Research Article

Design and Implementation of Augmented Reality-Based Housing Promotion Media for *Cipta Bangun Khatulistiwa Ltd.*

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Abstract: Information media continues to evolve with the advancement of time. It is needed at all times because through information media, people can access various types of current and emerging information, as well as exchange ideas and interact with one another. Numerous technologies have been developed to support the dissemination of information, one of which is Augmented Reality (AR). Augmented Reality (AR) can be defined as an environment that merges two realms: the virtual world and the real world. AR allows information to be embedded into the virtual world and displayed in the real-world using markers or barcodes via smartphones or other devices. Augmented Reality (AR) has been widely implemented across various sectors, one of which is promotional media. In the business world, AR can serve as a powerful promotional tool. Therefore, with the advancement of Augmented Reality (AR) technology, a promotional media application was developed using AR for the housing brochures of *Cipta Bangun Khatulistiwa Ltd*. This AR-based promotional media is expected to assist current and prospective consumers in gaining a more realistic view of *Cipta Bangun Khatulistiwa Ltd*. housing details through specially designed brochures, without the need to travel to the development site, which is relatively far from the city center.

Keywords: AR, Augmented Reality, SketchUp, Unity 3D, Vuforia SDK.

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1. Introduction

Information media continues to evolve in line with the advancement of time. It is always essential, as it allows people to access a wide range of current and even viral information, while also facilitating idea exchange and interpersonal interaction. The term media is derived from the word medium, which refers to a process that enables communication from the sender to the receiver through an intermediary. Media, as a component of communication, holds an important role as a message carrier from the communicator to the communicant. Generally, information is understood as data that has been processed into something more useful, providing knowledge and insights that are directly intended to assist recipients in making decisions.

One of the most impactful aspects of information media in today's technological landscape is promotional media, widely utilized by institutions and companies to market their products or services. *Cipta Bangun Khatulistiwa Ltd*. is one such company that employs promotional media to advertise its housing projects. As a prominent housing developer in West Kalimantan, the company has completed multiple development projects and received awards as one of the region's top developers in terms of both sales and housing construction. To date, *Cipta Bangun Khatulistiwa Ltd*. has built hundreds of housing units throughout West Kalimantan, focusing primarily on subsidized housing. However, the company's promotional strategies still rely on conventional methods such as printed brochures, newspaper advertisements, and banners placed in several locations—approaches that are increasingly outmoded.

Moreover, in contrast, major global companies like Coca-Cola, IKEA, and McDonald's have already advanced their promotional methods by incorporating emerging technologies, one of which is Augmented Reality (AR). Augmented Reality (AR) can be defined as an environment that combines two realms—virtual and real—by means of computer devices, making the boundary between them increasingly indistinct. AR enables virtual information to be presented and overlaid onto the real world through markers or barcodes using smartphones or other compatible devices. The virtual information is typically represented in the form of two-dimensional or three-dimensional (3D) digital objects [4].

In response to the advancement of AR technology, this study proposes the development of promotional media using AR for the housing brochure of *Cipta Bangun Khatulistiwa Ltd*. The integration of AR into the brochure is expected to assist consumers and prospective buyers in realistically visualizing the details of the housing projects offered by *Cipta Bangun Khatulistiwa Ltd*. This allows users to access immersive information without the need to visit the relatively remote construction sites physically, thus improving accessibility and promotional effectiveness.

2. Theory

This study adopts an application development approach to design and build a housing promotion media based on Augmented Reality (AR). The data collection methods include observation, interviews, and literature review. The application development process employs the Multimedia Development Life Cycle (MDLC) model.

