



INFORMATION TECHNOLOGY BASED MODEL FOR BALINESE CLASSICAL DANCE PRESERVATION

Nyoman Utami Januhari ², Ni Luh Ayu Kartika Yuniastari Sarja ^{*1}, Made Rudita ¹

^{*1} Department of Information System, STMIK STIKOM Bali, Indonesia

² Department of Computer Systems, STMIK STIKOM Bali, Indonesia



Abstract:

Bali is one of the famous island with unique art and culture. One of the interesting benefits of Balinese art is the art of dance. Dance which is the origin of Balinese dance there is Classical Balinese Dance. Classical Balinese Dance is a Balinese dance that has certain norms, rules, standards and has high artistic value. Currently the development of Balinese Dance is very rapid as many emerging modern dance in Bali. This causes the Balinese Classical Dance which is the origin of Balinese dance began to be forgotten and rarely staged. Many people are not aware of the existence of Classical Balinese dance. With the development of information technology, the delivery of information can be done by digitizing information. This research examines the utilization of information technology for preservation of classical Balinese dance. The result of this research is the information technology based model of preservation of classical Balinese dance to preserve classical Balinese dance so that people can revive the classical Balinese dance that has been almost forgotten. In addition, this research produce a classic balinese dance website and mobile application. The research method consists of stages of literature review, environmental aspect assessment, analysis, identification, model development, model implementation.

Keywords: Classical Balinese Dance; Information Technology Based Model; Preservation; Information Research Framework.

Cite This Article: Nyoman Utami Januhari, Ni Luh Ayu Kartika Yuniastari Sarja, and Made Rudita. (2018). "INFORMATION TECHNOLOGY BASED MODEL FOR BALINESE CLASSICAL DANCE PRESERVATION." *International Journal of Engineering Technologies and Management Research*, 5(11), 71-85. DOI: <https://doi.org/10.29121/ijetmr.v5.i11.2018.319>.

1. Introduction

Tsunamis Bali is an area famous for its art and culture. The art of dance in Bali has its own uniqueness that distinguishes it from other regions. The art of dance in Bali is mostly associated with religious ceremonies. Dance can be grouped into three groups namely 'wali', 'bebali', and 'balihbalihan'. The Wali dance is the art of dance for sacred performances. Bebali dance is the art of dance for ceremonial performances. Balihbalihan dance is the art of dance for visitor entertainment [1]. Several types of dance are grouped by [2]. Bandem classified Wali dance that is Sang HyangDedari, Rejang and Baris Gede. Bebali dances include Gambuh, TopengPajegan and Wayang Wong. Balih-balihan dances include Legong, Parwa, Arja, Prembon and Joged and various other modern dance choreography [2].

Classical dance is one of the traditional dance that has certain norms, rules and standards and has high artistic value. This type of dance is mostly caused by the palace or Puri [3]. Some examples of classical dance such as wayang wong, topeng, gambuh dance drama, arja, legongkraton and others. Gambuh dance is one of the forerunners of classical dance. Many people are not aware of Gambuh dance. In addition, classical dance such as legongkraton and condong are also fewer that staged the dance. Therefore the need for a medium that can be used to spread information about the classical dance that exist in Bali such as gambuh dance, legongkraton and condong.

With the development of information technology today, the delivery or dissemination of information has been based digitally. One way of delivering cultural information, especially art, is to digitize. Digitalization of culture is a concept of utilization of information and communication technology to increase the usefulness in the field of culture, especially in terms of managing, documenting, disseminating information and knowledge of cultural elements [4]. The concept of digitizing, according to Sukmana (2005) in [5] is the process of media transfer from printed form, audio, and video to digital form. Digitization is done to create digital document form files, for photocopying functions, and to create information systems.

Several studies have used information technology to preserve Balinese culture. As research conducted to introduce the Nawa Sanga Goddess is a manifestation of God in Hindu religion by utilizing virtual reality technology [6]. Besides, research on balinese culture law conservation about Banjar which is unity of society bounded by law which governs the region borders in controlling and ruling local society needs - based on its local customs. This preservation utilizes information technology that is information system that produces e-banjar Bali [7]. Research related to technology utilization information in the field of Balinese dance has been made use of augmented reality for the introduction of classic masks in Bali [8]. In addition, other research has made the introduction of basic applications of Balinese dance using augmented reality on the android platform [9].

The process of digitizing classical Balinese dance can be done by creating a documentation of the dance form both in photos, audio and video. The digital form of Balinese classical dance information can be published through the use of information technology. Based on this, then this research will examine the utilization of information technology to preserve classical Balinese dance. The development of the model aims to be able to describe the utilization of information technology in the process of digitizing and preservation of classical Balinese dance.

2. Research Method

The The research methodology used in this study adapts the IS Research methodology thinking framework advanced by [10]. According to Hevner (2004) an information system research must have two sides that are relevant to the knowledge of the environment (relevance) and obedient to the existing base (rigor).

