

Development of Mobile Technology for the Protection of Physical Infrastructure

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ABSTRACT

El The main objective of this project is to improve the response capacity, coordination and documentation of security activities, providing the university community with a safer and more reliable environment. Through the implementation of this technological tool, the aim is to optimize the management of human resources dedicated to surveillance, as well as provide valuable data for making strategic decisions regarding security. For this, the conceptualization, development and implementation of the mobile application will be explored in detail, considering technical, operational and security aspects. In addition, the potential impact of this tool on the efficiency of security guards, incident prevention and the general perception of security within the community will be analyzed.

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I. INTRODUCTION

The problem of insecurity on the campuses of Higher Education Institutions is a crucial issue that requires a strategic and specific approach. To address this situation, it is necessary to understand the social, economic, political, territorial and cultural context in which each HEI is located, since these factors directly influence the security of its facilities.

The first step is to recognize that security in HEIs is not simply a matter of physical surveillance, but is deeply related to the broader environment in which they operate. Specific contexts can affect students, faculty, staff, and visitors differently, so it is crucial to understand how these contexts influence the safety of the academic community.

El The initial objective of knowing the type of incidents that occur in HEIs is essential to develop specific strategies and efficiently use available resources. This involves collecting data on the frequency of incidents, types of victims, locations of occurrence, and modus operandi. Having a detailed inventory of these incidents will provide valuable information for the design of short-term insecurity care and prevention strategies.

By understanding the nature of incidents, HEIs can implement appropriate preventative measures and respond effectively to risk situations. This could include improving lighting in vulnerable areas, installing security systems, training staff in emergency protocols, and promoting community awareness on security issues.

Furthermore, it is essential to establish effective communication channels between the academic community and the institution's authorities, encouraging active participation in the identification of security problems and the search for joint solutions. Transparency and collaboration are key to building a secure environment and strengthening trust in security management within the institution.

The need to apply and implement technological tools and continually update patrol control systems arises because the control and monitoring of surveillance patrols are often not optimal according to the need or threat, this absence of monitoring Military rounds do not allow checking the fulfillment of certain functions, therefore, it is relevant to implement them in the BEIM, as well as to show the new state-of-the-art round control systems. To conclude, currently, due to the advancement of technology, the use of electronic security systems has increased, proving to be an effective and quick option for monitoring compliance with surveillance patrols. (García Bravo, 2022).

Digital technologies constitute an important factor in contributing to the growth of productivity and the economy, as well as socioeconomic development, which is why it is relevant for developing economies, such as

Mexico, to work on a medium and long-term strategy. with short-term actions, to effectively achieve the use, adaptation and deployment of such technologies in all sectors of the economy, government areas and society.

Currently, information technologies and the management of mobile applications have become an important resource for project development. In the work of Enríquez et al., (2020), who cites Velez Rojas, (2015) about smart cities and sustainable development, mentions that the application of ICT, together with technological developments, are of vital importance to provide support for measure, analyze and predict environmental changes for future generations. ICTs have important positive impacts on environmental sustainability at several levels: first-order effects, such as increasing e-waste flows; second-order effects, such as improving the energy efficiency of production; third-order effects, such as a shift from product to service in consumption or rebound effects in transportation (Hilty et al., 2006).

Mobile applications (Apps) become an alternative to simplify the development of daily activities. Currently, it is possible to find a large number that are committed to ecology and the environment, whose ultimate goal is to improve the lives of people in a community. sustainable way (Carceller, 2016). In their work, researchers Naser & Concha (2014) cited by Enríquez et al., (2020) mention that ICT not only improves the productivity and efficiency of organizational processes, but also provides the possibility of contributing to a sustainable development in the execution of public plans and programs. On the other hand, Gaona & García (2018) mention that the design of a mobile application includes the definition of requirements and its development strategy, and they refer to high-level programming tools, based on block programming, , which allows rapid design and development of mobile applications, following a prototype development methodology and standards such as ISO 29148.

