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Design of Digital Scoring for Pencac Silat IPSI Branch in Padang City

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Abstract

The development of Information and Communication Technology affects every aspect of human life, including in the field of Pencak Silat. In Pencak Silat matches, the scoring system has started to usedigital scoringand has begun to gradually leave the assessment blanks in the form of paper. In West Sumatra, Pencak Silat is a traditional martial art that has developed in all districts, as can be seen from the enthusiasm of participants in participating in Pencak Silat championships which are often held by the Indonesian Pencak Silat Association (IPSI) of the West Sumatra Provincial Government. However, the assessment tool does not yet use digital scoring. The purpose of this study is to design and produce a digital scoring application that meets the assessment aspects in the TGR (Single, Double Team) pencak silat competition category or the sparring category by prioritizing value transparency to improve the quality of Pencak Silat matches in West Sumatra. The digital scoring was developed with PHP which is used as a server-side scripting in web development that allows web applications to be dynamically created. The Digital Scoring which is designed to refer to the match rules of the 2016 IPSI XVI National Conference results is not only limited to hitting and kicking techniques but there are also other techniques such as slamming, pulling, elbowing, kneeling and so on which are declared as legitimate and valuable attacks. The system development method used in this research is the waterfall. namely a sequential software development method, where the process flows from top to bottom like awaterfall, passing through the phases of planning, modeling, implementation, testing and maintenance.

Keywords
digital scoring application; pencak silat; PHP

I. Introduction

Pencak Silat is a traditional martial art that developed in areas where the Malays spread such as Malaysia, Brunei, Singapore, the southern Philippines, and southern Thailand. As a Malay family, Pencak Silat is an art and game in Minangkabau society in addition to dance or Randai. If you pay attention, it can be seen that the Minangkabau dance movement adopts the Pencak Silat movement. According to the West Sumatra IPSI chairman who is also the former Mayor of Padang Fauzi Bahar, "In Minangkabau, religion, custom, and pencak silat cannot be separated from one another". This was expressed in his opening speech at the event of socialization of the Pencak Silat regulations resulting from the 2016 National Conference (Munas) which was held on January 29, 2022 ago.

Even though Pencak Silat has not yet been competed in prestigious world sports events such as the Olympics, all of Indonesia's efforts to encourage this sport to be competed in the biggest sporting event in Asia, the 18th Asian Games, certainly deserve

appreciation. Indonesia, apart from being the initiator, was also listed as the overall champion.

Indonesia's efforts to globalize Pencak Silat actually started long ago. Prior to the Asian Games, Indonesia also initiated Pencak Silat to be competed at the Southeast Asian regional level. His trail began at the 14th SEA Games in 1987. Since then, Pencak Silat has become one of the sports that are competed between Southeast Asian nations every four years.

Pencak Silat is competed in 2 (two) categories, namely the Tanding category and the TGR category (Single Kick, Double Kick, Team Kick). This TGR category is a standard motion art that is competed. The assessment aspect in this TGR category is the correctness of motion, stability, appreciation and stamina, while the match or match category is judged based on legitimate attacks on legitimate targets (*body protectors*) and attacks that cause the opponent to fall to the mat.

The sport of pencak silat is competed with a value calculation system that has been agreed upon by the association of the Indonesian Pencak Silat Association (IPSI). The score calculation system usually uses paper (assessment blanks) at city or district level championships, but if it is in the national class, such as the National Championship (Kejurnas), it uses *score* a more modernThe jury's assessment format, which originally used paper, now uses an Android-based tablet with a wifi connection. In addition to reducing the use of paper, it is also to speed up the process of determining the winner and minimize *human error*. In addition to the *scoring*process, the registration process, distribution of match schedules and results are easily accessible on the website.