Artifacts generated in this research in the form of constructs that became the basis of development model of information technology utilization for digitalization and preservation of classical Balinese dance. The research methodology used in this research is seen in Figure 1. Stages performed in this research as shown in Fig.1 can be explained as follows:

2.1. Literature Review

This model builds on the results of a knowledge base study and its relevance to the environment. A literature review that can be seen from the basic knowledge, the knowledge on which the model is based is the concept of classical Balinese dance, web server, website application, android, eclipse, SDK, religious ceremony, and customs.

2.2. Environmental Aspect Assessment

From the environmental side, identification of classical Balinese dance-related research, digitalization of art content, web application, and mobile application are presented. Besides, there is exploration of the traditional Balinese dance through observation and interview. The results of the environmental assessment will show the scope of the need for digitizing and preservation classical Balinese dance. From the environmental and knowledge base, it is expected that the application will be in accordance with the existing knowledge base and relevant to the actual environmental conditions.

2.3. Data Collection

In making the application, the first step is data collection that will become the content of the application. The collection of classical Balinese dance data in the form of descriptions, photographs and videos collected in several areas namely Denpasar, Gianyar and Karangasem.

2.4. Analysis

Stage analysis is done to analyze the concept. Concept analysis includes analysis of classical Balinese dance, information technology and support factor. This analysis will be the basis for obtaining factors that will be constructed in the model.

2.5. Identification

Identify the factors that will be the construct and the construct elements in the model design along with the correlation. This stage is terminated by establishing constructs and construct elements used for the design stage of information technology utilization model for preservation of classical Balinese dance.

2.6. Model Construction

Model construction is a build process undertaken to establish a model of utilizing information technology in the preservation of classical Balinese dance.

2.7. Application Development and Testing

Based on the model that has been built, then the next stage is to implement the model by creating a classic dance website and classical Balinese dance mobile application where these two

applications will be integrated. After the application is completed, followed by testing the application using black box testing method.

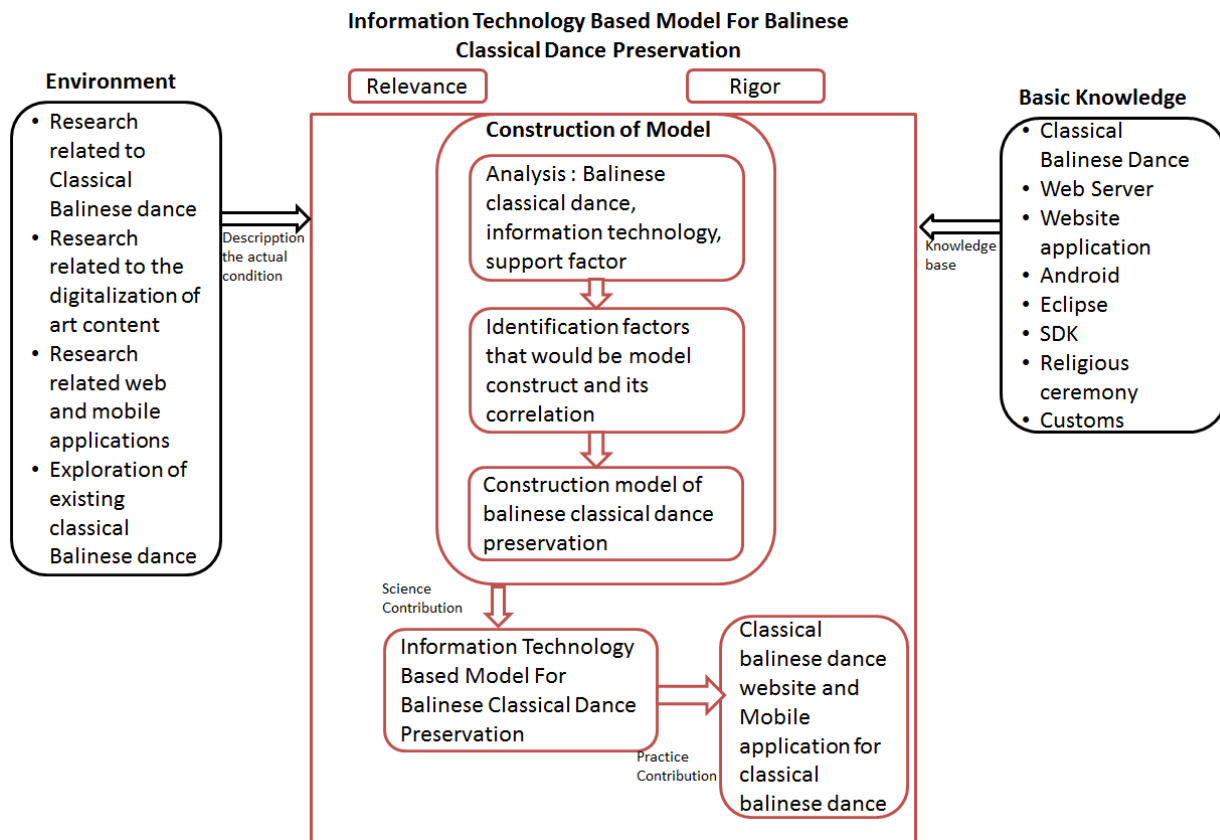


Figure 1: Research Methodology

3. Results and Discussions

3.1. Data Collection

The data was collected by conducting interviews and observations with dance experts, artists and Gambuh dance studio in several areas, namely Denpasar, Gianyar and Karangasem.

