

DEVELOPMENT OF APPLICATION LEAGUE BASKETBALL TEAM BANDUNG

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ABSTRACT

Basketball is a group ball sport consisting of two teams, each team consisting of five people. The team is fighting over the ball to score points by entering the ball into the opponent's basket. But basketball is not without problems. Many basketball teams complain because of the difficulty when they want to see an empty schedule and order a field to rent because the system is still conventional, it is difficult to find match opponents who are perceived as level and quality and difficult to know information about basketball tournaments. Therefore, a solution is provided to build an application in which the application has an online field rental feature, search and recommendation features and information about basketball tournaments. The design of this application development uses OOAD modeling with the UML concept. This basketball application uses Geofencing technology, Geotagging and Location based service. The method used to look for opponents recommendations is to use the TOPSIS method where the user will input the parameters that have been determined so that it will produce the output of a team that has the greatest preference value. After testing Alpha and Beta it can be concluded that this application has been able to provide convenience to the basketball team when renting, checking field schedules, searching for opponents and seeking information about basketball tournaments.

Keywords : Basketball, TOPSIS, Geofencing, Geotagging, Location Based Service.

1. PRELIMINARY

Basketball games are group ball sports consisting of two teams of five people each. Each team will fight each other for the ball to score points by entering the ball into the opponent's basket. The team that succeeds in putting the ball into the opponent's basket, will get a value [1].

In line with the notion of basketball above, the development of basketball in Indonesia experienced a significant development. Like the fact that was obtained that basketball sport in Indonesia was ranked second [2]. Especially basketball is very

popular among young people. Even many are among the workers who make basketball sports a hobby. All circles must have a team, be it a school team, a campus team, a team of friends, a complex, or an office team. With the growing development of basketball in Indonesia, making entrepreneurs make an effort to rent a basketball court to provide a place for basketball teams who want to play basketball.

But basketball is not without problems. Based on questionnaires conducted online to 40 respondents, the basketball team stated that 87.5% or 35 respondents had difficulties when they wanted to check an empty schedule and rent a field. In addition 90% or 36 respondents found it difficult when looking for match opponents who were perceived as level and quality. Another problem 92.5% of 37 respondents stated that they had difficulty finding information about basketball tournaments.

Based on the problems that have been described from the results of the questionnaire survey, it can be concluded that it is necessary to build a basketball application system that features an online field rental feature, a rival search feature, recommendations regarding looking for the best team opponents who are considered level and quality based on what they want, the standings system to assess the opponent's abilities, information about tournaments and others in one application. With the development of this software is expected to be the right solution to solve the problem. Based on the survey the results of the questionnaire concluded that users of the basketball team 85% used the Android smartphone for the rest using other devices.

There are several studies as references in enriching the study material. Following are previous studies in the form of journals related to research conducted by the author. The research conducted by Aris Wahyudi et al concluded that, with the online rental system being more time and cost-saving where to be able to rent no need to bother coming to a car rental, checking the status of cars that can be rented can also be seen directly in the application [3]. The other research references conducted by Pradihitya Nur Diya et al concluded that the TOPSIS method is suitable to be used as a recommendation algorithm based on what is desired by the user, where the

biggest preference value is the recommendation output [4].

The purpose of this research is:

Make it easy for the basketball team to order and check the field schedule without the need to visit the location of the basketball court.

Make it easier for the basketball team when they want to find information on opponents and find the best and quality match opponents that are deemed appropriate based on what they want.

Make it easy for the basketball team to find out information about basketball tournaments .

2. RESEARCH CONTENT

2.1 Theoretical Platform

This section will discuss the theories related to the research conducted .

2.1.1 Basketball

Basketball is a group sport consisting of two teams, each team consisting of five people. Basketball is usually played in a closed gym and requires only a relatively small field. Basketball is also easy to learn because of its large ball shape, so it does not make it difficult for the player to reflect or throw the ball. [1]

In this game teamwork is needed. In addition, accuracy and accuracy in entering the ball into the opponent's basket is also very necessary to achieve victory.

2.1.2 Geofencing

Geofencing is a concept to describe a geographical area which is then possible to provide context - based a ction proactively [5]. Is the next generation of location based services, whereby when a device is m obile start a dialogue with the user interaction if the device m obile dar i entering or leaving designated areas [6].

