Mobile Note Application for *Bendesa Adat* at Bali

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Abstract

Bendesa Adat is the head of village whose job is to coordinate customary matters in the village he leads, for example, the *piodalan* ceremony and also the *dewasa ayu*, especially the *dewasa ayu pengabenan* of the village. *Dewasa ayu* is a great day in doing an activity that is believed by the people in Bali. Determination of *dewasa ayu* and also *piodalan* has the calculations in accordance with the Balinese Calendar such as calculation of *wuku*, *sasih* and also *pengalantaka* that is in the Balinese Calendar. Not everyone understands how to look for *dewasa ayu* and *piodalan* that will occur in the village. *Bendesa Adat* Notes Based on Android are made to make people know about *piodalan* and *dewasa ayu* and holidays in Bali. This application consists of three main informations, there are ceremony day information, *dewasa ayu* information and also *piodalan* information that has been tried out to the public and from the results of the trial 32% of the community said they were very satisfied, 54% said they were satisfied and 14% said enough satisfied.

Keywords: *Bendesa Adat*, Calender Bali, *Dewasa Ayu,* Ceremony day

1. INTRODUCTION

Bendesa Adat is a term from a village head who has a special duty in the area of adat or religion in a traditional village in Bali. *Bendesa Adat* has the duty to regulate religious ceremonies or often called *piodalan* and the provision of *dewasa ayu* for the community in the village they lead [1]. *Dewasa ayu* have the meaning of a good day of the *yadnya* ceremony taking into account the character or traits of a day [2]. *Dewasa ayu* are believed to be able to influence safety in a fairly long period of time [3]. The calculation of the character or traits of the day can be done by looking at *wuku*, *sasih*, *pengalantaka* and also the *wewaran* that is in the Balinese Calendar. The Balinese calendar also has an important role in carrying out Hindu religious ceremony day and can also search for birthdays and determine one's personal characteristics [4]. Of course not everyone knows the timing of the ceremony, so that *Bendesa Adat* is needed which specifically coordinates in the religious field in the village [5].

The solution that could be given based on the problems experienced by some people are to make a mobile-based application that gives the community basic knowledge about the time of conducting religious or *piodalan* ceremonies, *dewasa ayu* and Hindu religious ceremony day so that people know what date and month there are the time of the religious ceremony. The concept used in making this application is almost the same as conventional Balinese Calendar, this application will make it easier for people to know about ceremony day, *piodalan*

and *dewasa ayu*, especially for *dewasa ayu pengabenan* and also marriage by referring to *Wariga Padewasan* book [6].

2. METHODS
2.1. Balinese Calender
Balinese calendar is a calendar that develops in the community, especially the people in Bali. The Balinese calendar is used as the basis for taking good days (*dewasa ayu*) to carry out an activity or conduct religious ceremonies in the community, especially in the area of Bali. Balinese people believe that every activity has a date for each good day. The calendar system generally uses the calculation of *wuku*, *sasih*, *wewaran* and also supplies those are available in the Balinese Calendar [7].

2.2. Waterfall Methods
Mobile Note Application for *Bendesa Adat* at Bali made using the waterfall development method. This method is the stages of application work done sequentially. The stages used are as follows [4].
1) Analysis
Analysis is a stage to collect *dewasa ayu* data obtained from interviews with *Sulinggih* and *Jero Bendesa* as well as from manuals related to the determination of *dewasa ayu* which will then be translated into the programming language used.

2) Design
The design is the stage of making the program so that it becomes an application in accordance with the data obtained at the analysis stage. This design process is the process of translating the data obtained into a programming language so that it is in accordance with the data used in determining *dewasa ayu* especially for the Balinese community.

3) Testing
Stages of testing are stages carried out with the aim of finding errors, especially in calculation of *dewasa ayu* before conducting trials with *Jero Bendesa*.

4) Implementation
The implementation stage is the testing phase using 2 villages as a trial application that has been made.