The Control of periodic rounds are those that detail the specific points and the specific hours that must be clocked in the territory, and its purpose is to prevent anyone from gaining illegitimate access to the property, taking advantage of the knowledge of the routes and the hours carried out by the security entity (Gamero Casado, 2019). This author points out that the control of free rounds are those established within a given time range, thus being the security guard who will record the points in the area, and these may or may not be consecutive, managing to monitor the entire point. at the end of the round (Gamero Casado, 2019).

The purpose of this work is to design an auxiliary technological tool in the management of compliance with the routes designed in the logistics of safeguarding material goods, optimizing their documentation and generating the resources used to be more efficient and increase the well-being and safety of the community.

II. MATERIAL AND METHODS

The proposed methodology is based on the following strategic stages: definition of the prototype, design, development and consolidation. The definition stage corresponds to a bibliographic review on the technological surveillance of existing technological methods for the management of security routes, all through formal sources, such as theses, articles and patents in order to update knowledge obtained about these systems. technological devices and Apps, in order to determine the characteristics and possible technical specifications of the prototype as a whole. For the deliverable of this stage, a technical report is proposed on the characteristics and specifications that the automated hydroponic system prototype must meet.

In the second stage corresponding to the design of the prototype of a technological tool for the management of security routes. Basic and detailed engineering will be carried out, according to the characteristics and specifications defined in the first stage. The deliverable of this stage will be the technical memory of the prototype, as well as the diagrams and procedures for its development, as well as the variable monitoring interface.

In the development stage, the results previously obtained will be considered for the implementation and operation of the prototype. The final product must comply with having all processes tested and validated in an operational environment.

System entry requirements

Information about the facilities that must be monitored (location, type of infrastructure, current status, etc.).

Specifications of the infrastructure to be protected (materials, critical structures, etc.).

Sensor data: Information from temperature, humidity, motion, etc. sensors that monitor the infrastructure.

Documents and records: Written or digitized information that is entered into the system, such as technical reports or procedure manuals.

Geospatial data: Information about the geographic location of the infrastructure being monitored, using GPS or digital maps.

Geolocation Data: Real-time location of mobile devices and monitored infrastructure..

System exit requirements

Immediate alerts through mobile notifications, text messages, emails, or communication systems in the infrastructure.

Automatic responses to security events (activation of alarms, notification of those responsible, etc.).

Reports and Analysis: Automatically generated documents summarizing system status, historical data analysis, and recommendations for maintenance.

Graphical displays: Screen representations that show the current state of the infrastructure, such as interactive graphs or maps.

User interface: Visual elements that allow users to interact with the system, including menus and buttons that facilitate navigation and access to different functionalities

Data Visualization: Interactive graphs and maps that show the information collected in real time.

III. RESULTS

Mobile’s applications applied to security define an emerging market that can revolutionize this sector. However, the special characteristics that mobile devices present pose an important challenge while opening new fields of research, since developers must make important decisions in the face of the variety of platforms, methodologies, programming languages, frameworks and tools during the development. design, development and testing of applications for mobile devices.

This App (Figure 1) is designed to work in all areas (productive sector, service companies, such as hotels, supermarkets, schools, etc.) Since in both types of companies (production and services) They work through processes, there is an organization and they have material goods, and in both branches there is the concern and commitment to offer the client or interested parties quality in the product and/or service.

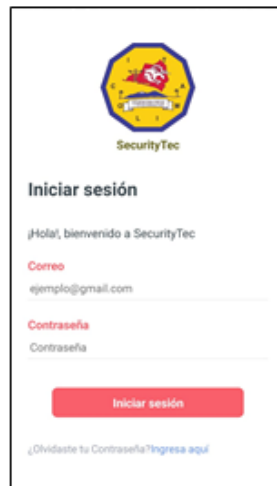


Figure 1: App home screen

Through this auxiliary technological tool for the management of compliance with the routes designed in the logistics of safeguarding material goods, optimizing their documentation and generating efficient use of the resources used and increasing the well-being and safety of the community, the company can become more competent, profitable, and productive.

