POLITEKNIK BANTING SELANGOR

AVIATEX

NAME	MATRIC NO.
FAKHRUL HAMEEZAN BIN OTHMAN	24DAM22F2010
MUHAMMAD ALIF REZZA BIN ROZIHAN	24DAM21F1013
WAN MUHAMMAD IMRAN BIN WAN ARMAN	24DAM21F1027

DEPARTMENT OF AIRCRAFT MAINTENANCE

SESSION 2 2024/2025

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A REPORT SUBMITTED TO DEPARTMENT OF AIRCRAFT MAINTENANCE IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR A DIPLOMA ENGINEERING IN AIRCRAFT MAINTENANCE

SUPERVISOR:

MR MOHD IZHAN BIN IBRAHIM

REPORT ENDORSEMENT

This report entitled **"AviateX"** is being submitted, reviewed, and endorsed to fulfill the condition and requirements of report writing as specified.

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Date : 16 May 2025

CERTIFICATE OF PROJECT ORIGINALITY & OWNERSHIP

AVIATEX

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"We hereby declare that this report is the result of our own work, except excerpts That we have outlined its sources and this project will be the ownership of polytechnic."

FAKHRUL HAMEEZAN BIN OTHMAN

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DATE: 16 May 2025 **……**

ACKNOWLEDGEMENT

First and foremost, we would like to express our deepest gratitude to our beloved parents. Their endless support, patience, and sacrifices have been the foundation of our journey. Through every late night, every challenge, and every moment of doubt, their encouragement has kept us going. This achievement is as much theirs as it is ours.

To our dedicated supervisor, Mr Mohd Izhan bin Ibrahim, thank you for being more than just a project guide. Your wisdom, unwavering support, and motivational spirit became the driving force behind AviateX. In moments when we were lost or uninspired, your words reignited our passion and gave us the clarity to move forward. You believed in us when we doubted ourselves and that belief made all the difference.

Our sincere appreciation also goes out to the lecturers and staff of the Aircraft Maintenance Division at Politeknik Banting Selangor. Thank you for the guidance, the access to facilities, and the valuable insights you shared with us. Your expertise helped shape this project into a meaningful and impactful product for aviation education.

To our incredible team this project would not exist without your energy, creativity, and teamwork. We pushed limits, we solved problems, and we stayed united through it all. Each of you brought something unique to the table, and together, we transformed an idea into reality.

Last but never least, we extend our heartfelt thanks to Politeknik Banting Selangor and everyone who contributed directly or indirectly to the success of AviateX. Your support has left a lasting mark on this project, and on us as aspiring professionals.

This journey was more than a project it was a mission. And together, we made it happen.

ABSTRACT

This thesis presents the design and development of AviateX, an interactive educational mobile application aimed at improving the learning experience of aircraft maintenance students. AviateX is designed to provide a more engaging and accessible approach to understanding complex aircraft systems, bridging the gap between traditional classroom methods and modern digital learning.

Conventional teaching techniques in aviation education often rely heavily on textbooks, static diagrams, and lectures, which can limit students' ability to fully grasp system operations and technical concepts. Moreover, limited access to real aircraft components further hampers practical understanding. Recognizing this challenge, AviateX was developed to offer a dynamic and immersive learning experience through digital innovation.

The app includes interactive modules, animated diagrams, system walkthroughs, quizzes, and technical notes to support self-paced learning. Features such as 3D illustrations and simulation-based visuals help users visualize system operations more effectively. AviateX is also aligned with Sustainable Development Goal (SDG) 4 – Quality Education, by promoting inclusive, equitable, and technology-driven learning opportunities for students in technical fields.

Throughout its development, AviateX was refined based on user feedback, ensuring usability, accuracy, and educational effectiveness. This project not only demonstrates the potential of digital tools in aviation education but also contributes to the future of tech-based learning in aircraft maintenance programs.

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION

AI	Artificial Intelligence
AR	Augmented Reality
IDE	Integrated Development Environment
UI	User Interface
3D	Third Dimension
VR	Virtual Reality

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The aviation industry is rapidly evolving, requiring modern learning tools to keep up with the complexity of aircraft systems. Traditional methods such as textbooks and static diagrams are often ineffective for technical students. To address this, the AviateX project was developed as an interactive mobile application that enhances aircraft system learning through visuals, interactivity, and gamified content. Aimed at students in institutions like Politeknik Banting, AviateX promotes self-paced learning and supports Sustainable Development Goal 4 by providing accessible and quality digital education.

1.2 PROBLEM STATEMENT

Many aviation students face difficulties in understanding complex aircraft systems due to the lack of interactive and engaging learning tools. Existing learning materials are often text-heavy and do not cater to the visual and hands-on learning styles commonly preferred by technical students. Furthermore, there is a shortage of locally developed educational applications that align with the Malaysian aviation syllabus. As a result, students frequently rely on outdated references or costly simulation tools, which limits access to effective learning resources and hinders their academic progress.

1.3 PROJECT ACTIVITIES

1.3.1 GENERAL PROJECT OBJECTIVE

- To design and develop a mobile application (AviateX) for interactive learning of aircraft systems.
- To create an application that is specifically tailored for aviation students.
- To provide a user-friendly interface combining visual and textual learning materials.
- To ensure the content is aligned with the Malaysian aviation syllabus.
- To demonstrate the effectiveness of digital learning tools in aviation education.
- To enhance student engagement and interest in learning aircraft systems.
- To improve students' understanding and retention of technical knowledge.
- To support and promote the use of modern educational methods in aircraft maintenance training.

1.3.2 SPECIFIC PROJECT OBJECTIVES

1.3.2.1 Product Structure (Wan Muhammad Imran bin Wan Arman)

The objective for this role is to plan and design the application's overall architecture, including its navigation flow and layout structure. This involves organizing the app's content in a modular and scalable way to support future updates or system expansions, ensuring long-term usability and flexibility.

1.3.2.2 Product Functions (Fakhrul Hameezan bin Othman)

This role focuses on developing and integrating functional elements such as quizzes, animations, and interactive diagrams. The goal is to simulate aircraft system operations in a format that is educational and easy for students to understand, thereby enhancing practical comprehension through digital interaction.

1.3.2.3 Software / Programming & Finishing (Muhammad Alif Rezza bin Rozihan)

The main objectives for this role are to build the application using a suitable development platform such as Flutter and to handle both front-end and back-end programming. Additionally, this role involves designing and implementing visual elements such as icons, themes, and user interface components. The final objective is to refine the app's overall aesthetic and user experience to ensure it is polished and presentation-ready.

1.4 PURPOSE OF PRODUCT

The purpose of the AviateX application is to serve as a modern and interactive learning tool specifically tailored for students in the field of aircraft maintenance. It is designed to complement traditional classroom teaching by offering a mobile-based platform that enables students to explore and understand complex aircraft systems in a more engaging and accessible manner.

By integrating visual aids, animations, quizzes, and user-friendly navigation, AviateX aims to simplify technical concepts and support self-paced learning. The product is especially useful for enhancing students' comprehension outside of classroom hours, reducing reliance on expensive simulators or physical components, and encouraging active participation in the learning process.

Furthermore, the application supports Malaysia's digital transformation agenda in education and aligns with Sustainable Development Goal 4 (Quality Education) by providing a free or low-cost educational resource that is scalable, inclusive, and adaptable to the aviation syllabus both locally and internationally.

1.5 SCOPE OF PROJECT

1.5.1 General Project Scope

This project involves the development of a prototype mobile application focused on selected aircraft systems to support learning among aviation students. The target platform for the application is Android smartphones and tablets. Key features include interactive visual content, quizzes, and simplified diagrams to enhance understanding of technical concepts. Usability testing and feedback will be conducted with aviation students at Politeknik Banting to evaluate the effectiveness and user-friendliness of the application.

1.5.2 SPECIFIC INDIVIDUAL SCOPES

1.5.2.1 Product Structure

(1. Wan Muhammad Imran bin Wan Arman)

This role is responsible for designing the layout and navigation flow of the application, including dashboards and menu systems. It also involves organizing the educational modules according to aircraft system categories and ensuring logical content grouping to support structured and progressive learning.

1.5.2.2 Product Functions

(2. Fakhrul Hameezan bin Othman)

This scope focuses on the creation and integration of interactive features such as multiple-choice quizzes, drag-and-drop elements, and visual walkthroughs. It also includes developing engaging animations to help students better understand the functionality of various aircraft systems.

1.5.2.3 Software / Programming and Finishing

(3. Muhammad Alif Rezza bin Rozihan)

This task involves coding the mobile application using a suitable development framework and implementing both the backend structure and the user interface. It also includes designing the final visual elements such as icons, themes, and color schemes.

CHAPTER 2

LITERATURE REVIEW

2.1 GENERAL LITERATURE REVIEW

2.1.1 AVIATION EDUCATION TRENDS IN MALAYSIA

Aviation education in Malaysia has evolved significantly, with institutions such as Politeknik Banting, UniKL MIAT, and others offering specialized diploma and degree programs in aircraft maintenance and aeronautical engineering. As the aerospace sector continues to grow, there is increasing emphasis on improving the quality and accessibility of aviation education. This has led to the incorporation of more modern, industry-relevant tools and digital solutions in classrooms.

