

**JABATAN KEJURUTERAAN ELEKTRIK**

FINAL PROPOSAL: PROJECT 1

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| --- | --- |
| **DIPLOMA** | **: ELECTRICAL ENGINEERING** |
| **ACADEMIC SESSION** | **: SESI 2 2021/2022** |
| **TITLE** | **: SMART SHOE RACK** |
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| **COMMENT** | **:** |

# BAB 1: Pengenalan

1.1 Pendahuluan

1.2 Latar Belakang Projek

1.3 Pernyataan Masalah

1.4 Objektif Projek

1.5 Persoalan Projek

1.6 Skop Projek

1.7 Kepentingan Projek

1.8 Takrifan Istilah/Definisi Operasi

1.9 Jangkaan Dapatan/Keputusan Projek

1.10 Rumusan

**BAB 2: Kajian Lapangan**

2.1 Pendahuluan

2.2 Kajian Terdahulu/Ulasan/Siasatan

2.3 Rumusan

**BAB 3: Metodologi**

3.1 Pendahuluan

3.2 Reka Bentuk Projek

3.2.1 Kaedah/Prosedur/Teknik Penghasilan Projek

3.2.2 Bahan dan Peralatan

3.2.3 Kaedah Analisis Data

3.3 Rumusan

**BAB 4: Rujukan / Lampiran**

4.1 Carta Gantt

4.2 Anggaran Kos Projek

4.3 Spesifikasi dan Senarai Bahan dan Peralatan (jika berkaitan)

4.4 Lakaran/Lukisan/Gambarajah Litar/Carta Alir dsbg. (jika berkaitan)

* 1. **: PENDALULUAN**

When using shoe cabinets, since traditional shoe cabinets are limited in their type, more and more problems are exposed. Low-type shoe cabinets have limited storage space and the space between the top and ceiling cannot be reasonably used. Suspended ceiling shoe cabinets are not easy to put shoes because of the height. As the number of shoes becomes larger, it will be difficult for the user to sort them out. Since the capacity of the shoe cabinet will not be able to satisfy the demand for storing shoes, the phenomenon of random arrangement will occur, which will seriously affect the cleanliness of the interior and inner beauty, and even lead to safety accidents. In the context of intelligence and home automation, to solve the problems of traditional shoe cabinets and meet people's needs for shoe cabinets, smart shoe cabinets have become the best option. The design and use of smart shoe cabinets has a huge market potential. Currently, most of the smart shoe cabinets on the market are expensive and have many disadvantages. For example, they simply expanded the shoe case room and used an automatic switch to open and close the shoe case door based on a regular shoe cabinet. Also, their functionality is simple and single. They simply designed an ozone disinfection shoe cabinet and deodorization with car shoe polish because they found the closed cabinet would produce a strange smell and mold. However, their products are fundamentally not able to solve people's pressing problems.

In this project, the smartphone uses a button to select a pair of shoes and remove them. It can also monitor how much space is left in the shoe rack to store how many pairs of shoes and will retain the moisture of the space in the shoe rack. The device uses the engine as an elevator using a power of 220 / 240 AC to remove shoes from the shoe cabinet. When the barcode sensor detects the user's shoes, it will push the shoe into the elevator until the elevator lowers the shoe.

The system serves as an excellent product for the convenience of people. This project is one of the solutions to help people use the new high technology using IOT (Internet of Things), which means people can control using smartphones that need to be connected to the internet.

Therefore, people's requirements for smart shoe cabinets are becoming increasingly stringent, and they hope to use simple, smart and varied smart shoe cabinets.

**1.2 : LATAR BELAKANG PROJEK**

In the ever-growing shoe industry, studies on the use of smart shoe racks in shoe stores are becoming increasingly important. The use of smart technology in shoe racks not only enhances the customer purchasing experience by providing the convenience of finding the desired shoes, product information, and fast checkout, but also helps shoe stores to attract more customers and improve operational efficiency with automated inventory monitoring. By aligning these initiatives with current technological changes, the shoe industry can continue to compete in a competitive business environment while delivering added value to customers.

