Augmented Reality Implementation in Laptop Product Promotion Media Using Web-Based QR-Codes

1st Dini Destiani Siti Fatimah
Department of Computer Science Garut Institute of Technology
Garut Institure of Technology
Garut, West Java, Indonesia
dini.dsf@itg.ac.id

2nd Ayu Latifah
Department of Computer Science Garut Institute of Technology
Garut Institure of Technology
Garut, West Java, Indonesia
ayulatifah@itg.ac.id

3rd Albie Firgi Bahari
Department of Computer Science Garut Institute of Technology
Garut Institure of Technology
Garut, West Java, Indonesia
1906005@itg.ac.id

*Corresponding author: dini.dsf@itg.ac.id
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***Abstract*— Technological developments were created for various needs, such as science, especially in the information field. This development has a very positive impact on technology users who promote electronic-based products. Augmented Reality is a tool to promote various products, especially to find out the specifications of electronic devices such as laptops, where users can view additional information relevant to the product being promoted via mobile devices such as smartphones or tablets. QR codes can also direct users to promotional websites that contain complete information about the laptop products being promoted. This research uses the MDLC (Multimedia Development Life Cycle) methodology to ensure that the built system can meet user needs and ensure effective use of AR and QR-code technology in laptop product promotion. The research stages consist of concept, design, material collecting, assembly, testing, and distribution. The results of the study show that the use of Augmented Reality as a promotional support medium is able to create innovative experiences for users, resulting in increased effectiveness in product promotion. By applying the Blackbox approach in testing application functions, the results show that all application components run according to predetermined expectations. The application of Augmented Reality technology in this application was carried out according to plan, successfully displaying product objects in 3D through the implementation of Augmented Reality.**

Keywords*— *Augmented Reality, Product Promotion, Laptop, Technology, QR code, Website Promotion, 3D Shape

I. INTRODUCTION

Augmented Reality is a concept that combines elements from the virtual or virtual world into the real world. This technology allows entrepreneurs to present their 3D images on website devices[1]. In the realm of advertising and marketing, technology has become a cornerstone for businesses of all sizes, reshaping promotional strategies and enhancing consumer engagement. Augmented Reality (AR) stands out as a cutting-edge technology that has gained traction in the marketing domain, offering a novel way to blend virtual elements seamlessly with the natural world [2]. This innovative technology has the potential to revolutionize marketing dynamics by providing businesses with sophisticated and accurate tools for promotional activities across various industries[1]. The integration of AR in promotional media opens up new avenues for businesses to create immersive and interactive experiences for their target audience, thereby increasing brand visibility and customer interaction. The application of AR technology extends beyond marketing into diverse fields, showcasing its versatility and impact on different sectors. For instance, AR has been leveraged in educational settings to introduce complex concepts in an engaging and interactive manner, such as in the introduction of the solar system to students [3]. By incorporating AR into educational practices, technology has facilitated a more immersive and practical learning experience, demonstrating the broad spectrum of applications for this innovative tool[4]. Moreover, AR has been utilized in the tourism industry to enhance visitor experiences through interactive applications that overlay digital information onto physical locations[5]. This integration of AR in tourism not only enriches the travel experience but also showcases the potential of technology to transform traditional sectors. The adoption of AR in various industries underscores the transformative power of technology in enhancing user engagement and interaction. In the healthcare sector, AR has been applied in dentistry to improve surgical outcomes by providing dentists with advanced visualization tools[6]. By merging AR technology with dental procedures, practitioners can enhance precision, reduce risks, and elevate overall patient care standards. Furthermore, the agricultural sector has embraced AR as part of the Internet of Things (IoT) ecosystem, integrating artificial intelligence and blockchain technologies to optimize farming practices [7]. This convergence of technologies highlights the potential of AR to revolutionize traditional industries and drive innovation across sectors. The development and implementation of AR applications for promotional purposes have also been explored in academic research, emphasizing the role of technology in enhancing marketing strategies. Studies have focused on designing AR applications for promoting university services, such as virtual campus tours and interactive catalogs [8]. By leveraging AR technology, educational institutions can showcase their offerings in a dynamic and engaging manner, attracting prospective students and stakeholders. Additionally, AR has been utilized in creating promotional materials for businesses, such as furniture catalogs that use AR to provide immersive shopping experiences[9]. These applications demonstrate the versatility of AR in transforming promotional media and engaging audiences through interactive and visually

appealing content. The evolution of technology, particularly the integration of AR, has redefined promotional strategies and consumer engagement across various sectors. Businesses are increasingly leveraging AR to create innovative and interactive experiences that captivate audiences and drive brand awareness[1]. As AR continues to advance and find new applications, its impact on marketing and advertising is poised to grow, offering businesses a powerful tool to differentiate themselves in a competitive landscape[10]. By embracing AR technology and exploring its creative potential, organizations can elevate their promotional efforts, foster customer loyalty, and stay at the forefront of technological innovation in the digital age.

