University Student Attendance Management System

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Abstract– The article describes the problem of managing the number of attendances or absences in the academic environment, as well as proposing a system of record and control these data.

The article supports the idea of an automated system over the day-to-day handwritten attendance registers, in order to facilitates the process as well as prevents students from touching things in order to protect them from COVID-19 spreading among them.

The system comprises a timekeeping system that will register every student or teacher in a database. The database itself will be managed by the University, so that reports, either individual or collective, can be issued whenever they are needed on both physical and electronic format.

Also, these reports would be used to create statistics and further help the growth of the academic process correlated with students' interest or attendance rate on certain classes. The timekeeping machines offer a quick alternative of counting the attendances and the process to do so is very much simplified.

Keywords-- *Attendance, registry, digitalized, online.*

I. INTRODUCTION

The process of monitoring attendances in any institution is a crucial part in determining the efficiency of the services offered by the institution and therefore the general interest of these who enjoy the institution's services, in our case, the students.

This process may be a pain staking routine, and intrinsically, this text proposes a replacement way of dealing with the old system, which means handwritten attendance registries, which had to be filled in after wrote every course, seminar or laboratory, for every student individually.

[1] Private Higher Education Institution

These registries would later be sent to the follow-up teams where all the attendances or absences would be counted manually for every student.

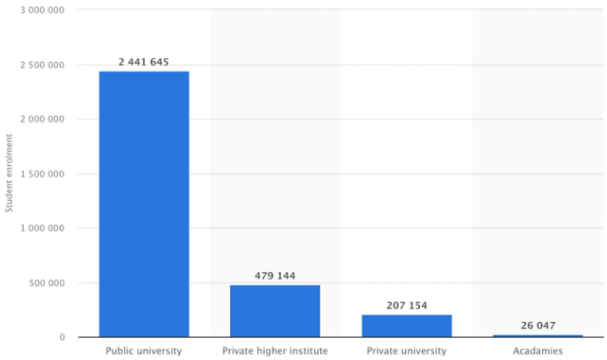
This method is both time consuming and susceptible to errors, either by marking a student as absent by mistake or counting the incorrect number of attendances when reports or statistics are to be delivered.

The present article proposes an automated system that is ready to count the number of attendances, store the info for an extended time in both physical and/or digitalized format, and create reports and statistics to point out the accurate number of attendances, the general interest for a selected course also as statistics concerning the attendance rate for each student.

Our new proposed system consists of an application with the student, and a webapp for the professors and instructors.

The foremost important part of our solution may be a database containing all the knowledge about students, faculty and timetables.

II. STATISTICAL ANALYSIS



According to Statista, Number of total enrollments of university students in Egypt in 2019/2020 about 2,441,645 students in public universities, 479,144 students in PHEI, 207,254 students in private universities and 26,047 in academies which is a total of 3,153,990 students in

only one year of enrollment in Egypt only. what about the rest of the world?

This was kind of a motivation for us having a very large target group that we are a part of, we understand their needs and, we understand how they always manipulate the system.

Let us talk about real numbers that matters, according to a paper made by prof. Mohamed El Zayat an assistant professor at the American university in Egypt, a student from the minute of enrollment to the graduation costs about 147 USD of paper for attendance.

Attendance matters, according to prof. Peter Massingham paper about attendance "Does Attendance Matter? An Examination of Student Attitudes, Participation, Performance and Attendance" Nonattendance of lectures and tutorials appears to be a growing trend and changes in the way we learn, teach, assess and use technology are recommended if we wish to reverse the trend. How are we going to study these changes if there is no way to gather and analyze attendance?

III. Digital Government Transformation

What is Digital Government Transformation?

Governments at all levels are undergoing digital transformation in order to deliver government services and programs more efficiently, transparently, and cost-effectively. Today, digital government transformation has become critical for meeting the expectations of modern citizens.

Digital Government Transformation Trends

- **Unifying Citizen Experiences**

According to Granicus, over 90 processes and forms for UK government services can be accessed online and in one place, making it easy for citizens to make transactions of all kinds with their government. As a result, the number of citizen requests made online has increased. This dramatic shift in contact channel has already identified over $308,000 USD in annual savings, a figure that is expected to rise with time.

- **Automating Manual Processes**

However, systems errors as nothing human is perfect. We can decrease these errors by time and save a lot of employees' times for more essential tasks than searching for existing document or checking errors in a new applied document. According to Granicus, many local governments using digital solutions to automate how they manage and track government records. Napa County, California, for example, is using software to streamline how it processes county records related to financial disclosures for elected officials. By replacing what was once manual and time-consuming with a digital solution, they are able to focus on higher priority work.