In addition to interviews and observations, also conducted data retrieval in the form of taking dance photos and video shooting staging classical Balinese dance. This data will be used as the content in the classical Balinese dance website.

The data was collected by conducting interviews with dance experts, Prof. Dr. I Made Bandem. In addition, interviews were also conducted with the chairman of SekaaDwi Tunggal Denpasar Mr. Sukana, chairman of SekaaMayasariGianyar Mr. I WayanSuambaand chairman of Sekaa Padang AjiKarangasem Mr. Jayantara. The focus of the interview is the gambuh dance as one part of the classical Balinese dance. The observations were conducted on SekaaGambuh in Bali province such as Denpasar, Gianyar and Karangasem and at Bali Art Festival (PKB) 2017.

Based on interview result with Prof. Dr. I Made Bandem, Balinese dance function and Balinese Dance classification consist of:

- 1) Wali dance is a sacred dance, has grown in the 8th century and does not use the actor. This Wali dance uses the concept of kesurupan or kerauhan, the performance is very intimate and the most sacred place. Examples of wali dance is rejang dance, sang hyangdance accompanied by kecak dance.
- 2) Bebali dance is a classical dance, called classical Balinese dance because it has used the role. The main play is taken from Ramayana, Mahabharata and Panji stories. One of the most classical forms of Balinese dance is the Gambuh dance which takes the story from the Panji story and has a dramatic structure, performance structure and performance structure. The structure of the show or scene is the scene of meeting, romance, sadness, departure and war. This is what causes the dance is called a classic has a scene taken from the story used. Classical dance has characters such as King or Prabu, Patih, Bondres and others. Classical Dance has a grip, a very clear pattern. Examples of Classical Dance are Gambuh, Mask, Wayang Wong, Arja. Legong Keraton Dance is a classical semi dance because it was created in the 19th century until the 21st century.
- 3) Bebalihan dance is a new or common creation dance. Wali dan Bebali dance is still a sacred nature, while balihan dance is a dance spectacle created on the basis of wali and bebali dance. Examples of bebalihan dance are Legong contemporary, Kebyar Duduk, Oleg Tamulilingan, Sekar Jagad, and others.

Gambuh dance roles in each region are not all the same. The difference is in the selection of episodes on the banner story that will be played. In every region in Bali it has Gambuh dance but its development is different. Gambuh Dance still lives in every area in Bali because it is related to religious ceremony.

Based on interview results, according to Prof. Dr. I Made Bandem, Gambuh Dance is able to compete because it has the power of history, has a good aesthetics, has various roles that can be used, can be developed also with new plays, not limited only to the Panji story, and also can be modified in English. Dissemination of information about dance Gambuh with information technology media, digitization and documentation is important because the dance is constantly evolving and constantly changing, so do not get the old style lost because it is not documented. It is important to write the style history of each dance. In addition, this documentation is the source for creation. Besides also to disseminate to other areas and abroad that Bali has a classical art that has a standard, so it is important that digitization.

According to dance artist Mr. Made Bukel, Gambuh dance history in Batuan Gianyar begins at the time of the kingdom in Gianyar. Gambuh Dance in Batuan still exist because of religious ceremony. Initially Gambuh in Batuan village was named Gambuh Tri Wangsa consisting of Dewa, Ida Bagus, and Jaba. After a farewell, the pekaandelan Banjar was able to create Gambuh itself. After the ceremony at Pura Dalem Sukaluwih, in 1971 formed Gambuh Banjar Pekaandelan. Then Gambuh is given the name Gambuh Mayasari. Gambuh in Batuan can be used in ceremonies at Temple, Ngasti or Nyekah ceremonies. In addition, Gambuh Batuan can also be performed as well as for the vows ceremony.

The next interview was conducted with the Chairman of Sekaa Seni in Padang Aji Village, Selat District, Karangasem District, Mr. Jayantara. In Padang Aji village, Gambuh dance is performed six times a year at every ceremony in temple. In the beginning, this dance was performed at the royal palace in Karangasem. The role of the dancer Gambuh is played only by men. The female play was performed by men.

According to Chairman Sekaa Gambuh Pedungan, Mr. Sukana, in 1850 has started there is Gambuh dance in Pedungan. Early Gambuh dance in the royal era in Puri Satria. Gambuh dance pedungan show used for ceremony Tumpek Wayang in tutug ketelun. In addition, the Pedungan Gambuh dance can be used for someone who renders the vows. Gambuh dance Pedungan must be preserved for the hardener of the universe.

3.2. Analysis

Based on the results of interviews with experts, artists and art sekaa can be concluded that the average art sekaa do not have documentation so it is necessary to be made documentation in digital form. With the documentation, the community and the younger generation can find information and remember about classical Balinese dance easily and quickly.

Information technology is the use of computers, information and information devices to collect, store, store and disseminate information [12]. Information technology in this research is called as prospect which will help to digitize and preservation of classical Balinese dance. Information technology to be used in the process of digitizing in the form of repository, hardware, software, database and network.