2.3. *Dewasa Ayu*
Dewasa ayu is a term of the good day of conducting religious ceremonies in the community especially in the area of Bali. *Dewasa ayu* are used as a benchmark of time to carry out religious ceremonies. *Dewasa ayu* are usually calculated by *wuku*, *wewaran*, *pengalantaka* and also *sasih* that exist in Balinese Calendar. Communities in Bali generally believe that every activities that will be carried out has a good day each of which is certainly different in terms of determining the date of its implementation. Basically, *dewasa ayu* can be calculated by

calculating *wuku*, *sasih* and also the *pengalantaka* that exist in Balinese Calendar [8].

2.4. Ceremony Day

The ceremony day is a special day that aims to commemorate an event or event that occurred in the past. The ceremony day in Bali is determined according to the calculation of *Wuku*, *Sasih*, *Wewaran* and the *Pengalantaka* in the Balinese calendar. The calculation of the ceremony especially for Hindu people in Bali can be distinguished into four, namely [9].

1) Calculation Based on *Wewaran*

Wewaran comes from *wara* which has the meaning as a day (name of day) which has a number of ten [9].

Table 1 Division of *wewaran*

Name of *Wewaran*		Name of day		
Ekawara	1.	*Luang*		
Dwiwara	1.	*Menga*	2.	*Pepet*
	1.	*Pasah* (*Dora*)	2.	*Beteng* (*Waya*)
	3.	*Kajeng* (*Biantara*)		
	1.	*Sri*	2.	*Laba*
Caturwara	3.	*Jaya*	4.	*Menala*
	1.	*Umanis*	2.	*Paing*
	3.	*Pon*	4.	*Wage*
	5.	*Kliwon*		
	1.	*Tungleh*	2.	*Aryang*
	3.	*Urukung*	4.	*Paniron*
	5.	*Was*	6.	*Maulu*
	1.	*Redite* (Minggu)	2.	*Soma* (Senin)
	3.	*Anggara* (Selasa)	4.	*Buda* (Rabu)
	5.	*Wrespati* (Kamis)	6.	*Sukra* (Jumat)
	7.	*Saniscara* (Sabtu)		
	1.	*Sri*	2.	*Indra*
	3.	*Guru*	4.	*Yama*
	5.	*Ludra*	6.	*Brahma*
	7.	*Kala*	8.	*Uma*
	1.	*Dangu*	2.	*Jangur*
	3.	*Gigis*	4.	*Nohan*
	5.	*Ogan*	6.	*Erangan*
	7.	*Urungan*	8.	*Tulus*
	9.	*Dadi*		
	1.	*Pandita*	2.	*Pati*
	3.	*Suka*	4.	*Duka*
	5.	*Sri*	6.	*Manuh*
	7.	*Manusa*	8.	*Raja*
	9.	*Dewa*	10.	*Raksasa*

Each day's name has a different number, from 1 day to 10 days. Usually the most commonly used authority to search for a day for either an activity or a ceremony is *triwara*, *pancawara* and also *saptawara*.

2) Calculation Based on *Pengalantaka*

Determination of *dewasa ayu* should also take into account both the *penanggal* and *panglong*. The *penanggal* can be interpreted as the calculation of the days after the occurrence of the *tilem* (dead moon) until the day before *purnama* while the *panglong* calculation of days after the occurrence of *purnama* (full moon) until the day before the occurrence of *tilem* [11].

The calculation of the *penanggal* and panglong is called a *pengalantaka*. The *pengalantaka* itself has the meaning of the system of adjustment of *tilem* (dead moon) and *purnama* (full moon) according to the position of the moon against the sun and also the earth. This allocation causes the age of the moon not forever 30 days, but the age of the month can also be as many as 29 days. This *pengalantaka* adjustment aims to equalize the signs that are in the bali calendar with the state of the moon. The ceremony day of the *pengalantaka* calculation consists of two holidays, namely the full ceremony day and the ceremony of the *tilem*.