But with so many competing arenas, a problem arose. Namely the limited availability of tools. It is felt by most regions in Indonesia, including the province of West Sumatra, that this digital assessment tool is not yet available, even though it has started to apply the Pencak Silat regulations as a result of the 2016 National Conference on each championship. In this 2016 rule, one of the assessment provisions is that if the opponent is 20 points behind, the match is stopped and the winner is immediately decided without having to complete the entire round. This value can be seen by match officials, fighters, coaches and spectators when using *digital scoring*, while if they are still using paper, the audience cannot see *scores* of fighters who are competing in the arena. Based on the background of the problem above, it is necessary to conduct a study entitled "Designing a *digital scoring* for the IPSI Pencak Silat Sports Branch of Padang City."

The main objective in conducting this research is to produce a product that is then able to be applied in an effort to solve the problems that occur. The advantages of this research are not only providing a description or providing a report on the shortcomings that occur. But it produces a product in the form of a digital assessment application for the sport of Pencak Silat.

The Industrial Revolution 4.0 demands that its development be followed, in various fields, including in the field of sports. Pencak Silat is one of them, namely by building a *digital scoring* in the Pencak Silat sport, athletes need to be supported by the application of *sport science.* With the application of technology the results are very transparent, objective and measurable.application *digital scoring* is not yet available in the city of Padang and even in West Sumatra. In Indonesia, this application is only available in several provinces on the island of Java. So it is very necessary for this digital scoring application, especially to apply the 2016 Pencak Silat regulations, so it is imperative to have this digital scoring application.