How does this relate to our project? – Every Step in digital transformation is a win, today we are proposing and providing a solution and that is what we proudly call a brave step towards a digital world.

IV. PROBLEM STATEMENT & MOTIVATION

– The lack of connection between the students and the university is a fact. We always need to go to our university building, and we do not always get the help that we seek quickly.

- **Attendance (as it is still in paper):**

Attending a lecture is a very manual process in our university and from here it all started.

- **Announcements**

We needed to solidify what a professor says in one place instead of unified Facebook groups that lets anyone to post which makes it hard to understand what is happening.

- **Slow System and Cloud Transformation**

Due to the use of local servers, our site is too slow to handle requests from this large number of students specially after coronavirus all students need to access the website.

- **Hard to find and change a Schedule**

This headline is so obvious as we never find it easy to find and get notified by upcoming lectures as students.

***Motivation* –** Our motivation is to re-design how the system works through adding ways that is not new but not used in this field of study.

As Evelyn Skye said, "Imagine, and it shall be. There are no limits." this is such a powerful sentence, and it is the core of our motivation.

V. SYSTEM ARCHITECTURE

Existing Systems:

There are some existing systems that specific to school thing or academic, but it is not modern enough to work smoothly also there are applications that provide some functionalities that similar to our

application but also most of them not related to school, and working with old way, they are focusing on how to manage the data more than the way of getting it.

Apps Like Sage.hr, Fresh Team, Grade Link and AUC App …etc.

- ***Application Architecture***

What is Redis? – Redis is an in-memory data structure store, used as a database, cache, and message broker.

What are flutter widgets – according to flutter documentation, Flutter widgets are built using a modern framework that takes inspiration from React. The central idea is that you build your UI out of widgets. Widgets describe what their view should look like given their current configuration and state. When a widget's state changes, the widget rebuilds its description, which the framework diffs against the previous description.

What is State – State represents the change of data in time.

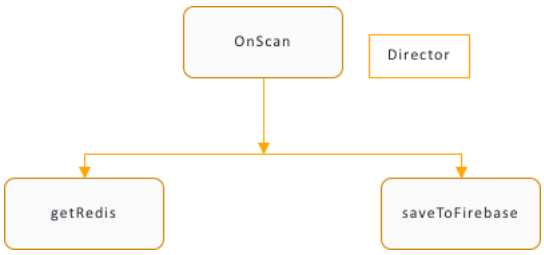


Figure 1. On barcode scan

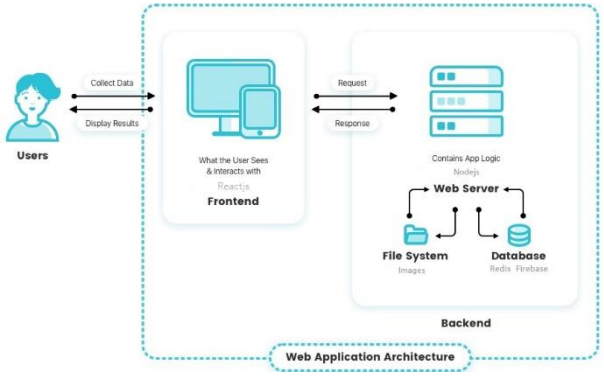
Here is a real-life demonstration of what happens in our app when the student scans a QR code it triggers two main functions first, it compares it with the value stored in Redis and secondly, it compares with it with scanned QR data on true it saves attendance to firebase.

Director function manages the state and do the checks to ensure no errors will occur whenever a regular QR code is scanned or even a fake one.

What is Riverpod? – Riverpod is a state management approach made by contribution of flutter community and recommended by the flutter team. It makes it easier to manage a state of data from anywhere inside a flutter app, all you need is wrap your main widget with a provider scope (a widget in Riverpod) and it gives you access to provided data anywhere.

- **Web App Architecture**

Every system has components that react in a way that make that system works, the architecture describes how these components communicate with each other, from the user getting result, to the front end that acts to the user actions and communicate with the backend to get and send the data over.



As it's shown in figure 2 how these components connected to each other.

Figure 2. WebApp architecture

VI. SOFTWARE IMPLEMENTATION

Flutter is a new open-source framework created by Google that assists in developing native Android as well as IOS apps with one codebase. It is more than just a framework as it is a full software development kit that has everything you require for building cross-platform apps.