Table 1: Characteristics of the application

| Characteristics | Description |
|-----------------|--|
| Session start | In this interface, you can log in as either an administrator or a user. To log in correctly, enter the email and password associated with your corresponding account. If the data entered is correct, you will be redirected to the next screen. If the password is incorrect, you will be notified with a message indicating the error. Additionally, if at any time you do not have an internet connection, an error message will be displayed informing you of the lack of connection. |
| Menu | In the administrator menu, you will find a section that displays the name of the administrator account, along with a navigator that allows you to access various available screens. On the first screen, called "Register", you can add accounts exclusively for users, in this case, security guards. In the second section, there are the "Reports", where you can view a detailed list of the routes taken by the security guards. The third section, titled "Privacy", gives you access to the terms and conditions that you must take into account to use the application properly. Finally, in the fourth section, you will find the "Logout" option, which will allow you to end the current session and will automatically redirect you to |

| | |
|----------|---|
| | the login screen. |
| Register | The registration screen offers a dedicated space to enter the data of the new user, in this case, a security guard. The following fields are provided that must be completed: Name: Enter the full name of the new user in this field. Email: Registers the email address associated with the user who is registering. Password: Enter a password for the account, ensuring you meet established security requirements. Confirm Password: Verify the previously entered password by retyping it in this field. This screen facilitates the registration process by providing an organized and clear space for entering the new guard's essential information. |
| Reports | The report screen presents the information on the routes taken in an organized manner through a detailed table. This table includes the following fields: Type of Tour: Indicates the nature or category of the tour taken. Buildings Toured: Shows the buildings visited during the tour. Date and Time of the Tour: Provides precise temporal information, indicating when the tour took place. User Email: Identifies the email of the user responsible for the tour. The screen allows you to filter the information according to the user's email and the date of the tour, thus providing additional functionality for easy search and classification of data. Additionally, when you select a specific row that represents a tour, you are automatically redirected to the notes associated with that tour. This functionality speeds up the review and detailed analysis of the information collected during each tour. |
| Notes | On this screen, the notes corresponding to the selected route are presented, detailing the name of the building and the observations associated with said place.. |
| Privacy | This section provides the detailed terms and conditions of the application, establishing the regulations and commitments that govern its use. Here, aspects related to privacy, the processing of personal data, and the responsibilities of both the user and the application provider are addressed. The privacy screen seeks to ensure transparency and mutual understanding about how user data is handled and protected, thus promoting a trustworthy and secure environment for using the application. |
| Scanner | This screen uses the device's camera to scan the QR code of the selected building. If the QR code does not match the building, an error message will be displayed. On the other hand, if the QR code matches the building, the user will be redirected to a form to enter the notes corresponding to the building. |
| Form | On this screen, a form will be presented that will include the name of the building for which the notes are being recorded, as well as a space for entering said notes. Once the relevant notes have been captured, the user can press the send button to transmit the information, being then redirected to the main screen. |
| Support | This section provides a detailed guide on how to use the application, offering clear and concise explanations of the functionalities present on the home screens and reports. Each section is described in detail, accompanied by illustrative images that facilitate visual understanding of each function. Additionally, a technical support section is included where an email address (Gmail) is provided to receive reports of inconveniences or problems related to the application. This direct communication channel guarantees an agile and efficient response to resolve any inconvenience that users may encounter while using the application. |

Favorable results are expected with the implementation of this tool since not only ideas are enough to seek change, but also concrete actions such as those included in the App. Additionally, the implementation of cutting-edge technological tools will be sought for the control and development of the project, which will promote the constant updating of companies that adopt it and continuous improvement through research.

IV. DISCUSSION AND CONCLUSION

SecurityTec is an application designed to efficiently manage and document the tours carried out by security guards. Its main objective is to guarantee compliance with the daily scheduled patrol routes, thus contributing to strengthening security at the Tecnológico Nacional de México in Colima.

Together, SecurityTec not only ensures compliance with planned security rounds, but also improves response capacity, operational efficiency and decision-making in the security field.

The mandatory elements that a safety route and its report must have been established.

Technological surveillance of existing technological methods for the management of security routes was carried out and the applicable regulatory elements were identified.

A conceptual proposal for a technological tool for the management of security routes was developed.

A prototype of a technological tool was designed for the management of security routes. establishing the user profile of the designed technological tool.

Usability tests (man-machine language) of the developed tool were carried out, integrating the necessary operability.

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