



Design and build an Android-based Occupational Health and Safety Information System application for Universitas Brawijaya

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ABSTRACT

Occupational Health and Safety (OHS) plays a critical role in safeguarding the well-being of staff, students, and visitors within academic institutions. Universitas Brawijaya recognizes the importance of a comprehensive OHS Information System to efficiently manage and disseminate vital safety information across its campus. This paper presents the design and development of an Android-based Occupational Health and Safety Information System (OHSIS) application tailored specifically for Universitas Brawijaya. The proposed OHSIS application aims to enhance the university's OHS practices by providing a user-friendly mobile platform that empowers staff, students, and visitors with essential safety-related information. Leveraging the popularity and accessibility of Android smartphones, the application will facilitate real-time access to safety guidelines, emergency protocols, hazard notifications, and safety training materials. The development process involved a systematic approach that encompassed several stages, including requirements gathering, system analysis, design, implementation, and testing. In the requirements gathering phase, input was solicited from key stakeholders, such as university administrators, faculty members, students, and OHS experts, to ensure that the application's features align with their needs and preferences. The OHSIS application boasts an intuitive user interface, which incorporates efficient navigation and streamlined access to critical safety information. Users can readily browse through a wealth of safety resources, such as safety manuals, instructional videos, and educational modules. Furthermore, the application features an emergency alert system, enabling users to report incidents promptly and receive real-time assistance. Incorporating cloud-based storage and integration with the university's existing OHS infrastructure, the OHSIS application ensures seamless synchronization and data sharing. Additionally, the app will employ robust security measures to safeguard sensitive user information and protect against unauthorized access. The application was rigorously tested through user acceptance testing and simulated scenarios to evaluate its usability, functionality, and performance. Initial feedback from beta testers exhibited positive responses, highlighting the app's effectiveness in promoting safety awareness and incident reporting. In conclusion, the Android-based Occupational Health and Safety Information System (OHSIS) application developed for Universitas Brawijaya serves as a powerful tool in strengthening the university's safety culture. With its comprehensive features and user-friendly design, the OHSIS application is poised to make a significant impact on ensuring the well-being of all members of the university community and fostering a safer academic environment. Future enhancements may include incorporating data analytics to identify patterns and trends in incidents and accidents, enabling proactive safety measures and continuous improvement of the OHS practices at Universitas Brawijaya.

Keywords: Occupational Health and Safety, Android application, Information System, Universitas Brawijaya and Safety awareness.

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Y. A. Yusran et al. (eds.), *Proceedings of the 2023 Brawijaya International Conference (BIC 2023)*, Advances in Economics, Business and Management Research 294,

https://doi.org/10.2991/978-94-6463-525-6_43

1. INTRODUCTION

The occupational safety and health (K3) system is very important to apply in the work environment or campus environment. K3 is an important part of every organization or institution to protect employees or workers from various risks and dangers that may occur in the work environment, and also to promote employee health according to Law Number 1 of 1970 [1]. Brawijaya University as one of the largest universities in Indonesia has many activities involving students, lecturers and employees. These activities include research, teaching, administration, and campus services. Therefore, it is necessary to have an effective and efficient K3 system in monitoring, identifying and handling potential dangers that may occur according to Government Regulation Number 50 of 2012 [2]. Good K3 management at universities will help reduce the risk of accidents and injuries, increase productivity and performance, and improve the quality of the work environment and campus environment as a whole. However, the K3 system in the university environment is often less than optimal in its implementation, especially in terms of collecting data, monitoring and reporting events related to K3 in the campus environment according to the RI Ministry of Health. [3]. Designing an Android-based K3 system application at Brawijaya University is one solution that can be used to help K3 management on campus. This application can provide convenience in collecting data, monitoring and reporting events related to K3 in the campus environment. Apart from that, this application can help increase awareness and participation of students, lecturers and employees in paying attention to K3 aspects in the campus environment according to Brawijaya University [4]. The Android-based K3 application will allow users to report K3 incidents that occur in real-time. The collected data can be used to monitor and evaluate safety and health in the campus environment, as well as to carry out risk analysis and identify areas that need improvement. Additionally, the application can provide access to OHS guidance, instructions and relevant information to assist employees and other users in addressing OHS risks.