Based on the results of environmental analysis, the existence of classical Balinese dance today due to classical Balinese dance is displayed at religious ceremonies. In addition, the supporting factor of the existence of this classical Balinese dance is local customs. Another factor is the knowledge of people who master classical Balinese dance and knowledge of people against the use of information technology.

3.3. Construct Identification

At this stage will analyze the construct that will be a component in the process of modeling the utilization of information technology for the preservation of classical Balinese dance. Constructions are identified through classical Balinese dance analysis, information technology analysis and factor analysis supporting preservation of classical Balinese dance. Based on the analysis that has been done then the construct that will be a component modeling that is:

1) Information Technology

Information technology is defined as a construct because information technology is a tool that helps digitize and preserve classical Balinese dance. The process of digitizing and disseminating information will be accelerated when applying technology. Technology is incorporated into model constructs because technology is used as a prime prospect for preserving classical Balinese dance in digital form. Information technology are repository and information technology sytem. Repository is a digitized form of Balinese dance digitization in the form of images and video stored

on digital storage media. This repository will become data content for information technology system. Information technology system is a system integration between software, hardware, database and network. Examples of information technology systems in this research are Classical balinese dance website and Mobile application for classical balinese dance

2) Support Factor

Support factor is defined as a construct because it is a factor that influences the existence of classical Balinese dance so it remains sustainable. Supporting factors are customs, religious ceremony and people knowledge.

3) Classical Balinese Dance Preservation

Classical Balinese dance is one of the constructs in the model because it is the purpose of this research.

3.4. Construction Model

Based on the construct that has been set in the analysis phase will be built model utilization of information technology for preservation of Bali dance kkasik. This model consists of three main constructs namely factor support, information technology, and preservation of classical Balinese dance. The model of utilizing information technology for preservation of classical Balinese dance can be seen in Fig. 2. In Fig.2 can be explained the utilization of information technology is shown by the second construct that is construct information technology.

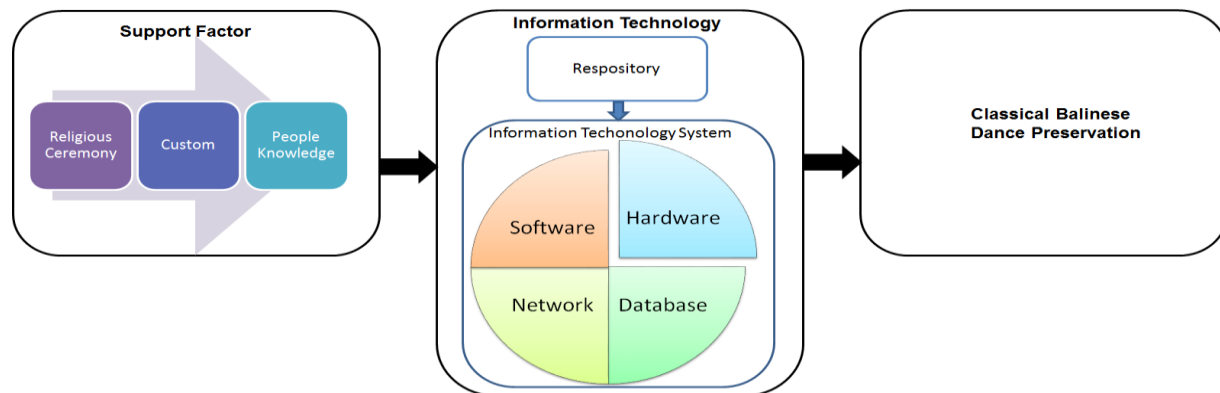


Figure 2: Information Technology Based Model for Balinese Classical Dance Preservation

The impact in the utilization of this information technology is preservation of the classical Balinese dance shown by the third construct of classical Balinese dance preservation. Preservation of classical Balinese dance is determined by supporting factors as seen in the first construct of religious ceremony, customs and people knowledge.

In construct utilization of this information technology there are two sub construct that is repository and system of information technology. Both sub-constructs are interconnected because the repository will be the input on the information technology system. The core in this information technology-based model is digitizing classical Balinese dance. The result of the digitization will be stored in the sub construct repository. In construct information technology system there are four sub construct that is software, hardware, database, and network. These four subconstructs are interrelated. Information technology system is an application for the dissemination of classical Balinese dance information in the form of websites and applications based on mobile phones

android. In this information technology applications there will be hardware in the form of android smartphone and personal computer to access the application. The network is required for access to both web and mobile android apps. Database is a data storage medium for applications. The classical Balinese dance web can serve as a web server that stores and manages all data related to classical Balinese dance. In addition there is also a web interface that can display information related to classical Balinese dance that can be accessed by the general user. For android mobile phone applications can be accessed by the general user by accessing the application on the smartphone. This android mobile phone application will display classical Balinese dance information by making requests to webserver and database.

3.5. Information Technology System

Based on the model that has been produced, one form of application of the model is to build a classical balinese dance website and mobile application for classical balinese dance. With the website and application of this android based mobile phone, all information about classical Balinese dance can be easily accessed by the whole society.

3.5.1. User of Application

This classical Balinese dance application has three (3) types of users, members and administrators. Member is the user who is the admin of each studio that manages the studio's related data and the studio profile. Users are users who can search data related to dance and studio. Administrators are users with the highest access. The administrator performs to manage all data in the application.