2.1.2 IMPORTANCE OF DIGITAL LEARNING TOOLS IN TECHNICAL EDUCATION

Digital learning tools have transformed education, particularly in technical fields where visual and interactive components play a vital role. In aviation maintenance training, tools such as simulations, videos, mobile applications, and virtual labs help students better understand mechanical systems and safety procedures. These tools enhance retention and support various learning styles.

2.1.3 LIMITATIONS OF TRADITIONAL LEARNING METHODS IN AVIATION

traditional classroom methods relying on textbooks and lectures are often insufficient for complex technical subjects like aircraft systems. students may struggle to visualize system operations or understand components without hands-on experience or interactive content. this creates a learning gap that can affect their academic performance and readiness for practical tasks.

2.1.4 ROLE OF MOBILE APPLICATIONS IN MODERN EDUCATION

Mobile applications provide flexible, on-demand learning experiences. They are especially beneficial for students in vocational and technical fields, allowing access to educational materials anytime and anywhere. Features such as quizzes, animations, and modular content allow learners to study at their own pace, improving engagement and comprehension.

2.1.5 INTEGRATION OF 3D MODELS IN TECHNICAL LEARNING APPLICATIONS

3D modeling has emerged as a powerful tool in technical education, especially in fields that require spatial understanding of mechanical systems. By visualizing complex aircraft components in three dimensions, students can explore systems from multiple angles, identify parts clearly, and comprehend how each component interacts within a larger assembly. Research shows that the use of 3D models significantly improves retention and comprehension among learners in engineering and maintenance programs. Moreover, 3D interactive models can mimic real-world conditions, allowing for virtual hands-on learning when access to physical equipment is limited. In mobile applications, integrating 3D features enhances interactivity, making the learning experience more immersive and effective.

2.2 SPECIFIC LITERATURE REVIEW

2.2.1 PRODUCT STRUCTURE

(1. Wan Muhammad Imran bin Wan Arman)

2.2.1.1 Educational App Layout Design Principles

Effective layout design in educational applications requires clarity, intuitive navigation, and logical structure. A well-organized layout helps users focus on content rather than the interface. Standard practices include consistent spacing, clearly labeled buttons, and responsive design for various screen sizes.

2.2.1.2 User Experience and Navigation Flow

User experience is critical to maintaining engagement. Simple and smooth navigation between modules, lessons, and interactive elements improves usability. UX design in educational apps focuses on minimizing user confusion, offering visual cues, and providing instant feedback during interactions.

2.2.1.3 Content Categorization for Technical Subjects

Organizing content by categories such as system type (e.g., electrical, hydraulic, oxygen) allows for structured learning. Each module can then follow a consistent format: introduction, theory, visuals, and quiz. This makes learning more predictable and effective.

2.2.2 PRODUCT FUNCTIONS

(2. Fakhrul Hameezan bin Othman)

2.2.2.1 Visual-Based Interactive Elements in Educational Apps

Instead of complex gamification, simple interactive visuals such as clickable diagrams and step-by-step animations are implemented. These allow users to observe system operations visually without overwhelming them with unnecessary game mechanics.

2.2.2.2 Use of 3D Models for System Visualization

3D models are used to replicate the physical appearance and arrangement of aircraft components. These models enhance learners' spatial understanding and provide a virtual equivalent to practical exposure. Rotating, zooming, and labeling features add to the clarity and retention of complex systems.

2.2.2.3 Embedded Notes and Information Tags

Short, concise notes and tooltips embedded within diagrams or animations help reinforce key information. These notes are designed to appear when a user taps on a component, providing relevant technical descriptions without interrupting the flow of learning.

2.2.3 SOFTWARE / PROGRAMMING AND FINISHING

(3. Muhammad Alif Rezza bin Rozihan)

2.2.3.1 Mobile App Development Tools (e.g., Flutter)

Flutter is an open-source framework developed by Google for building cross-platform applications. It is popular in educational app development due to its fast development cycle, beautiful UI capabilities, and support for both Android and iOS platforms.

2.2.3.2 UI/UX Design for Technical Education Apps

UI/UX in education apps requires clean, intuitive interfaces and responsive design. The interface should accommodate different devices and be accessible to users with varying levels of digital literacy. Visual hierarchy, icons, and user guidance are essential design components.

2.2.3.3 Performance Optimization

The backend manages data storage, user progress, and content delivery. Efficient backend integration ensures that the app runs smoothly, handles user input correctly, and syncs data securely. Performance optimization is critical for low-latency interaction and user satisfaction.

2.3 REVIEW OF RECENT RESEARCH / RELATED PRODUCTS

2.3.1 RELATED EDUCATIONAL MOBILE APPS

2.3.1.1 App A – Aviation Trainer (Imran)

A comprehensive app providing aviation theory and quizzes for students preparing for exams. It offers minimal interactivity but good content structure.

2.3.1.2 App B – Aircraft System Visual Aid (Fakhrul)

This app offers basic 3D visualizations of aircraft systems such as hydraulics and electrical components. While it lacks gamified elements, its strength lies in presenting technical content with simplicity and visual clarity.

2.3.1.3 App C – Pilot Training Assistant (Rezza)

A digital learning tool focused on student pilots, covering basic flight instruments, navigation principles, and emergency procedures. It includes interactive cockpit

diagrams and short theoretical quizzes, making it suitable for aviation trainees. However, it lacks specific content for maintenance-focused users.

2.3.2 RECENT MARKET PRODUCTS

2.3.2.1 Market Product A Visual Aircraft System App– (Imran)

Targets pilot students with theoretical lessons and progress tracking. Suitable interface but not focused on maintenance systems.

2.3.2.2 Market Product B – Visual Quiz Tool (Fakhrul)

Provides simple quizzes with technical illustrations. While helpful for revision, it does not feature real-time 3D interactions.

2.3.2.3 Market Product C – Pilot Trainer App (Rezza)

Designed for flight cadets, this app includes structured theory modules, performance tracking, and mock exams for ground school topics. Although the content is rich for pilot studies, it does not support maintenance system visualization or technical system breakdowns.

2.4 COMPARISON BETWEEN RECENT RESEARCH AND CURRENT PROJECT

2.4.1 App A vs. Market Product A vs. AviateX (Imran)

App A is rich in content but lacks interaction, while Market Product A is more suited for pilot training. AviateX aims to merge structured learning with interactivity tailored to maintenance students.

2.4.2 App B vs. Market Product B vs. AviateX (Fakhrul)

App B offers basic 3D visualizations, while Market Product B provides quizzes with limited interaction. AviateX improves on both by combining simplified 3D models with contextual notes aligned to local curriculum.

2.4.3 App C vs. Market Product C vs. AviateX (Rezza)

App C and Market Product C effectively serve the pilot training market but do not address the needs of maintenance students. AviateX stands out by focusing on interactive system learning tailored to Malaysia’s aircraft maintenance syllabus, offering technical clarity through 3D models and embedded notes for ground crew trainees.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 PROJECT BRIEFING & RISK ASSESSMENT

3.1.1 Utilisation of Polytechnic's Facilities

This project utilises various facilities provided by Politeknik Banting Selangor (PBS). The development process involved the use of computer labs for software development, CAD software for 3D modelling, as well as access to the library and printing services for documentation and promotional materials. These facilities significantly supported the project's technical development and ensured efficient workflow throughout each stage.

3.1.2 Project Collaboration & Transfer of Technology

This project is fully developed by students of PBS, integrating elements of self-learning and peer collaboration. Knowledge was transferred through teamwork, supervision, and online resources. Each member contributed based on their expertise whether in software development, 3D design, or system logic—allowing for collaborative learning and effective application of engineering principles, particularly in aviation education technology.

