fərdiləşdirmədən istifadə etmək daxildir. Çatbot tətbiqlərində ədalətlilik, şəffaflıq və effektivlik etik süni intellekt üsulları və ciddi qiymətləndirmə prosedurları ilə daha da təmin edilir.

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ADVANCING ATTENDANCE TRACKING AUTOMATION IN EDUCATIONAL INSTITUTIONS.

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Abstract
In recent years, there have been unprecedented technological advancements that have completely revolutionized the way educational institutions track and manage the crucial aspect of student attendance. This groundbreaking transformation has opened up a plethora of new possibilities, enhancing the efficiency, accuracy, and overall effectiveness of attendance management systems. With the introduction of cutting-edge tools and innovative solutions, educational institutions are now equipped with the means to seamlessly monitor and precisely record student attendance, ensuring a seamless flow of data that is invaluable for both administrative and academic purposes. These remarkable advancements have not only simplified the once tedious task of attendance tracking but have also paved the way for enhanced transparency, engagement, and accountability within educational settings. Technological advancements in student attendance tracking have improved convenience and accessibility for educational institutions. Cloud-based systems provide real-time access to attendance data from any location. Biometric technologies, such as fingerprint or facial recognition, ensure accuracy and prevent proxy attendance. Improved communication channels, such as parent portals or mobile apps, allow parents to easily access attendance records and stay informed. These advancements have simplified administrative processes, enhanced transparency, and fostered a strong partnership with parents/guardians.
Keywords: attendance tracking, RFID, biometric authentication, data analytics, monitoring systems, scalability, paperless solutions, time-saving.

Finally, the last section talks about the contribution of this research. It is stated that a newly proposed program or system based around the concept of Automate Intervene Investigate (AII) can greatly impact

educational institutions of various levels. Because it is proving an improvement to current manual methods, there is a serious case that AII should be taken on. With positive feedback on AII, it is expected that this could just be the tip of the iceberg where the development of effective information patterns for finding high-risk students can lead to a new level of education sector EDM tailored applications.

Following this section, the introduction explains the concept of Educational Data Mining (EDM), that there are various techniques from statistics and machine learning that are applied to data from educational systems with the aim to improve course planning, student performance, and teaching strategies. It is stressed that EDM has begun to have a positive impact in educational institutions where analytics has been employed and the reality of adopting these technologies can greatly help institutions to discourage absence and put in better systems for tracking and intervention through study automation and analytics. Advancing attendance tracking automation in educational institutions starts by introducing the problem of chronic absenteeism that is prevalent throughout the world. Within this chapter, the reader is shown statistics and research on how absence affects academic performance from a student level as well as an institutional level. The research also shows the negative impact of the current attendance tracking methods utilized within educational institutions. This creates a clear understanding that attendance does matter from both parties and something must be done to improve tracking and intervention methods. [1]

Benefits of Attendance Tracking Automation

In this section, the benefits of tracking automation on students' attendance in educational institutions are analyzed. Many benefits are found, but there are some areas that lack enough empirical data evidence. Automated systems for attendance tracking are good at indicating the low attendance rate for many students and, hence, can force them to change in order to achieve better results. This phenomenon can be seen in many academic institutions that still implement traditional methods in tracking student attendance. A low attendance rate will make a student be kicked off from the academic institution due to unsatisfactory results. By using the data obtained from the tracking, teachers or the persons in charge can make informed decisions regarding the students. In other cases, tracking using the automation system is excellent as a way of finding the root cause of a problem. A high absence rate of a student does not always mean he/she is reckless. Some of them might have health problems or be involved in an accident. Besides increasing the students' attendance rate, the automation system was found to be increasing the lecturers' performance in teaching and learning processes. This is due to a better understanding of the students' behavior, attendance patterns, and any predictive modeling that can be useful for building up a context for action. This will allow improvement in the upcoming lectures and can identify the students who need special attention. By knowing the students' attendance patterns, this system can also predict the possible graduation time for a student. A high absence rate was found to be increasing the time to graduate for a student and possibly leading to dropping out from the academic institution. Although it is a long-term process, the result can be useful to the institution for future reference. [3,4]