3.5.2. Requirement Analysis

Requirement analysis process is the process of searching the needs of information systems. This functionality requirement analysis is an analysis of the functional requirements of the software created. This functional requirement is a feature found in the software created [13]. The functional requirement analysis was obtained based on interview and observation result. The functional needs of Classicalbalinese dance application are as follows:

- 1) Users can find information about the history of Classical Balinese dance
- 2) Users can find information about the category of Classical Balinese Dance
- 3) Users can find information about description of Classical Balinese Dance
- 4) Users can find information about the studio of the classical Balinese dance
- 5) Users can search video and photos classical Balinese dance
- 6) Users can find information about news
- 7) Member can login and manage data related to details of studio information
- 8) Administrator can maintenance member data
- 9) Administrator can maintenance studio data
- 10) Administrator can maintenance history data
- 11) Administrator can maintenance dance data
- 12) Administrator can maintenance dance category data
- 13) Administrator can maintenance news data
- 14) Administrator can maintenance photos data
- 15) Administrator can maintenance videos data

The analysis of non-functional requirements includes analysis of hardware requirements, software and system users who will use the application. The result of device requirement analysis hardware is the required hardware composed over laptops with i3 core processors. Software used is web browser Mozilla Firefox, XAMPP, Dreamweaver, PhpMyadmin, and Android SDK.

3.5.3. Classical Balinese Dance Application Overview

The classical Balinese dance application requires data input in the form of dance, studio, photo and video data. While the output of the system has been mapped into the form of information that is easily understood by the whole community. Administrators and members will enter the data they have into the system. The system will process and store the data. The process of data management on the application is only done through the website. If at any time users need related information, they live to access the application either through the website or mobile application based on android. Design the system on the website using data flow diagram as shown in Figure 3.

Based on Figure 3 it can be seen that Classical balinese dance website has three (3) types of user, member, and administrator. User is an entity that can interact with the system without logging in. Users can search dance and studio data and get information related to dance and studio. Member is a user who serves to perform data management of the studio. Member managing studio data such as studio name, studio chairman, studio description, studio location, and history of the establishment of the studio. In addition, members manage news data or event studio, photo studio and video studio. Admin is the user who has the highest permissions. Admin can manage all data contained in web application.