2. LITERATURE REVIEW

The design of an Android-based occupational safety and health (K3) system application at Brawijaya University is based on the concept of occupational safety and health (K3) which is very important in the world of work, which is a set of activities carried out to minimize the risk of accidents and illnesses that occur in a job , including hazard and risk identification, risk assessment, risk control, monitoring and evaluation, as well as reporting and corrective action, and in today's digital era, technology applications can play a very important role in increasing user awareness and participation in maintaining occupational safety and health , especially the K3 application which can help users access the necessary information regarding work hazards and risks, as well as provide solutions in overcoming emergency situations, and in Indonesia, K3 applications have begun to develop rapidly in the last few years, with several K3 applications having been developed in Indonesia, such as "K3 Plus" which was developed by the Ministry of Manpower and Transmigration, and "Safety First" which was developed by the National Disaster Management Agency, so designing an Android-based K3 application is very important to make it easier for users to access information about K3, which can be accessed easily via smartphone, so that users can obtain information about K3 anywhere and anytime, as well as increase user awareness and participation in maintaining occupational safety and health, with several benefits from the Android-based K3 application such as making it easier for users to access information about K3, increasing user participation in participating in the K3 program, as well as providing convenience in reporting K3 incidents.

Studies related to Occupational Safety and Health (K3) aim to ensure that the work environment is free from the risk of injury and disease that could harm employees. This involves the identification and evaluation of risks, as well as the development and implementation of procedures and policies to mitigate identified risks. Theories that may be the basis for designing K3 applications include theories related to K3, such as Hazard Identification and Risk Assessment (HIRA), K3 Management, and Occupational Health and Safety Management Systems (SMS-K3). HIRA is used to identify potential hazards and risks associated with certain jobs or activities, while K3 Management and SMS-K3 are used to manage risks and ensure that relevant procedures and policies are followed and implemented correctly.

Findings related to designing Android-based K3 applications can include the use of information and mobile technology to facilitate the process of identifying hazards and reporting K3 incidents. The K3 application can enable users to report K3 incidents directly to the authorities, update information related to risks and hazard assessments, and provide guidance and resources related to K3. Materials that may be used in designing an Android-based OSH application may include programming languages such as Java or Kotlin, development platforms such as Android Studio, and technologies such as GPS and cameras to facilitate reporting of OSH incidents and mapping of identified

risks. In addition, researchers can collect data from employees and related parties within Brawijaya University to ensure that the K3 application is designed according to their needs and preferences.

Research on mobile application development for safety and health management in the construction industry by H. Gu et al. [5] shows that mobile applications can help workers in the field to speed up reporting of K3 incidents and handling risks. In this research, the K3 application was designed with features that allow users to report K3 incidents directly, identify potential hazards and risks, and access resources related to K3. This research also shows that K3 applications can speed up responses to K3 incidents and reduce the risk of injury to workers in the construction industry. A study on the role of mobile applications in occupational safety and health management by A. M. Mahajan et al. [6] discuss that mobile applications can increase employee compliance with K3 policies, speed up incident reporting, and enable quick access to resources related to K3. This study shows that K3 applications can facilitate communication between employees and management, as well as improve the overall effectiveness and efficiency of K3 management. In this study, researchers also identified several challenges associated with using the K3 application, such as privacy and data security issues. Designing an effective K3 application that suits the needs and preferences of users within the Brawijaya University environment can be done through collecting data from employees and related parties, as well as using programming languages such as Java or Kotlin, development platforms such as Android Studio, as well as technology such as GPS and cameras to facilitate K3 incident reporting and mapping of identified risks. By combining findings and theories related to K3 management, such as Hazard Identification and Risk Assessment (HIRA), K3 Management, and Occupational Safety and Health Management System (SMS-K3), designing an Android-based Occupational Safety and Health (K3) system application can play a role important in improving occupational safety and health within the Brawijaya University environment.