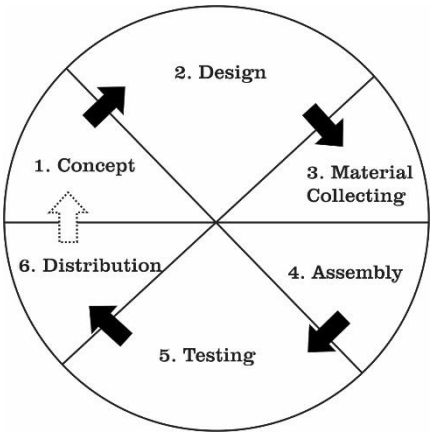


Figure 1. Multimedia Development Life Cycle (MDLC) Stages

2.1 Research Design

This research applies the MDLC model for application development. The MDLC model consists of six sequential stages: concept, design, material collecting, assembly, testing, and distribution. This model was chosen to provide a systematic framework for the development of the AR-based application.

2.2 Research Subjects and Targets

The population in this study consists of consumers or prospective consumers targeted by *Cipta Bangun Khatulistiwa Ltd*. Data were collected through on-site observations at *Cipta Bangun Khatulistiwa Ltd*. office and through interviews with the company's management team.

2.3 Data Collection Techniques

This research employs three main data collection techniques.

- First, observation was conducted by directly examining the information dissemination process at *Cipta Bangun Khatulistiwa Ltd*. to understand the current promotional practices.
- Second, interviews were carried out with the company's manager, AR experts, and participants in AR-related discussion forums to gain in-depth and practical insights.
- Third, a literature review was performed by gathering information from various written and digital sources such as modules, journals, e-books, reference books, and relevant websites. This step aims to build a strong theoretical foundation to support the analysis in this research.

2.4 Design Framework

- The research design is structured according to the MDLC model, comprising the following stages:
- Concept: Define the purpose of the application, identify target users, determine the application type, and establish general specifications.
- Design: Develop a detailed specification of the application architecture, including AR system workflows, flowcharts, and user interface designs.
- Material Collecting: Gather necessary materials such as images, audio, animations, barcodes, 3D housing models, and required software tools.
- Assembly: Construct multimedia objects and integrate them into the application based on the design. Tools used include PC/Laptop, smartphone, Windows 10, Unity 3D, Vuforia SDK, SketchUp, and Adobe Photoshop.
- Testing: Evaluate the application to ensure ease of use and alignment with design specifications.
- Distribution: Deliver the final application to *Cipta Bangun Khatulistiwa Ltd.*

2.5 Research Procedure

- The research procedure follows the MDLC stages as outlined below:
- Concept: Determine the objectives and scope of the AR application for housing promotion.
- Design: Design the system workflow, flowchart, and user interface of the application.
- Material Collecting: Collect digital assets such as 3D house models, barcodes, and supporting software.
- Assembly: Develop the AR application using Unity 3D, Vuforia SDK, SketchUp, and Photoshop.
- Testing: Test the AR application for functionality and usability.
- Distribution: Submit the application to *Cipta Bangun Khatulistiwa Ltd*. for deployment and use

3. Method

3.1 The workflow

The AR system workflow canters on image detection. In the context of AR, a marker refers to an image that will be recognized by the system. The process begins with the camera capturing the marker; once the marker's pattern is recognized, the system matches or identifies the marker against a database previously configured on the Vuforia Developer website. If the pattern recognition and matching process is successful, the system immediately displays the corresponding information and renders the pre-designed 3D object created using Unity 3D [2]. The workflow of the Augmented Reality (AR) system is illustrated in Figure 2.