3) Calculations Based on *Wewaran* and *Wuku*

Wuku or *pawukon* comes from a book that is part of the balinese calendar dating cycle which is seven days old [18]. Generally, the pawukon can also be used to count Balinese birthdays, which usually amount to 210 days on a conventional calendar [17]. *Wuku* system in bali has thirty *wuku* so my *wuku* cycle runs as much as two hundred and ten days [12,16].

Table 2. Division of *wuku*

No.	Name	No.	Name
1.	*Sinta*	16.	*Pahang*
2.	*Landep*	17.	*Krulut*
3.	*Ukir*	18.	*Merakih*
4.	*Kulantir*	19.	*Tambir*
5.	*Tolu*	20.	*Medangkungan*
6.	*Gumbreg*	21.	*Matal*
7.	*Wariga*	22.	*Uye*
8.	*Warigadian*	23.	*Menail*
9.	*Julungwangi*	24.	*Perangbakat*
10.	*Sungsang*	25.	*Bala*
11.	*Dungulan*	26.	*Ugu*
12.	*Kuningan*	27.	*Wayang*
13.	*Langkir*	28.	*Klawu*
14.	*Medangsia*	29.	*Dukut*
15.	*Pujut*	30.	*Watugunung*

The ceremony day calculation of the *Wewaran* and *Wuku* amounted to fourty two days, namely *Nyepi*, *Siwalatri*, *Banyu Pinaruh*, *Soma Ribek*, *Sabuh Mas*, *Pagerwesi*, *Tumpek Landep*, *Persembahan Bhatara Guru*, *Buda Cemeng Ukir*, *Anggara Kasih Kulantir*, *Tumpek Wariga*, *Penyucian Bhatara Brahma*, *Anggara Kasih Juluwangi*, *Sugian Jawa*, *Sugian Bali*, *Penyekeban Galungan*, *Penyajaan Galungan*, *Penampahan Galungan*, *Galungan*, *Umanis Galungan*, *Pamaradin*

Guru, *Ulihan*, *Pemecekan Agung*, *Penampahan Kuningan*, *Kuningan*, *Buda Cemeng Langkir*, *Anggara Kasih Medangsia*, *Buda Kliwon Pegatwakan*, *Tumpek Krulut*, *Buda Cemeng Merakih*, *Wedalan Bhatara Sri*, *Anggara Kasih Tambir*, *Buda Kliwon Matal*, *Tumpek Kandang*, *Buda Cemeng Menail*, *Anggara Kasih Perangbakat*, *Buda Kliwon Ugu*, *Tumpek Wayang*, *Buda Cemeng Klawu*, *Anggara Kasih Dukut*, *Saraswati*, *Purnama*, *Tilem*, *Kajeng Kliwon* and also ceremony day of *Pujawali Bhatara Wisnu* [13].

4) Calculations Based on *Pengalantaka* and *Sasih*

The *sasih* could be interpreted as a month in the calendar. The number of *sasih* in the Balinese Calendar is equal to the number of months in the year on the conventional calendar commonly used is twelve months, but in one year the Balinese Calendar consists of only 354 days. This *sasih* usually changes every month just like a typical calendar [14].

Table 3 Division of *sasih*

No.	Sasih	Period	Month
1.	*Kasa*	30 days	July to August
2.	*Karo*	29 days	August to September
3.	*Katiga*	30 days	September to October
4.	*Kapat*	29 days	October to November
5.	*Kalima*	30 days	November to December
6.	*Kanem*	29 days	December to January
7.	*Kapitu*	30 days	January to February
8.	*Kawulu*	29 days	February to March
9.	*Kasanga*	30 days	March to April
10.	*Kadasa*	29 days	April to May
11.	*Jiyestha*	30 days	May to June
12.	*Sadha*	29 days	June to July

The calculation of the ceremony day in the Balinese calendar based on the calculation of the *pengalantaka* (*penanggal* and *pangelong*) as well as the *sasih* amounted to two ceremony day, namely *Nyepi* ceremony day and also *Siwalatri* ceremony day [19].