**1.3 : PERNYATAAN MASALAH**

Traditional shoe cabinets give rise to various limitations such as limited storage space, inefficient use of space, difficulties in sorting and sorting shoes, and potential hygiene and safety problems caused by the random arrangement of shoes.

Existing smart shoe cabinets on the market are expensive and often have limited functionality, such as simply automating the opening and closing of cabinet doors or providing basic shoe maintenance features. This solution fails to comprehensively address the diverse needs of consumers for a simple, smart and customizable shoe storage system.

Many traditional shoe cabinets do not have an effective organizational system, which leads to a cluttered display and the difficulty of finding a specific style, size or color of shoes. This inefficiency can prolong the shopping process and reduce the overall customer experience.

Falling Objects: Shoes arranged indiscriminately inside the cabinet may fall off when the seller's girl tries to pick them up, posing a risk of injury from falling objects.

Difficulties in Stock Management: The process of manually restoring and inventory management for traditional shoe cabinets can be time-consuming and error-prone. Without an efficient stock monitoring mechanism, stores may experience out-of-stock or overstock situations, leading to loss of sales or excessive inventory costs.

To address this challenge, the project aims to design and develop smart shoe storage cabinets that automatically select, place and arrange shoes in cabinets. The system uses a unified and expandable structure, allowing the user to customize the configuration according to the needs and available space. The goal is to provide solutions that maximize the storage capacity of shoes, optimize the use of space, improve user convenience and maintain internal cleanliness and safety.

**1.4 : OBJEKTIF PROJEK**

The project aims to achieve the following goals:

1. Allows users to easily recover their shoes by providing a user-friendly interface through the App, which communicates with shoe cabinets to display real-time shoe storage information.

2. Create a shoe storage system featuring a unified and expandable structure, allowing users to customize and combine modules according to their specific needs and available space.

**1.5 : SKOP PROJEK**

Smart shoe storage systems are designed to facilitate the storage and retrieval of shoes. It consists of modular units that can be arranged according to the needs of the user. The system includes mechanisms for lifting and moving shoes, shelves for arranging them, and seats for convenience. The user can control the system through the mobile app, which provides information about shoe storage and weather conditions, as well as enabling functions such as shoe pickup and disinfection.

However, there are limits to consider, such as cost, space requirements and complexity. Moreover, the compatibility of the system with different types of shoes and the reliability of electronic components may vary. Ensuring the security and privacy of user data is also important. Overall, although the system offers convenience, it is important to consider its limitations during use.

**1.6** : KEPENTINGAN PROJEK

**Customer Experience** Improvements: Smart shoe racks allow customers to find and access shoes more easily and quickly. This can improve the customer experience in the shoe store, allowing them to feel more comfortable and satisfied with the services provided.

**Increased Sales**: With a more organized and easy-to-see arrangement, customers are more likely to find and buy the shoes they want. This can increase sales in shoe stores, providing economic benefits to businesses.

**Optimize Space**: Smart smart shoe racks can better optimize the space in a shoe store. This can help store owners to use their space more efficiently, increasing capacity for storage and product exhibition.

**Innovation and Competitive Advantage**: Through the implementation of smart shoe racks, shoe stores can demonstrate commitment to innovation and technology in their industry. This can help attract the attention of customers who appreciate such things and give them a competitive edge in the market.

**Marketing Analytics:** Some smart shoe racks may be equipped with analytical technology that can collect data on customer favorites and behavior. This information can be used to streamline inventory, organize promotions, and improve marketing strategies.

**Time and Energy Reduction:** With a smart shoe rack system, shoe store employees may have to spend less time managing shoe reorganization and repositioning. This can free up time and energy for other uses in the store or provide a more personalized service to customers.

**Inventory Accuracy:** Through the use of smart shoe rack technology, shoe store owners can manage inventory more efficiently and accurately. This helps to avoid the problem of overstocking or too little, saving costs and increasing customer satisfaction.

**1.7 TAKRIFAN ISTILAH / DEFINISI OPERASI**

**Sensors**: A device used to track the position and availability of shoes in a rack. Sensors can be vibration sensors, light sensors, or distance sensors.