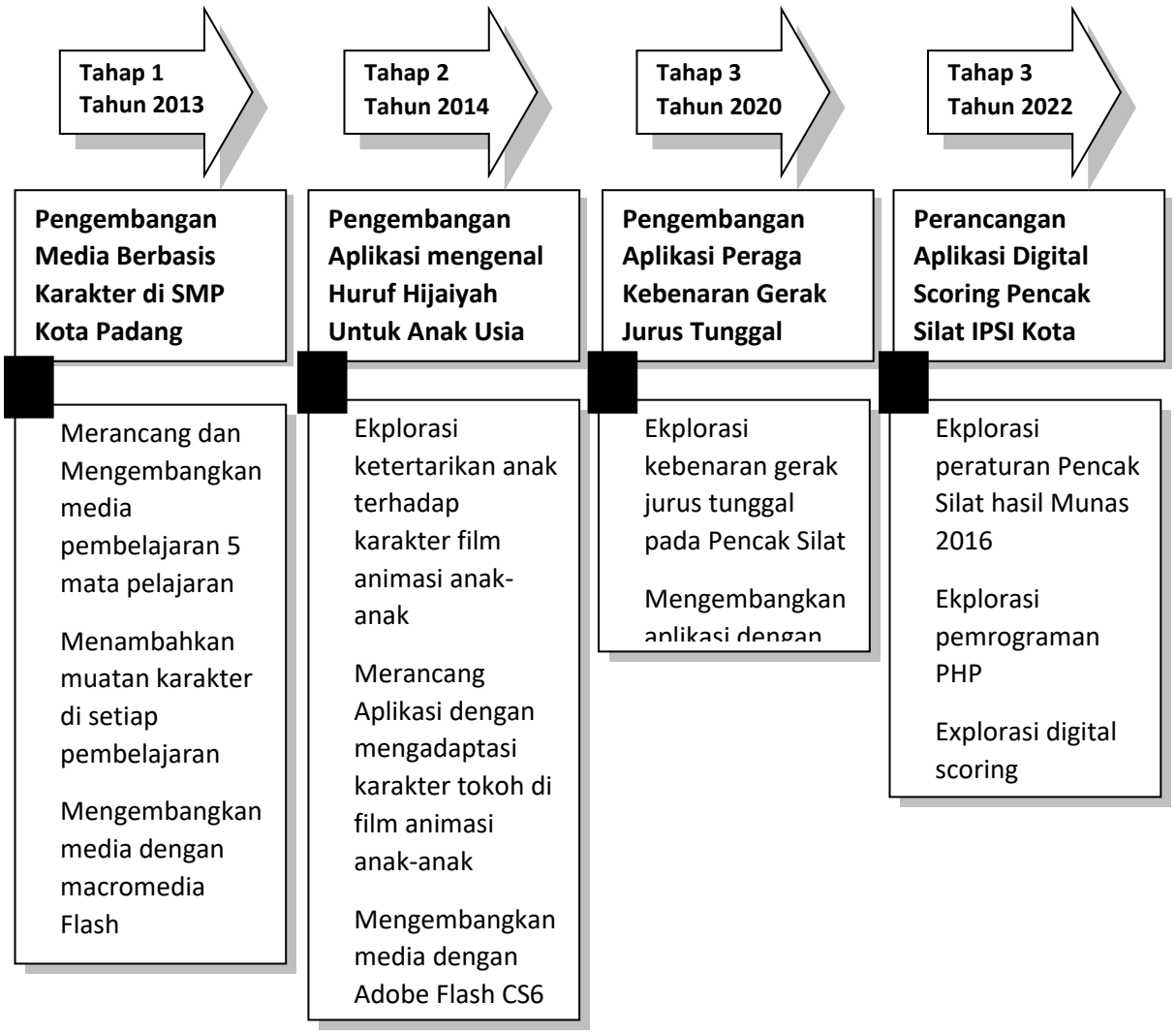

Figure 1. *Road Map Research*

Pencak Silat is a form of movement which is a self-defense mechanism against threats from one or more persons who endanger personal safety by using the limbs as weapons to attack and defend, which is surrounded by religious values.

Apart from being a martial art, pencak silat is also a dance. As a martial art, in pencak silat there are elements of art and elements of martial arts. Practicing Pencak Silat is done to get in excellent physical condition so that you have the ability to defend yourself to avoid danger. The substance of motion in Pencak Silat is: punches, kicks, locks, slams, cuts and evasions accompanied by a pattern of steps and stances. Pencak Silat movements are often used as movements in dance. As a dance, the movement of pencak silat is more subtle and full of "flowers" or called *developments*. The dance moves emphasize martial arts and often people don't see that the dance is a martial art as well.

The developed in the Minangkabau realm, namely:

Table 1. Aliran Pencak Silat di Minangkabau

1	Silek Tuo (Silat Tua)	7	Silek Luncua (Silat Luncur)
2	Silek Harimau (Silat Harimau)	8	Silek Gulo-Gulo Tareh (Silat Gulo-

			Gulo Tareh)
3	Silek Lintau (Silat Lintau)	9	Silek Baruah (Silat Baruh)
4	Silek Sitaralak (Silat Sitaralak)	10	Silek Kumango (Silat Kumango)
5	Silek Pauah (Silat Pauh)	11	Silek Ulu Ambek (Silat Ulu Ambek)
6	Silek Sungai Patai (Silat Sungai Patai)		

Source: List of Silat Schools/Universities, IPSI Padang City.

As a sport that is competed in, Pencak Silat has standard match rules and applies in every championship. In its development there have been several changes to the rules of the Pencak Silat competition, namely:

1. IPSI Competition Rules in 2012
2. PERSILAT Competition
3. Regulations 2013 IPSI Competition Rules follow the 2013 Persilat rules.
4. IPSI 2016 competition rules are recommended to be used after PON XX. PON was postponed to 2021 due to the COVID-19 Pandemic so that the IPSI National Conference was postponed to 2021.
5. In 2020 PERSILAT drafted the Pencak Silat Competition Regulations, which were planned to be ratified at the 2020 Persilat Congress, but were postponed to July 2022.
6. PB IPSI MUNAS XV in December 2021, ratified the draft of the 2016 National Conference results.