Challenges in Implementing Attendance Tracking Automation

Benefits of implementing attendance tracking automation schedules are perceptible to both academicians and educational institutions. Yet, only around 5-10% of higher education institutions have automated attendance tracking systems in place. The number is currently not known for K-12. This leads one to ponder the question, why have more institutions not implemented attendance tracking automation software if the benefits are so great? This section outlines the challenges faced and alternative solutions to automating attendance tracking in educational institutions. Open-ended survey questions were designed to gather alternative solutions, and similar challenges were grouped from both the literature and the survey. Challenges were found in the implementation of traditional barcode, magnetic stripe, RFID, biometric, and online attendance systems. Alternative solutions to these challenges defined will lay the groundwork for a customizable attendance tracking system in the subsequent section. [5]

These challenges are very specific to types of automation and efficiency measures, with the benefits being a common goal. Challenges to the types of automation are problems specific to the technology used, such as barcode, magnetic stripe, and biometrics. Measures of efficiency involve manual modification of data, lacking important features of traditional methods, and lack of user satisfaction. A common criticism of present automated systems is that they force all instructors to use a standard method of taking attendance. Measures of efficiency aim to replace the functionality of a current method with an automated method to improve results. These specific challenges must be taken into account during the creation and implementation of any type of automated attendance tracking method. [6]

Best Practices for Successful Implementation
The following is a list of best practices for a successful implementation of an automated attendance system. Many are common sense and have been known to work through successful experiences, while others use lessons learned through tough experiences. These tough experiences only show a successful implementation is more important. [7]

a. Clearly define the business goals, objectives, and success criteria. A successful change to any organization is almost impossible without management knowing what they are trying to achieve. Student attendance tracking at educational institutions can be viewed in so many different ways. Is it only used to count missed days for money allocated from federal or state funding, to comply with government standards, to notify parents of missed days, to help teachers on possible improvements of students missing classes, to comply with the law, or all of the above? With so much room for interpretation, there needs to be a clear defined goal that is realistic in the first phase, moving onto more comprehensive approaches that will be detailed in a stage-by-stage approach. From the goals set, objectives should be measured and, after completion, evaluated as success criteria towards getting the desired results.

b. Obtain sponsorship. After defining goals, a sponsor should be assigned to make sure the project stays on track with the original scope and does not fall into an analysis paralysis state. This could be a head teacher, a principal, or a dean. Someone who holds the project close to their heart and is benefiting from the successful implementation. They are critical for any personnel involved in the project. Often times, there can be personnel changes at educational institutions, and if the implementation of the change is not favored, the newly appointed personnel may try to revert to the former process. If the project is tied to that specific person and they are benefiting from this change, they can make sure that it stays in place.

Background: In the esteemed Faculty of Medicine at Cyberjaya University College of Medical Sciences, there exists a small yet vital department known as the Foundation in Science, which caters to two intakes of aspiring medical professionals. Evidencing commendable discipline, the students devoutly attend their classes. However, a new rule enacted by the top management has instigated a wave of concern among the students, lecturers, and administrative staff. The rule stipulates that a minimum of 95% attendance must be maintained starting from August 2005. In response to these concerns, a meticulously researched and efficaciously executed computerized system for tracking student attendance was introduced.

Objective: The primary objective of this transformative system is to instill a sense of punctuality among the students, compelling them to arrive promptly for their classes and thwarting any potential acts of cheating or substitution by misguided peers. Furthermore, the system sets out to obliterate any errors that may arise when attendance is manually recorded by the lecturers.