Steps that can be taken to conduct research on Designing Occupational Safety and Health (K3) System Applications in the Android-Based Brawijaya University Environment:

1. Preliminary study

Conduct an initial study on K3 policies within Brawijaya University and evaluate the existing K3 management system. Apart from that, it is also necessary to conduct research on the use of information and communication technology in K3 management as well as mobile applications that have been developed in similar environments.

2. Needs analysis

Analyzing user needs (employees and related parties) for Android-based K3 system applications. This is done by collecting data through interviews, surveys, or direct observation in the field.

3. Application design

Designing Android-based K3 system applications using programming languages such as Java or Kotlin and development platforms such as Android Studio. Application design must consider the features that users need, such as K3 incident reporting, identification of potential hazards and risks, risk mapping, and access to K3-related resources.

4. Application development

Developing an Android-based K3 system application based on the design that has been made. During this stage, it is necessary to test and evaluate the application to ensure that the application can function properly and meet user needs.

5. Implementation and use

Implementing an Android-based K3 system application within the Brawijaya University environment and providing training to users on how to use the application. After the application is implemented, periodic evaluations need to be carried out to ensure the application can help improve occupational safety and health within the Brawijaya University environment.

6. Evaluation and improvement

Evaluate the use of the Android-based K3 system application periodically and make improvements or corrections to the application if necessary. Application evaluation and improvement can be carried out based on feedback from users, data analysis results, and the latest technological developments.

With this roadmap, it is hoped that research on the design of occupational safety and health (K3) system applications in the Brawijaya University environment based on Android can be carried out systematically and produce applications that can help improve occupational safety and health in the Brawijaya University environment.

3. RESEARCH METHODS

This research was conducted using experimental research methods. The purpose of this research is to obtain an explanation of the problem under study by connecting cause and effect between the dependent variable and the independent variable that influences the problem, namely by testing the smart safety helmet tool in the world of construction both in terms of comfort and safety based on work safety standards in the world of construction, which includes suitability to needs according to Qomariyatus Sholihah [7]. The implementation of this research was carried out by:

1. Literature Study

The literature study was carried out by searching for literature through national journals, previous research, the internet and books regarding theories related to the problem being studied.

2. Pre-experimental design

Used to test design prototypes for smart safety helmets and research instrument equipment with parameters for suitability for comfort and work safety in the world of construction. This needs to be done to ensure that the installation of research tools and instruments can function properly when the actual experiment is carried out.

3. Experimental

Testing the design of the Occupational Safety and Health (K3) System Application Design in the Android-Based Brawijaya University Environment with the following steps:

Designing an Android-based Occupational Safety and Health (K3) System Application in the Universitas Brawijaya Environment.

4. Data Collection

This research uses two types of data, namely primary data about the results of products in the form of smart helmet development for the world of construction.

5. Tool Design

Application requirements analysis: Identify user needs and functional and non-functional requirements for the application. Talk to relevant parties such as safety and health staff, end users, and management to understand their needs and the purpose of the application.

User interface design: Design a simple, easy-to-use, and attractive user interface (UI) for the application. Choose colors, fonts, and other visual elements to create a consistent and professional appearance. Development platform selection: Select the Android development platform that will be used to create the application.

Application workflow creation: Create application workflows based on user needs and desired functionality. Create a flowchart to show how users will interact with the application from start to finish.

Database creation: Create a database to store application data such as usernames, passwords, and other information. Make sure the database is well designed and secure to prevent data leaks.

Implementation of application features: Start implementing required features such as registration, login, data input, profile settings, and other features. Make sure that these features are well integrated and easy for users to use.

Testing: Perform application testing to ensure that everything works properly and meets user requirements. Test the application across various devices and network conditions to ensure that the application can run smoothly in various environments.

Launch: Once the app is tested and declared ready, it can be officially launched on the Android app store. Make sure the app meets app store requirements and is safe for users to download and use.

