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Design of a Mobile Access Control Application to Optimize Security and Efficiency in the Entry and Exit of University Students in Peru

Asencios-Trujilo Lida Violeta[1], Asencios-Trujillo Lucia[2], La Rosa-Longobardi Carlos Jacinto[3], Gallegos-Espinoza Djamila[4], Piñas-Livia Cristina[5], Perez- Siguas Rosa[6], Matta-Solis Hernan[7]

[1]Escuela de posgrado: Universidad Nacional de Educación Enrique Guzmán y Valle
Lima-Peru
lasencios@une.edu.pe

[2]Escuela de posgrado: Universidad Nacional de Educación Enrique Guzmán y Valle
Lima-Peru
asenciostrujillolida@gmail.com

[3]Escuela de posgrado: Universidad Nacional de Educación Enrique Guzmán y Valle
clarosa@une.edu.pe

[4]Escuela de posgrado: Universidad Nacional de Educación Enrique Guzmán y Valle
gallegosespinozadja@gmail.com

[5]Escuela de posgrado: Universidad Nacional de Educación Enrique Guzmán y Valle
Lima-Peru
lpinas@une.edu.pe

[6]TIC Research Center: eHealth eEducation: Instituto Peruano de Salud Familiar
Lima-Peru
hernanmatta@gmail.com

[7]TIC Research Center: eHealth eEducation: Instituto Peruano de Salud Familiar
Lima-Peru
hernanmatta@gmail.com

Abstract— The main objective of this research work is to design a mobile access control application to optimize security and efficiency in the entry and exit of university students in Peru. For the development of this work, the RUP methodology was used and among its different stages the purpose of the work and the way in which this application was designed are explained. Also, we know that the technological advance with the passing of them is increasing is beneficial to use for problems that may arise in society, education, etc. in this case for the safety and efficiency of entry and exit of university students. Finally, a well-designed and properly implemented mobile application can be a powerful tool to optimize security and efficiency in the access of university students in Peru, thus contributing to a more effective and convenient educational experience for all involved.

Keywords- Mobile application, RUP methodology, students, design.

I. INTRODUCTION

Student safety is a priority. An efficient and safe entry and exit system helps prevent incidents such as robberies, assaults or risky situations that may affect the physical and emotional integrity of students. Therefore, an efficient entry and exit process can reduce the possibility of incidents, such as tumult or congestion, which can result in injury or property damage [1].

Likewise, an orderly and controlled system for the entry and exit of students allows university authorities to maintain better control over who enters and leaves the institution, which can be crucial in emergency or security situations [2].

The efficiency in the entry and exit of university students facilitates compliance with the rules and regulations established by the university, which contributes to an adequate academic environment and respect for the rights and responsibilities of students. A university that guarantees safety and efficiency in the entry and exit of its students projects a positive and attractive image both nationally and internationally. This can influence the attraction of new students and the prestige of the institution [3].

The safety and efficiency in the entry and exit of university students in Peru are essential to protect the safety and well-being of students, maintain an adequate academic environment and contribute to the academic success and reputation of educational institutions. The installation of access control systems with smart cards or mobile applications allows universities to manage who has access to different areas of the

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campus centrally. This helps ensure that only authorized persons can enter specific areas [4].

Universities can develop mobile apps that allow students to securely register and authenticate when entering and leaving campus. These applications can provide real-time information on parking availability, public transportation schedules, and other mobility-related services. In this way, to avoid long waits at entry and exit points, electronic queue management systems can be implemented that allow students to schedule their arrival and departure at specific times, reducing crowding [5].

Technology offers numerous tools and solutions that can significantly improve the safety and efficiency in the entry and exit of university students in Peru. Proper implementation of these technologies can optimize the student experience and strengthen security on college campuses. A mobile application can play a critical role in improving security and efficiency in the entry and exit of university students in Peru in several ways: Students can use the mobile application to securely authenticate themselves when entering the university campus. This can be done through methods such as facial recognition, QR code scanning or biometric authentication. This ensures that only authorized students have access.

Similarly, students can check out through the mobile app. This can help the university keep track of who is on campus at any given time and can be useful in emergency situations [6].

The mobile app can provide up-to-date information on class schedules, events, and activities on campus. Students can plan their arrival and departure according to their schedules, reducing congestion at peak times. The app can offer real-time information about the availability of on-campus parking or public transportation alternatives. Students can reserve parking spaces in advance [7].