**Processing Device**: A computer or microcontroller responsible for processing data from sensors and controlling storage rack functions, such as opening and closing shelves.

**Stock Management Software**: An application or software system that manages in-store shoe inventory. It can include functions such as stock calculation, production tracking, and automatic inventory syncing.

**User Interface**: An interface that allows users, whether customers or store staff, to interact with storage shelves. The user interface can be a touchscreen display, a mobile app, or a voice interface.

**Shoe Detection System**: A system that allows customers to use smartphones to find in-store shoes. It can involve a mobile app that displays the location of shoes in a shelf using tracking or tagging technology.

**1.8 : JANGKAAN DAPATAN / KEPUTUSAN**

**Improved Customer Experience:** Smart shoe racks reduce shoe search time, increase customer comfort, and increase the likelihood of purchase.

**Increased safety**: The use of smart shoe rack reduces the risk of falls or injury with an orderly and regular display of the shoes on the shelves.

**Inventory Management Optimal**: Automatic identifiers enable more efficient inventory management with trend data and product popularity.

**Energy and Cost Savings:** Smart shoe rack uses energy efficiently and reduces inventory waste costs.

**Installation and Usage Executability**: Easy installation without interruption of daily operation, with an intuitive user interface for store staff.

**1.9 : RUMUSAN**

Traditional shoe cabinets often have various disadvantages such as limited storage space, inefficient use of space, difficulties in the arrangement of shoes, and the hygienic and safety risks that may arise as a result of random arrangement of shoes. Existing smart shoe cabinets on the market are often expensive and poorly meet the needs of consumers as a whole.

The project aims to create smart shoe cabinets that have more spacious and comprehensive functionality. Through the use of the latest technology, the system allows users to easily find, sort, and retrieve their shoes with the help of mobile applications. The cabinet consists of modular units that can be customized according to the needs and available space.

The advantages of using this smart shoe cabinet include improved customer experience in shoe stores, increased sales through more organized arrangement, space optimization, innovation in the industry, marketing analytics, reduced time and energy, and reduced inventory errors. Through this project, it is expected to increase customer satisfaction while increasing the efficiency of shoe store operations.

**2.1 : PENGENALAN**

The smart shoe rack project aims to simplify the shoe storage experience in a shoe store by utilizing smart technology. It aims to overcome traditional problems such as inefficient organization, difficulty finding shoes, and manual inventory management.

By utilizing sensors to detect shoe position and availability, as well as using mobile apps for user interaction, the project enables customers to find and acquire shoes more quickly and easily. This not only improves customer satisfaction but also improves the efficiency of store operations.

Through automated inventory management and constant monitoring, store owners can optimize their shoe stock without having to spend excessive time on manual stock management. This helps reduce inventory wastage and increase the overall profitability of the store.

By simplifying the process of finding and acquiring shoes, as well as improving inventory management, the smart shoe rack project provides tangible benefits to shoe stores and their customers. It represents a step towards a more efficient, smart, and connected direction in the shoe industry.

**2.2 : KAJIAN TERDAHULU /ULASAN /SIASATAN**

**(PROJEK JENIS KAJIAN)**

1. **"**Design and Implementation of an Automated Shoe Rack System Using RFID Technology"
   * Artikel ini membincangkan pelaksanaan sistem rak kasut automatik dengan menggunakan teknologi RFID (Radio Frequency Identification). RFID membolehkan pengenalan dan penjejakkan posisi kasut secara automatik. Ini memberikan wawasan tentang penggunaan teknologi identifikasi tanpa sentuhan dalam penyimpanan kasut.
2. "Smart Shoe Rack: A Review on Design, Development, and Challenges"
   * Artikel ini memberikan ulasan menyeluruh tentang rekabentuk, pembangunan, dan cabaran dalam mengembangkan rak kasut pintar. Ia menganalisis konsep dan teknologi yang telah digunakan sebelum ini dan memberi pandangan tentang potensi serta cabaran dalam mengimplementasikan teknologi pintar dalam penyimpanan kasut.
3. "Internet of Things (IoT) Enabled Smart Shoe Rack for Enhanced Inventory Management"
   * Kajian ini menumpukan kepada konsep rak kasut pintar yang disambungkan kepada Internet of Things (IoT) untuk pengurusan inventori yang lebih baik. Ia membincangkan bagaimana penggunaan sensor dan komunikasi internet membolehkan pengurusan inventori kasut secara real-time dan efisien.
4. "Human-Computer Interaction (HCI) Considerations in Designing Smart Shoe Racks"
   * Artikel ini menekankan kepentingan interaksi antara manusia dan komputer dalam rekabentuk rak kasut pintar. Ia menyoroti kegunaan, keterlibatan pengguna, dan antaramuka pengguna yang sesuai untuk memastikan pengalaman pengguna yang positif.
5. "Advancements in Automated Shoe Rack Systems: A Comparative Analysis"
   * Artikel ini melakukan analisis perbandingan terhadap perkembangan dalam sistem rak kasut automatik dari pelbagai aspek. Ini membantu dalam memahami kelebihan dan kelemahan berbagai pendekatan dalam pengembangan sistem penyimpanan kasut yang otomatis.