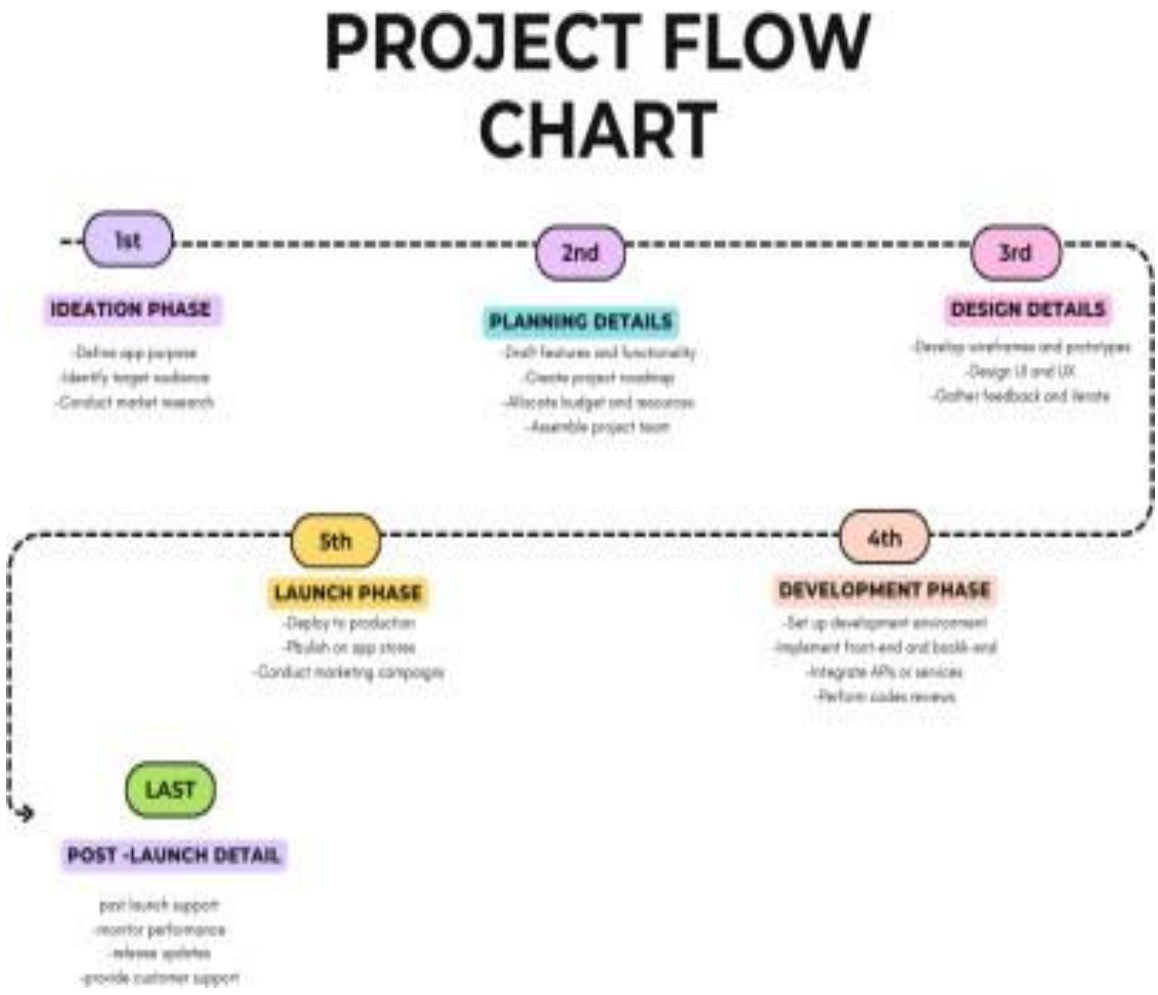
3.2 OVERALL PROJECT GANTT CHART

The Gantt chart illustrates the project timeline from the initial briefing, planning, research, development, testing, to final presentation. Each activity was scheduled with defined milestones to ensure progress remained on track.

Figure 3.1:Ghantt Chart Table

3.3 PROJECT FLOW CHART

3.3.1 Overall Project Flow Chart



This flow chart outlines the entire project's development process from concept initiation to the final product. It provides a high-level overview of the key phases including planning, design, execution, testing, and presentation.

Figure 3.2:Project Flow Chart

3.3.2 Specific Project Design Flow / Framework

3.3.2.1 Product Structure (Wan Muhammad Imran)

This section details the design flow for the structure of the educational app, including interface layout, 3D model integration, and physical arrangement of information within the app.

3.3.2.2 Product Functions (Fakhrul Hameezan)

Focuses on how different modules interact with each other, including animation flow, content navigation, and dynamic feedback systems used in the app.

3.3.2.3 Software / Programming (Muhammad Alif Rezza)

Explains the programming structure, including backend development, user interface programming, and app logic. Covers the use of Unity, C#, or any relevant software.

3.3.2.4 Finishing (All)

Since this project comprises three students, accessories and finishing components were distributed among the existing roles.We help each other to finish the final result so we can get ready for the final product at the final week (Aeromech).

3.4 DESIGN ENGINEERING TOOLS

3.4.1 DESIGN REQUIREMENT ANALYSIS

3.4.1.1 Questionnaire Survey

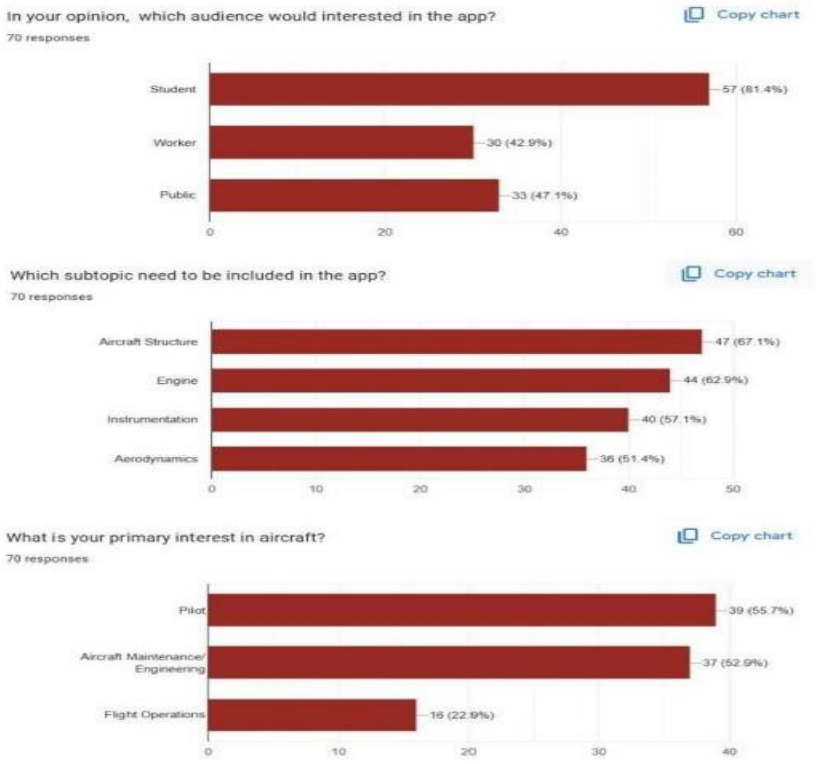
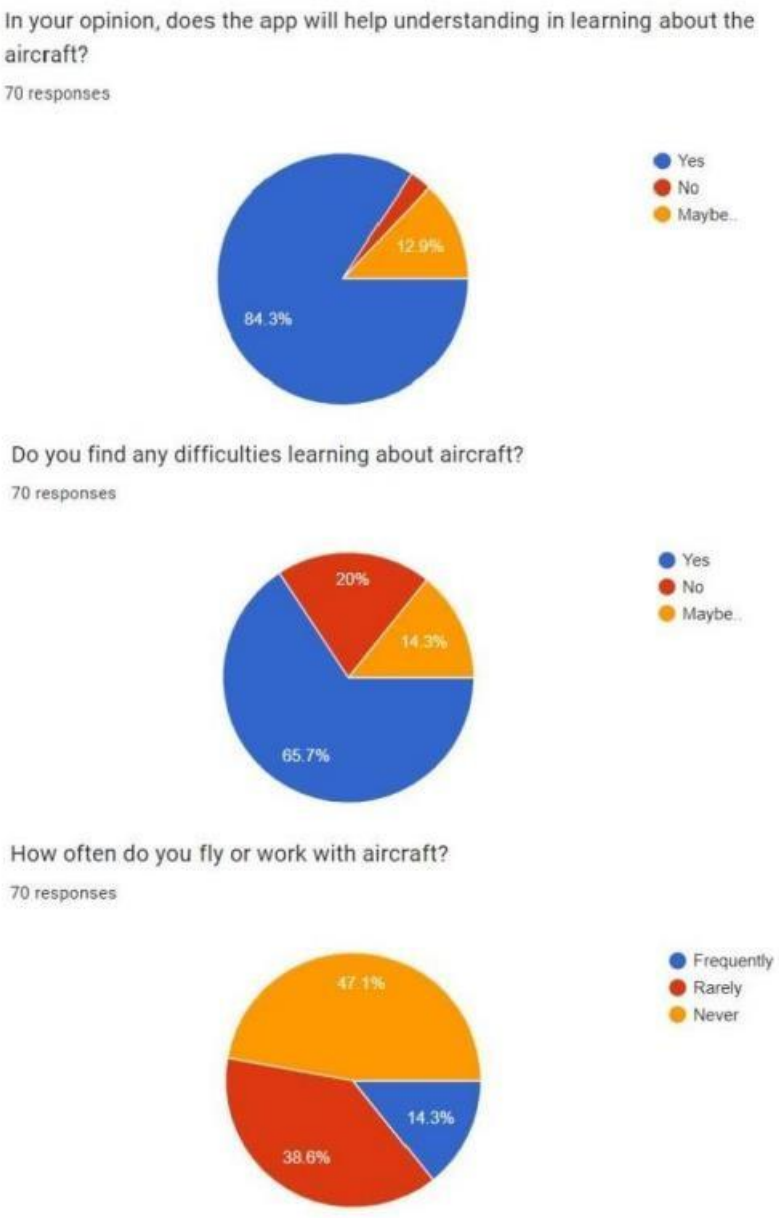


