Development of Scoring System for Archery Competition Results Website Based

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Article Info	Abstract
	The purposes of the research are to develop a website-based archery competition scoring system and analyze the effectiveness of a website-based archery competition scoring system. This research is research development or Research and Development (R & D). The research method used is a research and development (R & D) scoring system for web-based archery competition results. The types of data in this research are quantitative data and qualitative data, quantitative data in the form of evaluation results of archery experts, technology experts and users of scoring systems, qualitative data in the form of observations. The data analysis technique used is descriptive analysis in the form of percentages. The results of this study are the product of a website-based archery competition scoring system product and a scorer application to enter scores into an android-based scoring system. The results of data analysis on the average score of expert assessment in trial 1 (one) was 74.6% and the results of data analysis on average score of expert assessment in trial 2 (two) was 88.2%. The results of data analysis from users of the scoring system related to the effectiveness of using the product of the scoring system were 87.2%. Conclusion, this research produces a website-based archery competition scoring system that is more effective in processing and presenting the results of archery competition scores.

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INTRODUCTION

Science and Technology (IPTEK) is a science that is very useful in human life. Information and communication technology or ICT (Information and Communication Technology) has become an inseparable part of global life (Februariyanti & Zuliarso, 2012). Science and technology can create various solutions to problems that were difficult to solve in the past, by creating various tools that make work easier.

The development of technology today, especially information technology is growing very rapidly (Batubatara, 2015). Advances in science and technology are something that cannot be avoided in this life, because technological progress will run in accordance with scientific advances (Ngafifi, 2014). Advances in science and technology have a huge influence in various fields of human life (Muhson, 2010). Advances in science and technology have helped many human activities in various activities, especially in the field of sports, both in training and during matches (S. Wicahyani, Woro, Handayani, & Hartono, 2018). The development of science and technology has made a very positive contribution in various fields including sports (Hartono, Akhiruyanto, & Fathoni, 2017).

Sport is one area that needs to be studied more deeply, researchers seek to identify various talents so that sports achievement can increase (Asaribab & Siswantoyo, 2015). Sports achievement is one area that gets special attention by the government. This is because good sports achievement can be said to be one indicator of the success of development in a country (Muhson, 2010). Achievement sports are sports aimed at increasing the potential of athletes to increase the dignity of the Indonesian nation (Shodikhin, Rumini, & Pramono, 2020). Achievement sports are sports that foster and develop athletes in a planned, tiered and sustainable manner through competitions to achieve achievements with the support of science and technology. The development of science and technology is very influential in the political, economic, social, and cultural fields. In addition, the development of science and technology has a great influence in the field of sports (Shodikhin et al., 2020). The sports skills of athletes will increase, if in a sports training, the information on the results of the exercise provides appropriate feedback (S. Ying et al., 2011).

Achievement sports are closely related to athletes and coaches, besides that there are rules that bind both of them. In the current era, science and technology has entered into the rules of both competitions and sports competitions. For example, there is goal line technology in football which determines whether the ball goes in or not and other recent inventions, namely VAR (Video Assistant Referee) which functions to record all events in football matches and assist referees in making decisions by viewing replays of events that are considered odd. by the referee. This shows that now sports are highly regulated by science and technology, both in terms of athlete preparation to competitions.

Archery is one of the sunnah sports recommended by the Prophet apart from horse riding. The sport of archery places great emphasis on accuracy, but does not rule out other supporting components that help. Archery itself in recent years is quite popular among the public, with the proliferation of various open tournament championships at the district, provincial and national levels. Archery is divided into several divisions, namely the Standardbow Round (national), Fita Recurve, Fita Compound, Traditional, and Barebow. However, for the PON level, only 3 divisions are contested, namely the Standardbow Round (national), Fita Recurve and Fita Compound and for the international scale only the Fita Recurve and Fita Compound Divisions are contested. Some of these divisions are also distinguished by different distances from each other.