Maintenance: After launch, ensure the app remains updated and well managed. Perform regular maintenance to fix bugs and improve application performance. Listen to feedback from users and act on it to improve the app.

4. RESULT AND DISCUSSION

4.1. K3 System Design

Designing an Occupational Health and Safety (K3) Information System is a complex process that includes strategic steps in creating, developing and implementing an information system that comprehensively supports the management and implementation of K3 in the work environment. The main objective of designing this K3 information system is to collect, store, manage, analyze and present data and information related to K3 efficiently, accurately and timely, so that it can be used to make appropriate decisions in order to maintain safety, health, and the welfare of workers in the workplace. In the initial stages of designing an K3 information system, identifying business needs and requirements is a critical step that must be carried out carefully. This involves active participation from various related parties, including management, K3 staff, and workers themselves. Data collection is the next stage, where this system must be able to collect various information, such as data on accident incidents, injuries, occupational diseases, exposure to hazards, K3 inspection results, and worker health data, accurately, in detail and systematically. After the data is collected, the data processing and analysis process is the next step in designing the K3 information system. In this stage, big data analysis technology (big data) and artificial intelligence (AI) can be utilized to identify trends, patterns and potential risks that may be difficult to detect manually. Thus, this information system is able to provide in-depth insight into K3 conditions in the workplace, thereby enabling K3 management and staff to take preventive and corrective actions in a timely manner. The success of designing an K3 information system also depends heavily on alignment with applicable regulations and safety standards. This system must be designed to meet the requirements of K3 regulations set by local regulatory bodies, as well as ensure that sensitive data related to K3 is kept confidential and is not misused by unauthorized parties. Therefore, a strong data security layer must be implemented in these systems. Aspects of accessibility and readability are also serious concerns in designing K3 information systems. An intuitive interface and clear data display must be provided so that the system can be easily accessed and understood by all users, from management to workers at various levels. This will support the effective use of the system and facilitate a faster and more precise decision making process. In addition, the K3 information system must support reporting of K3 incidents quickly and accurately. This system must also enable efficient communication between various related parties, such as management, K3 staff and workers, in order to share the latest information regarding K3 and preventive actions that need to be taken. Furthermore, training for users on how to use the K3 information system correctly must be carried out to ensure the system is used optimally. Routine maintenance and system updates also need to be carried out so that the system continues to run efficiently and in accordance with changing needs and the latest technological developments. Finally, performance evaluation is an important aspect in designing K3 information systems. Regular evaluation of system performance will help identify weaknesses and necessary improvements to increase the effectiveness and efficiency of the system in supporting K3 programs in the workplace. Overall, designing a good K3 Information System will provide great benefits for companies in maintaining worker safety and health, reducing the risk of accidents, and complying with applicable regulations. With an effective K3 information system, it is hoped that workers' productivity and work quality will increase, creating a safer and healthier work environment, as well as making a positive contribution to the company's long-term growth and success.

4.1.2 SIMK3 UB Based on Android

The implementation of an IT-based SMK3 measurement system has an important role in maintaining occupational safety and health and maintaining the continuity of safe work processes according to Sholihah et al. [8]. Within the Brawijaya University environment, the Android-based K3 Information System has become an innovative technology solution that is highly mobility-oriented and supports the management and implementation of occupational health and safety in the campus environment. With the adoption of the Android platform, this K3 information system provides advantages in terms of accessibility and ease of use. This allows users, including staff and students, to access and use K3 information quickly and efficiently via their Android mobile devices, thereby encouraging better awareness and action regarding occupational safety and health across campus. of internet-based occupational safety and health. One of the main advantages of the Android-based K3 Information System is its ability to provide real-time access and higher mobility for users. By using an Android device such as a smartphone or tablet, K3 staff, lecturers, students and other related parties can access K3 data, report incidents or potential dangers, and take preventive action whenever and wherever they are on campus. The use of computers in the future has the potential to dominate human work and overcome the limitations of human computing capabilities. In this context, the Internet of Things (IoT) allows users to control electronic equipment remotely via the internet, utilizing more efficient work automation according to Sholihah et al. [8]. In addition, the Android-based Occupational Safety and Health (K3) Information System can utilize special features of mobile devices, such as sensors, cameras, and GPS location. This allows users to collect data directly from the field, take pictures, or record visual information related to K3 situations more easily. The collected data and