Geofencing correlates geographical areas with objects together with a specified condition first. The function of geofencing made to the current location of the device m obile ie when the user enters or leaves a geographic area that has been made can be detected automatically, and the results of such detection can produce the desired outcome. Where the output is run automatically when all predetermined conditions are met.

2.1.3 Location Based Service

Location based service adalah service yang Location based service is a service that functions to search with Global Positioning Service (GPS) technology and Google's cell-based Location . Location-based maps and services use latitude and longitude to determine geographical location, but as a User we need our realtime address or position not latitude and longitude values. Android provides a geocoder that supports forward and reverse

geocoding . Using geocoder , you can convert the latitude latitude to the real world or vice versa [7]. Location-based services or location-based services are essentially general terms used to describe the technology used to find the location of the device that we use .

Metode TOPSIS

TOPSIS (Technique For Others Reference by Similarity to Ideal Solution) is one of the multicriteria decision-making methods first introduced by Yoon and Hwang (1981). TOPSIS uses the principle that the chosen alternative must have the closest distance from the positive ideal solution and farthest from the negative ideal solution from a geometric point of view using Euclidean distance to determine the relative proximity of an alternative with the optimal solution.

Based on comparisons with relative distances, alternative priority arrangements can be achieved. This method is widely used to solve practical decisions. This is because the concept is simple and easy to understand, the computation is efficient, and has the ability to measure the relative performance of alternative decisions [8].

Stages in the TOPSIS method are:

1. Determine the criteria and alternative data into a matrix, where X_{ij} is a measurement of the choice of the i -th alternative and the j th criteria. This matrix can be seen in equation one.

$$D = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix}$$

2. Creating a matrix R is a normalized decision matrix every normalization of r_{ij} value can be done with calculations using equation two

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}$$

Keterangan :

x = matrix value

i = row matrix

j = column matrix

m = number of alternatives

3. Make a normalized decision matrix weighted

$$y_{ij} = W_i r_{ij}$$

Keterangan :

y = the normalized weight

i = row matrix

j = column matrix

W = weight value for each specified alternative

r = normalized results step 1

4. Make a positive ideal solution matrix and a negative ideal solution matrix

$$y_j^+ = \begin{cases} \max y_{ij}; & \text{Jika } j \text{ adalah atribut keuntungan} \\ \min y_{ij}; & \text{Jika } j \text{ adalah atribut biaya} \end{cases}$$

$$y_j^- = \begin{cases} \min y_{ij}; & \text{jika } j \text{ adalah atribut keuntungan} \\ \max y_{ij}; & \text{jika } j \text{ adalah atribut biaya} \end{cases}$$

- Determine the distance between the values of each alternative with the positive ideal solution matrix and the negative ideal solution matrix.

$$D_i^+ = \sqrt{\sum_{j=1}^n (y_i^+ - y_j^i)^2}$$

$$D_i^- = \sqrt{\sum_{j=1}^n (y_i^- - y_j^i)^2}$$

n = criteria

Y = the weight of the normalized

i = line matrix

j = column matriks

- Menentukan nilai preferensi untuk setiap alternatif

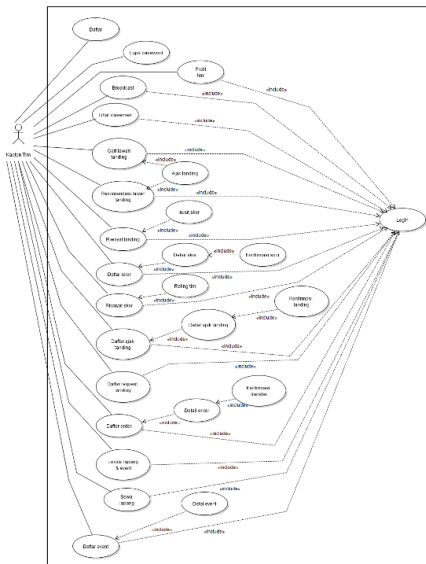
$$V_i = \frac{D_i}{D_i^- + D_i^+}$$

2.2 Result and Discussion

This chapter will explain the system anasis that will be built until the system testing.