The application of AR and QR-code technology in laptop promotional media can be implemented through promotional websites. Users can access this website via the QR code contained in the promotional media and can see laptop products being promoted through AR technology. Technological developments were created for various needs, such as science, especially in the information field. This development has a very positive impact on product promotion for technology users. Laptop products are widely promoted through digital media. Promotion of laptop products carried out in conventional ways, such as using print media, television, and radio, has a weakness because it is difficult to measure its effectiveness. In addition, conventional promotion will require a hefty fee. To improve promotional media and help laptop buyers, augmented reality technology is implemented as a tool to find laptop specifications, and users can view additional information relevant to the product being promoted via mobile devices such as smartphones or tablets. QR codes can also direct users directly to a promotional website that contains complete information about the laptop products being promoted.

Several previous studies related to this research: A study was conducted that aimed to create an interactive learning media using Augmented Reality technology. This media is designed to help 4th-grade elementary school students understand herbal leaf plants better. In this research, it is hoped that students' interest in learning about the herbal leaves around them will increase[11]. Based on research conducted by[12], the results of this study are the implementation of a Mobile augmented reality in learning chemistry subject: an evaluation of science exploration. This application provides a unique experience for customers when choosing the products they want, thus increasing their chances of buying products from Sampurna Mebel.

The purpose of this study is to implement the use of AR and QR-code technology to increase buyer interest in laptop products. In addition, this study also aims to provide recommendations for companies in utilizing AR and QR-code technology in laptop product promotion media. The results of this study are expected to contribute to developing more effective and efficient laptop product promotion technologies.

II. METHODS

The research process consists of well-organized stages to reach findings that are supported by scientific analysis and are carried out quickly and regularly. , videos, and more. The MDLC method has six stages, namely Concept, Design, Material Collecting, Assembly, Testing, and Distribution.

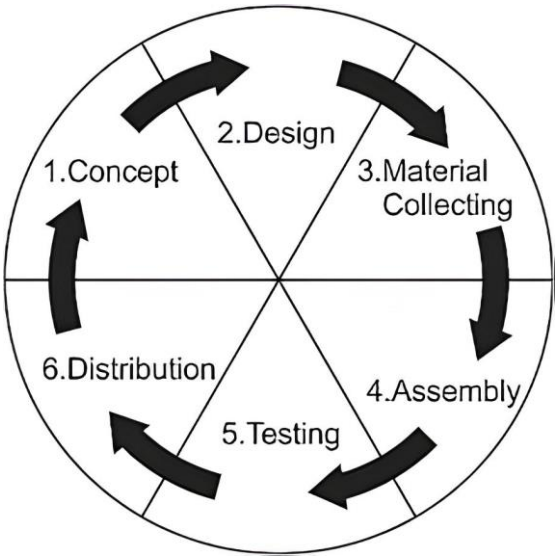

Fig. 1. Model Multimedia Development Life Cycle

In describing the activities and objectives of this study, this research is based on the framework (Fig.2) and Work Breakdown Structure (Fig.3) presented in the design activity flowchart (Fig. 4), with the following stages:

1. The concept consists of basic design activities for the application to be built, especially on the purpose and type of application to be created.

2. Design consists of Design activities. Preparation of details related to program architecture, style, user interface (UI), and material or component requirements for the program is a crucial step. These specifications are as detailed as possible to avoid repetition at the next stage, namely, gathering materials and assembling. At the design stage, various elements such as storyboards, Unified Modeling Language (UML) diagrams, Use Case Diagrams, Activity Diagrams, Sequence Diagrams, and system flow schemes are taken into account, as well as the design of the screen display is also part of this process[13].

3. Material collecting consists of activities to collect materials needed in the system being worked on, such as audio, video, and images.