The main objective of this research is to design a mobile application for access control to optimize security and efficiency in the entry and exit of university students in Peru.

The research work is structured as follows, in session II literature review, III methodology, IV results, V discussions and finally VI conclusions.

II. LITERATURE REVIEW

The author [8], focuses on developing a web platform adaptable to various devices (such as smartphones, tablets, laptops and PCs) in order to modernize and improve the process of registration of classes, entrances and exits in the University Corporation Minuto de Dios. Currently, the process is outdated and unecological. To achieve this, they propose the creation and implementation of a web platform that allows management from the cloud and is accessible from any device mentioned. It is planned to implement QR codes in each classroom of the university so that professors can scan them with their smartphones and register their classes digitally or through links sent to their institutional emails. This will streamline the process and make it friendlier. In addition, the administrative platform will allow to see the history of registered classes in real time, which will help identify problems such as equipment failures, material damage or dirt in the classrooms. In summary, the project seeks to modernize and make more efficient the process of registering classes and control the status of classrooms in real time through the use of a web platform and QR codes.

The author [9], infers in creating a mobile application that manages the entry and exit of bicycles of students, professors and administrative staff at the headquarters of the Cooperative University of Colombia (UCC) in Bogotá. UML (Unified Modeling Language) models are employed to improve the quality of the software, ensuring that it meets the metrics and requirements necessary for bicycle access control through a state-of-the-art mobile application developed with Ionic and Angular. The Scrum agile development approach is used to obtain both a web application and a mobile application that meets the access control needs of the university. In short, the software developed meets the needs of the university by improving the management of bicycle parking on its campus through a mobile and web application.

Likewise, the author [10] infers to automate the processes of controlling student access to the Learning and Research Resource Center (CRAI) of the State University of Milagro (UNEMI). The project is based on the central question: How could the automation of entry and exit processes to CRAI-UNEMI improve access control, reduce waiting time and generate user attendance reports? The need for this project arises from the observation of the inconvenience experienced by the academic community due to long lines and delays caused by manual processes at the reception of the center.

III. METHODOLOGY

For the following research work, the RUP methodology was used, which will be detailed as follows:

A. BEGINNING

The main objective of the research is to design an access control mobile application to optimize security and efficiency in the entry and exit of university students in Peru.

1. **User Registration**: The app must allow college students to securely register and verify their identity to gain access.
2. **Attendance Record:** Automatically record student attendance as they enter and leave campus, making it easy to track and report attendance.

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3. **Problem Reporting:** Allow students to report security issues or incidents through the app for quick response by authorities.
4. **Access History:** Provide students with a history of their previous accesses and the ability to see if there has been unauthorized access to their accounts.
5. **Administrative Application:** Develop a companion application for university administrative or security staff to monitor and manage student access.

B. ELABORATION

Figure 1 shows the system architecture of the mobile application design, how it will be structured where users will have to download it and what they register will be stored in the application database for better control of entry and exit of university students in Peru.

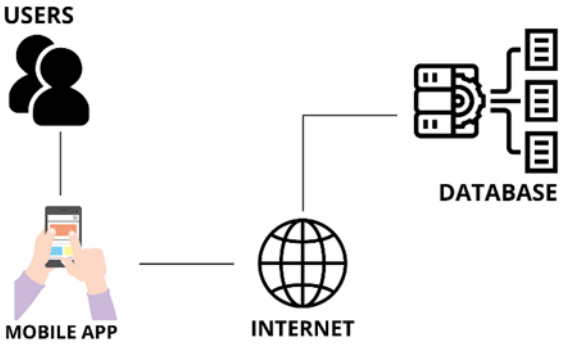

Figure 1. System architecture

C. CONSTRUCTION

In Figure 2, you can see what the beginning of the design of the mobile application will be that will have two buttons: register and start. It is necessary to have a username and password in order to comply with our main objective, which is the security and efficiency of the entry and exit of university students.

Also, in figure 3 you can see the modules that the application will have, which are: registration that has a QR that the student will show when entering the campus so that those in charge can register their attendance and departure of each student, this button has been implemented to prevent another student from using a code of his partner and register it as if it were his own.

Figure 2. Login

Figure 3. Modules

On the other hand, figure 4 shows the student attendance and exit registration module, where the QR code will show the student's data and mark their entry and exit.

In Figure 5, the calendar module is shown where each user can access to see how many attendances he has had and how many absences, he will also be able to know by selecting the day the time of entry and exit, allowing to have a record with all the data stored.