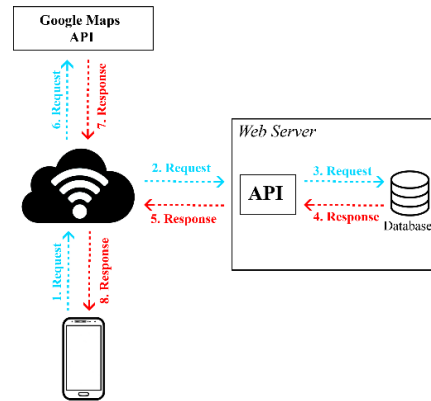
2.2.1 Functional Needs Analysis

Functional needs analysis here describes the activities that will be implemented in the system and explains the needs needed so that the system can run well and in accordance with needs. Berikut t is the use case diagram based on existing needs.



Gambar 1. Use Case Diagram

2.2.2 Analysis of System Architecture



Gambar 2. Mobile System Architecture

The following is a description of Figure 2 Software architecture on the Mobile platform .

- The user's mobile device requests to Google Maps to get Maps.
- Google Maps API will provide a response to the mobile device then displays Maps Mobile device the.
- Mobile devices do Request The web server to get the requested data.
- The web The server accepts Request data requests and retrieves data according to requests from the database.
- The database receives a Request request and gives a response to the Web server.
- The web server will send data via the internet network.
- The internet network will forward the response to the user's Mobile device.

2.2.3 Location Based Service Technology Analysis

In this study to meet the functional requirements of the application, namely to determine the location of the field and the Event required the use of LBS technology. Based on reference references taken from

Case examples regarding the use of location-based service technology are when users want to find the nearest field and Event , then with this LBS technology the user can find the nearest field and Event location in Maps based on the user's location. So that with the use of this LBS technology can help the system that is built in getting the coordinates of the user's location itself.

How it works or the use of LBS in this application is essentially the same as the use of LBS in general in other existing applications such as Google Maps . Here is how LB S works on applications built: Pengguna mengaktifkan GPS terlebih dahulu sebelum menjalankan fungsi dari fitur mencari lokasi lapangan dan Event di google Maps.

- The user activates the GPS first before running the function of the field location and Event search feature on google Maps .

2. When accessing the field location and Event menus , the application will start using LBS to get the location of the user.
3. The application will then display the location of the user from LBS and will also use it to process the nearest field and Event data from the user.
4. Users can route to field locations or Event by pressing the route button and will open a third party application namely google Maps with field location data or Event taken to route.

2.2.4 Geotagging Technology Analysis

In the research of the system to be built, it will utilize the technology available in Mobile device that is Geotagging technology . Here is an example case for using Geotagging technology :

When a user performs a field rental and admin employers airy receive the rental, the basketball team captain must confirm the evidence t transfer by filling out the form and also take photos of the evidence t transfer payments. By the time the captain of the basketball team took the photo proof t transfer payments will automatically get the tag latitude and longitude. Where the tag will be used as input data for the geocoder process . Results of the geocoder is a form of address information in which the photograph evidence transfer. The address information will be displayed on google maps confirmation page section transfer admin field entrepreneur .

The user activates ur Geotagging fit and activates amera on an android smartphone , then the user takes a photo of the confirmation evidence b proof of payment transfer and the tagging process is stored in Exif The header to be taken t ag latitude and t ag longitude for the process of changing latitude and



longitude data into address information through a Geocoder to store latitude and longitude data into the database . The following is the architecture or process of taking Geotagging data based on the case example:

Gambar 3. Geotagging Data Collection Process

1. Users take photos of confirmation of payment proof in the application.
2. The system gets the latitude and longitude data taken.
3. The system takes and changes the latitude and longitude data through the geocoder process to address information.
4. The system will store latitude and longitude data into the database and the field entrepreneur's web admin subsitem will display information on the position of the Captain of the Basketball team when shooting confirmation evidence Transfer on google maps .

2.2.5 Analysis of Geofencing Technology

In the research of the system to be built, this will utilize Geofencing technology . Here is a case example of using Geofencing technology :

When the user enters an area with a radius of 50 meters, where there is an Event or basketball tournament that will be held by the Event committee , the application will send a notification to the user's cellphone that the user is in the Event area being held.

Geofencing mechanism to determine the point that will be Geofencing is by first determining the latitude and longitude that Geofencing wants to give . S fter getting latitude and longitude, and define a radius that want to be included, the specified radius perimeter this term.