4. Assembly consists of the activity of making all objects or materials for applications based on the design stage, such as storyboards and navigation structures. This stage is made web-based.

5. Testing consists of the activity of the application trial stage to the customer or shop owner, after which the shop owner or customer will provide an assessment or input to improve the performance of the application that has been made.

6. Distribution consisting of application activities will be moved and stored in the appropriate storage media. This stage can also be referred to as the evaluation stage, which is carried out to improve the quality of the finished product.

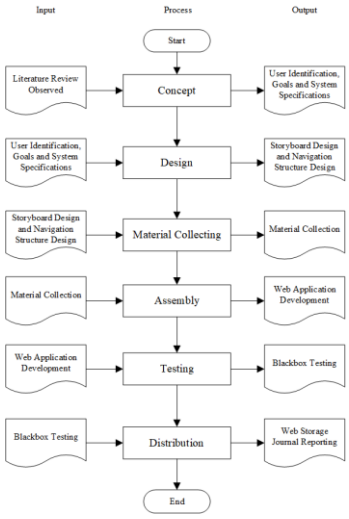

Fig. 2. Framework

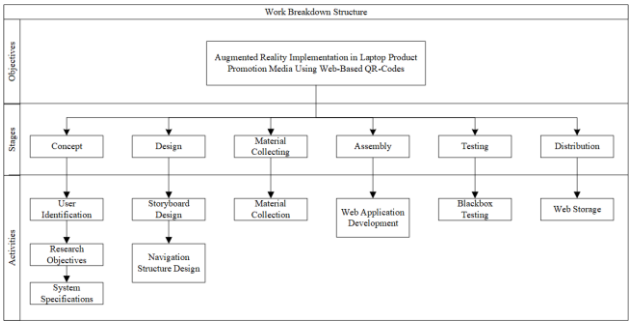

Fig. 3. Work Breakdown Structure

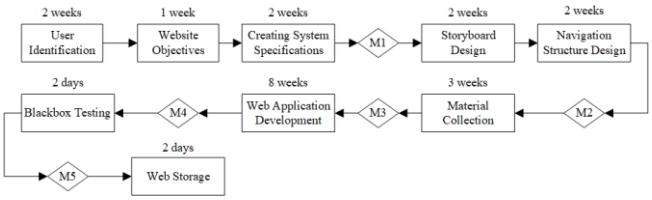

Fig. 4. Activity Flowchart

III. RESULTS AND DISCUSSION

A. *Concept*

At this stage, the activities carried out include the phase in which the main objectives and scope of the application are clearly defined, providing a shared understanding between developers and users. The process of formulating this concept not only depends on the developer but also involves the user so that the application can better suit their needs. In this study, interviews were conducted with the Head of the Perintis Store to achieve a better understanding. In general, the process carried out at this concept stage focuses on marketing media to determine objectives and system specifications. The purpose of this promotional media is to show Garut pioneer shops. This laptop product promotion media aims to make it easier for users in the promotion process, and promotional media like this can promote it.

B. *Design*

At this stage, the activities carried out include some of the software used, namely Xampp MySQL, Javascript Personal Home Page Cascading Style Sheet (CSS), Hypertext Markup Language (HTML), and Visual Studio Code. The design process carried out at this stage includes making navigation structures and making storyboards.

1. Navigation, at this stage, the arrangement of the navigation structure is carried out after obtaining a thorough understanding of the contents of the media used.

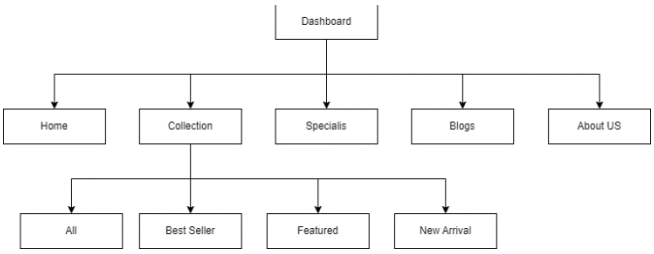

Fig. 5. Navigasi Structure

2. Storyboard At this stage, the storyboard is prepared after detailing the content that will be used in each part of the laptop product promotion media.

