

## INDIGENOUS BALI OF LONTAR PRASI USING AUGMENTED REALITY FOR SUPPORT STRENGTHEN LOCAL CULTURAL CONTENT

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### ABSTRACT

*Lontar Prasi Bali is one of the cultural heritages that is still preserved in the Balinese life system. The problem is that the understanding of the Balinese Lontar Prasi can only be understood by some people so not all can understand the functions and stories contained in the Balinese Lontar Prasi. The solution to this problem is to provide a touch of Augmented Reality technology to show the story's contents in Lontar Prasi through 3D characters, audio, and text. The method used is the Prototyping Model chosen because it accommodates the scope and timeline of application development and facilitates communication between application developers and organizations. The test was conducted using four types of smartphones. The test results show that the four smartphones can be seen when the camera detects objects on the marker, Xiaomi Note 8 Pro and Oppo Reno F1 can detect objects within 1 second. While the Samsung A50s can detect objects for 2 seconds and the Xiaomi Redmi 5 can detect time for 3 seconds*

**KEYWORDS** *Indigenous Bali, Lontar Prasi Bali, Augmented Reality, Culture Local Content*



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## INTRODUCTION

Local culture must be seen as a component of national culture and in the context of how national identity is developed. Regional culture must develop properly in order for national culture to be effectively realized (Tiryakian & Nevitte, 2020). In the viewpoint of the international community, Indonesia's cultural variety is extremely diverse, with origins in every region of Indonesia. Indonesia has a wide range of cultural traditions, including regional differences. The Indonesian Ministry of Education and Culture keeps track of cultural heritage and compiles a list of it. There are 1,086 classified cultural heritage artifacts out of the 9,770 total items that have been recorded (Steimer-Herbet, 2018). It is impossible to divorce this cultural diversity from the history of the country, which has continued to allow it to be appreciated to this day. All of the younger generation is hesitant to turn a blind eye after hearing discussions about the cultural variety of Indonesia and this general digital era. This is a fantastic chance to spread the word about culture, which is supposedly starting to disappear. Numerous initiatives have been made to enhance local culture, but for these initiatives to be successful, the younger generation must be made aware of the value of cultural preservation (Kim et al., 2019). One noble legacy of the original Balinese culture is the Balinese lontar prasi, for instance. The deterioration of Indonesian native culture, particularly Balinese culture, may give rise to young people who want to preserve the dwindling tradition. Younger generations that continue to uphold local values are incredibly rare, which is why many have created younger generations that are more interested in and proud of the western lifestyle culture (Kaul, 2019).

Lontar Prasi is the name of one kind of lontar. As a type of traditional Balinese comic, pictorial lontars, like Lontar Prasi, feature characters from wayang performances (shadow puppet plays), narrate stories from Balinese epics like the Ramayana and Bharathayuda, and educate and transmit local knowledge to readers (Hinzler, 1993). Tenganan's lontar prasi is still viewable and recordable, and its current state is typical. The bulk of the existing physical conditions of the lontar prasi are weak and destroyed since the lontar sheets are sensitive and have been stored for many years. Due to the lontar's poor physical condition, the picture (prasi) of its tale is not readily obvious, which has raised questions about how to preserve, safeguard, and digitize cultural material in order for it to endure in the future.

The digital era is one in which information technology may be quickly and easily exchanged, which serves as a means of adapting to the new normal period. In order to engage younger generations in the preservation of the Balinese lontar prasi culture as well as the preservation of local cultural content that is based on technology (Tzima et al., 2020), technology can be used as a support in the creation of visualization media in attempts to maintain local cultural content (Xu, 2018).