Finally, in figure 6 is the schedule module where each student can visualize their class schedule, allowing them to control their time and arrive well to classes.

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Figure 4. Support Module

Figure 5. Attendance/no-show record

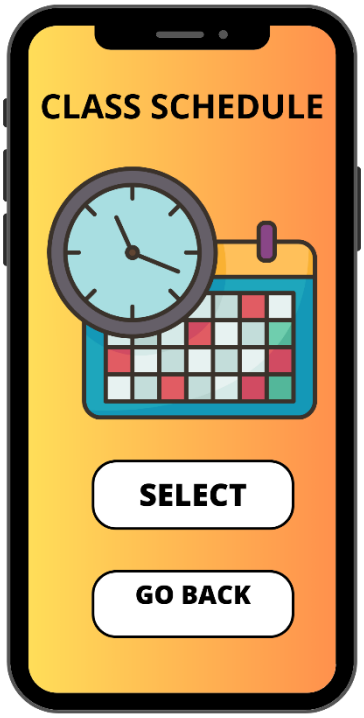

Figure 6. Class Schedule

D. TRANSITION

A survey was conducted to 15 university students to know their requirements as users for the design of the mobile application, the questions that were asked were the following:

1. Do you think a mobile app could be used to check in and out of your study campus? By asking this question it is expected to know if students would be willing to have an application to register their entry and exit times, where 80% agreed and 20% indicated that maybe. Figure 7 shows the results.

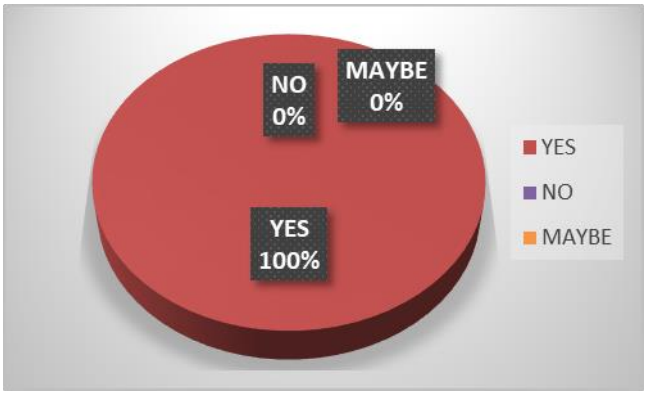

Figure 7. Use of the mobile application

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2. Would you use a mobile app will check-in and check-out be more effective? By asking this question what you want to get is the opinion of university students, where showing the application and the QR that it generates will prevent other classmates from posing as one preventing data usurpation. Figure 8 shows the results where 100% of students agree to use the mobile application.

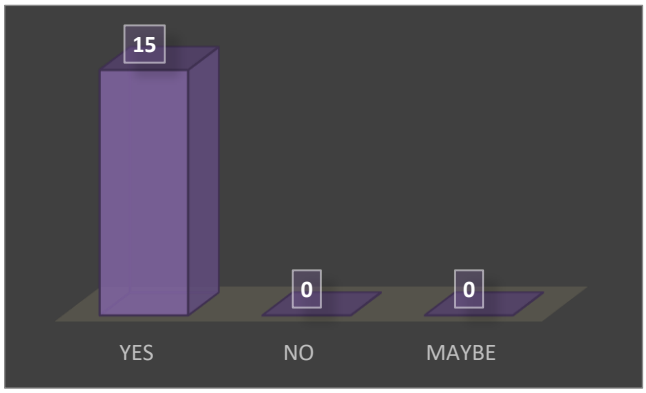

Figure 8. Use of the application

IV. Discussion

The author [8] presents an interesting proposal to improve the efficiency and security in the registration of classes and the control of the state of the classrooms in the Minuto de Dios University Corporation in Colombia. The focus on modernizing

- University Context in Peru: The State University of Milagro (UNEMI) may have specific needs and characteristics different from universities in Peru. It is essential to adapt the proposal to meet the particular needs of educational institutions in Peru.
- Technology Used: The proposal mentions process automation, but does not specify what type of technology would be used. For a mobile application in Peru, it is important to select technologies that are widely accessible and compatible with common mobile devices.