The rules for the 2016 IPSI XVI National Conference were not only limited to hitting and kicking techniques but also other techniques such as slamming, pulling, elbowing, crouching and so on. These techniques can now be used and varied in the sport of pencak silat. Some notable changes include:

1. Weighing procedure
   Weighing will be carried out on the morning of the match day, prior to the start of the first match, only for those who are scheduled to compete on the same day. During weighing, athletes must still wear the standard pencak silat uniform without a belt, pubic shield or other protection.
2. All attacks are allowed.
   In the latest regulations all attacks that lead to *body protectors* legalized. Attacks such as elbows, elbows, pulls, hip slams, jump attacks are all allowed even attacks to the back area. However, some attacks are also not allowed such as attacking the head, locking, slamming backwards/suplex, pulling elbows, pulling knees, pulling necks and stepping on opponents.
3. Scissors can be attacked.
   In the previous rules, those who liked to use cutouts to buy time for the game could no longer relax, because cutouts were now allowed to be attacked. Scissors may be attacked with kicks or punches, but must not be stepped on. In addition, the fighter who cuts can also catch the attack and drop and earn points.
4. Down attack can be twice.
   Cuts, front or back strokes can be done twice and combined respectively. For example, if you fail to do a sweep, you can continue with cutting.

5. Attack points.
   There is no point one anymore, there are only 2, 3 and 4. For hand attacks such as punches and elbows are worth 2, foot attacks such as kicks are worth 3 and drops are worth 4.
6. Scissors can be while pulling.
   When doing cuts, a fighter can pull the opponent, be it a body protector, hands, clothes, feet, all are allowed to help in the cutting process.
7. The jury's assessment uses *digital scoring*.
8. Judges who judge 3 people, if two judges enter a value simultaneously for 2 seconds then the value will enter the digital system and if only 1 judge enters it will not enter the digital system.
9. If in a match there is a difference of up to 20 points, the match will be stopped and WMP wins (the Referee stops the match).

Along with the development of technology as it is today, the assessment using the assessment form in the form of paper needs to be reduced and switch to digital assessment as an effort to improve the quality of Pencak Silat matches with the following modules:

1. Registration of Competing Class Participants and TGR
2. Verification of
3. Recap Participant Data
4. Print ID Card of
5. Competing Class and TGR Draw
6. Chart
7. Management Match Schedule
8. Print Match Schedule for Competing Class and TGR
9. Digital Scoring Referee Jury for Competing Class and TGR
10. Value Monitoring (Public)
11. Value Monitoring (Chairman/Competition Council)

PHP, are a scripting language with general functionality mainly used for web development. The language was originally created by a Danish-Canadian programmer Rasmus Lerdorf in 1994. The PHP reference implementation is now produced by The PHP Group. PHP was originally an acronym for Personal Home Page, but now stands for PHP's recursive initializer, Hypertext Preprocessor.

PHP code is usually processed on the web server by a PHP interpreter which is implemented as a module, daemon, or as an executable Common Gateway Interface (CGI). On the web server, the result of interpreted and executed PHP code (can be any type of data, such as HTML or binary image data) will make up the whole or part of the HTTP response. Various web template systems, web content management systems, and web frameworks exist that can be used to organize or facilitate the creation of that response. In addition, PHP can be used for many programming tasks outside of the web context, such as standalone graphics applications and robotic drone control. PHP code can also be directly executed from the command line.

PHP is used as *a server-side scripting* in web development that allows web applications to be created dynamically. PHP is *open source software* that is distributed and licensed for free and can be downloaded freely from the official website http://www.php.net. PHP also has the ability to communicate with third-party applications (*API Services*) using the services provided by the developer.

Several studies that are relevant to this research are research conducted by Jaka Dody Estanto entitled "Development of Supporting Tools for Web-Based Pencak Silat

Competition (Scoreboard)*:* FKIP Untan Pontianak. The results showed that the digital score product was developed using the PHP "Hypertext Preprocessor" formula.

The similarity between previous researchers and the research to be carried out is in terms of providing convenience for referees and judges in assessing athletes and athletes can also see directly the scores they get. It is hoped that the development of the digital score application can be used as a media to directly assess the fighter and the value will appear transparently

III. Research Method

The research was conducted based on the research methodology flow chart as shown in the following figure.