Archery is a sport that cannot be separated from current technological advances, because with the development of archery, it must be followed by the development of science and technology (Science and Technology) (Hanani, 2018). The tools used such as bows and arrows cannot be made arbitrarily, these

tools must be made with special materials and assisted by sophisticated tools.

Shooting in archery can be interpreted by drawing a bow, aiming and releasing. Archery can be described as a relatively static sport that requires strength and endurance of the upper body, particularly the forearms and shoulders (Tinazci, 2011). The shooting consistency of an archery athlete is generally considered to be the determining factor of a good score. It can be said that archery requires consistency in each athlete to obtain maximum results (Quan, Mohy-Ud-Din, & Lee, 2017).

Scientists from Stanford University (Chanh Nguyen and Irving Lin) are developing an automatic face target in archery in a multi-step way to determine the location and shape of a set of concentric circles that are evenly distributed representing the target face, locate and direct each arrow and find the pinpoint location. where the arrow pierces the target's face. In this case they can also capture it at various angles, but still keep it in a fixed circle shape. This technology has also been tested on mobile phones, the results are also quite good (Nguyen & Lin, 2015).

Archery is a sport that is indeed popular among people from children to adults (Saddle & Hanif, 2005). Archery has developed rapidly in various regions, there are lots of fans of this sport ranging from children, adults to parents.

The scoring process is a very important process in archery. The scoring process is carried out by the scorer who is assisted by the athlete by reading out the score obtained in the presence of other athletes who are in the same bearing. The scoring process is an important process in archery competition, because it is to find out the results obtained by athletes. The current scoring program is only limited to input data that has not been maximized, because it uses Microsoft Excel which is still simple or data input is only

done manually (Hanani, 2018). The use of simple Microsoft Excel has many shortcomings, such as taking too long to input data, prone to errors, then athletes, coaches and officials have to wait a long time to get correct and valid race results. The manual scoring system requires more time in delivering the information to the audience (Ramadhan, Maulana, Hannats, & Ichsan, 2018). In addition, many junior athletes (SD) also do not know the scoring process, it also creates a separate obstacle in the junior level archery competition. The arrows that come out also increase the length of the scoring process because the athlete must first find the missing arrows. The scoring process requires the scorer to be more thorough and do not forget to re-check the calculations made by the athlete so that there are no errors in data input.

Based on observations and interviews with the data processing team at Popda SD, SMP and SMA and Kejurprov Central Java 2019, the scoring process still has many weaknesses, because it is still too manual. The process of inputting score data to a laptop/computer is still too long and there tend to be human errors or errors in the input process due to the large number of data scores entered. According to one of the data processing teams, the current scoring system just hasn't worked optimally. There are many technical and non-technical obstacles from the scoring system that interfere with the course of the archery competition. It takes the development of a more sophisticated scoring system, so that the archery competition runs smoothly.

During the election for the sport of archery on 18-21 February 2020, which took place at the UNDIP stadium. Researchers distributed questionnaires to coaches, officials, referees, athletes and scorers to analyze the need for the development of a scoring system for archery. The results obtained are as follows:

Table 1. Questionnaire for the Needs Analysis of the Development of a Scoring System for the sport of Archery

No	Source person	Amount	Percentage	Description
1.	Coach	2	95	Central Java Pelatda Trainer
2.	Official	6	100	
3.	Referee	6	95	1 International Licensed Referee
4.	athletes	14	86.4	
5.	Scorer	14	93.5	
Jumlah		42	93.8	

From the data above, it can be concluded that both coaches, officials, referees, athletes and scorers need the development of a scoring system for archery with an average percentage obtained reaching 93.98%. The development of the archery scoring system is expected to overcome various problems that researchers have previously observed at Popda SD, SMP and SMA, namely the scoring process is still manual, the process of inputting score data to a laptop/computer is still too long and there tend to be human errors or errors in the process. input because the data score entered is large. The scoring process also needs several stages to get results, so coaches, officials, referees and athletes need to wait a bit longer to find out the score and ranking results obtained by each athlete.