We will discuss some of the advantages and disadvantages of the framework.

Our software can fit any organization it is smooth, responsive and reactive, the software used the most popular frameworks to make it reliable.

Build with a great database structure and reliable API's.

The system can deal with a really big number of audiences as the memory can handle more than eighty thousand users per second.

a. High Performance

Numerous factors impact the performance of an app, including CPU usage, frame number per second, average response time, request number per second, and more.

Flutter offers a consistent 60fps, which is the rate at which contemporary screens display a smooth and clear picture. That makes the system reports made in fast and easy way and be sent faster.

Digital correction and modification facilitate the currency of writing, automatic filling of duplicate data, and the speed of displaying and providing data to interested parties or the sender.

b. Accessibility and Internationalization

As a result of advocating for inclusivity and diversity, Google offers integrated opportunities to make apps that can be accessed by a broad spectrum of users. Normally, when you need your app to operate in different regions and languages, you want to get your code ready for localized content, which is usually created later.

This process is referred to as internationalization. Flutter for mobile development natively offers widgets that are based on the Dart into package, which makes this process more straightforward. It now supports 24 languages, but also units of measure, layout options, currencies, and dates. Easy access to data through several ways including smartphones and computers (Web), and you can change the language for previous reports, which makes it easier to send the report to any organization inside our out the country.

c. Immediate Updates

Flutter's architecture has been engraved with hot reload function to allow for instant updates without the need for plugins.

With hot reloading, you can view updates in real time. If you experience an error as you run the code, the framework allows you to fix it immediately and to carry on without having to restart it. Returning to normal programming where it takes many minutes for deployment can be a problem.

Hot reload improves your productivity, allows for experimentation without lengthy delays, and assists with fast iterations. The ease and speed of adjusting and updates and the speed of showing them to the user and the speed of the effect of changes that the user makes on the program, which makes it faster and easier to use than the patient and doctor interface, which gives comfort and more time to more important tasks such as detecting the patient or examining it in a deeper way which increases the doctor's productivity from the number of cases.

d. Mild Learning Curve

If learning Dart is simple, then familiarizing yourself with this tool will be easier.

Many people with little coding knowledge can develop prototypes and apps with the framework. Also, you do not need any mobile development experience to use it.

Moreover, Google is popular for developing well-structured and detailed documentation, which is something that React Native has an issue doing.

Facilitate programming for the programmer, edit and add future modifications that we talked about in advance.

e. Custom and Ready-made Widgets for Quick UI Coding

This tool uses ready-designed widgets.

With these building blocks, the tool assists you in creating a user interface.

While many approaches utilize different objects like controllers, views, and layout, this framework features a unified and consistent object model.

Every object in this tool is a widget, including fonts, buttons, and paddings.

You can combine widgets to form layouts, and you can decide to utilize widgets on any customization level.

Widgets in this framework are arranged in trees, which assists in rendering.

But they can lead to excessive sophistication of the complete structure.

Big applications can need as many as ten layers of code to form a basic object.

Hence adequate planning of the structure is needed in advance.

Create an easy environment for users (doctor, patient, labs, etc.) Create a flexible environment that can be controlled and harnessed, to meet the requirements of different and diverse users, and modifications can be added based on the wishes of users to facilitate the process of using the program.

SYSTEM FUNCTIONS

Audience Side

Attending

The system provides an easy way to attend the lecture as well as giving an immediate feedback. As shown in figure 3.

Figure 3. Attendance System Screen

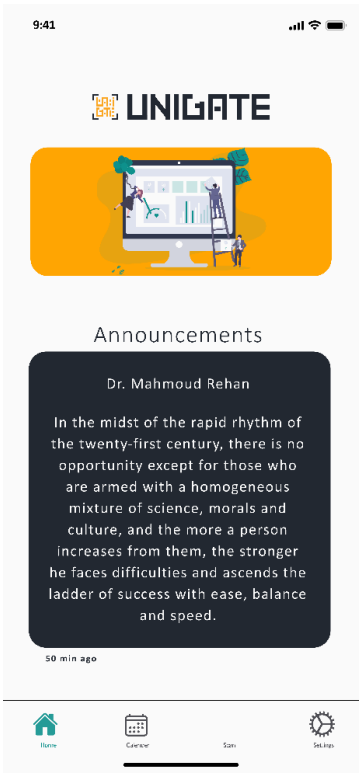


Figure 4. announcements viewing

Announcement viewing

The system easily allows the audience to see what professors/instructors announces by just opening the application as shown in figure 4.