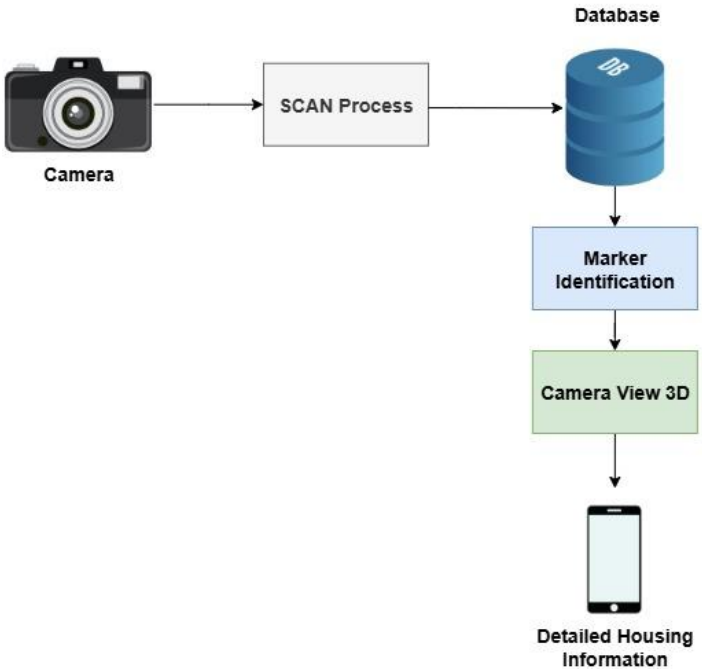


Figure 2. Augmented Reality (AR) System Workflow

3.2 Flowchart System

Furthermore, A The flowchart in Figure 3 illustrates of the developed application or the operational workflow of the Augmented Reality (AR) application. The process begins when the application enters the camera mode using the Vuforia engine. The user is then instructed to point the camera at a designated marker. The system proceeds to identify the marker and validate it against a predefined database. If the marker is recognized and deemed valid, the system renders a 3D object using AR technology. If the marker is invalid, the system will prompt the user to try again. Once a valid marker is detected and the 3D object is successfully displayed, the process concludes. This logical sequence ensures the accurate rendering of AR content and enhances user interaction by providing immediate visual feedback.

Advanced research using AR has been carried out by several researchers specifically in the medical sector, architecture, reconstruction services, education, traditional houses, [14,15,16,171,8,19,20,22,23,24,25] and with the methods used are able to provide convenience for users in exploring objects so as to provide effectiveness and also super flexible convenience by using technological media. In this study, the tester was able to achieve> 50% in terms of ease and mastery in the use of AR devices that had been completed. [21].

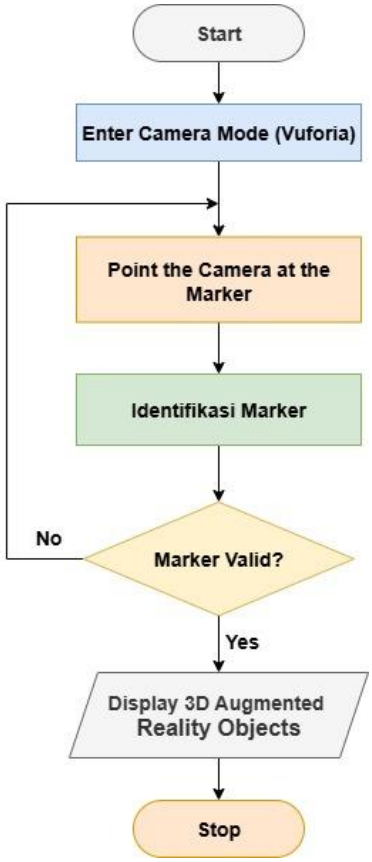


Figure 3. Application Flowchart

3.3 User Interface Design

The User Interface (UI) design represents the visual component of a software or hardware device that facilitates interaction between the user and the system, which is then displayed on the screen. The user interface integrates elements of visual design, interaction design, and information architecture. Its primary objective is to enhance usability and optimize the user experience. The interface design of the developed application is presented in Figure 4.

Figure 4. User Interface Design

The user interface displayed in Figure 4 shows three main stages of interaction within the application: the initial camera view, the marker scanning interface, and the display of the 3D model. These interfaces are designed to be intuitive and minimalistic, allowing users to focus on the core function of scanning markers and viewing augmented content. Visual cues guide users through the process, ensuring smooth navigation and reducing the learning curve, especially for first-time users. The layout has been optimized for mobile screens, with clear positioning of elements to support effective interaction in real-time AR environments.