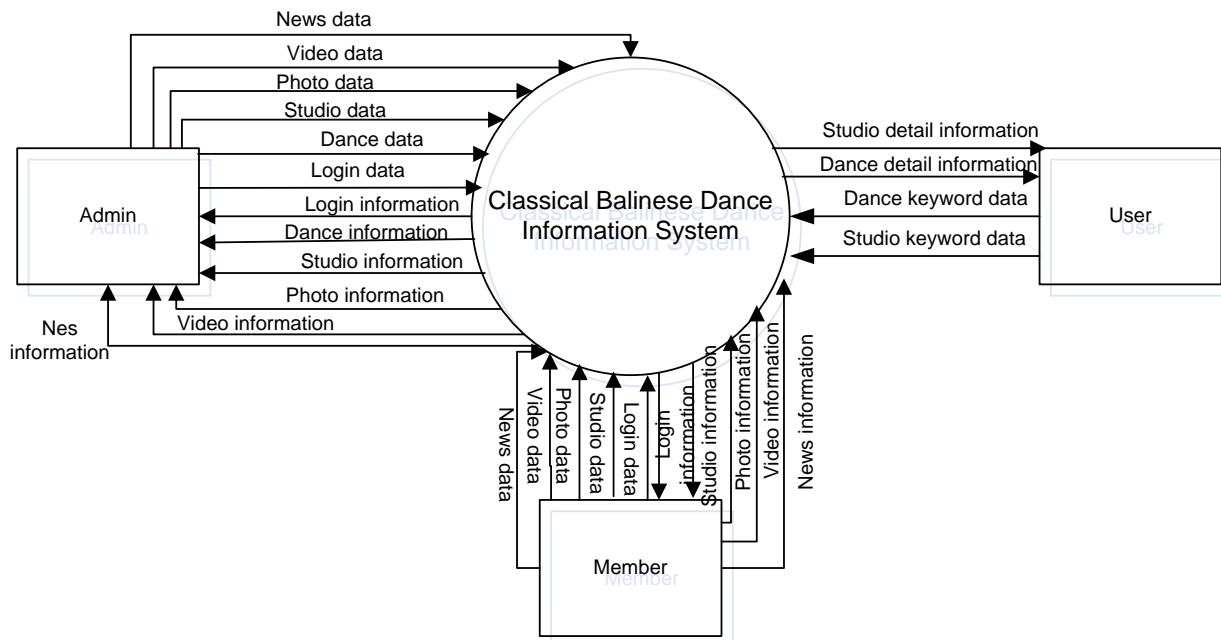


Figure 3: Website system overview of classical Balinese dance

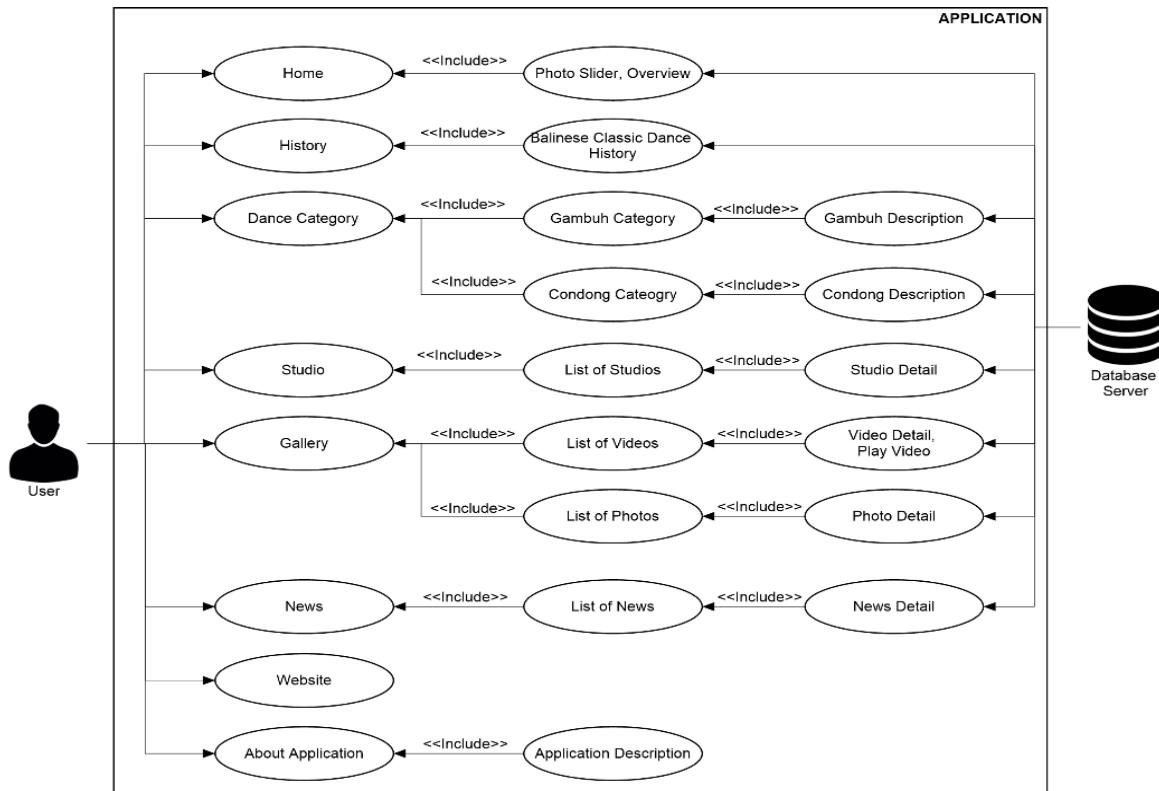


Figure 4: Mobile phone system overview of classical Balinese dance

Admin perform maintenance of historical data, dance data, dance category data, studio data, photo data, video data, and news data. In the application based mobile phone android consists of 1 (one) user is a general user who access information related to classical Balinese dance.

While the design of mobile phone based application system to display information on the smart phone can be seen in Figure 4. In mobile phone application there is only one user that is general user who will be able to access information about history, dance category, studio, gallery, news, link to website and about. In mobile phone applications all information is obtained from database server.

3.5.4. Architecture System Design

Design of system architecture can be seen in Figure 5. Based on Figure 5 it can be explained that this system has a server system where there are web servers and databases. The Web server functions as the primary server and performs or transfers user request files via a predefined communication protocol. Utilization of web server in this research to transfer all aspect of filing in a web page like text, video, and picture. While the database serves to store all the data contained in the application. In Figure 5 explained that the data entered through a personal computer (PC) administrator with a predefined admin account. In the process of addition or request data requires the Internet network to connect applications to the web server.

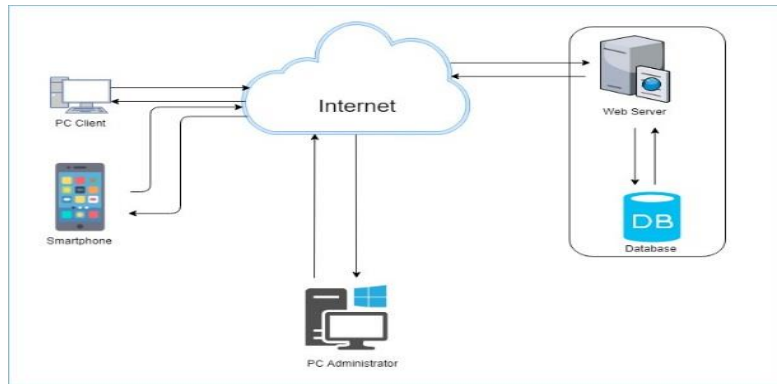


Figure 5: System architecture design

To be able to access the application of Classical Balinese Dance can be done in two ways:

- 1) Through the PC Client by accessing the URL address of the classical Balinese dance website through a browser that will then send requests to the web server and database. The web server will translate the requested data and information and provide an html response.
- 2) Through Smart Phone by downloading and installing APK file on smartphone. Classic Bali Dance Applications can be accessed via android smartphone. The workings of this application is the smartphone will send a request to the webserver and database. Data and information will be sent again to the smartphone app to be displayed.