TABLE I. STORYBOARD

No	Visual	Description
1	Title: Dashboard Page Laptop Promotion Media. Scenes: 1 The main page displays the product background, shop name, some characters, menu, Collection, Specials, Blogs, and About Us.	This section is packaged in one page with several views that can be selected to move to the desired page.
2	Title: Collection page Laptop Promotion Media Scenes: 2 Scene 2 displays all the Best Sellers, Featured, New Arrivals, and Laptop Products.	This scene displays all laptop products, best-selling products, products with the latest features, and laptop specifications.
3	Title: Specials page Laptop Promotion Media Scenes : 3 Display products, media pages, AR, and QR Code	In this scene, there is an image of a laptop, an AR media page, and a QR Code where, when we scan a product, the form of a 3D image appears.
4	Title: Blogs page Laptop Promotion Media Scenes: 4 Displays information about laptops	In this scan, there is information about laptops, ranging from tips on choosing laptop products to knowing business opportunities and the latest trends in the development of laptops.
5	Title: Page About US Laptop Promotion Media Scenes: 5 Displays store bio.	In this scan, we explain the background of the pioneering shop selling laptops, contacts, social media, and purchase links.

C. *Material Collection*

At this stage, materials are collected according to the needs for designing laptop product promotion media. The material used is in the form of text files and images. These text and image files were obtained from various sources, while some were made by the researchers themselves.

TABLE II. TEXT MATERIAL

No.	Tex Type	Font Type
1	Logo Letter	Agency FB
2	Shop Name Latter	Times New Roman
3	Menu Letter	Calibri

TABLE III. IMAGE MATERIAL

No	Picture Name	Picture Format	Source
1	Logo	.png	Printis
2	*Background*	.jpg	Website
3	Gambar 3D	.jpg	Assembler
4	Objek *QR-CODE*	.png	Assembler

D. Assembly

At this stage, all materials or objects that existed in the previous stage, namely the Material Collecting stage, are processed and compiled into a product promotion or marketing application. At this stage, various elements that have been prepared beforehand, such as images, text, designs, and other content, are carefully integrated and arranged to create an application that is attractive and effective in promoting products.