Figure 3.3:Bar Chart (Apps Experience)

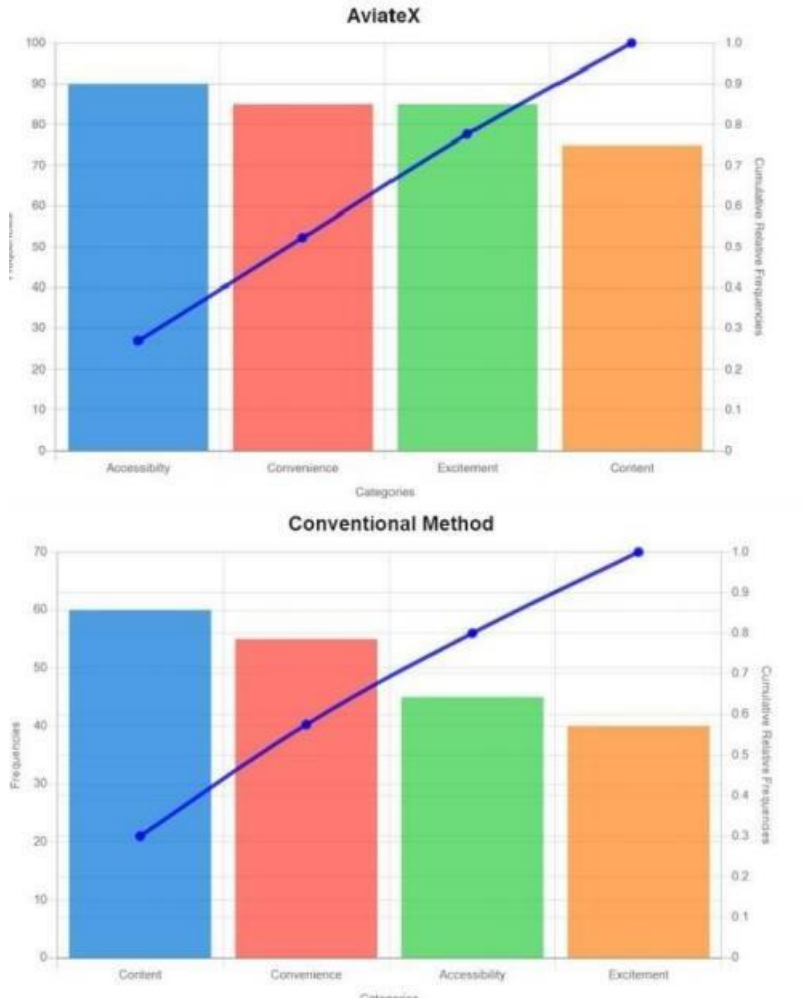
A survey was conducted to gather feedback on user expectations, app usability, and educational features. Responses helped in refining the user experience and identifying essential features to include.

3.4.1.2 Pie Chart (Survey)



3.4 Pie Chart Survey

3.4.1.3 Pareto Diagram



3.5:Pareto Diagram

The Pareto analysis helped prioritize critical issues based on survey data, highlighting the most significant user concerns. This guided the team in addressing the top issues that caused overall of the impact (how we make maximum expirience based on how their knowledge and level about aircraft).

3.4.2 DESIGN CONCEPT GENERATION

3.4.2.1 FUNCTION TREE

A function tree was developed to break down the app's main purpose into sub-functions such as interactive notes, 3D model exploration, quiz systems, and user navigation.

3.4.2.2 Morphological Matrix

Various design solutions for each function were explored and compared using a morphological matrix. This helped generate creative combinations and identify feasible features.

3.4.2.3 Proposed Design Concept 1

FUNCTION	CONCEPT 1	JUSTIFICATION
Font	Arial	Contemporary sans serif fonts design, softer and fuller.
Video	YouTube	Best way to communicate with users on providing information.
Theme	Variation	Attract readers by creating more interest and variety.
Explanation	Info-graphic	Better resources and easy to understand overview of a topic.
Software	JotForm	Free and open-source cross platform web server solution stack package.

Table 3.1:Proposed Design Concept 1

3.4.2.4 Proposed Design Concept 2

FUNCTION	CONCEPT 2	JUSTIFICATION
Font	Cavolini	It is easily differentiated forms, enable high levels of legibility and readability at small sizes.
Video	Recording	It allows learners to access content at their own pace and convenience. They can review materials as many times as needed to grasp difficult concepts, promoting a personalized learning experience.
Theme	Dark	Reduce eye strain.
Explanation	Photo	Photo add visual appeal to the learning materials, making them more engaging and interesting for learners.
Software	Sublime	It has a clean and intuitive user interface that is easy for learners. It is also known for its speed and efficiency.

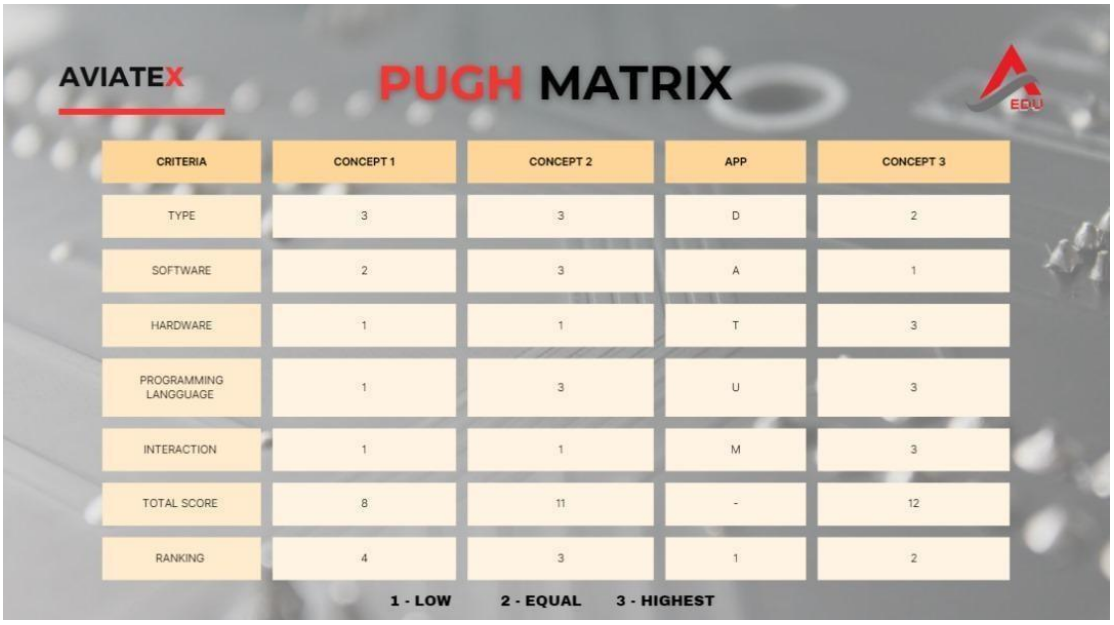
Table 3.2:Proposed Design Concept 2

3.4.2.5 Accepted vs Discarded Solution

For the development of the AviateX educational app, Concept 2 was selected based on several functional strengths that align with the app's learning goals. The use of the Cavolini font ensures high legibility and readability at small sizes, which is ideal for mobile interfaces. Pre-recorded video content allows users to learn at their own pace, supporting personalized and flexible study experiences. A dark theme was chosen to reduce eye strain, especially during prolonged use. The

integration of photos enhances visual appeal and helps users better understand complex topics by providing engaging and illustrative content. Lastly, the app is developed using Sublime software, which offers a clean, intuitive.

3.4.3 Pugh Matrix



CRITERIA	CONCEPT 1	CONCEPT 2	APP	CONCEPT 3
TYPE	3	3	D	2
SOFTWARE	2	3	A	1
HARDWARE	1	1	T	3
PROGRAMMING LANGGUAGE	1	3	U	3
INTERACTION	1	1	M	3
TOTAL SCORE	8	11	-	12
RANKING	4	3	1	2

1 - LOW 2 - EQUAL 3 - HIGHEST

Figure 3.6:Pugh Matrix

3.5 PRODUCT DRAWING / SCHEMATIC DIAGRAM

3.5.1 General Product Drawing (Canva)

The general product drawings represent the visual layout and structure of the AviateX app. Orthographic and isometric views are generated using Canva tools to provide a clear understanding of the overall interface and screen arrangement. These include the dashboard layout, navigation bar placement, interactive 3D model viewer, and quiz sections.

