwise, it will show an error message. The email field will validate the entered email and prompt an error message if the email format is incorrect. After entering the required values, the admin needs to click on the "submit" button to save the entered data. If creating the customer account is successful, it will show a success message. Otherwise, it will show an error message.

These UIs show the Admin, Trainer, and Customer register pages. A new admin, trainer or customer can register in this screening system by filling this out and pressing the register button. After these registrations, they can log in to this system. And this registration is only done by the admin due to the security perspectives.
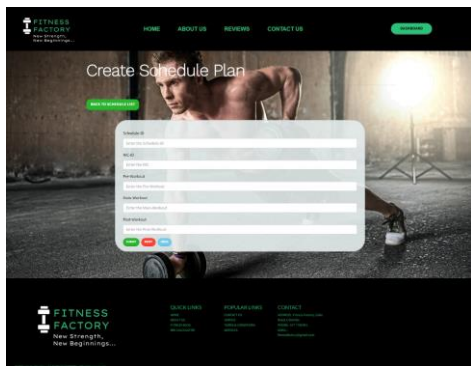

Figure 6.4: Create a workout plan page

Initially, after navigating to this page, the user must type the workout name. Then the user must select the workout category. The user must enter instructions for that specific workout. Then they can enter tips for that workout. Finally, the user can attach an image of the workout. Then if the user wants to clear the field user can click the 'reset' button that will clear all fields. And finally, if the user completes all the required fields, then the user can click the 'submit button. If the form fields are not correctly filled or missed, the system will show an error message. This feature is only accessible by the user trainer of the system.
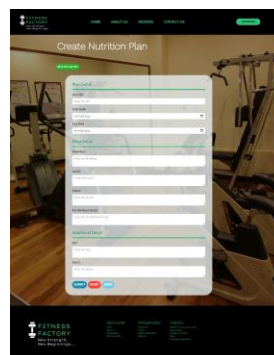

Figure 6.5: Create a nutrition plan page

Initially, the trainer is required to enter the customer NIC, start date, and end date of the plan in this form. And then they are required to enter the breakfast, lunch, dinner, and pre-workout snacks of the customer for the meal details section. In the additional details section, the trainer is required to enter the dos and don'ts when following the meal plan. After entering the required values, the trainer needs to click on the "submit" button to save the entered data. If the trainer needs to clear the values entered for several fields at once, the trainer can click on the "reset" button. If the plan is successfully created, the system will show a success message. Otherwise, it will show an error message. This feature is only accessible by the user trainer of the system.
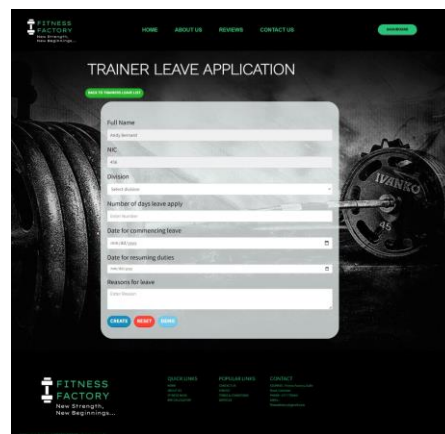

Figure 6.6: Create a trainer leave application

After the user is navigated to this page, users can enter leave details such as full name, division, the number of days that are on leave, Reasons for leave, etc... in this interface. After entering the required details trainer needs to click on the "Submit button" to submit the entered details to get the leave approved by the owner which is the system admin.

After a successful login, the customer, admin, and trainer are navigated to a dashboard. Using this dashboard, they can navigate through the web application to complete their tasks. After login users can see their profiles and manage their profiles. The customers of the system can create and manage FAQs, they can view their workout schedules, workout profiles as well as meal plans. Trainers can create and manage customer meal plans, customer workouts, customer workout schedules and add new workouts to the system. In addition to those, trainers can apply for leaves and manage them. Admins of the system can view nutrition plan lists, workout lists, and register both the users who are trainers and customers to the system and manage them. In addition to those, admins can create memos and reminders for themselves. Customers of the system can inquire about anything from the gym management using the inquiries functionality. It is an email service which is developed using a microservice. Apart from these functionalities reports are generated to make this system more productive user registration reports, trainer leave reports, workout reports and meal plan reports are generated in this system. Through this report generation, users can get detailed information on the functionalities of the system. Likewise, the functional implementation of the system is done.

VII.   DISCUSSION

The management system for this gym includes complete computerization of all gym operations and automated maintenance of all records. This system has been built as software that can detect errors instantly. As a result of the system's full establishment, the gym administration cannot make mistakes after it has been formed as a reliable system. The goal of this project is to provide a system for online database maintenance and transactions to manage a gymnasium. It searches and offers sophisticated search options to locate records efficiently. This system generates reports and stores data using a graphical user interface (GUI). During system research, it is typically crucial to examine and pinpoint the flaws in an existing system. This can help with identifying the needs for the new system and the analysis can lead to the discovery of numerous alternatives for a better solution. It also requires software to keep track of gym memberships, trainer records, equipment among other things, and any arrangement or transaction made in the gymnasium. This is a very important system

because it records all information about gymnasium users. This system also reduces paperwork as the number of human resources required is reduced. All records in this system are automated, this is a very necessary and worthwhile endeavor.