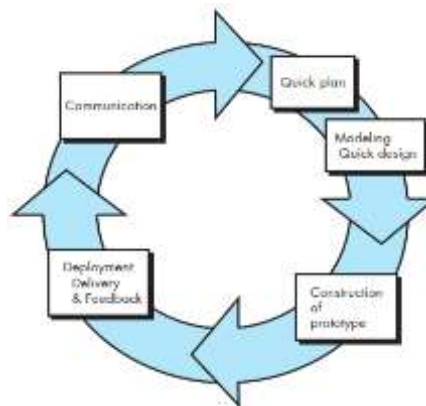
The fourth iteration of industry could benefit from the application of augmented reality technologies. Augmented reality (AR) is a technique that mixes two or three dimensional virtual things to make them appear real, and then displays or projections them in real time (Aslan et al., 2019). This can be done in either two or three dimensions. Augmented reality can be used to comprehend and organize an object by helping to see or show abstract notations. This can be done with the help of augmented reality. Applications for augmented reality are quite similar to

multimedia in the sense that they utilize augmented reality in order to provide interactivity as well as additional information that is comprehensive about an object that exists in two or three dimensions. Interacting with virtual things in order to position them in the actual environment is the core concept of augmented reality (AR) (Pauls & Karsakov, 2021). This augmented reality technique requires the display of characters in Lontar Prasi. The advancement of augmented reality technology in an era marked by technological upheaval in industry Interactive media is used in teaching and learning (Shirley & Malathi, 2020).

In an effort to preserve Balinese culture and to strengthen local cultural content that can be seen by the younger generation and the community and understanding in the current era, even up to the present day (Wakhyuni et al., 2018). This article aims to use augmented reality to digitize the original Balinese culture, specifically lontar prasi Bali. For the AR implementation to work, this same character objects from the puppet stories on the Balinese lontar prasi must be displayed, and animations must be created and the character will move when the scanning process is carried out on each sheet of prasi lontar. This AR can be done on a smartphone, which will hopefully pique the interest of a wider audience and inspire the next generation to learn about and preserve Lontar Prasi Bali.

## RESEARCH METHOD

In this study, a prototype model is used to construct the Lontar Prasi augmented reality (AR) application. The prototype approach was selected because it accommodates the scope and timeline of application development and facilitates communication between application developers and government organizations (Kunicina et al., 2020). Prototyping enables application developers to create a first prototype that meets the analysis of the software's required features (Börsting & Gruhn, 2018).



**Figure 1**  
**Prototyping Model (Pressman, 2009)**

The application development model employing prototyping involves various phases, namely (Freitas et al., 2020):

1. Communication

During the communication phase, interviews with Widya Aksara SMEs were held to determine the application needs in order to acquire material and information about the Balinese lontar prasi for the development of the Lontar Prasi AR application.

2. Quick Plan and Quick Design

At this step, the lontar prasi augmented reality application is planned and designed based on the outcomes of the communication stage's interviews and requirements analysis.

3. Construction of Prototype

At this stage, the design and development of the AR lontar prasi bali application are implemented.

4. Development Delivery and Feedback

At this step, the AR lontar prasi bali application that has been developed is tested with users by measuring the loading time of the user's smartphone in order to obtain feedback on the application's inadequacies.

### The Working Principle of Augmented Reality at Lontar Prasi Bali

Applying the AR operating principle, the concept of using AR in lontar prasi bali is determined. Using the camera on a smartphone, application users can scan the Balinese lontar prasi to display the puppet figures from the Balinese lontar prasi story (Aditama & Setiawan, 2020). Figure 2 illustrates the operating principle of augmented reality on lontar prasi.