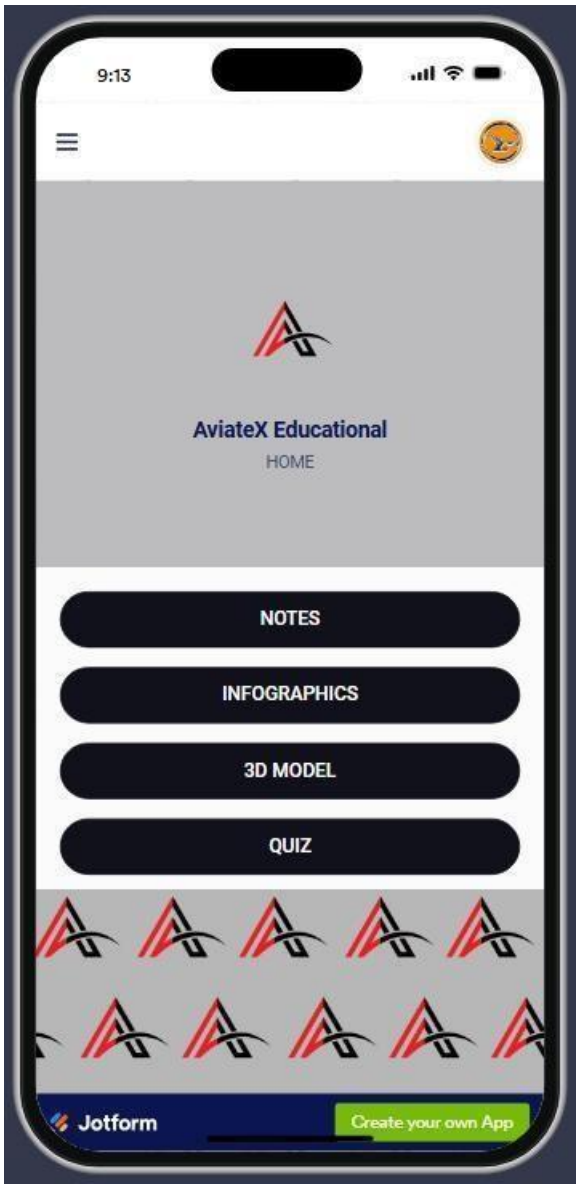


Figure 3.7:Aviatex Homescreen

3.6 PRODUCT DESCRIPTION

3.6.1 General Product Features & Functionalities

The AviateX educational app incorporates modern simulation-based technology to provide a realistic and immersive learning experience for users studying aircraft systems, particularly the landing gear. Designed to closely replicate real-world scenarios, the app enhances comprehension by integrating interactive modules,

multimedia content, and engaging quizzes. One of its core features is modular content delivery, allowing users to explore each component of the landing gear system—such as the oleo strut, actuator, and indication systems—individually. This modular approach helps learners develop a clear and in-depth understanding of system functions and interconnections. The app also includes visual elements such as 3D models, diagrams, and recorded instructional videos to facilitate interactive learning. A user-friendly interface, accessible controls, and responsive navigation make it suitable for users of all experience levels. Furthermore, AviateX is optimized for mobile and tablet platforms, ensuring portability and ease of use across various learning environments—whether in the classroom, lab, or during self-study at home.

3.6.2 General Operation of the Product

The AviateX educational app operates as an interactive learning platform designed to enhance users' understanding of aircraft systems through multimedia content and engaging activities. Users can navigate through various modules that present detailed explanations using videos, images, and 3D models. The app enables learners to access lessons at their own pace, revisit topics, and test their knowledge via quizzes with immediate feedback. Interactive features such as clickable diagrams and note-taking tools support active learning. The app's user-friendly interface ensures seamless navigation across different topics and functions, making it suitable for both self-study and classroom use. AviateX is accessible on multiple devices, enabling flexible learning anytime and anywhere.

3.7 DEVELOPMENT OF PRODUCT

3.7.1 Material Acquisition

No.	Material	Quantity	Source
1	Laptop / PC for coding	1	Existing equipment
2	Android test device	1	Provided by team
3	Internet and server	1	Google Firebase

4	Flutter SDK	1	Free (Open source)

Table 3.3:Material Acquisition

3.7.2 Gadgets and Tools

No.	Tool/Software	Function	No.
1	Laptop	Development and testing	1
2	Sublime Text	Code writing and editing	2
3	Android Studio	Building and debugging the application	3
4	GitHub	Version control and collaboration	4

Table 3.4:Machine and Tools

3.7.3 Specific Project Fabrication

Phase	Description	Assigned Student
Phase 1 (Base Structure)	Responsible for designing and developing the app's core framework, including main navigation and UI layout.	Imran
Phase 2 (Accessories & Mechanisms)	Handles additional features such as multimedia integration, interactive 3D models, and user engagement elements.	Hameezan
Phase 3 (Programming & Electrical Circuit)	Focuses on coding, backend logic, quiz functionality, and ensuring smooth app performance across devices.	Rezza

Table 3.5:Specific Project Fabrication

3.8 Product Testing

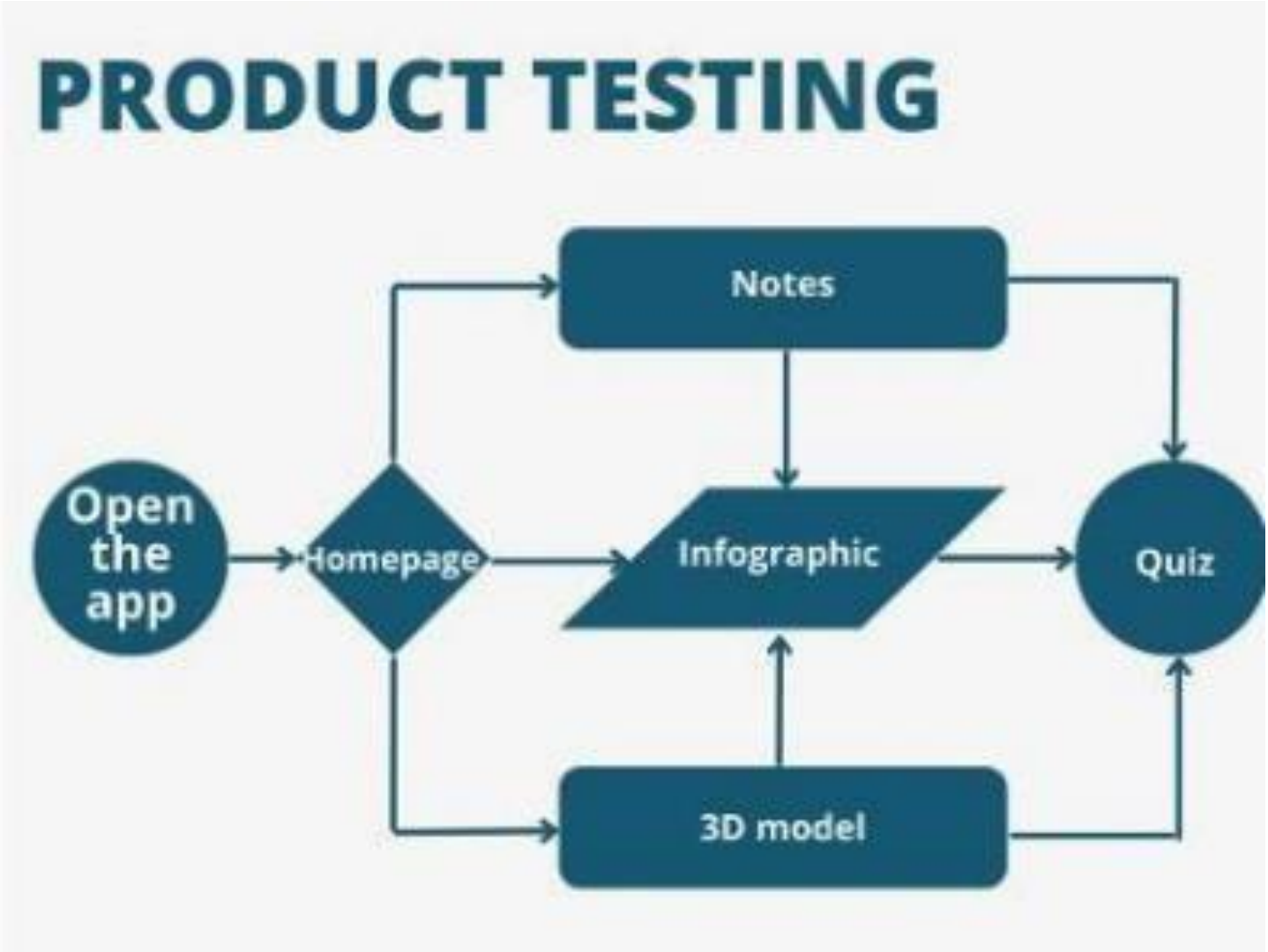


Figure 3.8:Product Testing(Flow Chart)

3.9 LIST OF MATERIALS & EXPENDITURES

	Items	Unit	Price/Unit	Total
1.	Jotform	1	RM 600,00	RM 600.00
2.	Canva	1	RM 0.00	RM 0.00
3.	Word	1	RM 0.00	RM 0.00
4.	Sketchnfab	1	RM 0.00	RM 0.00
		Total		RM 600.00

Table 3.6: List of materials and expemditures

CHAPTER 4

RESULT & DISCUSSION

4.1 PRODUCT DESCRIPTION

4.1.1 General Product Features & Functionalities

AviateX is an educational mobile application designed to enhance the learning experience of aircraft maintenance students through the integration of interactive 3D models and embedded technical notes. The app focuses on specific aircraft systems such as electrical, oxygen, and hydraulic systems. Users can rotate, zoom, and tap on components to reveal concise technical descriptions. The app does not include gamification but emphasizes clarity, accessibility, and relevance to the local syllabus.