View weekly Schedule

The system provides an extra feature that audience can easily view their weekly schedule by going to schedule icon. As shown in figure 5

Figure 5. Weekly Calendar

Professors/Instructor Side

Generating Attendance session

The system is allowing the professors/instructors to open a new session of attendance depending on the selected subject and terminate it once done. As shown in figure 6.

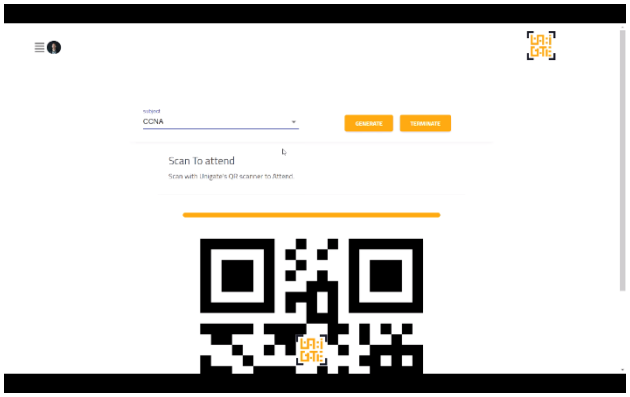


Figure 6. generating attendance session

Create an announcement

Just by writing the announcement it can be delivered to the audience just by click, also it can be deleted by clicking on the bin icon, and you will get the feedback immediately. As shown in figure 6.

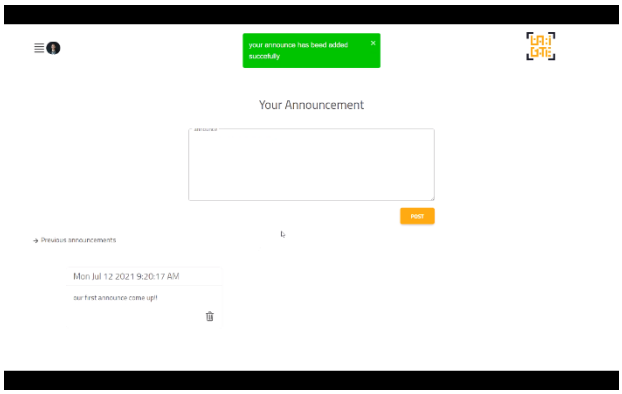


figure 7. Create an announcement.

Modify profile properties.

The owner of the account will be able to modify his/her profile Name and Picture, also to update subjects, include add and delete subjects. As shown in figure 8

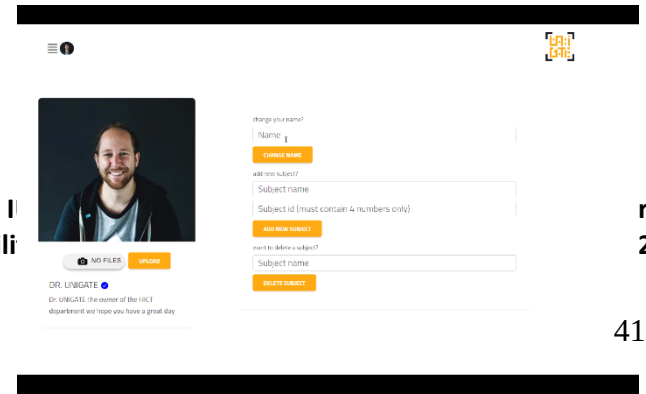


figure 8. Modify profile properties.

VII. RESULTS

We pushed the limits giving a one second rate for the QR code to change automatically on our site and scanning did work.

Data sending and retrieving through firebase and Redis works fine in the initial release and this how we see it is secure:

Firebase uses TLS protocol to secure data and safely send reset request to user emails.

Using Redis through GCP Gives us secures the connection with TLS protocol.

VIII. CONCLUSION AND FUTURE WORK

The System is actually a work-in-progress, it needs continuous development, but it achieved what we wanted it to be and more, that is why we think we should consider the following in our future plan:

1. Admin dashboard, to make it easier to manage the system.
2. Exporting attendance in excel sheet.
3. Switching to flutter hooks, hooks makes apps more fast with readable organized code.
4. Allowing professors to attend students through college id. (If the student doesn't have a smart phone)

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