3.5.5. Database and Interface

Database is one of the compulsory part of the system. That is why database is also need to design before implementation process. In designing the system there are seven related entities such as user, news, dance, dance studio, photo, video, and studio. Each entity has a relation one to many. After all the entity object already found, then the next process is to creating database conceptual. Database conceptual describes relationships between tables contained in the classical Balinese dance application. At application there are seven tables that are related to one another. Database conceptual can be seen in fig. 6. After designing process, the next process is to implement that design into real coding using MySQL Database. The main data that stored in database are knowledge in the form of multimedia, note, video in different kind of file extention. The data grouped based on the owner of the data, which is the studio, since the concept is the cloud model system, so all data will stored in the same database.

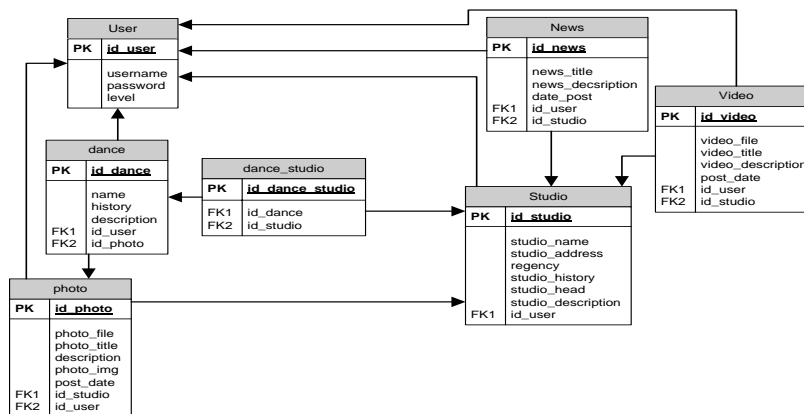


Figure 6: Database Conceptual



Figure 7: The Main Page of Classical Balinese Dance Website

Development of balinese classical dance website using PHP programming language. This system consists of two sides namely the front end system and back end system. Front end system is a view that can be accessed by all users or the community without having to login. Back end system is a system that can only be used by users who have access to login that is admin and member. The main page of the classical balinese dance website can be seen in Figure 7.

The classic Balinese dance website contain information about classical Balinese dance, history, studio, dance category, dance, news video and photos. On the history page display the history of classical Balinese dance based on the results of data collection. On the dance category page display the classical Balinese dance type. The example of classical Balinese dance is Gambuh dance. On the studio page display studio that houses the classical Balinese dance. On the studio page listed studios where learning classical Balinese dance such as Gambuh and Condong. On the documentation page display classic Balinese dance photos and videos obtained from the data collection. On the news page display news related to each studio that teaches classical Balinese dance. On the administrator side and members, can perform maintenance of existing data on applications such as addition, update and delete dance data, studio data, and other data. The addition of studio data can be seen in figure 8 and the addition of dance data can be seen in figure 9.

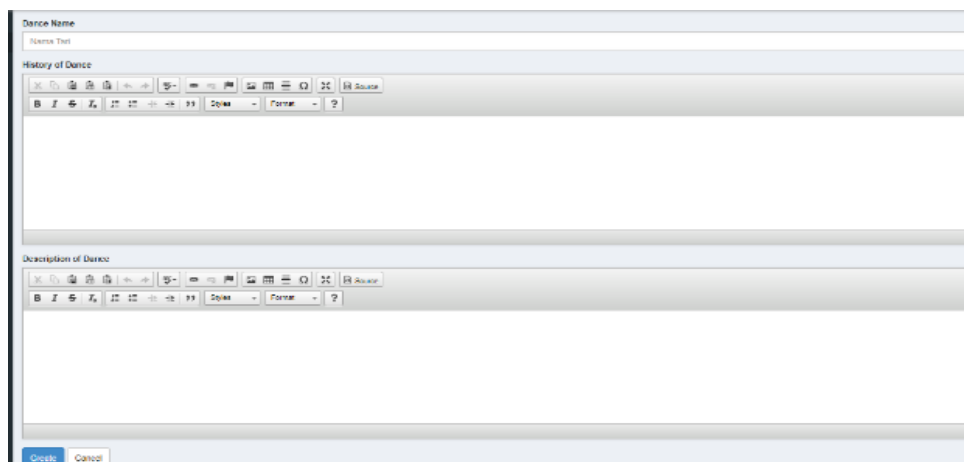


Figure 8: The Insert Studio Page of Classical Balinese Dance Website

Figure 9: The Insert Dance PageOf Classical Balinese Dance Website

Data that has been entered by the administrator and studio members can be accessed through mobile phone applications by installing on mobile phones that have android operating system. Display of mobile phone application can be seen in fig.10.