The researchers of the system hope new features to be implemented in the future, adding a payment system, booking for available free periods for personal training, users can have face recognition, natural language processing for inquiries with Google API system integration, find gymnasium locations with maps API, and schedule trainer meetings by tracking free time slots, and manage a supplement ordering system and make an automated diet plan and workout schedules according to customer BMI likewise. These are the functionalities we hope to add to this system, increasing this system's productivity. Every partnership (Admin, Trainer, and Customers) is expected to use face recognition to get the attendance of those who attended in the future.

VIII.   CONCLUSION

This "Computerized System to manage business functionalities for a Gymnasium" was successfully built and developed meeting the requirements as identified throughout the requirements analysis process, such as exclusive use of the system and efficient work reducing the number of errors in the old manual system. The current proposal is designed to achieve the goals expressed in modern times. The new automated system is significantly faster, more reliable, and more user-friendly than the previous method, the system is designed and checked step by step. It eliminates human error; it is almost certain that it will happen during the activity that you need to process a large amount of data. If fixed, the cost is minimized. Manual labor is heavily decreased because a transaction can occur at any time, and manual recording is unnecessary in many places. All the important things are done in the gym management system to satisfy the essentials in the gym. Before the system worked with many people, problems/issues which have been in the prevailing system are improved to make work easy and efficient. This system is automatic, using only the machine's work.

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REFERENCES

[1] Ahmed, M. & Nayeem, J. (2016). Smart gym management system. *This system about the use of technology to reach better is to become part of human life*, pp. 12.

[2] Babu, R., Jin, Z. & Ahmad, A. (2019). Information management system of sports gymnasium in colleges and universities. *This project develops a management information system for the gymnasium in colleges and universities*, pp. 12.

[3] Jishnu T Jojo & J. M. J. a. G. T. (2012). *The newly developed site for Gymnasium is more suited than the manual database. Gym management interface: an overview*.

[4] Kumar, A. D., Ram Rayal, K. B. & M. S. (2020). *Smart Gym Management System*, pp. 18.

[5] Kumar, R., Rashi, W. & Raam, K. (2019). Smart gym management system. *In this gym management system total computerization of the activities of the gym to Maintaining records of everything in the automated system*, pp. 18.

[6] Mahima, K., Pooja, R., Niyati, W. & Lodha, G. (2019). Survey paper on gym management system project. *The project 'gym management system' is prepared to eliminate the time required for the existing system in the previous system*, pp. 10.

[7] Monir, A. I. 2.-2.-6.-0. & Jannatun, N. I. 2.-2.-6.-0. (2016). *A project paper on smart gym management system*, pp. 9.

[8] Rahman, M. M. & B. (2020). Gymnasium management web-based system. *Gym Management System (GMS) is a web-based application*, pp. 16.

[9] Shakoor, M. A., Abbas, M. & Mehdi, M. I. (2018). *Database and transactions management system for a smart gym: Layyah Fitness Center*.

[10] Utkarsh Krishak, R. (2018). Survey of gymnasium management system. *The system results in the quick retrieval of information that is very vital for the progress of any organization*, pp. 10.

[11] Vazhacharickal, P. J., Joseph, S. K. & Thomas, G. (2017). The data collection of gym management system. *The reason behind there is a lot of information to be maintained and has to be kept in mind while running the business*, pp. 8.

[12] Park, Seokcheon. (2017). Design of custom training system for fitness club based on NFC. *Journal of Internet Computing and Services, 18*, 1-6.

[13] Hyun-Suk Lee & Joohyeon. (2017). An exploratory study on design planning of smart i-fitness wear associated with contents. *Journal of the Korean Society of Design Culture, 23*(4), 399-413.

[14] Li Ganlin. (2014). Design and implementation of fitness exercise prescription system based on cloud storage. *Xidian University*.

[15] Chen XL, Zhu ZQ, Chen M & Li Y. (2018). Large-scale mobile fitness app usage analysis for smart health. *IEEE Communications Magazine, 56*(4), 46-52.

[16] Dl.ucsc.cmb.ac.lk/jspui/handle/123456789/3899.

[17] Elib.unikom.ac.id/gdl.php?mod=brose&op=read&id=jbptunikompp-gdl-jecoberthw-37250.

[18] Prcrepository.org:8080/xmlui/handle/20.500.12475/301.

[19] Research%20SLIIT/047070.pdf.

[20] Pare, G, Leaver, C & Bourget, C. (2018). Diffusion of the digital health self-tracking movement in Canada: Results of a national survey. *Journal of Medical Internet Research, 20*.

[21] Charnwood, Jung, Kwak, Yonghoo & Park, Seoyeon. (2017). Research on planning and design of smart fitness wear for personal training improvement. *Science of Emotion & Sensibility, 20*(3P), 97-108.

[22] Lee, Daetaek. (2010). The development of an exercise prescription program algorithm model based on an HCI environment. *The Korean Society of Living Environmental System, 10*(3), 324-333.

[23] Dl.ucsc.cmb.ac.lk/jspui/bitstream/123456789/3899/1/2012MIT012.pdf

[24] www.simlilearn.com/tutorials/mongodb-tutorial/what-is-mean-stack-introductionexamples#:~:text=MERN%20stack%20is%20a%20collection,stack%20are%20all%20JS%2Dbased = Accessed: 2021-12-28.

[25] Research%20SLIIT/IJSRT_V6_issue3_493.pdf.