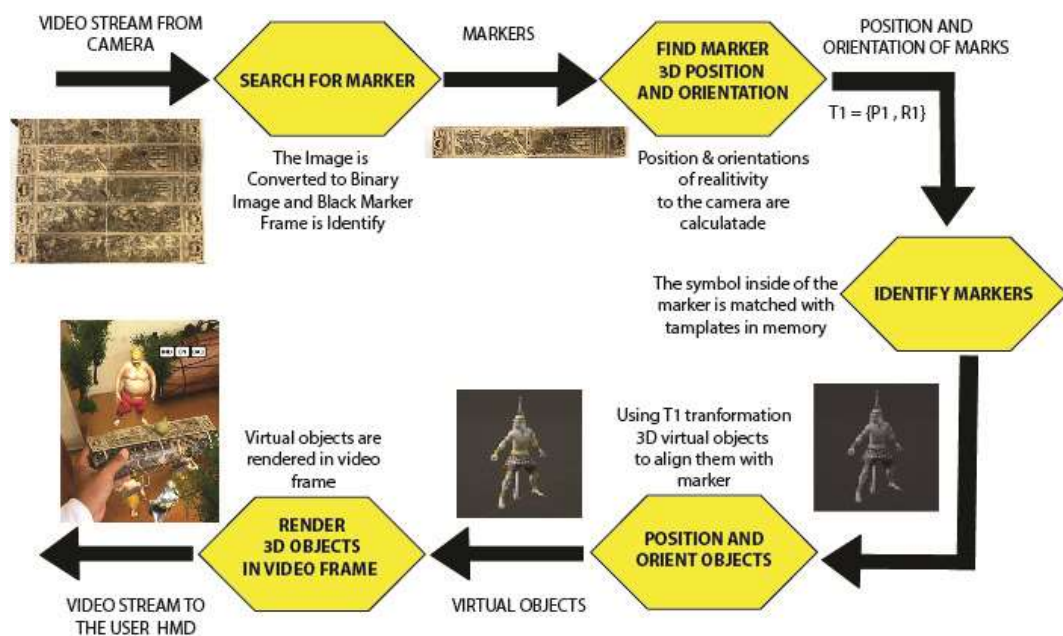


Figure 2

### AR Lontar Prasi Bali Working Process

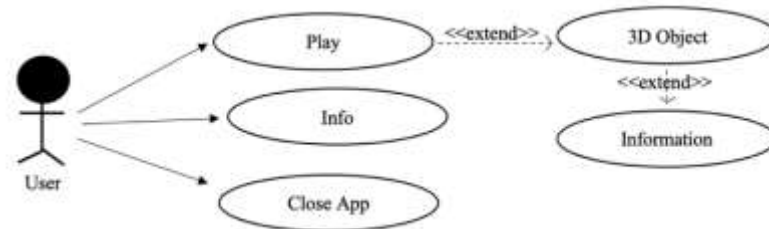
Figure 2 depicts the operational concept of augmented reality and its application: (1) The camera collects data from real-world markers and sends it to the computer. Markers that have been printed in the form of images or special codes; (2) On the

computer, software will track the shape of the image from the marker and determine how many videos it contains. (3) Once a box is located, the software conducts mathematical calculations to determine the camera's position in relation to the black box in the marker. (4) After computing the graphics model, it will be in the same region and scope as the black box, and it will be projected to the screen to show graphics in the real world.

## RESULT AND DISCUSSION

### Augmented Reality Design

The researcher first designed the application in the form of a use case diagram before beginning the process of coding to actually implement the application. The relationship between the user and the program can be graphically represented with the use of something called a Use Case Diagram. Use case diagrams are utilized in order to ascertain which functions are housed within the system as well as who is granted permission to access each of these services (Cavique et al., 2022).



**Figure 3**  
**Use Case Diagram**

### Augmented Reality Implementation

Creating this 3D item dari karakter cerita lontar prasi bali utilizing Blender program. Entering the image that is to be used as a marker into the developer site that is provided by Vuforia is the first step in the process of producing markers. The use of a lontar on the marker will, at a later time, cause it to bring up a 3d item based on the character that has been created.

**Table 1**  
**The Step of Making AR Lontar Prasi**

Step	Process	Information Results
1	Create a 3D object using characters from the "Ramayana" narrative.	

- 
- 2 Making a lontar prasi marker and uploading it on Vuforia



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- 3 Import the SDK file for Vuforia into Unity



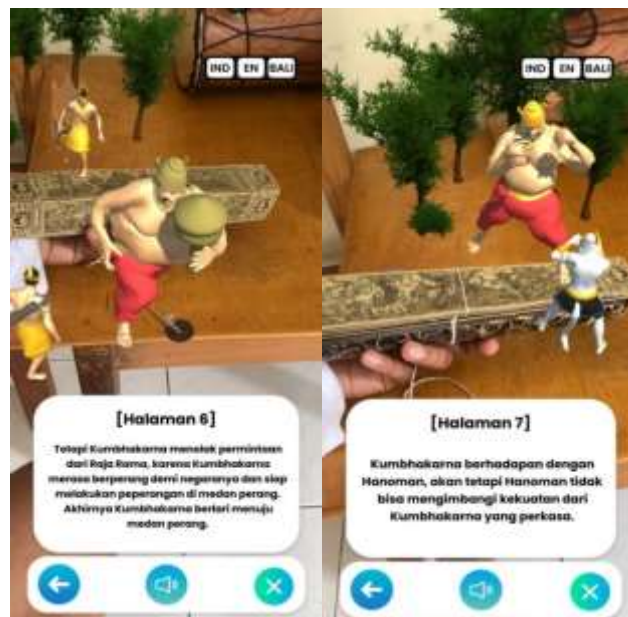
- 
- 4 Drag the target image into the Unity hierarchy, followed by the 3D object. Then provide the license key generated in vuforia.