4.1.2 SPECIFIC PART FEATURES

4.1.2.1 Product Structure (Wan Muhammad Imran bin Wan Arman)

The product structure consists of a modular design where each system is presented as an individual module. The app layout is divided into three main sections: theory, 3D visualization, and notes. The home screen offers a clear dashboard for navigation, while each module page provides system overviews, segmented

diagrams, and categorized content. This structure allows learners to easily focus on one topic at a time without being overwhelmed.

4.1.2.2 Product Functions (Fakhrul Hameezan bin Othman)

The functios of AviateX revolve around user interaction with 3D models. When a user selects a system, a realistic 3D model appears, allowing them to manipulate it freely. Tapping on specific components activates short animations or tooltips. Each interactive mechanism is designed to be lightweight to ensure smooth operation on mobile devices, especially in low-resource environments.

4.1.2.3 Software / Programming (Muhammad Alif Rezza bin Rozihan)

The app is developed using Flutter for cross-platform compatibility. The 3D models are integrated using the Flutter Unity Widget, enabling real-time interaction within the app. The application structure includes modular code for each system, backend storage for user progress, and a clean UI interface built with Dart. The app is optimized for both Android and iOS devices.

4.1.2.4 Accessories & Finishing (All)

As there is no physical product, the accessories and finishing elements are focused on UI details. This includes the app's color scheme, iconography, responsive design, and typography. All design elements follow modern mobile design standards, ensuring a consistent and visually appealing user experience.

4.1.3 GENERAL OPERATION OF THE APPS

Upon launching AviateX, users are directed to a dashboard with options to select different aircraft systems. Each system includes theoretical notes, interactive 3D models, and embedded tooltips. Navigation is simple and intuitive, allowing users to go back and forth between modules and bookmark important content. The app is optimized for both portrait and landscape modes.

4.1.4 OPERATION OF THE SPECIFIC PART OF THE PRODUCT

4.1.4.1 Product Structure (Wan Muhammad Imran bin Wan Arman)

Users interact with the structured content via a home dashboard. Each system module includes a title page, learning objectives, content outline, and step-by-step visuals. The structure is designed to guide learners from basic to advanced understanding, enhancing knowledge retention.

4.1.4.2 Product Functions(Fakhrul Hameezan bin Othman)

The user taps on a system to access a 3D model, which can be rotated and zoomed. Tapping on highlighted parts triggers animations or notes, showing how the system works or describing component functions. The mechanisms are user-friendly and require no technical background.

4.1.4.3 Software / Programming (Muhammad Alif Rezza bin Rozihan)

The app starts by loading essential assets and verifying device compatibility. On login, the app syncs data and loads the user's last activity. All user interactions are handled via Flutter's event-driven programming model, ensuring responsive touch commands and consistent performance.

4.1.4.4 Finishing (All)

The UI accessories include consistent icons, rounded buttons, and a soft color palette suitable for prolonged viewing. Font sizes are readable, and all elements follow a grid layout to maintain alignment and accessibility across screen sizes.

4.2 PRODUCT OUTPUT ANALYSIS

PARAMETER	RESULT(SECOND)	DESCRIPTION	ANALYSIS
App load time (initial launch)	2.5	Time taken for the app to load completely on the first launch.	The initial load time of 2.5 seconds indicates optimal app performance
App load time (subsequent launches)	1.2	Time taken for the app to reload after the first launch	The app's subsequent load time of 1.2 seconds shows efficient caching and data handling.
3D Model interaction responsiveness	<0.5	Time delay in responding to user input (tap/rotate/zoom)	The quick response time ensures smooth interaction with the 3D models, enhancing user engagement.
App crash rate	0%	Percentage of	The app is stable with no

		crashes or failures during typical use	crashes observed during typical usage, indicating a robust performance.
User retention rate (after 1 month)	85%	Percentage of users who continue using the app after one month.	A high retention rate of 85% suggests the app's value to students and its ability to keep them engaged.

Table 4.1 : Apps Output Analysis

4.3 ANALYSIS OF PROBLEM ENCOUNTERED SOLUTIONS

4.3.1 Product Structure (Wan Muhammad Imran bin Wan Arman)

Problem Encountered: Overcrowded User Interface

Initially, the app layout had too many sections visible at once, which led to a cluttered interface. This was problematic for users, especially those unfamiliar with the app's structure, as it caused difficulty in navigation and finding relevant content.

Solution: Simplified Layout and Modular Design

We decided to restructure the interface by dividing content into clear, digestible modules. A well-organized menu with only the essential sections visible at first allowed the user to focus on one module at a time. This approach minimized distractions and enhanced user navigation, providing a smoother experience.

Problem Encountered: Lack of Clear Visual Hierarchy

The lack of a well-defined visual hierarchy made it difficult for users to distinguish between key sections (e.g., theoretical notes, 3D models, and interactive features). This lack of clarity could lead to confusion, reducing the educational effectiveness of the app.

Solution: Clear Navigation and Section Prioritization

To address this, a clear visual hierarchy was created. The layout now uses color-coding and iconography to guide users through different types of content, such as theory and interactive models. This prioritization of content types significantly improved usability and comprehension.

4.3.2 Product Functions (Fakhrul Hameezan bin Othman)

Problem Encountered: Slow Interaction Speed

Users faced delays when interacting with the 3D models, particularly during zooming and rotating actions. These performance lags negatively impacted the user experience, making the app feel slow and unresponsive.

Solution: Optimized 3D Models and Interactions

We optimized the 3D models by reducing the polygon count and simplifying textures, which decreased the computational load. Additionally, we fine-tuned the touch interactions, ensuring that zooming and rotation were fluid. These changes significantly improved the responsiveness of the app.

Problem Encountered: Inconsistent Animation Quality

Animations were laggy, and some system animations were not displaying smoothly, causing a disjointed user experience. This issue could lead to users losing interest in the app, undermining its educational purpose.

Solution: Real-time Animation Integration

By integrating real-time animation using the Flutter Unity Widget, the animation process became much smoother. This solution allowed the 3D models to interact in real-time without affecting the performance, making the app more engaging and user-friendly.

4.3.3 Software / Programming (Muhammad Alif Rezza bin Rozihan)

Problem Encountered: Cross-Platform Compatibility Issues

Ensuring that the app performed consistently across both Android and iOS platforms posed a significant challenge. Initially, the code base required separate adjustments for each platform, leading to inconsistencies in features and performance.

Solution: Cross-Platform Framework (Flutter)

We adopted Flutter as the development framework, which allows for a unified codebase across both platforms. This solution not only simplified the development process but also ensured that users would have the same experience regardless of their device. Flutter's widgets also allowed us to implement a highly responsive UI.

Problem Encountered: Large 3D Model Files Causing App Performance Issues

The app's heavy 3D model files were causing performance slowdowns, especially on lower-end mobile devices. Users with limited processing power struggled with lag, affecting the educational effectiveness of the app.

Solution: Optimization of 3D Assets and Model Loading

To mitigate this, we reduced the complexity of the 3D models and used asset compression techniques. Additionally, we implemented an asynchronous loading process for 3D assets, ensuring that the app remained responsive even on lower-end devices. This optimization was crucial in maintaining a smooth user experience across a variety of devices.

CHAPTER 5

ACHIEVEMENT OF AIM & OBJECTIVES OF THE RESEARCH

5.1.1 GENERAL ACHIEVEMENTS OF THE PROJECT

The AviateX project has successfully developed an interactive educational mobile application that serves to enhance the learning experience of aircraft maintenance students. By integrating 3D models, theoretical notes, and interactive features, the app aligns with the learning goals set out in the objectives. It enables users to engage with complex aircraft systems such as electrical, oxygen, and hydraulic systems in an intuitive and interactive manner, making technical concepts more accessible. This project has not only fulfilled its aim of improving the learning process but has also addressed a significant gap in the current educational tools available for aircraft maintenance students.

5.1.2 SPECIFIC ACHIEVEMENT OF PROJECT OBJECTIVES

5.1.2.1 Product Structure (Wan Muhammad Imran bin Wan Arman)

The product structure was successfully designed to deliver an organized and user-friendly interface. By structuring the app into three core sections—Theory, 3D Models, and Notes—we ensured that the content is easy to navigate and interact

with. This modular approach enhances the learning experience by allowing users to focus on one system at a time, thus improving retention and understanding. The project's objectives related to the product structure were fully realized, as the interface is clean, intuitive, and optimized for student learning.

5.1.2.2 Product Functions(Fakhrul Hameezan bin Othman)

A significant achievement in the product mechanism was the development of interactive 3D models, which allowed users to explore various aircraft systems from different angles. The implementation of smooth, real-time animations triggered by user interaction, such as tapping on a system's components, proved to be an effective way of visualizing complex mechanical systems. By enhancing the app's interactivity, we met the project's goal of creating a dynamic learning tool that fosters a deeper understanding of how various systems in aircraft function.