Gambar 4. Geofencing Use Scheme

2.2.6 Analysis of TOPSIS Method

In the research or development per soft lift, the TOPSIS method is used to provide a search for the best team recommendations that are deemed level based on the parameters that have been inputted by the team who want to find the competitor. The parameters or criteria specified in this TOPSIS refer to some research references that have been made before, namely by Liang Wu [9], Wei Hua [10], Li Yan [11], Zhao Jin [12], Oguzhan Geyik [13] and Reza Kiani Mavi [14] which in some of these studies took a team's strength offense and defense criteria , some of the reasons are still in the same scope, because these criteria are a basic core in a basketball team . The importance of these two things is due to offense to assess the effort being carried out to break through an opponent's defense area and defense to assess the effort being carried out to hold back when the opponent attacks.

Then there are also other studies, namely what was done by Wisnu Mahardika which refers also to the main reference, namely the book written by Hal Wissel which can be used as a criterion, namely cooperation, skills, endurance, strategy and team speed which are the values of a very specific team success in basketball requires good cooperation, team skills from each individual such as 3 basic techniques that need to be mastered, namely dribbling, passing and shooting, team endurance to assess team stamina, strategies to assess team tactics or formation and the speed of the team because of the basketball game which has a very fast tempo and is played with sports

other [15].

Sample case :

The Jamika BC team wanted to find the best competitor's recommendations and also the level that must be done by the Jamika BC team, namely inputting the parameters that had been determined based on several references described earlier. namely team attack, teamwork, team defense , team endurance, team strategy, team skills, and team speed. The criteria value is in the form of percentage (%). This criterion is a criterion for the search for opponents, and the value that inputs from that parameter is the weight of the criteria. Suppose the team includes the values of the three parameters, namely:Penyerangan tim :

- Team Attack : 20%
- Teamwork : 20%
- Team Defense : 30%
- Durability Team : 70%
- Team Strategy : 50%
- Team Skills : 30%
- Team Speed : 30%

Following is the elaboration of TOPSIS steps based on the example cases described above::

1. Determine alternative criteria and data

a. Alternative Data

Tabel 1. Alternatif Data

Kode Alternatif	Nama Alternatif
A1	Bandung Raptors
A2	Bima Basket
A3	BPJ
A4	Ratmaja BC
A5	Jamika BC
A6	Kartika Raya BC
A7	OS Celeres BC
A8	Pagarsih BC
A9	Parahiyangan BC
A10	Holis BC

b. Criteria Data

Tabel 2. Criteria Data

Kode	Nama	Tipe	Bobot
C1	Penyerangan Tim	Benefit	50
C2	Kerjasama Tim	Benefit	20
C3	Pertahanan Tim	Benefit	30
C4	Daya Tahan Tim	Benefit	70
C5	Strategi Tim	Benefit	50
C6	Keterampilan Tim	Benefit	30
C7	Kecepatan Tim	Benefit	30

c. Alternatif Value

Tabel 3. Alternative Value

#	C1	C2	C3	C4	C5	C6	C7
A1	30	20	20	20	10	30	20
A2	10	10	30	10	30	20	30
A3	40	30	20	30	50	30	50
A4	20	30	50	30	20	50	50
A5	50	20	20	20	30	30	20
A6	20	20	50	50	50	30	20
A7	10	10	20	30	20	10	20
A8	30	20	10	20	30	20	20
A9	40	50	30	30	30	50	30
A10	50	50	30	50	30	30	30

1. Make Normalization

From this step the process of calculating the TOPSIS method begins, as we know that the initial step of the topsis method is to make normalization first. The formula used is as explained earlier :

$$r_{11} = \frac{30}{\sqrt{30^2+10^2+40^2+20^2+50^2+20^2+10^2+30^2+40^2+50^2}} = \frac{30}{104,89} = 0,29$$

$$r_{21} = \frac{10}{\sqrt{30^2+10^2+40^2+20^2+50^2+20^2+10^2+30^2+40^2+50^2}} = \frac{10}{104,89} = 0,09$$

$$r_{31} = \frac{40}{\sqrt{30^2+10^2+40^2+20^2+50^2+20^2+10^2+30^2+40^2+50^2}} = \frac{40}{104,89} = 0,38$$

And so on until the rows and columns end

2. Make a normalized decision matrix weighted

The next step after making normalization, is to make the normalized decision matrix weighted. The stage regarding the process of explaining this weighting researcher gets from the previous research reference by Farima Angraini et al which examines to a major reference [9]. So at this stage there is a matrix multiplication with the weight of preference using the formula previously explained.

$$y_{11} = 0,286038777 * 50 = 14,30193884$$

$$y_{21} = 0,095346259 * 50 = 4,767312946$$

$$y_{31} = 0,381385036 * 50 = 19,06925178$$

dan seterusnya sampai baris dan kolom terakhir.