3.4 Brochure Design

The brochure serves as a visual medium for presenting detailed information related to *Cipta Bangun Khatulistiwa Ltd*. housing projects. It includes comprehensive content such as house types, architectural designs, specifications, mortgage (KPR) facilities, housing locations, and floor plans. This brochure is specifically designed to integrate with the AR application, enabling users to scan markers embedded within the brochure to visualize 3D models of the houses. The design of the brochure interface is shown in Figure 5.

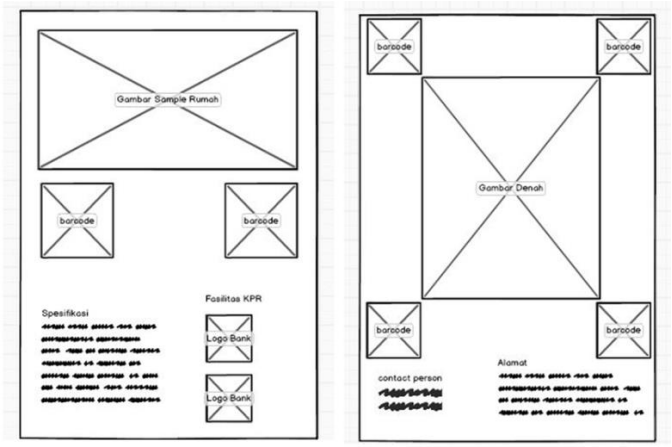


Figure 5. Brochure Design

The brochure layout shown in Figure 5 is divided into sections that accommodate both textual and visual information, providing a structured overview of the housing offerings. Key areas are designated for house images, specifications, mortgage (KPR) options, and location details, along with clearly placed barcode markers that serve as AR triggers. Each marker corresponds to a specific house type or unit detail, which users can scan using the mobile application to view the associated 3D models. This interactive design ensures that potential buyers receive not only static promotional content but also an immersive visual experience directly from the printed brochure.

4. Result and Analysis

The application development process combines multiple software tools to build a functional and interactive AR experience for housing promotion. By integrating 3D modelling, AR rendering, and visual design, the system delivers both technical performance and user-friendly presentation.

4.1 Development Applications

The development of this application integrates a suite of specialized software tools to achieve the desired functionality. SketchUp was utilized for 3D object modelling, enabling the creation of visual representations of residential spaces and building structures. Unity 3D served as the primary platform for designing and implementing the Augmented Reality (AR) application, while Vuforia SDK was employed to manage image targets in the form of barcodes.

In addition to core software for 3D modelling and AR development, Adobe Photoshop was used to design supporting visual elements. These included the creation of marketing brochures integrated with AR-trigger barcodes, as well as the application's logo design. The combination of these tools allowed the application to be both technically functional and visually engaging, enhancing its appeal and usability.

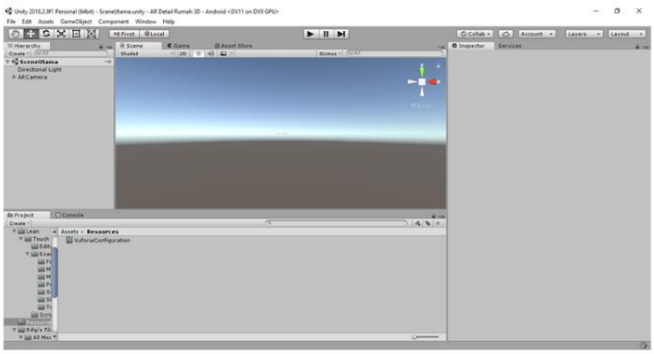
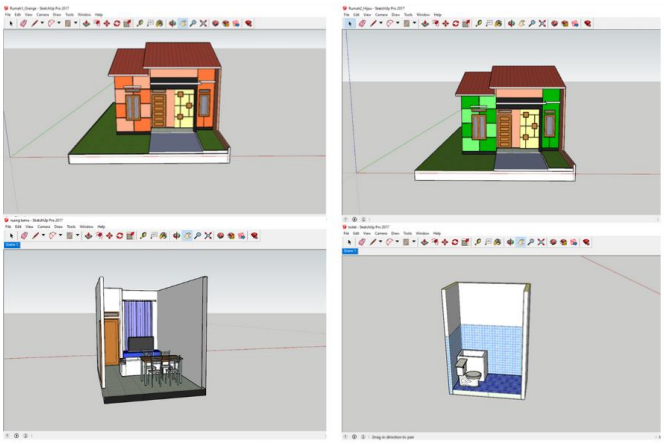