System: The ingenious system harnesses the power of fingerprint biometrics to conveniently and accurately register the attendance of each and every student. Comprising a cutting-edge fingerprint terminal, a meticulously designed time sheet, and a sophisticated computer, the system revolutionizes the process of monitoring student attendance.

Fingerprint Terminal: This state-of-the-art device is impeccably connected to the computer and necessitates a one-time setup. Imbued with user-friendliness, the device boasts a minute yet impressive LED screen that promptly showcases the name of the student, thereby effortlessly verifying their identity.

Upon the gentle touch of a finger, the terminal swiftly transmits the timing information to the connected computer system. Time Sheet: Serving as a temporary repository, this ingeniously designed module dutifully records the precise time at which the student's finger makes contact with the terminal, capturing both entry and exit times. In essence, it becomes the embodiment of the comprehensive attendance sheet. Computer: As the central hub of the system, the computer assumes the pivotal role of storing the intricate details of each student as well as meticulously preserving the attendance data. It becomes the principal tool employed for monitoring student attendance during every single class session, thereby facilitating smoother administrative processes and ensuring accurate data management.The relevant data is shown in following table.(Table 1)

Student Name	Student ID	Entry Time	Exit Time
John Doe	123456789	08:00 AM	09:30 AM
Jane Smith	987654321	08:10 AM	09:35 AM
Alice Johnson	456789123	08:05 AM	09:25 AM
Bob Brown	654321987	08:02 AM	09:28 AM
Emily Davis	321654987	08:15 AM	09:40 AM

Potential mock data collected by fingerprint solution in university.

Integration with Student Information Systems.Pervasive and Integrated Approach

Collecting data about student attendance is generally considered a mundane and tedious task. It requires that professors document which students attended a class and store this information in some easily accessible form. Our work aims at automating the collection of attendance data, relieving this task to a certain degree. One way of making the task of taking attendance easier is to integrate the attendance tracking system with systems that are already in use to record student information.

Most universities have Student Information Systems (SIS). A SIS is basically a database maintained by the university on each student. It typically contains a wealth of information about the student, including name, address, phone number, courses registered, grades from previous semesters, etc. A well-integrated SIS can provide a wealth of resources to aid in tracking student attendance. For example, it can provide a list of registered students for a class, providing an automated way of taking attendance relative to a manual roll call based on this list. Many SIS also maintain attendance data, particularly in the context of tracking whether a student has stopped attending class and thereby disqualify them from receiving financial aid. Integrating with a SIS attendance database potentially allows a comparison of attendance data collected via automation with existing data to verify that it is accurate. Finally, students often have barcodes on their university ID cards which can be used to access their SIS information. Our work already incorporates the use of barcodes for student ID, so this would be another means of leveraging SIS integration. High-level matching of student ID with SIS data might allow automatic linking of a student's attendance data with their record in the SIS.

Reporting and Analytics. As part of the whole system approach to examine the management practice of attendance tracking, the vendor was asked to describe how the data gathered by the proposed system could be used to improve the management practice and decision-making around the use of class attendance data.The function of reporting and analytics within the stance of attendance tracking is an important area in need of attention on the part of educational institutions. Too often, attendance data is seen as passive information and it is not utilized to its full potential. The vendor was asked to prepare two key scenarios that would demonstrate how use of the attendance tracking system could be shown to impact the management and decision-making around attendance data. In each scenario, the vendor was instructed to present a description of the proposed system functionality, the value that would be added to attendance data, and the method through which this value could be realized. In addressing this request, the vendor provided a detailed insight into how a classic business intelligence model could be used to adapt learners' behavior in class. In this scenario, the vendor described how technology could be used to

readily identify students who are not following their normal routine with the aim of getting them back on track. A decision support system could also be used to identify patterns of learners that are successful in class and compare their activities to less successful students. This area represents advanced functionality of reporting and analytics of students' activities around course attendance but also provides an opportunity to positively influence students before considering measures such as financial penalties. [8]