In addition to several things described by the researchers above, the development of this scoring system is expected to be able to input data and deliver information quickly to the official/trainer during the archery competition. This will greatly assist athletes, officials and coaches in formulating strategies for the next archery competition session. Besides, the delivery of results can also be accessed on the spot and by anyone who is involved in the archery competition.

The existing scoring system still has many shortcomings so that it needs to be developed even better, as for some of the shortcomings of the current scoring system, namely:

Using a simple Microsoft Excel program (offline). Input score data is still manual, so it is prone to errors in the data input process because the amount of data is very large.

Scorers must queue in the data input process, because the input process is carried out one by one by the admin (data processing team).

The length of time inputting in one series can have an impact on the next series. Athletes, coaches and officials have to wait a long time to get the overall score.

METHODS

The research design used in this study used a research development design or R & D. This study used development research methods to develop a web-based archery scoring system.

Development is a process stage that includes basic personality changes that are balanced, intact, and in harmony with knowledge and skills in creating good products both hardware and software that can be developed and validated to test product effectiveness (Sudarmono & Hanani, 2019).

The data in this study uses a mix method where there is qualitative data and there is quantitative data in the research procedure. Qualitative data were obtained from literature review, observation and interviews, while quantitative data were obtained from expert assessment questionnaires.

The research procedure for developing a website-based archery competition scoring system is (1) Needs analysis is the first step taken by researchers in this development research. Needs analysis has three stages that must be carried out by researchers, namely literature review, observation and interviews (2) Designing a product that is in accordance with the needs analysis in the form of an initial product draft of a website-based archery competition scoring

system (3) Expert Validation by three experts, namely two archery experts, namely Yudi Arief Fianto, S.Pd (Central Java PPLP Trainer) and Fauzul Darmawan (International Referee), and Ivan Rosyadi, S. Kom as IT expert (4) The revision of the initial product draft was carried out after receiving assessments and advice from archery experts and IT experts regarding the scoring system to be developed (5) Trial 1 was conducted to determine the extent to which the scoring system product was effectively used in the archery competition scoring process (6) Product revisions are carried out after getting the results from the 1st trial (7) Trial 2 was conducted to determine the extent to which the scoring system product was effectively used in the archery competition scoring process on a wider scale (8) Trial 2 was conducted to determine the extent to which the scoring system product was effectively used in the archery competition scoring process on a wider scale (9) After conducting two trials and repairing and revising based on suggestions and input from experts, the final product was obtained in the form of developing a scoring system for website-based archery competition results.

The analysis used in the study to test the feasibility of the product is a questionnaire that uses options with a Likert scale of 1-5, with the categories of answers being very poor (SK), less (K), sufficient (C), good (B) and very good (SB).

The final result of the analysis of this questionnaire test is stated by:

$$P \, (\%) = \frac{f}{N} \, x \, 100$$

Information:

P : The result to be searched in percentage

F : Number of scores to be searched the percentage

N : Score criteria obtained from the maximum score of the questionnaire

The questionnaire eligibility criteria can be seen in the table:
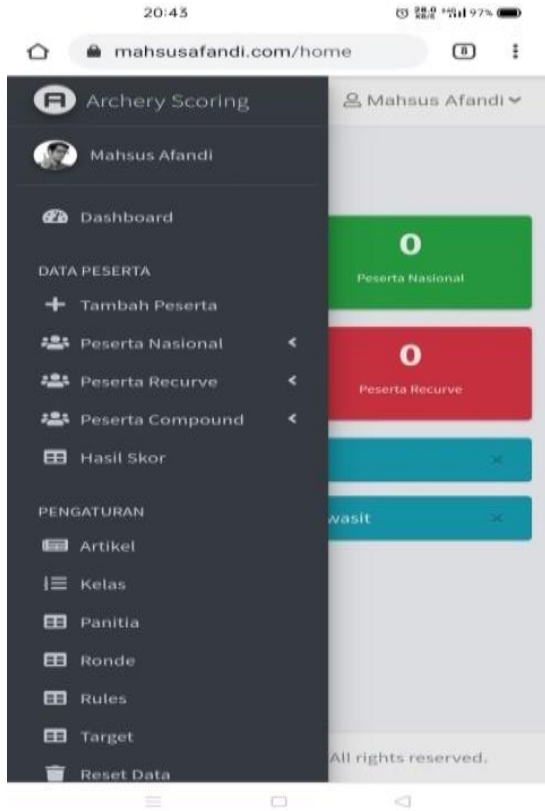
Table 2. Score Interpretation