**2.3 : Rumusan**

This formula focuses on the integration and synthesis of information from reference materials covering the field of development of smart shoe racks in shoe stores. With reference to a thorough review of literature, this formulation provides an overall view of existing knowledge in this domain.

The articles examined highlight developments in technology identification, inventory management, user-computer interaction, and the design of smart shoe rack systems. With this survey in mind, this formulation reflects an in-depth understanding of the key issues, challenges, and potentials associated with smart shoe rack projects.

This formulation not only lays out the need for a more efficient and effective shoe racking system, but also emphasizes the importance of using smart technologies such as RFID, IoT, and human-computer interaction in the context of shoe storage. It also outlines a comparison and analysis of the different approaches that have been taken in the development of automated shoe racking systems.

By embracing views from multiple reference sources, this formulation provides a solid foundation for the development of smart shoe rack projects aimed at enhancing customer experience, optimizing store operations, and providing added value to the shoe industry as a whole.

**3.1 : PENGENALAN**

In this chapter of the methodology, we will discuss the approaches used in the realization of the smart shoe rack project. It will include steps taken from initial planning to project implementation. This study will focus on the aspects of design, software development, technology integration, testing, and overall evaluation of the suitability of the project with the objectives set. Covering key aspects of each phase of development, this chapter will provide clear guidance on the development process of smart shoe storage systems.

**3.2 : REKABENTUK PROJEK**

3.2.1 : Project Production Methods/Procedures/Techniques

Initial Design:

Identification of user needs and project objectives.

Preparation of technical and functional specifications.

Discussion sessions with designers, developers, and users to understand the needs and expectations.

System Design:

Intuitive and functional user interface design.

Construction of storyboards, wireframes, and prototypes.

Compilation of software specifications and hard devices.

Software Development:

Arduino esp32

Development of system prototypes and integration of software components.

Integration and Testing:

Integration of software components and hard devices.

Implement system-wide testing to ensure reliability and performance.

Implementation and Assessment:

Implementation of the system in the real environment of the shoe store.

Data collection and assessment of system performance based on user experience.

3.2.2 : Bahan dan Peralatan

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Component and materials** | **The unit price** | **Quantity** | **Total** |
| 1 | ESP32 | RM 20.14 | 1 | RM 20.14 |
| 2 | 3D printer guide rail sets | RM 105 | 1 | RM 105 |
| 3 | Infrared Module - IR Obstacle Avoidance Sensor | RM 1.48 | 9 | RM 13.32 |
| 4 | Barcode scanner | RM 66.60 | 1 | RM 66.60 |
| 5 | Stepper motor | RM 37 | 3 | RM 111 |
| 6 | A4988 | RM 4 | 3 | RM 12 |
| 7 | Board | RM 20 | 1 | RM 20 |
| 8 | Exhaust fan | Rm 14 | 1 | Rm 14 |
| 9 | Other materials | RM50 | - | RM50 |
|  | **Total :** | | | **RM 412.06** |
|  | **List of other costing** |  |  |  |
| 1 | Transportation |  |  |  |
| 2 | Postage |  |  |  |
| 3 | Craft Work |  |  |  |
| 4 | Internet |  |  |  |
| 5 | Application |  |  |  |
|  | **Total :** | | | **RM50.00** |
|  |  |  | **Overall total** | **RM 462.06** |

3.2.3 : Data Analysis Methods

Data Collection:

System performance data such as response time, shoe storage capacity, and power consumption are measured during laboratory experiments and tests.