Figure 6. Environmental Design

Figure 7. Developing the Application Using Unity 3D

4.2 3D Assets Development

SketchUp is a design software commonly used in the field of graphic and spatial design, particularly for creating 3D objects. It is professionally utilized across disciplines such as civil engineering, architecture, game development, and filmmaking—essentially in any area involving 3D modelling. In this study, SketchUp was employed to develop 3D assets (image targets), which were then imported into Unity 3D as visual objects to be rendered when a barcode is scanned through the AR application.



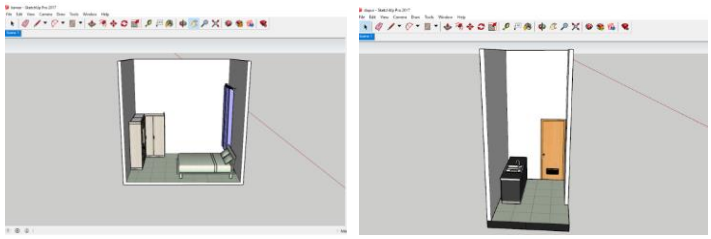


Figure 8. 3D Assets for AR Objects

4.3 Final Product

After completing the application design process, the development stage was carried out, resulting in a fully functional AR-based promotional application.

Figure 9. 3D Assets for AR Objects

As shown in Figure 9, the application features two primary interfaces: an initial screen displaying the Unity logo as the development platform, and an Augmented Reality (AR) camera view that captures the floor surface where the marker will be detected. This indicates that the application employs AR technology to overlay virtual objects onto the real-world environment captured by the camera.

4.4 Barcode

A barcode is a code consisting of a combination of bars and spaces that represent numbers and letters, commonly used to input data into a computer system. In this application, six barcodes were used, with each one linked to a specific 3D object.

Figure 10. Barcode

4.5 3D Object

At this stage, 3D objects are rendered in AR using image targets previously created in the online database via the official Vuforia Developer website, and then imported into Unity 3D. When the AR camera detects the appropriate image target (barcode), and if it matches one from the predefined database, the corresponding 3D model—such as a house or room layout—is displayed in real-time.