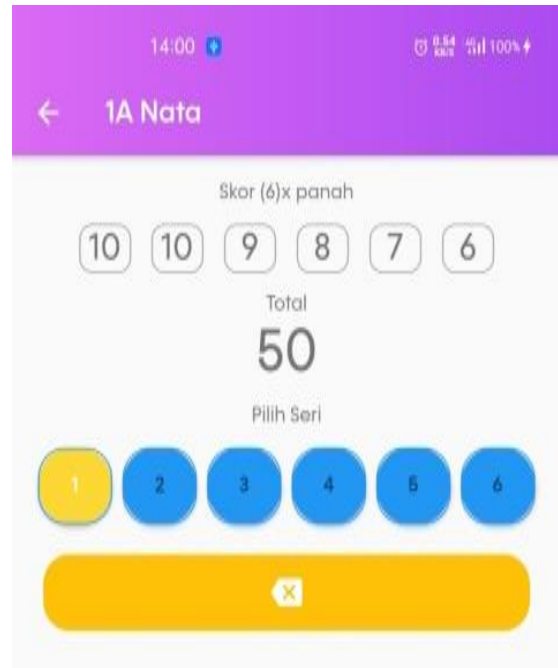| Percentage	Category
0 - 20	Very Poor (SK)
21 - 40	Less (K)
41 - 60	Sufficient (C)
61 - 80	Good (B)
81 - 100	Very Good (SB)

(Source: Mahardini, Akhlis, & Sumpono, 2017)

RESULT AND DISCUSSION

The product produced in this study is a website-based scoring system for archery and a scorer application for entering athlete score data into the website.
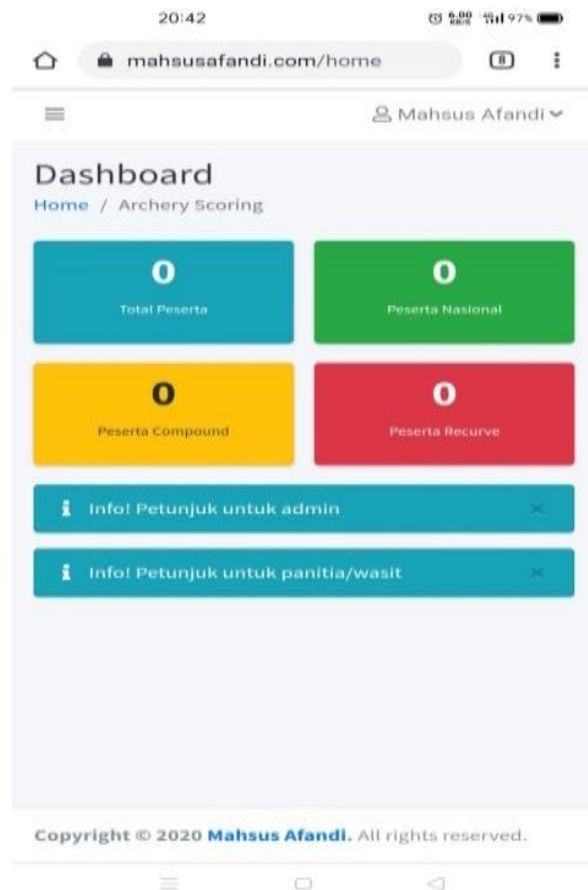
Picture 1. Web Based Scoring System

Picture 2. Scorer App on Android

The data obtained from filling out questionnaires by archery expert 1 (referee), archery expert 2 (coach) and technology expert are guidelines for declaring the feasibility of the scoring system to be used in the trial. The following are the results of filling out questionnaires from experts:

Table 3. The Description of Validity Data of the Experts

Experts	Average	Precentage
(Referee)	4.11	82.3
(Coach)	3.26	65.3
IT Experts	3.84	76.8
Average	3.73	74.6
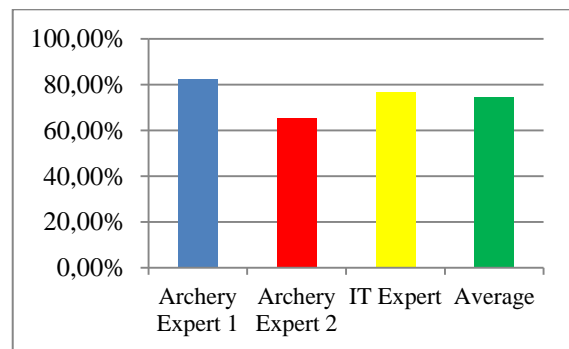
Picture 3. Graph of Data Filling Questionnaires from Experts

Looking at the table of results, the average score of the questionnaire assessment carried out by each archery expert and IT (Telecommunication) expert obtained an average score of 3.73 (three point seventy three) or 74.6%. Based on the criteria that have been set, the average assessment of archery experts and IT (Telecommunication) experts meets the "good" criteria (Mahardini, Akhlis, & Sumpono, 2017). After the initial product draft was validated by experts, then the initial product draft was improved according to the advice of the experts to reduce the weaknesses of the product developed before being tested in trial 1.

One indicator to determine the effectiveness of the product is to know the users of this website-based scoring system product. Trial 1 of this website-based scoring system was carried out by the Limited Selection of the Central Java PON Team Phase 2 at the Candra Birawa Puskepram Field, Semarang City. The data obtained from filling out the scoring system user questionnaire is a guideline to state whether the product of the website-based scoring system can be accepted by the user in the archery scoring process. The following are the results of filling out questionnaires from users in the form of tables:

Table 4. The Description of Validity Data of the User in Trial 1 (one)
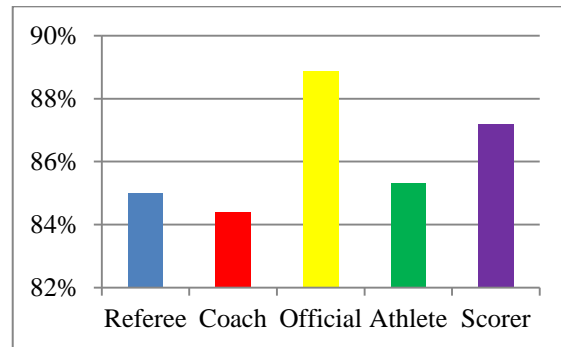
User	Average	Precentage
Referee	12.75	85
Coach	12.66	84.4
Official	13.33	88.8
Athlete	12.80	85.3
Scorer	13.57	90.4
Average	13.09	87.2

Picture 4. Graph Description of Data Filling Trial Questionnaire 1 (one)

The data above shows that the use of the scoring system in trial 1 has an average percentage of 87.2% so it is in the "very good" category (Mahardini, Akhlis, & Sumpono, 2017). These results indicate that an effective and efficient scoring system is used in archery competitions. The manual scoring system requires more time in delivering the information to the audience (Ramadhan, Maulana, Hannats, & Ichsan, 2018).

The implementation of trial 1 of the scoring system product can be carried out well, but there are some suggestions and inputs from users that aim to improve the scoring system to be even better. The following are suggestions and feedback from users that emerged after the 1st trial:

Table 5. Suggestions and Feedback from Experts

Comment	Repair Suggestions
There is no user guide in the scoring system	Provide guidelines for using the scoring system, so that other people can also use the scoring system (general in nature)
The scoring system sometimes still has errors when used	Improve the scoring system so that it does not experience errors when using, so that the course of the archery competition is not disturbed
The scoring system sometimes has bugs when inputting large amounts of data simultaneously	Improve the scoring system so as not to experience bugs when inputting large amounts of data, so that the data input process can take place quickly and the archery competition runs smoothly

(Source: User Rating Questionnaire)

The data obtained from trial 1 is used as a basis for revising the product before being used in trials 2. One of the indicators to determine the effectiveness of the product is to know the user's response to the website-based scoring system product after it is given.