3. Creating an ideal solution matrix mat r IKS positive and negative ideal solution.

The ideal solution matrix is based on weighted normalization and attribute cost or benefit . Positive ideal solution is taken the maximum value of the normalized weighted if attribute benefit criteria, if the cost is taken minimum value. Conversely, a positive ideal solution is taken from the minimum value of weighted normalization if the attribute of benefit criteria , if the maximum cost is taken. The formula from this stage was explained earlier. The results of

#	C1	C2	C3	C4	C5	C6	C7
+	23,84	10,78	10,78	10,78	10,78	10,78	10,78
-	4,77	2,16	2,16	2,16	2,16	2,16	2,16

this stage are as in the following table.

Tabel 4. Ideal Solution Matrix Result

4. Specifies the distance between the values of each alternative

Here determine the distance with the positive ideal solution matrix and the negative ideal solution matrix obtained from the weighted normalization results and the ideal solution matrix table, using the formula described earlier.

D_1^+

$$= \sqrt{\frac{(14,30193884 + 23,83656473)^2 + (4,313310928 + 10,78327732)^2 + (6,188527478 + 15,47131869)^2 + (14,07052941 + 35,17632353)^2 + (4,902903378 + 4,902903378)^2 + (8,825226081 + 14,70871014)^2 + (6,092076991 + 15,23019248)^2}{34,16328787}}$$

D_1^-

$$= \sqrt{\frac{(14,30193884 + 4,767312946)^2 - (4,313310928 + 2,156655464)^2 - (6,188527478 + 3,094263739)^2 - (14,07052941 + 7,035264707)^2 - (4,902903378 + 4,902903378)^2 - (8,825226081 + 2,941742027)^2 - (6,092076991 + 6,092076991)^2}{13,75663679}}$$

5. Determine preference values for each alternative

The closeness of each alternative to the ideal solution is calculated based on what has been explained previously:

$$V_1 = \frac{13,75663679}{13,75663679 + 34,16328787} = 0,28707551$$

$$V_2 = \frac{12,344388}{12,344388 + 38,46327984} = 0,242963091$$

$$V_3 = \frac{30,55225516}{30,55225516 + 18,97623038} = 0,616862293$$

#	Positif	Negatif	Preferensi
A1	34,16	13,76	0,29
A2	38,46	12,34	0,24
A3	18,98	30,55	0,62
A4	25,25	25,27	0,50
A5	28,07	23,62	0,46
A6	19,09	37,31	0,66
A7	34,07	15,22	0,31
A8	31,45	15,81	0,33
A9	19,81	27,55	0,58
A10	14,36	37,53	0,72

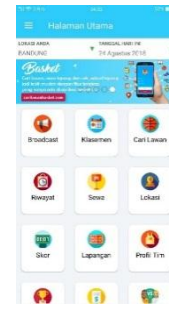
And so on, so that it will get the results in the following table:

Tabel 5. Hasil Perhitungan Nilai Preferensi

The conclusion from the table above is that the Team with A10 code (Holis BC) has the highest preference value among the other teams. M aka output from rival search recommendations and felt my level best and berkualitas based are fed by teams find opponents are Holis BC.

2.2.7 Implementation of the Built System

Following is the implementation of the basketball application that was built.



Gambar 5. Basketball Application Main Page

2.2.8 System Testing

In the testing process in this study using alpha testing techniques the reference from Roger S. Pressman includes security testing , performance testing , device compatibility testing , device specific testing and blackbo [16] . L alu after alpha testing is done then the next beta testing, where the researchers tested here directly to the intended users to determine whether the application is built to be well received or not.

After doing alpha and beta testing then get a test result, where the results of alpha testing techniques do not experience error or bugs . Here the researcher will discuss more deeply in this beta test t hat is, using User Acceptance Testing (UAT) where testing is carried out objectively carried out directly by the application user. This is done to be able to determine the extent to which the application built can help or facilitate and can solve problems that have been explained on the background of the problem and in accordance with the expectations of the user [17] .