Mobile Applications for Attendance Tracking. Since mobile phones are an essential part of a student's life, mobile applications have been designed for checking and maintaining the attendance. Many apps are available on various platforms, but most of them are aimed towards a single user checking his/her attendance. But in the case of universities, faculty needs to access the attendance records of students studying in their respective courses. These apps use the GPS in the student's mobile to locate whether he/she is in the classroom or not. When the student enters the class, he/she has to mark the attendance, and the app, based on the location, enables the relevant faculty to view the respective attendance record. But there are certain limitations of this method, like the all-time functioning of GPS can increase battery drainage of the mobile phone, privacy concerns, and proxy attendance as the student can mark his attendance and leave the class.

An alternate approach using QR codes can be used for the same. A unique QR code is generated for every class, and when the student scans the QR code using the mobile app, his attendance is marked. But the most versatile and secure method is using RFID as explained in section 6. [9] The idea of an application to monitor student attendance is one that has been considered by a number of organizations. For instance, The University of Scholar developed an Attendance System for Android Devices. The purpose of the aforementioned system was to develop an effective solution to tracking student location and collecting attendance. The system tracked location by utilizing GPS, triangulation, and RFID – though only the GPS and QR code system was implemented. The tracking mechanism involved the installation of an application onto the student's smartphone while the attendance collection was conducted via the scanning of a QR code. While successful in the proof of concept stage, the system was abandoned due to time constraints and a lack of resources. [5,9] An additional example of an attendance-based application is the uAMS system created by students at The University of Queensland. uAMS is a mobile web application that assists lecturers in collecting attendance and allows students to view their attendance history. The system functions by generating a unique barcode for each student and processes attendance by scanning the barcode and making a comparison to a back-end database. While an effective system, the primary weakness of a mobile-based system (be it QR code, GPS, RFID, or otherwise) is the need for hardware installation and oft recurring maintenance. Given the cost of hardware installation and the frequency at which it is subject to change, mobile applications are not an ideal baseline for attendance automation.

Cost Analysis and Return on Investment. When considering a significant strategic technology investment such as the implementation of an RFID attendance tracking system, decision makers must consider the cost of the investment and the expected return. In the case of RFID, such an analysis is complex. In many situations, it is a relatively new, unproven technology, and the potential benefits often cannot be fully realized until the system is in place and teachers and students begin to use it. In order to address this issue, we can consider electronic card-based systems similar to RFID. By comparing the initial cost of implementation, ongoing cost per annum, and benefits of these systems to manual paper-based methods, we can work to build a picture of the cost and benefits of a system which has not yet been implemented. Once we have done this, we can compare this to RFID technology and use this to build an approximate cost-benefit analysis of implementing RFID.

In broad terms, cost is composed of direct and indirect costs. Direct costs are costs that can be attributed directly to the implementation of the system. For a card-based system, this will include the cost of cards and card readers, and possibly new technology such as PDAs for teaching staff. For RFID, this is the cost

of the RFID chips. Since recent trends have seen RFID chips becoming progressively cheaper, it is very likely that the cost of chips will be less than cards. For estimates on the cost of chips and RFID card readers, a data search was conducted using Google, and these were then compared to costs available at a UK-based educational resources supplier. Indirect costs, on the other hand, are costs that are incurred in implementing the new technology but are not directly associated with it. This will include the cost of training staff to use the new technology and the cost of transferring student data to the new system.