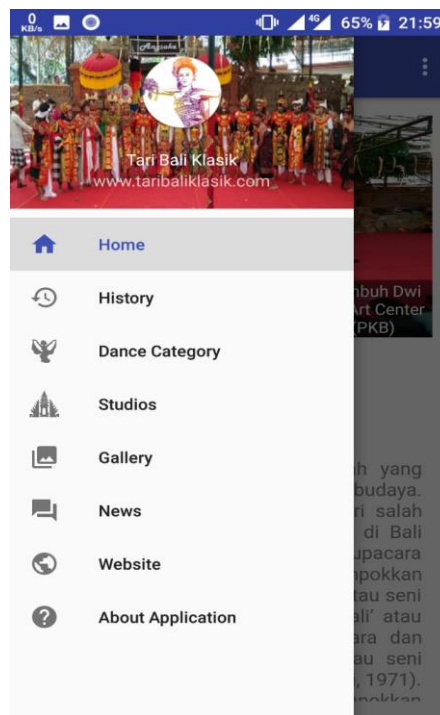


Figure 10: The interface of mobile phone application

3.6. Testing

Black-Box testing attempts to find errors in several categories, including: incorrect or missing functions, interface errors, errors in data structures or external database access, performance errors, initialization and termination errors [14]. Testing on this research is done by using Black Box testing method. Black box testing is used to test all functionality and ensure there is no error in all functions.

Based on the results of tests conducted concluded that all the functions of the system has been running well. After testing, this application is ready for use by people who need information about classical Balinese dance

4. Conclusions and Recommendations

Based on the research that has been done then it can be concluded that:

- 1) Preservation of classical Balinese dance is done by utilizing information technology. In this research has produced Information Technology Based Model For Balinese Classical Dance Preservation.
- 2) This research produces classical Balinese dance website and classical Balinese dance mobile phone application which is a form of application of the model that has been produced.
- 3) Classical Balinese Dance website and mobile phone application is the information system to facilitate the delivery of information about Classical Balinese dance to the community. This classical Balinese dance application helps the public to know information and documentation about the classical dance in digital and web form.
- 4) The application using online storage media, thus it can be accessed anywhere and anytime.

In future, based on the model that has been built, can conduct research on the influence of supporting factors in the implementation of classical Balinese dance applications that have been produced. In addition, framework can be made that contains methods, policies, strategies for successful application of classical Balinese dance applications.

Acknowledgements

The authors would like to express the great thank to Directorate General for Research strengthening and Development, Ministry of Research, Technology and Higher Education, Republic of Indonesia as the sponsor of this research through the scheme of national strategic university research grants.

References

- [1] Panji, I.G.R, "Sekilas Tentang Dinamika Seni Pertunjukan Tradisional Bali dalam Konteks Pariwisata Budaya", 1971.
- [2] Bandem, I.M, Balinese Dance in Transition Kaja and Kelod, 1995.
- [3] Bandem, I.M, Etnologi Tari Bali. Denpasar: Kanisius, 1996.
- [4] Kluckhohn, C. and Kroeber, A. L, "Culture: A Critical Review of Concepts and Definitions", Cambridge, MA: Peabody Museum, 1952.
- [5] Sitokdana, M.N.N, "Digitali sasi Kebudayaan Di Indonesia", Seminar Nasional Teknologi Informasidan Komunikasi 2015 (SENTIKA 2015), 2015, pp. 99-108.
- [6] Rudiasti N.N.W, Sudana, A.A.K.O., Raharja M.S, "Android based Introduction of DewataNawa Sanga Virtual Reality Application", International Journal of Computer Applications. Vol. 169, No. 7, 2017, pp. 38 45.
- [7] Pinatih, I.G.B.A, Sudana, A.A.K.O., Purnawan, I.K.A, "E-Banjar Bali, Population Census Management Information System of Banjar In Bali By Using Family Tree MethodAnd Balinese Culture Law", Journal of Theoretical and Applied Information Technology. Vol. 59, No. 2, 2014, pp. 411-420.

- [8] Nugraha, M.L., Crisnapati, P.M., Sunarya, I.M.G., Kesiman, M.W.A. “Augmented Reality Book Pengenalan Topeng Bali Klasik”. KARMAPATI. Vol. 2, No. 7, 2013, pp. 987-995
- [9] Franza, N.P.S., Sudana, A.A.K.O., Wibawa, K.S, “Application Of Basic Balinese Dance Using Augmented Reality On Android”, Journal of Theoretical and Applied Information Technology. Vol. 90, No. 1, 2016, pp. 61-66
- [10] Hevner, A. C., March, S., Park, J., dan Ram, S,” Design Science in Information Systems Research”, Management Information Systems Quarterly, Vol. 28, No. 1, 2004, pp. 77-105
- [11] Rosa & Shalahuddin, “Rekayasa Perangkat Lunak”, Bandung: Informatika, 2013.
- [12] Rezvani, M., Gilaninia, S., Mousavian, S.J. (2011). Strategic Planning: A Tool for Managing Organizations in Competitive Environments, Australian Journal of Basic and Applied Sciences, 5(9), 1537-1546
- [13] Pressman, R.S, “Rekayasa Perangkat Lunak: Pendekatan Praktisi (Buku Dua)”, Yogyakarta: Penerbit Andi, 2002.
- [14] B. B. Agarwad, C, “Software Engineering & Testing”, Boston, 2010

*Corresponding author.

E-mail address: yuni@stikom-bali.ac.id