3. RESULT AND DISCUSSION

3.1. The Searched Algorithm of The Ceremony Day *Raya*, *Dewasa Ayu* and *Piodalan* Data

The data that used in creating the application divided into three parts, which are ceremony day, the data for *Dewasa Ayu*, and also the data for *Piodalan* that obtained from the interview result with the *Bendesa Adat* Renon. The data would be created on the stored procedure database *MySql* with the algorithm as follows

a. The Algorithm of Ceremony Day

The amount of ceremony day data that used in creating the application is fourty seven ceremony day data in total. The algorithm example of ceremony day data that used as stored procedure in the database can be as follows

Table 4. The Algorithm of ceremony day *Galungan*

If (Saptawara = Buda && Pancawara = Kliwon && Wuku = Dungulan)

Print "Hari Raya Galungan"

.
The searched algorithm of the data for ceremony day would be created in the stored procedure form which will be saved into the database. The saved database will be shown in the *Bendesa Adat* file application.

b.   The Algorithm of *Dewasa Ayu*
The data for *Dewasa Ayu* that used in creating the application can be divided into two data, which is the *Dewasa Ayu* for the funeral event and the *Dewasa Ayu* for the wedding event. The algorithm of The *Dewasa Ayu* data can be as follows

Table 5 The Algorithm of wedding *Dewasa Ayu*

If (Pengalantaka = 'penanggal' && (Saptawara = Soma, Buda, Wrespati, Saniscara) && (Sasih = Katiga, Kapat, Kalima, Kapitu, Kadasa) && (penanggal = 1, 2, 3, 5, 7, 10, 13) Print "Dewasa Ayu perkawinan"

The searched algorithm of the data for The wedding *Dewasa Ayu* will be used as The data for *Dewasa Ayu* in the application. These algorithms will be created in the stored procedure in the MySql and will be used to show the data for *Dewasa Ayu* in the application.

c.   The Algorithm of Piodalan
Piodalan is a religious ceremony in Bali which is held to thank you for giving Ida Sang Hyang Widhi Wasa or God Almighty that is usually performed at every temple in Bali [15]. The data for *Piodalan* that obtained from the interview will be converted into the computer language so the data can be easier to retrieve.

Table 6 The Algorithm of piodalan

If (Pancawara = Kliwon, Saptawara = Saniscara, Wuku = Kuningan) Print "Piodalan ring Pura Dalem"

The Algorithm of the data for *Piodalan* will be created in the stored procedure at *MySql* and then will be used as the data for *Piodalan* in the *Bendesa Adat* record applications.

3.2. The API Speed Test
The API speed test is intended to test the speed of the data response that used in the *Bendesa Adat* file application. The test is done using three different devices from the RAM, memory, CPU to the type of device used.

Table 7 Device Specification

Samsung Galaxy J1 2016	OPPO A37F	Xiaomi Redmi Note 3 Pro
- CPU Exynos 3475	- CPU Quad-Core 1.2GHz	- CPU Hexa-core
- RAM: 1 GB, Internal: 8 GB	- RAM: 2 GB, Internal: 16 GB	- RAM: 3 GB, Internal: 32 GB
- Android 5.1 Lollipop	- Android 5.1 Lollipop	- Android 6.0.1 Marshmallow

Table 8 API Application List

| API Event Data | API Calendar Data |

Then, The API response speed will be tested on three different devices.