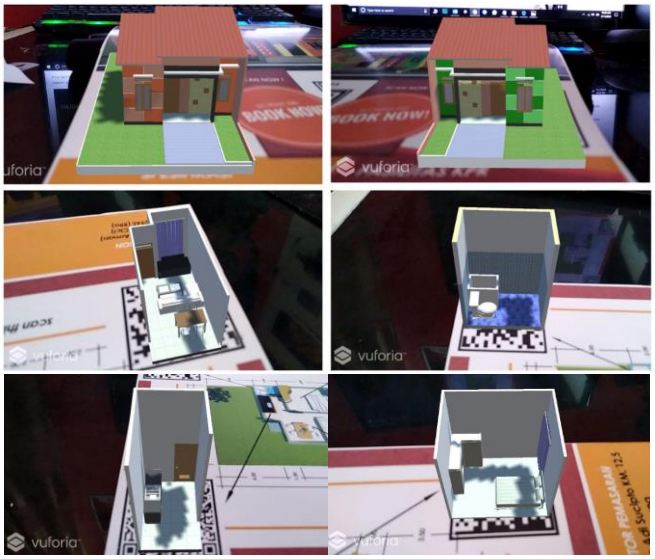


Figure 10. 3D Overall View of Interior Design

4.6 Brochure

The brochure serves as a visual component for presenting comprehensive information related to *Cipta Bangun Khatulistiwa Ltd*. housing projects. It includes detailed content such as house types, architectural designs, technical specifications, mortgage (KPR) facilities, housing locations, and floor plans. This printed material is designed not only to inform but also to complement the AR experience.

Figure 11. Marketing Brochure Display with Barcode

The Figure 11 illustrates the final brochure design, created using Adobe Photoshop. The layout integrates visual appeal with functional elements, including designated areas for AR marker placement to activate corresponding 3D content.

4.7 Testing

Software testing is an essential process that involves executing and evaluating the application to determine whether it meets the expected functional requirements and to identify any discrepancies between expected and actual outcomes. In this study, testing was conducted to evaluate the usability and functionality of the Augmented Reality (AR)-based promotional application developed for *Cipta Bangun Khatulistiwa Ltd.*

Field tests were conducted on 15 employees of *Cipta Bangun Khatulistiwa Ltd.* Respondents were asked to interact with the application and assess various aspects such as ease of use, display quality, response accuracy, and overall experience. Based on their evaluations, feedback was compiled and analysed using achievement level criteria categorized as: *Very Good*, *Good*, *Good Enough*, *Not Good*, and *Not Very Good*.

The results of the field test are shown in Table 2, where 80% (12 respondents) rated the application as *Very Good*, 13.3% (2 respondents) rated it as *Good*, and 6.7% (1 respondent) rated it as *Good Enough*. No participants classified the application as *Not Good* or *Not Very Good*. These results indicate that the application was well-received and met usability expectations in real-world testing scenarios.

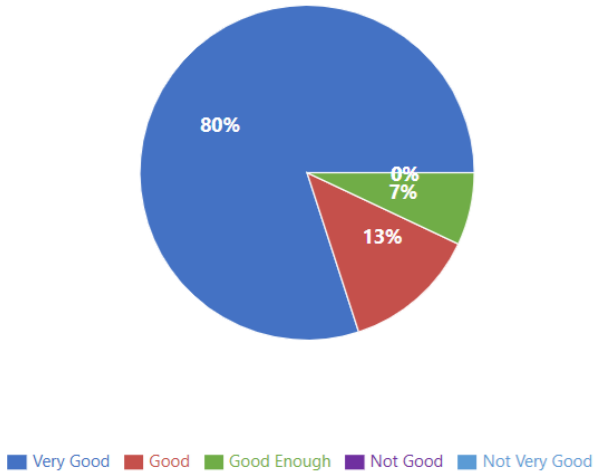


Figure 12. Visualization of the Field Trial in Percentage %

Table 1. Achievement level of field test results

Criteria for Achievement Level	Percentage (%)	Number of Respondents
Very Good	80	12
Good	13.33	2
Good Enough	6.67	1
Not Good	0	0
Not Very Good	0	0

5. Conclusions

The conclusion drawn from the final project as presented in the previous chapters is as following this point: [1] This information media assists consumers in accessing detailed information about the marketed housing units through Augmented Reality (AR) technology, eliminating the need for them to visit the construction site in person. [2] The integration of Unity 3D, Vuforia SDK, and SketchUp successfully produces an interactive AR application that is both technically functional and visually appealing. [3] The implementation of AR-based promotional media offers a modern and efficient alternative to traditional marketing methods, enhancing user engagement and understanding of the housing product. [4] Field test results indicate a high level of user satisfaction, with most respondents rating the application as very good in terms of usability and effectiveness for property visualization.

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