V. Conclusion

The design of a mobile application for access control with the aim of improving security and efficiency in and entry and exit of university students in Peru is an initiative of great relevance in the digital and technological era. This application can bring numerous benefits, such as the reduction of waiting times, the automation of processes, the monitoring of attendance and the improvement in the management of security in educational institutions. However, its success will depend to a large extent on adapting to the specific context of the country, taking into account local regulations, the needs of Peruvian universities and the culture of use of technology among students. In addition, special attention should be paid to data security and privacy, as well as inclusivity to ensure that all students can benefit from this tool.

Finally, a well-designed and properly implemented mobile application can be a powerful tool to optimize security and efficiency in the access of university students in Peru, thus contributing to a more effective and convenient educational experience for all involved.

academic processes is valuable, and using technology such as a web platform and QR codes seems like a wise strategy. However, when analyzing this proposal from the perspective of the Peruvian context, it is important to consider some specific differences and challenges that could arise in the implementation of a similar mobile application for the safety and efficiency in the entry and exit of university students in Peru.

The author's proposal [9] to create a mobile and web application that manages bicycle access at the Universidad Cooperativa de Colombia (UCC) in Bogotá is interesting and relevant in the context of mobility and sustainability in universities. However, when considering the adaptation of this proposal to the Peruvian context and to the management of entry and exit of university students instead of bicycles, some key considerations emerge: Different Needs and Priorities: Although bicycle management is important in terms of sustainable mobility, the entry and exit management of university students in Peru could have different needs and priorities. For example, it could focus more on student safety and efficiency in controlling access to facilities.

The author's proposal [10] to automate access control processes to the Learning and Research Resource Center (CRAI) of Milagro State University (UNEMI) is a relevant and beneficial approach in terms of security and efficiency for universities. However, when considering its application in the Peruvian context and specifically for the entry and exit of university students in Peru, some important considerations arise:

References

[1] Guaña, E. P. R., Rosado, S. G. P., & Quijosaca, F. (2019). Evaluación de la calidad en uso de un sistema web/móvil de control de asistencia a clases de docentes y estudiantes aplicando la norma ISO/IEC 25000 SQuaRe. *Revista Ibérica de Sistemas e Tecnologias de Informação*, (E19), 108-120.

[2] Escandon Pin, J. X., & Coronel Molina, R. C. (2020).Diseño e implementacion de un prototipo de Marccion con control dactilar utilizando Hardware de Bajo costo y Viualizado a traves de una aplicación Web(Bachelor´s thesis)

[3] Díaz Collantes, J. A., & Flores Soraluz, G. I. (2019).Diseño e implementacion de prototipo de un sistema biometrico para

mejorar el control de asistencia del personal docente en la Facfym.

[4] Pazmiño La Rosa, K. E., & Ramírez Murrieta, G. A. (2019). *Aplicación móvil para control de acceso y asistencia en la empresa Ecuador on Rails mediante reconocimiento facial y códigos QR utilizando el Framework React Native camera y tecnología Numato* (Bachelor's thesis, Universidad de Guayaquil. Facultad de Ciencias Matemáticas y Físicas. Carrera de Ingeniería en Sistemas Computacionales.).

[5] Proaño Calvas, A. I., & Vallejo Vinueza, D. A. (2020).Sistema de Control e Asistencia y Gestion de Horario de Actividades Docentes (Bachelors thesis, Quito: UCE).

[6] Marti Gonzales, C. (2019). Aplicacion movil y web para el control de asistencia de los empleados de una compañía (Bachelors thesis).

[7] Requena Umbo, S. C., Zapata Varillas, O. R., & Castro Hurtado, A. E. 82021). Aplicación web para el seguimiento y control academico de los estudiantes d elas instituciones educativas del distritio de Castilla-Piura.

[8] Ortiz Suarez, J. J., & Rico Sanchez, Y. M. (2021).Plataforma web(LoggerApp) generadora de codigos QR para optimizar el registro de class, entradas y salias en la Corporación Universitaria Minuto de Dios sede Girardt (Doctoral dissertation, Corporacion Universitaria Minuto de Dios).

[9] Aranas Alcivar, E. A., & Hidalgo Vizhñay, F. A. (2020).Diseño de un aplicación web para el control del ingreso de estudiantes al centro de recursos para el aprendizaje y la investigcion (Bachelors thesis).

[10] Paez, J. A., Cortes, J. A., Simanca, F. A., & Blanco, F. (2021).Aplicacion de UML y SCRUM al desarrollo del software sobre control de acceso.Informacion tecnologia, 32(5), 57-66.