information can be immediately uploaded to the server and accessed by related parties for further analysis, integrating the potential of IoT in the context of internet-based occupational safety and health. In the design and user interface aspects, the Android-based K3 Information System at Brawijaya University must be designed with a focus on ease of use and responsive display on mobile devices. The intuitive and user-friendly interface will help users, especially those unfamiliar with technology, to access and use the system smoothly. Apart from that, the Android application can also be integrated with other features, such as push notifications, to make it easier for users to receive the latest notifications and information regarding K3. Data security is also a major concern in designing an Android-based K3 Information System. This system must have a strong security layer to protect sensitive and confidential company data related to K3 from unauthorized access. Security measures, such as data encryption and user authentication, must be implemented to prevent potential security threats and data breaches. Implementation of an Android-based K3 Information System at Brawijaya University must also be accompanied by training for users on how to use the application correctly and efficiently. This training is important so that all users can maximize the potential of the K3 information system and understand all the available features. With the Android-based K3 Information System at Brawijaya University, it is hoped that occupational safety and health in the campus environment can be improved significantly. Easier and more accurate data collection, faster reporting of incidents, and better accessibility of OHS information will help OHS management and staff identify risks, implement preventive measures, and improve the safety culture at the university. Thus, this Android-based K3 Information System will contribute positively in creating a safer, healthier and more productive work environment for all campus residents at Brawijaya University.



Figure 1 SIMK3 UB Application Login Display

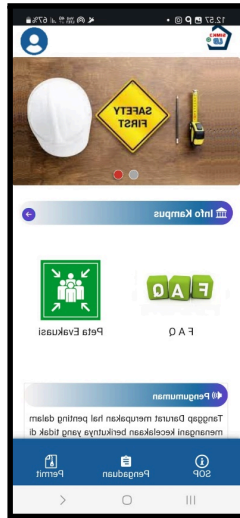


Figure 2 SIMK3 UB Application Home Display

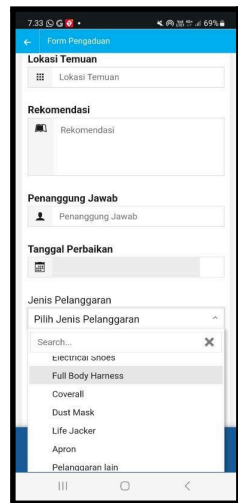


Figure 3 Display of the UB SIMK3 Application Complaint Report



Figure 4 Evacuation Map Display of SIMK3 UB Application

CONCLUSION

The K3 Information System which is integrated and based on Android provides the advantages of high accessibility and mobility, so that users can easily access and use K3 information anytime and anywhere. Special features on mobile devices also help enrich the data collected and make it easier to report incidents from the field. Implementation of the K3 Information System needs to be supported by active participation from all related parties, including management, K3 staff, lecturers, students and other related parties. Effective training of users is also important to maximize the benefits of the system and ensure proper use.

Data security is crucial in implementing the K3 Information System at Brawijaya University. This system must have a strong security layer to protect sensitive K3-related data and prevent potential security threats and data breaches. With the K3 Information System at Brawijaya University, it is hoped that the university can achieve a better level of occupational safety and health. Accurate and fast data collection, efficient incident reporting, and better accessibility of K3 information will help identify risks and minimize the potential for accidents and injuries, as well as create a safer and healthier work environment for all campus residents.

ACKNOWLEDGMENTS

With sincerity and gratitude, we would like to express our deep appreciation to the Institute for Research and Community Service (LPPM) Universitas Brawijaya for the financial grant that has been given to me and my team. This grant is not just financial assistance, it is also a very meaningful form of support in realizing and advancing our research innovation.

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