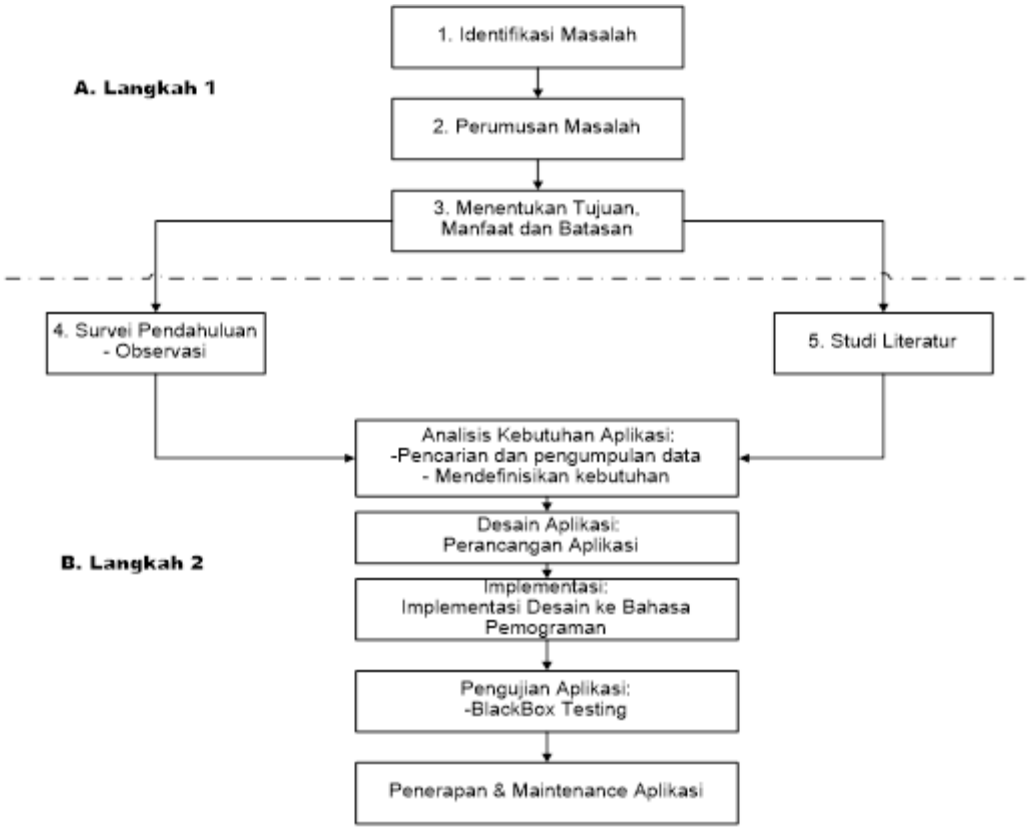

Figure 2. *Research Flowchart (Nazir, 2015)*

Based on the research flow chart in the picture above, the stages carried out in this research are:

Based digital appraisal. Then the second stage is to determine the formulation of the research problem. The third stage is to determine the goals, benefits and limitations. The achievement target in this stage is to know the purpose and benefits of designing this digital scoring application. After that, the fourth stage is a preliminary survey. This preliminary survey is intended to find out things related to this research. And the fifth stage is the study of literature related to this research.

The system development method used in this research is the *waterfall*. namely a sequential software development method, where the process flows from top to bottom like

a*waterfall*, passing through the phases of planning, modeling, implementation, testing and maintenance. The stages of developing this system can be seen in the image below:

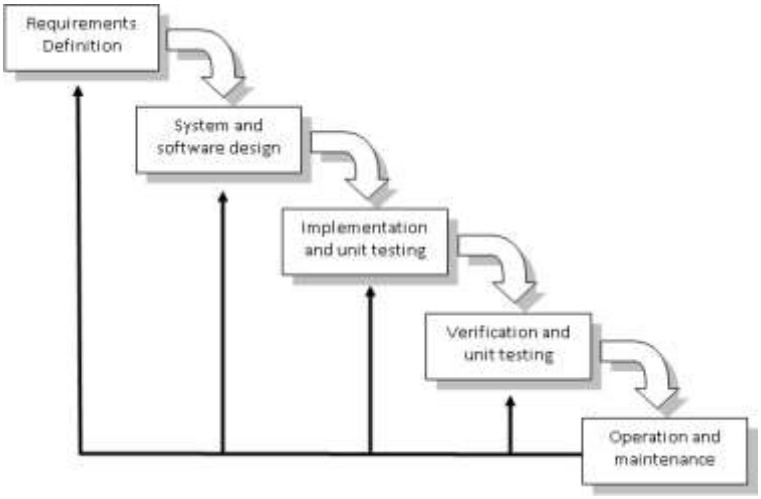

Figure 3. Waterfall Method (Pressman, 2001)