Future Trends in Attendance Tracking Automation. The future of attendance tracking will largely be influenced by the potential of emerging technology. Identification methods are expected to evolve, relying more on biometrics and smart cards than on traditional methods. Biometric systems can identify students by a unique characteristic such as their fingerprint, hand, or face. A smart card generally can double as a student ID and can keep track of details such as the students' time in and out, and also what room they are in. Some systems are able to send messages to parents to notify them of unexplained student absences by interfacing with email and phone messaging systems. So behavior that is registered in the system as being 'out of the ordinary' can quickly be addressed and resolved. [4,7,10]

It is also highly probable that attendance tracking and monitoring will move towards mobile device integration. The potential for software to be functional on various mobile platforms will be a massive benefit for teachers who are already using the technology within their classrooms to take the roll. Relevant data can be accessed anywhere, and delegating the responsibility of recording attendance to teachers will become the primary aim. This, in turn, will see the end of students' direct involvement with the recording of their own attendance and will reduce a loophole which allows students to sign in or out in the place of an absent classmate.

Recommendations for Educational Institutions. In order to maximize the benefits of automated attendance tracking in educational institutions, we recommend that the following steps be taken to ensure that the system is implemented correctly and further opportunities are explored. This paper focuses on stepping stones for improvement with students who possess already existing identification cards, and does not aim to delve into invasive biometric identification methods. Implement networked student identification cards. Since many modern campuses have multiple networked facilities, it would be best to implement a system where a student's identification card is swiped through a magnetic reader and the attendance records are stored in a centralized database that can be accessed by the respective instructors. This is much more feasible than the traditional method of passing around a sign-up sheet. Additionally, it is possible to have the identification cards interact with RFID readers installed inside a classroom, and take attendance when the student is within the wireless range of the reader. This method can provide a solution that is both automated and unobtrusive. [5,11]

Conclusion

Overall, the final phase in the creation of the automated attendance tracking system hinged on two major areas: finalizing the technology and refining the business process. In the change management phase, one area we failed to analyze properly was identifying the groups and individuals who would be affected by the changes caused by the new system. The lack of understanding of the extent of changes the automated system will cause within the lecturer's normal day-to-day routine greatly affected the outcome of the project as there were unanticipated loopholes that we had to analyze and resolve. These issues were both technical and behavioral. For example, verifying the authenticity of medical certificates when a student swipes for a lecture they did not attend and finding students impersonating others by the use of a lost swipe card. These issues required a great deal of collaboration between IT and Mathematical Sciences staff and students to analyze and resolve. A simulation model involving the verification of students and students with medical conditions was created by students from the computer and mathematical sciences faculty, which was used to find a simple and effective resolution to these issues. The success of these collaborations showed that often stakeholders have to work in areas beyond their primary job description to ensure the smooth running and maintenance of the new system. This understanding was deemed

important to capture and was implemented throughout documentation. During the trials of these interactions, it became apparent to all teams that the coming together of these multiple disciplines was beneficial to the overall understanding of issues and effective resolution techniques. The knowledge that projects developed in other faculties had the potential to resolve similar issues and interest in the attendance tracking automation was widespread. A service-oriented architecture style was employed, and proof of concepts demonstrated a web service to book study spaces and interface developments to the tracking system using RFID. With the technology's success in the academic environment and potential to be applied across the university, foresights to future developments and collaboration between faculties were included in development and deployment plans.

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RSA ALQORİTMİNIN RİYAZİ VƏ PROQRAM TƏMİNATININ İŞLƏNMƏSİ

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Xülasə
Kriptoqrafik alqoritmlər, məlumatları müstəqil və təhlükəsiz bir şəkildə ötürmək və saxlamaq üçün istifadə olunan texnologiyalardır. Bu texnologiyalardan biri də RSA alqoritmidir. Asimmetrik şifrələmə növü olan RSA alqoritmi mesajların şifrələnməsi və deşifrə edilməsi üçün geniş istifadə olunur. RSA alqoritminin necə işlədiyini başa düşmək üçün ilk növbədə açıq və gizli açarlar anlayışını başa düşməliyik. RSA alqoritmində hər bir istifadəçinin bir cüt açarı var: açıq açar və şəxsi açar. Açıq açar istifadəçiyə mesaj göndərmək istəyən hər kəs üçün əlçatan olur və ondan mesajı şifrələmək üçün istifadə olunur. Şəxsi