Table 9 Application Speed Test

Samsung Galaxy J1 2016	Oppo A37f	Xiaomi Redmi Note 3 Pro	Note
06,24 seconds	04,07 seconds	02,90 seconds	API Event Data test
01,42 seconds	00,83 seconds	00,72 seconds	API Calendar Data test

From the table above, it could be concluded that the device affects on the data response that taken in this *Bendesa Adat* file application. In order to get the average API response, the *JMeter* application is used and will be set by the 30 users simultaneously logged in to each existing API.

Table 10 The Average Time of API Test

Average Time	Note
6245,10 milliseconds	API Event
10127,83 milliseconds	API Calendar

The table shows the average time of each API that exists in the *Bendesa Adat* file application with 30 users simultaneously logged into the API.

3.3. Results of The Application Utilization

The application utilization is done by testing it to the public. The *Bendesa Adat* file application is utilized to determine the user's satisfaction with the created application. This utilization was done by 30 people. The user satisfaction of the application is done by giving out the questionnaire to the respondents who have tried the application.

Table 11 The User Satisfaction Questionnaire

No.	Statements	Value				
		VD	D	QS	S	VS
1.	The application can run well and efficiently on Android devices.					
2.	Feel comfortable with the appearance of the application.					
3.	The utilization of the application is simple and easy to use.					
4.	The application responds according to the data that the user needs.					
5.	The provided information in the application is simple and understandable.					
6.	The provided information helps users to easily set the day of the ceremony and notify the event that will be held.					
7.	As a medium of learning in providing recommended days of ceremonial activities.					
8.	The provided information is very useful.					
9.	The application is suitable for the society needs.					

The questionnaires were distributed to the people who have tried the *Bendesa Adat* file application. The result of user's satisfaction calculations from the distributed questionnaires is as follows
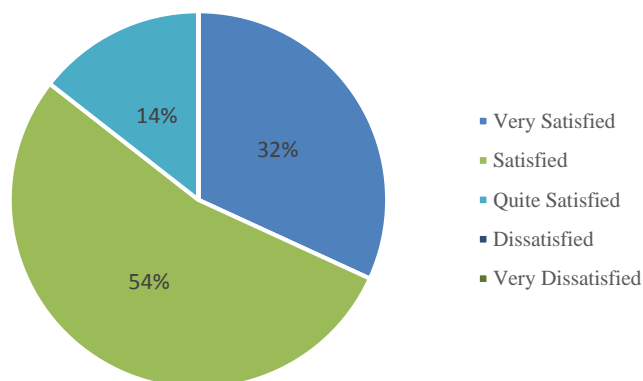

Figure 1 Results of the questionnaire

From the results of the questionnaire distributed about the use of application to 30 people can be concluded that 0% of the public expressed very dissatisfied and dissatisfied, 32% of the respondents expressed quite satisfied, 54% of the respondents expressed satisfied and 14% expressed very satisfied.

Compared to other research studies, this research is more specified in villagers' needs such as the events that will be held in the village [5]. This research can also provide information about the *Dewasa Ayu* of the funeral and marriage ceremony [11]. The application that created in smartphones helps to know the information related to the events that take place as well as finding the recommendations of the *Dewasa Ayu* anywhere and anytime [12]. This application is created to help the society in finding any information about the village institution and the *Bendesa Adat* so that the coordination between the society and village institution or *Bendesa Adat* can be more simplified [10].

4. CONCLUSION

The application of the traditional records by *bendesa adat* that based on mobile provides information on ceremonies day, *dewasa ayu* and also events or *piodalan* existing. This application makes it easy for the public to know the events that will occur in their village and also provide convenience in coordinating with the village apparatus or the traditional *bendesa* in the village. The application made has been tested using the Balinese Calendar by matching the ceremonies day and *piodalan* in each villages. *Dewasa ayu* testing in the application is done by directly asking for the *Bendesa Adat* or by using the *Kunci Wariga* book. The application has been applied to the general public and as many as 32% of the community stated that they were quite satisfied, 54% of the community expressed satisfied and 14% of the community said they were very satisfied with the application that had been made.

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