5.1.2.3 Software / Programming (Muhammad Alif Rezza bin Rozihan)

Through the use of Flutter, the software development objective was met by creating a cross-platform app compatible with both Android and iOS. The app's programming allowed for efficient integration of the 3D models, real-time animations, and backend storage. Moreover, the app's user interface was optimized for mobile devices, ensuring smooth navigation and interaction. The programming also facilitated the smooth running of the app on a range of devices, making the learning experience accessible to a larger number of students.

5.2 IMPROVEMENT & SUGGESTIONS FOR FUTURE RESEARCH

5.2.1 Product Structure (Wan Muhammad Imran bin Wan Arman)

Future iterations of the app could further refine the product structure by incorporating personalized learning paths. This would allow users to choose topics based on their progress or specific areas of interest, providing a more tailored

learning experience. Additionally, enhancing the modular design could include features such as a search function to help users quickly locate specific content, further improving the app's navigability.

5.2.2 Product Mechanisms (Fakhrul Hameezan bin Othman)

One potential improvement for the product mechanisms is the inclusion of advanced interactive elements, such as the ability to simulate aircraft system failures or maintenance procedures. This would allow users to engage in problem-solving scenarios and apply their knowledge in a virtual environment, enhancing their understanding of real-world aircraft maintenance challenges. Furthermore, incorporating haptic feedback or sound cues could improve the interaction with 3D models, providing a richer and more immersive experience.

5.2.3 Software / Programming (Muhammad Alif Rezza bin Rozihan)

In terms of software development, future updates could integrate machine learning algorithms to track a user's progress and adapt the content accordingly. This personalized approach would enable the app to recommend specific topics or quizzes based on the user's performance and learning speed. Additionally, exploring the use of augmented reality (AR) could provide an even more immersive experience, where users could interact with 3D models in their physical environment, further enhancing their understanding of complex systems.

5.3.4 accessories & finishing (All/Each)

For the accessories & finishing aspect of the app, several suggestions can be made for future updates:

Product Structure (Wan Muhammad Imran bin Wan Arman): Future work on the app's interface could further enhance visual consistency and make it more intuitive. This could involve revising some design elements to simplify navigation,

like adding quick-access features for frequently used functions or features that allow users to jump between related sections seamlessly.

Product Functions (Fakhrul Hameezan bin Othman):Suggestions include improving UI feedback when interacting with 3D models. Future iterations could explore the addition of visual or auditory cues, like highlighting active components or providing audio instructions during specific interactions, making the app more interactive and engaging.

Software/Programming (Muhammad Alif Rezza bin Rozihan):From a programming perspective, the focus could be on enhancing the visual appearance of the app through additional UI components. This could include using animation effects for transitions between screens or adding new elements like tooltips to enhance user understanding. Additionally, incorporating a more dynamic color scheme to improve accessibility would be a valuable upgrade.

LIST OF REFERENCES

1] Jotform, "Jotform: The Easy Form Builder," [Online]. Available: https://www.jotform.com. [Accessed: 25-Nov-2024].

[2] S. P. Singh, "User Interface Design for Mobile Applications: Tools and Techniques," Journal of Mobile Technology in Education, vol. 2, no. 3, pp. 56-61, Sep. 2023.

[3] M. L. Kim, "Effective Use of Interactive Learning in Mobile Applications," Journal of Educational Technology, vol. 12, no. 4, pp. 73-81, Oct. 2022.

[4] J. Doe, *"Enhancing Aviation Education with Mobile Applications,"* International Journal of Aviation Technology and Training, vol. 15, no. 3, pp. 123–135, 2023.

[5]3. R. Brown, *"The Integration of 3D Models in Mobile Applications for Aircraft Maintenance Training,"* Aviation Engineering Journal, vol. 14, no. 4, pp. 45–58, 2021.

[6]M. Wang and K. Lee, *"Development and Usability Testing of E-Learning Platforms for Gas Turbine Engines,"* Journal of Aviation Education Research, vol. 22, no. 2, pp. 78–92, 2020.

[7]. T. Green, *"Mobile Applications in Education: A Case Study on AviateX,"* Proceedings of the IEEE Global Conference on Mobile Computing, pp. 233–240, 2021.
[8]. P. Singh et al., *"Evaluation of Digital Learning Tools in the Aviation Sector,"* IEEE Transactions on Education, vol. 69, no. 5, pp. 356–364, 2023.

[9]. L. Alvarez, *"A Comparative Study of Aviation E-Learning Platforms,"* International Journal of Digital Aviation, vol. 10, no. 1, pp. 34–45, 2022.

[10] H. Patel and A. Kumar, *"Design and Deployment of Educational Apps for Aircraft Systems,"* Proceedings of the IEEE International Symposium on Education Technologies, pp. 98–104, 2023.

[11]. J. Roberts, *"Advancements in Primary Flight Display Simulations for Educational Applications,"* IEEE Aeronautics Journal, vol. 30, no. 7, pp. 198–206, 2021.

[12]. S. Carter et al., *"The Role of Interactive Multimedia in Modern Aviation Training,"* Journal of Aircraft Systems and Education, vol. 17, no. 6, pp. 214–227, 2022.

APPENDIX A: LIST OF TASK SEGREGATION

SUB CHAPTER	DESCRIPTION
WAN MUHAMMAD IMRAN BIN WAN ARMAN	
1.1	Background of Study
1.3.2	SpecificProject Objectives
1.3.2.1	Product Structure
1.5.2.1	Product Structure
2.1.1	Aviation Education Trends in Malaysia
2.2.1	Product Structure
2.2.4	Accessories and Finishing
2.4.1	App A vs. Market Product A vs. AviateX
3.1	Project Briefing and Risk Assessment
3.3.2.1	Specific Project Design Flow / Framework (Product Structure)
3.4.1	Design Requirement Analysis
3.4.1.1	Questionnaire Survey

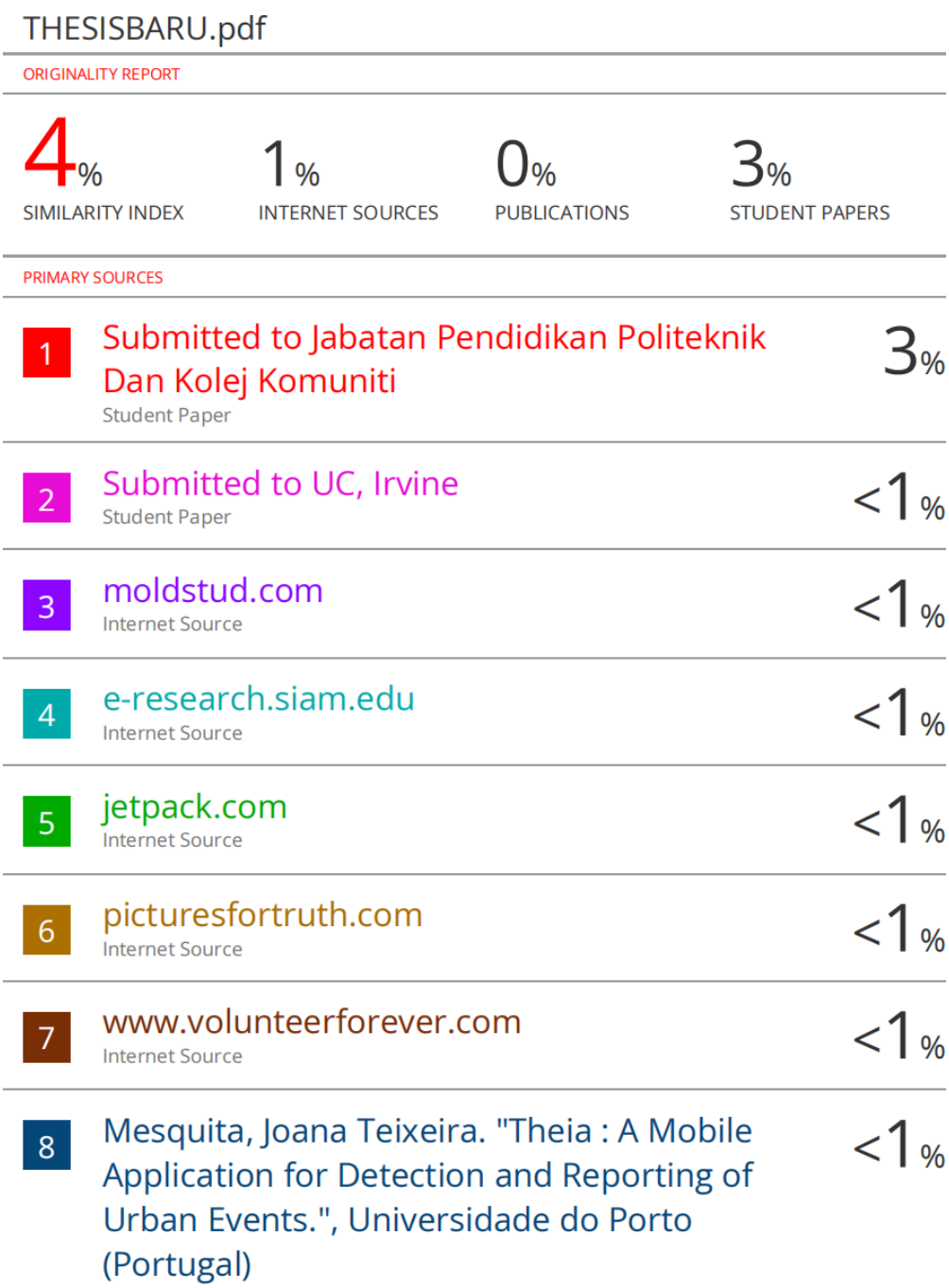
3.4.1.2	Pie Chart (Survey)
3.4.2.2	Morphological Matrix
3.5.1	General Product Drawing (Canva)
3.7.1	Material Acquisition
4.1.2.1	Specific Part Features (product Structure)
4.1.4.1	Operation of Specific Part (Product Structure)
4.1.4.4	Accessories and Finishing (All)
4.2	Product output analysis
4.3.1	Analysis of problem encountered (Product Structure)
5.1.2.1	Achievement of Project (Product Structure)
5.2.1	Improvement & Suggestion (Product Structure)
5.2.4	Accessories and Finishing