2.2.8.1 Skenario Pengujian

The testing scenario conducted in this study uses a questionnaire and Likert scale. Questionnaires will be submitted to a number of certain respondents and have questions with a choice of five answers using a Likert scale 1 to 5. Here are the Likert scale details used:

Tabel 6. Scale Assessment Likert

Kategori	Nilai	Presentase(%)
Sangat Setuju	5	81-100
Setuju	4	61-80
Ragu-ragu	3	41-60
Tidak Setuju	2	21-40
Sangat Tidak Setuju	1	0-20

While to find out the number of answers from respondents in the form of percentage, the following formula is used.

$$P = \frac{\text{total nilai}}{\text{skor ideal}} \times 100\%$$

Keterangan

P = Percentage value sought

Total nilai = Total score responded

Skor ideal = Max weight x Number of respondents

The following are questionnaire questions that will be asked to respondents who use this basketball application. The questions asked were 5 pieces with the following questions:

Answer Category	Score	Frequency Answer	Amount Score
Strongly agree	5	18	90
Agree	4	22	88
Doubtful	3	0	0
Disagree	2	0	0
Strongly Disagree	1	0	0
Amount		40	187

1. Is this basketball application easy to use?
2. Does this application make it easier for you to rent a field?
3. Does this basketball application make it easier for you to find opponents?
4. Does this basketball application make it easier for you to find the best match as desired by your team?
5. Does this basketball application make it easier for you to search for tournaments?

2.2.8.2 Hasil Pengujian

Following are the percentage results of each answer that has been calculated by using the formulas above. This questionnaire has been tested for 40 users

1. Is this basketball application easy to use?

Tabel 7. First Question Processing

Answer Category	Score	Frequency Answer	Amount Score
Strongly agree	5	34	170
Agree	4	6	24
Doubtful	3	0	0
Disagree	2	0	0
Strongly Disagree	1	0	0
Amount		40	194

$$P = \frac{194}{5 \times 40} \times 100\% = 97\%$$

2. Does this application make it easier for you to rent a field?

Tabel 8. Second Question Processing

Answer Category	Score	Frequency Answer	Amount Score
Strongly agree	5	25	125
Agree	4	15	60
Doubtful	3	0	0
Disagree	2	0	0
Strongly Disagree	1	0	0
Amount		40	185

$$P = \frac{185}{5 \times 40} \times 100\% = 92,5\%$$

3. Does this basketball application make it easier for you to find opponents?

Tabel 9. Third Question Processing

Answer Category	Score	Frequency Answer	Amount Score
Strongly agree	5	26	130
Agree	4	14	56
Doubtful	3	0	0
Disagree	2	0	0
Strongly Disagree	1	0	0
Amount		40	186

$$P = \frac{186}{5 \times 40} \times 100\% = 93\%$$

4. Does this basketball application make it easier for you to find the best match as desired by your team?

Tabel 10. Fourth Question Processing

$$P = \frac{187}{5 \times 40} \times 100\% = 93,5\%$$

5. Does this basketball application make it easier for you to search for tournaments?

Tabel 11. Fifth Question Processing

Answer Category	Score	Frequency Answer	Amount Score
Strongly agree	5	20	100
Agree	4	19	76
Doubtful	3	1	3
Disagree	2	0	0
Strongly Disagree	1	0	0
Amount		40	179

$$P = \frac{179}{5 \times 40} \times 100\% = 89,5\%$$

3 FINAL CHAPTER

1.1 Conclusion

Based on the results of testing the basketball application software on this Android platform, the following conclusions are obtained :Perangkat lunak basket yang dibangun ini sudah mampu memberikan kemudahan kepada pengguna dalam melakukan pengecekan jadwal dan persewaan lapangan basket.

1. The basketball software that was built has been able to provide convenience to users in checking schedules and leasing basketball courts.
2. T2. he basketball software that was built has been able to provide convenience to users in conducting rival searches and recommendations to find the best rival who is considered to have the same level of quality.
3. Basketball built software is already able to provide convenience to the user for information *e vent* basketball tournament.

1.2 Suggestion

This basketball application is still far from perfect and there are still many shortcomings. For this reason, further development and improvement is necessary. The suggestions for software development that are built are as follows:

1. Developing software in terms of performance so that resources taken from smartphones become even lighter.
2. Applications can only run on one platform, namely android, the application should also be developed in the operating system for other platforms to expand users who use this application.

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