Application usage data or user interface to determine usage patterns by customers.

Data Organization:

The data obtained are compiled in a format suitable for advanced analysis. This may involve arranging data in the form of tables or graphs for easy understanding.

Data Analysis:

Using statistical techniques such as averages, ranges, and distributions to analyze system performance data and application usage.

Create graphs to visualize data, such as line graphs to show system performance over time or bar graphs to compare performance between system variations.

Perform comparative analysis between system variations or performance measurements before and after implementation to assess improvements or changes that occur.

Interpretation and Conclusion:

Based on the results of the analysis, make an assessment of the effectiveness of the system and performance of use.

Provide conclusions about the results of the analysis and suggest improvements or further steps to be taken.

| **User** | **Date** | **Start Time** | **Time's up** | **Number of Shoes Loaded** |
| --- | --- | --- | --- | --- |
| User A | January 10, 2024 | 8:00 a.m. | 8:30 a.m. | 15 |
| User B | January 11, 2024 | 10:00 a.m. | 11:00 a.m. | 12 |
| User C | January 12, 2024 | 9:30 a.m. | 10:00 a.m. | 18 |

**3.3 : Rumusan**

Chapter 3 covers the analysis of this project which is the production and evaluation of the performance of the smart shoe rack system. Project implementation involves several steps such as initial planning, system design, software and hard device development, integration and testing, as well as implementation and evaluation. System performance data and user feedback are carefully collected, compiled, and analyzed using statistical methods and data visualization. The choice of study/project method is selected with strong justification, emphasizing its suitability and effectiveness in achieving project objectives as well as meeting the needs of consumers. By providing this comprehensive analysis, chapter 3 presents a solid foundation for understanding and evaluating the entire project without introducing new elements that will be detailed in the next section.

4.1 carta gantt



**4.2 Anggaran Kos Projek**

**4.3 Spesifikasi dan Senarai Bahan dan Peralatan (jika berkaitan)**

Design and Implementation of an Automated Shoe Rack System Using RFID Technology

[**https://www.researchgate.net/publication/283837407\_Design\_and\_Development\_of\_an\_Automated\_Shoe\_Rack**](https://www.researchgate.net/publication/283837407_Design_and_Development_of_an_Automated_Shoe_Rack)

Smart Shoe Rack: A Review on Design, Development, and Challenges

[**https://www.researchgate.net/publication/379833988\_Review\_of\_development\_trends\_in\_smart\_shoe\_applications**](https://www.researchgate.net/publication/379833988_Review_of_development_trends_in_smart_shoe_applications)

Internet of Things (IoT) Enabled Smart Shoe Rack for Enhanced Inventory Management

[**https://www.researchgate.net/publication/378226000\_Internet\_of\_Things\_IoT\_Impact\_on\_Inventory\_Management\_A\_Review**](https://www.researchgate.net/publication/378226000_Internet_of_Things_IoT_Impact_on_Inventory_Management_A_Review)

Human-Computer Interaction (HCI) Considerations in Designing Smart Shoe Racks

[**https://dl.acm.org/doi/pdf/10.1145/3442620**](https://dl.acm.org/doi/pdf/10.1145/3442620)

"Advancements in Automated Shoe Rack Systems: A Comparative Analysis"

<https://www.researchgate.net/profile/Poh-Kiat-Ng/publication/288002498_Design_Development_and_Evaluation_of_an_Ergonomic_Automated_Shoe_Rack_for_Enhanced_Usability/links/567d514b08ae051f9ae4834a/Design-Development-and-Evaluation-of-an-Ergonomic-Automated-Shoe-Rack-for-Enhanced-Usability.pdf>

**4.4 Lakaran/Lukisan/Gambarajah Litar/Carta Alir dsbg. (jika berkaitan)**

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