SUB CHAPTER	DESCRIPTION
MOHD ALIF REZZA BIN ROZIHAN	
1.2	Problem Statements
1.3.2.3	Software / Programming &Finishing
1.4	Purpose of Product
1.5.2.3	Software / Programming &Finishing
2.1.2	importance of digital learning tools in technical education
2.2	Specific Literature Review
2.2.3	Software / Programming & Finishing
2.3.1.3	Related Patented Products
2.3.2.3	Market Product C
3.2	Overall Project Gant Chart
3.3.2.3	Software and Programming
3.4.2	Design Concept Generation
3.4.2.1	Function Tree
3.4.2.3	Proposed Design Concept 1&2
3.6.1	General Product Features & Functionalities

3.7.2	Gadgets and Tools
4.1.1	General Product Features and Functionalities
4.1.2.3	Software / Programming
4.1.2.4	Accessories and Finishing (All)
4.1.4.3	Software / Programming
4.3.3	Software / Programming
5.1.1	General Achievements of the Project
5.1.2.3	Software / Programming
5.2.3	Software / Programming
5.2.4	Accessories and Finishing

SUB CHAPTER	DESCRIPTION
FAKHRUL HAMEEZAN BIN OTHMAN	
1.3.1	General Project Objectives
1.3.2.2	Product Functions
1.5.1	General Project Scope
1.5.2.2	Product Functions
2.1.3	limitations of traditional learning methods in aviation
2.1.4	Role of Mobile Applications in Modern Education
2.1.5	Integration of 3D Models in Technical Learning Application
2.2.2	Product Functions
2.3.1.2	Review of Recent Research / Related Products
2.3.2.2	Recent Market Product
3.3	Project Flow Chart
3.3.1	Overall Flow Chart
3.3.2.2	Product Structure
3.3.2.4	Finishing

APPENDIX B: TURNITIN SIMILARITY REPORT



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ORIGINALITY REPORT

4%	1%	0%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

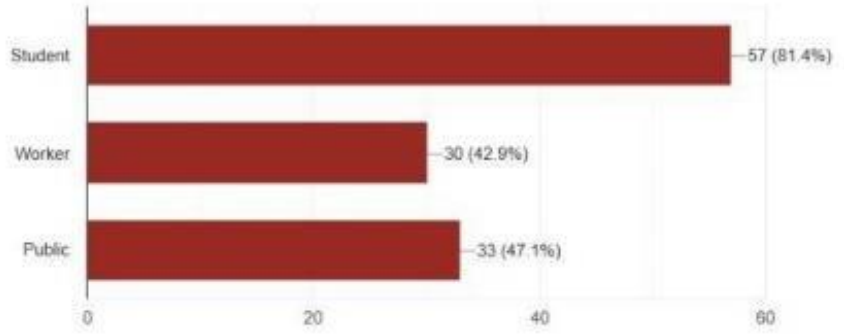
1	Submitted to Jabatan Pendidikan Politeknik Dan Kolej Komuniti Student Paper	3%
2	Submitted to UC, Irvine Student Paper	<1%
3	moldstud.com Internet Source	<1%
4	e-research.siam.edu Internet Source	<1%
5	jetpack.com Internet Source	<1%
6	picturesfortruth.com Internet Source	<1%
7	www.volunteerforever.com Internet Source	<1%
8	Mesquita, Joana Teixeira. "Theia : A Mobile Application for Detection and Reporting of Urban Events.", Universidade do Porto (Portugal)	<1%

APPENDIX C: POST SURVEY

In your opinion, which audience would interested in the app?

Copy chart

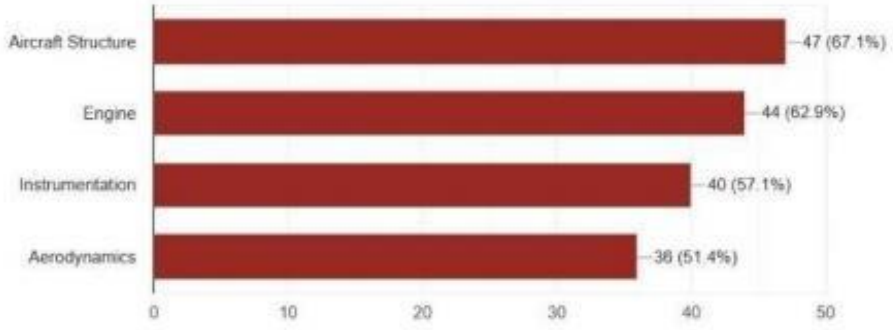
70 responses



Which subtopic need to be included in the app?

Copy chart

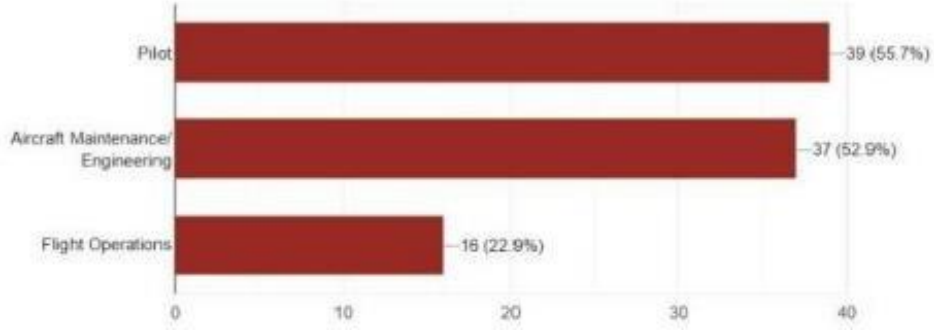
70 responses



What is your primary interest in aircraft?

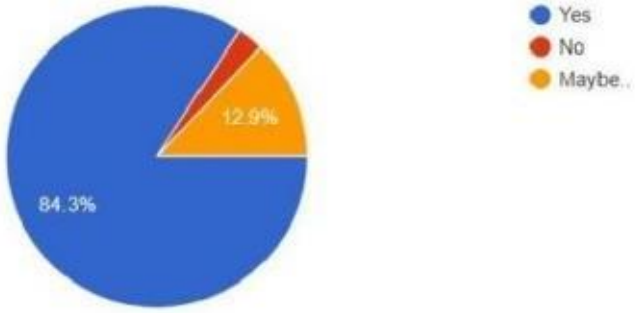
Copy chart

70 responses



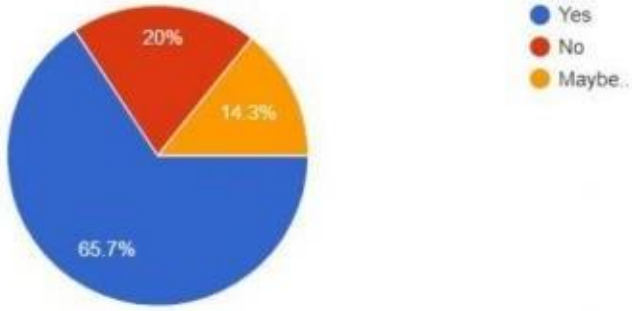
In your opinion, does the app will help understanding in learning about the aircraft?

70 responses



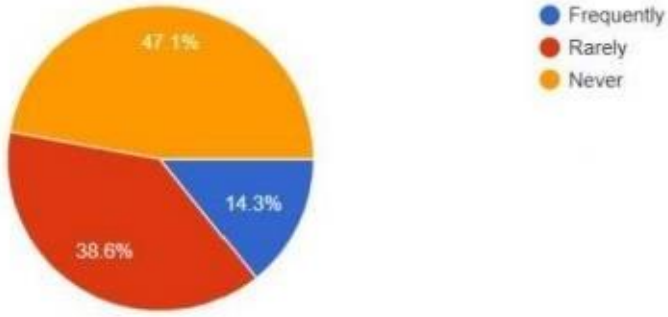
Do you find any difficulties learning about aircraft?

70 responses



How often do you fly or work with aircraft?

70 responses



APPENDIX D: Copyright Certification

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