1. Making 3D Laptop Models

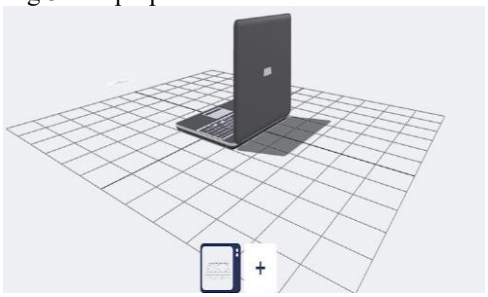

Fig. 6. 3D Laptop Models

2. Making 3D Laptop Modeling

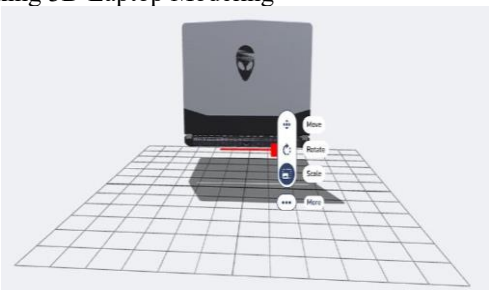

Fig. 7. 3D Laptop Modeling

3. Making 3D Laptop Texturing

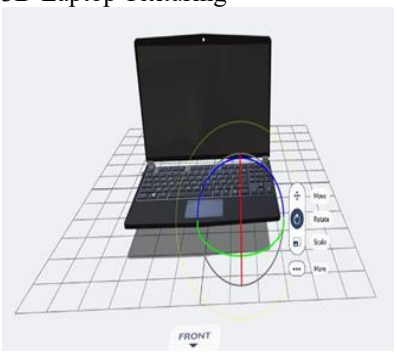

Fig. 8. 3D Laptop Tekturing

4. Making Qr-code

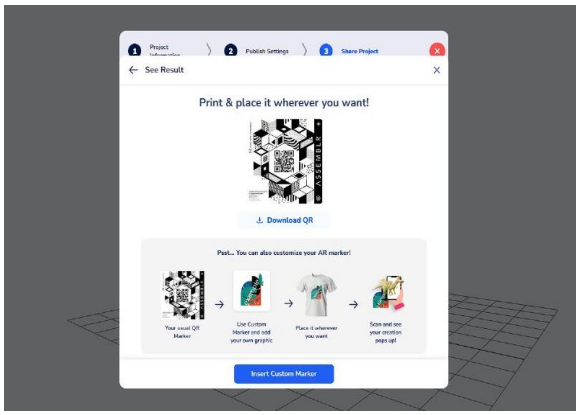

Fig. 9. Result Of Making QR-code

5. Making home page

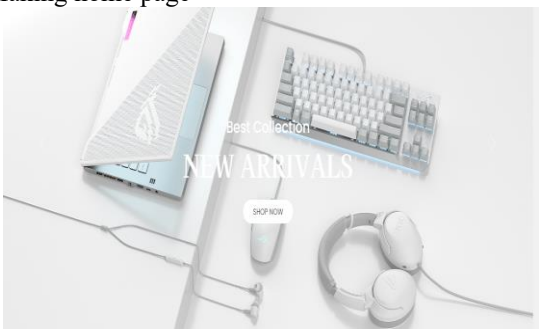

Fig. 10. Home Page

6. Making Collection page

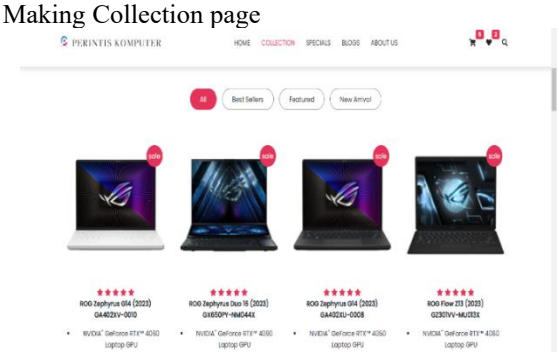

Fig. 11 Collection Page

7. Making Specials page

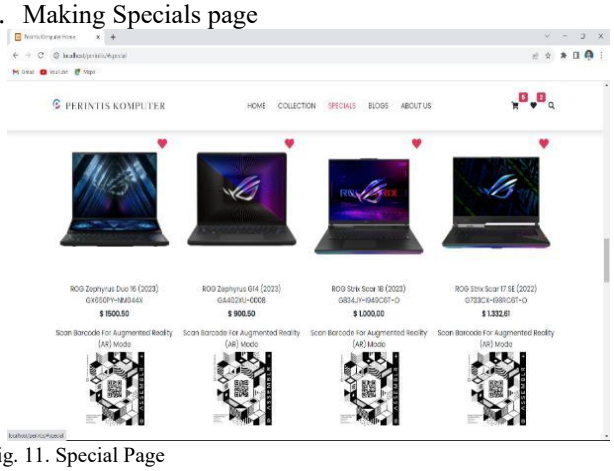

Fig. 11. Special Page

8. Making Blogs Page

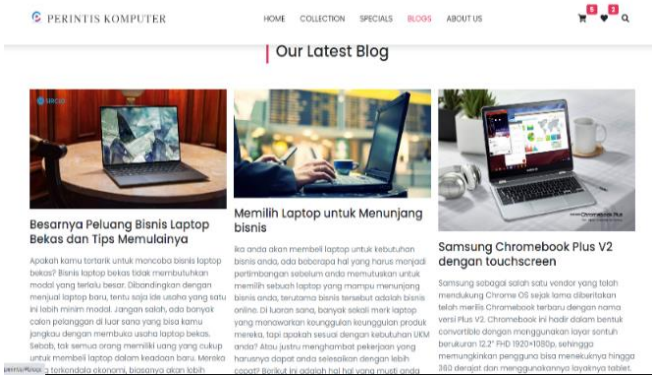

Fig. 12. Blogs Page

9. Making About Us Page

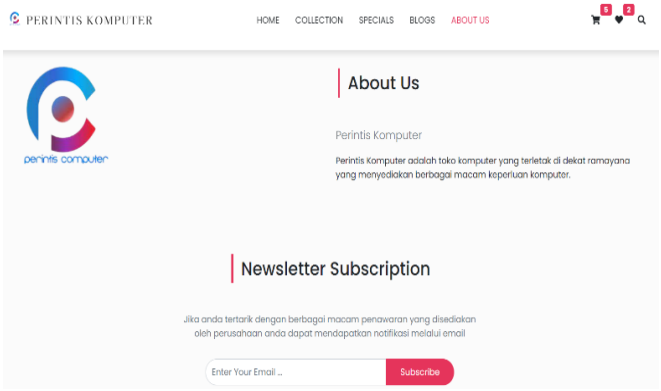

Fig. 13. About Us Page

E. Testing

Testing is carried out after completing the previous stages by opening the promotional media application and observing whether there are bugs in the promotional media. The first stage of testing is called "Alpha Testing," which involves the testing method "Black Box Testing," in which the software is tested functionally without considering internal program code.