The following stages will be carried out in system development are:

1. Needs analysis (*requirements definition*)
   This stage searches and collects all the requirements needed to support the completeness of the application to be built, then defines all the requirements that will be met in the application created.
2. Application design (*system and software design*)
   In this stage a design will be made of the application to be built, including the preparation of processes, data, process flow and fulfillment of needs in accordance with the needs analysis carried out. The resulting design documentation is in the form of *use case diagrams* and *activity diagrams*.
3. Implementation of design and writing of program code (*implementation and unit testing*)
   In this stage, the system design will be translated into commands that are understood by computers using programming languages.
4. Application testing (*verification and unit testing*)
   This stage is carried out to ensure that the application made is in accordance with the design and all functions can be used properly without any errors according to user needs. Testing uses *blackbox testing*, where testing is focused on application functionality requirements.
5. Implementation and maintenance (*operational and maintenance*)
   At this stage, the application is ready to be implemented according to the purpose of the application. Maintenance, repair and application development are carried out to maintain the quality and stability of the application.

IV. Results and Discussion

4.1 Results

The *digital scoring* was built with the aim of simplifying the duties of match officials, both as judges and judges, as well as being able to display *real* and transparent scores that can be seen by fighters, coaches and spectators present at the arena.application *digital scoring* consists of:

Score blank is designed to have buttons that meet every aspect judged by the jury, such as a hit worth 2, a kick is worth 3, and a drop is worth 4. There is also a score reduction button in the event of a violation committed by a fighter. Button -1 is referred to as Reprimand 1 deduction of 1 point for a fighter who commits a violation, Button -2 is referred to as Reprimand 2 deduction of 2 points for a fighter who commits a violation, button -5 is called warning 1 deduction of 5 points for a fighter who commits a violation, and button -5 -10 is a warning of 2 deductions of 10 points for a fighter who commits a violation. If the fighter commits another violation, he will be declared defeated by disqualification. Assessments are given by the jury by pressing the buttons provided in the score blank, the numbers are read in the value column in each round.

This jury's assessment blank is to assess or give a *score* to two fighters who are competing, namely the fighter who occupies the red corner and the fighter who occupies the blue corner. This scoring blank is installed on a tablet computer and placed on the judges' table as many as three units if the match is agreed to use three judges and five units if using five judges.

Figure 4. *Scoring Blanks*

Each score given by the jury in a match through the scoring blank board is automatically connected to the score recapitulation blank on the referee-jury board's computer monitor screen, so that judges who have not entered a score or who gave the wrong score can be monitored. This is an effort to anticipate the occurrence of misjudgments and ensure the neutrality of the jury in giving scores. The panel of judges can monitor the score of a fighter given by the jury in each round in a match.