- 5 When accomplished, convert the settings to.apk for Android. The Lontar Prasi.apk file has been prepared for installation on mobile devices.



The following is an augmented reality visual display that may be used to visualize the story on each lontar prasi sheet that can support local strengthening of cultural content. To display characters in augmented reality, you can use a mobile scanner application on the user's smartphone to scan the following image of a lontar prasi that has been marked. Figure 4 illustrates the effects of character visualization via augmented reality.



**Figure 4**  
**Example of AR Character Lontar Prasi Bali on Mobile Device**

### Testing of Augmented Reality Applications

For testing AR applications, smartphone loading times are measured. When the program runs on a smartphone with various specifications, testing is performed. This test is only performed while inserting a memory card into a smartphone camera, where it determines the response time difference. This test was conducted on three distinct smartphone models, including the Xiaomi Note 8 Pro, Samsung A50s, Oppo Reno F1, and Xiaomi Redmi 5. Table 2 below shows the results of the loading time test.

**Table 2**  
**Response Time Loading Results**

Process	Device Result			
	Xiaomi Note 8 Pro (second)	Samsung A50s (second)	Oppo Reno F1 (second)	Xiaomi Redmi 5 (Second)
Loading time to open the application	3	4	4	6
The loading time presents the primary menu.	2	2	2	3
Loading time required to launch an augmented reality camera	2	2	2	3
loading time for marker detection	1	2	1	3

Response time loading testing is carried out to get the best response results by comparing several smartphones with various specifications in detecting markers (Binetti et al., 2021). The results from four smartphones can be seen in terms of response time loading to opening applications, the Samsung A50s and Oppo Reno F1 have the same loading time, which is 4 seconds. The Xiaomi Note 8 Pro got 1 second faster while the Xiaomi Redmi 5 has the longest time of 6 seconds. Response time loading of displaying the main menu page, 3 of 4 smartphones got 2 seconds of loading time, with different results when displaying menus from the Xiaomi Redmi 5 smartphone. In terms of opening the AR camera, the same thing is also obtained by the Xiaomi Note 8 Pro, The Samsung A50s and Oppo Reno F1 got 2 seconds to open the AR camera, while the Xiaomi Redmi 5 got 3 seconds. For the results of the camera detecting objects on the marker, the Xiaomi Note 8 Pro and Oppo Reno F1 can detect objects within 1 second. While the Samsung A50s can detect objects for 2 seconds and the Xiaomi Redmi 5 can detect time for 3 seconds. For the overall response time loading test, the Xiaomi Note 8 Pro smartphone has a faster average response time loading compared to other smartphones. While the Xiaomi Redmi 5 smartphone has a slower average response time loading. In terms of smartphone specifications, the application can run on all smartphones, Xiaomi Redmi 5 has lower specifications compared to 3 other smartphones so it can be



concluded that smartphone specifications can affect the results of the response time loading test and can support local dissemination of content.

## CONCLUSION

Augmented reality technology can be used to maintain and strengthen local content, particularly the lontar prasi bali cultural legacy. The advantages of augmented reality in visualizing the characters of the lontar prasi story, specifically the Ramayana story, are demonstrated by the fact that the user can view the story on each sheet of lontar prasi in three dimensions by using a smartphone to scan the lontar and display the character of the lontar prasi story. In application development, it is highly beneficial to always consider suggestions for understanding the requirements of augmented reality (AR) applications. User testing employs a loading time test to identify smartphone users suitable with the augmented reality (AR) application, allowing for the effective implementation of the AR application lontar prasi bali.

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