The website-based scoring system product after being tested in trial 1 to users of the scoring system, will then be tested in trial 2. The data obtained from this trial is used as the basis for revising the final product before mass production. One indicator to determine the effectiveness of the product is to know the user's response to the website-based scoring system after the trial is carried out.

The product of the scoring system after being tested 1 and has been revised, the next step is to conduct trial 2. In this trial 2, the researchers originally planned to collect data in the Limited Selection of the 3rd Phase of the Central Java PON Team at the Puskepram Candra Birawa Field, Kota Semarang is constrained by the Covid-19 pandemic. The implementation of the 3rd Phase of the Limited Selection of the Central Java PON Team at the Puskepram Candra Birawa Field, Semarang City, which was originally scheduled to be held in December, has been postponed until the specified time.

The researcher in this case consulted with the supervisor regarding the postponement of the Implementation of the 3rd Phase of the Limited Selection of the Central Java PON Team at the Candra Birawa Puskepram Field, Semarang City which at the same time delayed the data collection process. The supervisor in this case provides a solution for retrieving data by giving an evaluation sheet to the expert as a substitute for trial 2 which was originally to be carried out at the 3rd Phase of the Limited Selection of the Central Java PON Team at the Candra Birawa

Puskepram Field, Semarang City. The following are the results of filling out questionnaires from experts:

Table 6. Filling in Expert Questionnaire Data on Trial 2 (two)

Experts	Average	Precentage
Referee	4.76	95.3
Coach	4.11	82.3
IT Experts	4.38	87.6
Average	4.41	88.2
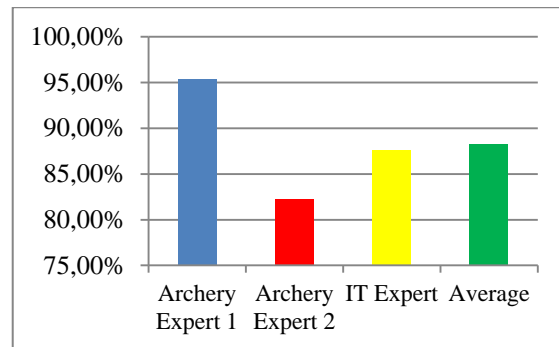
Picture 5. Graph of Expert Questionnaire Data Filling in Trial 2 (two)

Looking at the table of results, the average score of the questionnaire assessment carried out by each archery expert and IT (Telecommunication) expert obtained an average score of 4.41 (four point four one) or 88.2%. Based on the criteria that have been set, the average assessment of archery experts and IT (Telecommunication) experts meets the "very good" criteria (Mahardini, Akhlis, & Sumpono, 2017). Therefore, it can be concluded that the product scoring system can be effectively used in the archery competition scoring process.

Feedback in the form of suggestions and comments is very much needed for product improvement. The following are suggestions and input from experts:

Table 7. Suggestions and Feedback from Experts

Comment	Repair Suggestions
The background display in the scoring system is less attractive	Given a more attractive color compatibility, so that the appearance is fresher and pleasing to the eye
The appearance on the dashboard is made attractive but simple	On the dashboard display to make it more attractive and simple, so that the scoring program can be easily understood, studied and operated by others
Print results in landscape form are less effective	Changed in portrait form to be more effective and efficient
The reset button in the score results has not worked optimally	Fix the reset button to fix the wrong score

CONCLUSION

This research produces a website-based scoring system product and a scorer application that can be used in archery competitions. This website-based scoring system product meets the criteria very well based on the expert validation test, trial 1, and trial 2 so that it is effectively used in the scoring process in archery competitions. This website-based scoring system product can still be developed even better. This website-based scoring system product that is currently being created is only for the qualifying round, so it can still be further developed for the elimination round and so on.

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