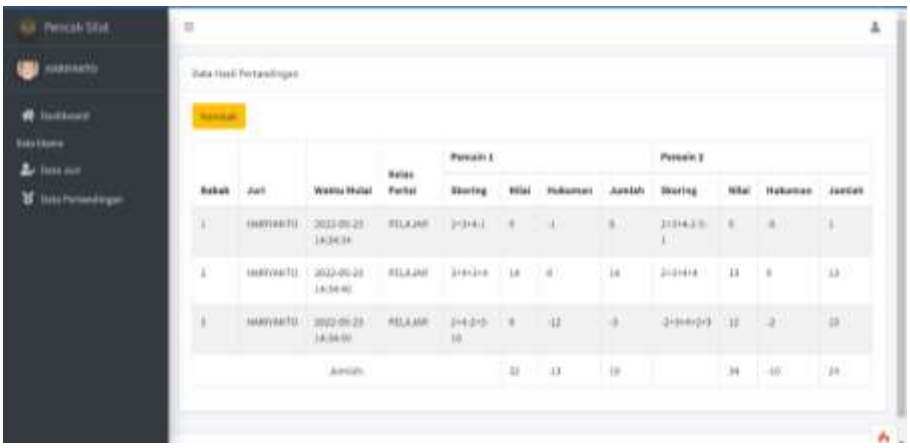

Figure 5. *Digital Scoring*

One of the advantages that is prioritized in *digital scoring* is the transparency of the scores, for this reason a recapitulation of scores is provided which allows the fighter to see the value given by each jury in each round in *real time.* The coach or official can also see the value of the athlete who is competing. Even the audience can see the value of the superior fighter in each round. Because the recapitulation of the value for this audience is projected using *infocus* .

Figure 6. Recap of Test Results

The validity of *digital scoring* is carried out by a practitioner in judging the Pencak Silat sport. In this case, Mrs. Afrida Yanti, S.Sos, who is an international referee-juror and holds a position at IPSI Padang, is the head of the referee-jury institution. Validity test is carried out in order to get input regarding the suitability of the designed digital scoring application. using the following Sugyono (2016:95) formula.

$$Validity\ value = \frac{total\ score\ obtained}{maximum\ score}\ x\ 100\%$$

Description:
Total Score Obtained (Validator) : 70
Total Maximum Score Questionnaire : 72

$$\text{Value validity} = \frac{70}{72} \times 100\%$$

= 96 (Very Valid)

According to Sugyono (2016: 99)procedure for determining the level of validity is obtained with criteria such as the following table:

Table 2. Criteria for Determining the Level of Validity

o	Value (%)	Category
	80% - 100%	Very valid
	60% - 79%	Valid
	40% - 59%	Fairly valid
	20% - 39%	Not valid
	0% – 19%	Very invalid

The digital scoring application developed is only in the form of sparring category assessments, namely categories that feature 2 (two) Pesilats from different angles. Both of them face each other using elements of defense and attack, namely parrying, dodging, hitting kicks on targets and knocking down opponents, using competitive tactics and techniques, stamina and fighting spirit, using rules by utilizing a wealth of techniques and moves. To address the challenges and harness the opportunities offered by digital technologies during this crisis, participants shared a concern to recognize and protect digital rights in particular around the areas of privacy and inclusion (Hariati, 2021). This can be interpreted as internet users in Indonesia belongs to the category of digital natives group (Gunawan, 2020). The use of digital technology worldwide is increasing, especially since the COVID- 19 pandemic in early 2020 (Yugo, 2021).

Furthermore, it is necessary to develop a digital scoring application for the arts category (Single, Double Team) for the Single Category, namely the category in which a Pesilat displays his skills in the Baku Single Kick correctly, precisely and steadily, full of soul, bare-handed and armed and subject to the provisions and regulations laid down. applies to Single category.

The Doubles category is a category that features 2 (two) Pesilats from the same team, demonstrating the skills and richness of their attack-defense techniques. Attack-defense movements are performed in a planned, effective, aesthetic, steady and logical manner in a number of regular series, starting with bare hands and continuing with weapons, and subject to the rules and regulations that apply to the Doubles category.

The Team Category is a category in which 3 (three) Pesilats from the same team demonstrate their skills in Standard Team Kicks correctly, precisely, steadily, full of spirit and compact with their bare hands and are subject to the rules and regulations that apply to the Team category.

Figure 7. *Digital Scoring Applications in Single Category*

V. Conclusion

Based on the results of the validity test on the aspects of Material Substance, Visual Communication Display, Application Design and Software Utilization, the overall score obtained is 96%, Digital Scoring applications are in the "Very Valid" criteria. The digital scoring application can improve the quality of pencak silat matches, especially in terms of value transparency, while minimizing the error rate in the assessment by the judges on duty.

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