TABLE IV. ALPHA TESTING

No	Test Scenario	Test Class	Expected Result	Test Result
1.	Main Page	List Button Menu Bar	Displays the Home button, Collection button, Specialties button, Blogs button, and About Us button.	Suitable
2	Collection Page	Button All	Displays all products along with laptop specifications.	Suitable
		Best Seller Button	It is displaying laptop products that are in demand and in great demand.	Suitable
		Featured Button	Displays superior laptop products.	Suitable
		New Arrival Button	Displays updated or newly released laptop products.	Suitable
3	Specialist Page	*Qr-Code* 1	Showing the 3D effect of the ROG Zephyrus Duo 16 (2023) laptop product GX650PY-NM044X.	Suitable
		Qr-Code 2	Showing the 3D effect of the ROG Zephyrus G14 (2023) laptop product GA402XU-0008	Suitable
		Qr-Code 3	Showing the 3D effect of the ROG Strix Scar 18 (2023) G834JY-I949C6T-O laptop product	Suitable
		Qr-Code 4	Showing the 3D effect of the ROG Strix Scar 17 SE (2022) G733CX laptop product - I98RC6T-O	Suitable
4	Blogs Page	Button l Bloogs	Information about laptops, tips on choosing laptop products, business opportunities, the latest trends in laptop development	Suitable
5	About Us Page	Button l About Us	Information about stores, contacts, and social media.	Suitable

F. Distribution

In the last stage, after the website application assembly process and application testing are complete, the laptop product promotion media application will be stored on Google Drive, which is the first step in the implementation process.

The integration of augmented Reality (AR) and QR-code technology in laptop promotional media represents a significant advancement in marketing strategies, offering a dynamic and interactive approach to engaging consumers. By incorporating QR codes in promotional materials, users can seamlessly access promotional websites that leverage AR technology to showcase laptop products in an immersive manner Fitriani et al. (2022). The implementation of AR technology in promotional media for laptop products addresses the limitations of conventional advertising methods, such as print media, television, and radio, which often need more measurability and incur high costs (Saryani, 2022). Technological advancements, particularly in the field of information technology, have paved the way for innovative solutions in product promotion, with AR technology playing a pivotal role in enhancing user experiences (Fauzan, 2023). The application of AR technology in promotional media extends beyond the laptop industry, with implications for various sectors seeking to enhance customer engagement and brand visibility[14]. In the context of educational settings, AR technology has been utilized to introduce complex concepts in an interactive and engaging manner, showcasing the versatility of this technology across diverse applications[15], [16]. This research utilizes the Multimedia Development Life Cycle (MDLC) methodology, as highlighted in the study by [17] and [18].

The testing method of the system includes black-box testing, which aligns with the description of the testing method "Black Box Testing" mentioned in the user task. Furthermore, the reference by [19] discusses the implementation of Augmented Reality technology, which is relevant to the context of the user task that involves the application of AR technology in promotional media. These references provide insights into the testing methods, specifically black-box testing, and the application of Augmented Reality technology, which are directly related to the user task's context of Alpha Testing and the utilization of AR technology in promotional media[20].

IV. CONCLUSION

Based on the results and discussion, it can be concluded that the implementation of augmented reality development on laptop product promotion media uses the MDLC (Multimedia Development Life Cycle) methodology, which consists of several stages, namely the concept, design, material collecting, assembly, testing, distribution stages. The augmented reality system that has been created is used to promote laptop products as a medium for consumers to determine the purchase of laptop products. This system will make it easier for consumers to increase their interest in laptop products because it is more practical and efficient. Subsequent developments improved the quality of in-browser AR so that there were no performance issues on low-end devices, thereby ensuring a seamless and consistent experience in accessing the feature within reach for all users. Suggestions for further researchers evaluating the performance of privacy and security systems, both the use of cameras and sensors that have the potential to reveal user information, are that development must apply privacy measures and comply with industry best practices to protect user data and maintain user trust.

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