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Access to The Utilization of Science and Technology of Sports and Familiarity of the Sports Community towards Technologically Based Devices

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Access to The Utilization of Science and Technology of Sports and Familiarity of the Sports Community towards Technologically Based Devices

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Abstract. The advancement of sport, especially sport coaching in Indonesia, depends on the level of success of sport science and technology transfer process to sport community. This study aims (1) to describe patterns of sports science and technology transfer process to community, and (2) to analyze the level of accessibility and familiarity of the tools of technology-based physical ability test among coaches and sport community. This is a continuation of embryo research on modeling selection and utilization of technology-based devices through the Nominal Group Technique (NGT) at the research stage next year. The experiment was conducted by applying the combination method of various approaches. The approaches includes: Bibliographical Studies, Survey Descriptive, Nominal Groups Technique (NGT), as well as certain stages of a study on modeling the selection and use of hardware and software tools of modern physical ability test on sports community achievements in Surakarta. The results showed that basically the coaches have a tendency as follows: (1) 98.7% respondents felt that most coaches are ready to make improvements by training themselves in using sports science and technology, (2) 97.3% felt that a refreshing model of science and technology-based exercise planning process organized by the stakeholder group exercise can be followed periodically and coached evenly, (3) Respondents did not agree with the statement that community sports coach had appreciation for applied sports science and technology development, the lowest mean item score is the issue of "appreciation of science and technology development in sports". It is high time for coaches in Indonesia to increase their appreciation to sport science and technology, and sport community.

1. Introduction

The forward orientation of the development of sports science and technology, has confirmed that in the Republic of Indonesia Act No. 3 of 2005 on the System of National Sport, particularly



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Article 74, that: (1) government, local governments, and / or communities to develop science and sustainable technologies to promote national sports, (2) government, local governments, and/or society can establish research and development institute of science and technology that are useful to promote sports coaching and development of a national sport, (3) development of science and technology held through research, assessment, technology transfer, dissemination, scientific meetings, and cooperation among research institutions, both nationally and internationally who have specialized knowledge and technology in sports; (4) the development of science and technology promoted and applied for the advancement of sports, and (5) Further provisions regarding the development of sport science and technology regulated by Government Regulation.

Performance in sports is actually a product of the accumulation of systematic efforts of various factors, that its realization must be escorted through the scientific process. Sport science and technology (Science and Technology OR) is something that should be applied properly in a series of efforts to achieve excellence in sports. Excellence is achieved strong correlation with degrees in mastery of science and technology. Mastery of sport science and technology is not a

mere technical issue, but related to the problem of “outlook” and “way of life” in a collective society. The challenge ahead is to seek the establishment of the people who love sports as well as a community that is sports science and technology literate.

The use of technology is playing an ever increasing role in sports. Engineers and scientists are taking advantage of advances in modeling and materials in the design of boat hulls, oars, swimsuits, running shoes, clothing, golf clubs, skis, snowboards, bikes, and so on to allow the athletes to increase their performances over time. Technology has the potential to play a significant role not just in the equipment but also in the training of the athletes [1]. The development of sport science and technology in Indonesia is actually quite rapid. But the momentums that occur are not comparable with its benefits on the practical level. There’s even an impression that the sports coaches on the field are less familiar with other forms of software and hardware technology that is actually useful in sports for developing effective performances of athletes. Science and technology in sports has not been optimally implemented in the sports community in the homeland. The coaches are in fact former athletes who were more likely to believe on their personal experiences rather than utilizing modern tech equipment or applying the research results of Sport Science.

In association with the use of Sport Science and Technology in the coach community, there are typical problems that need to be revealed and analyzed until the root of the problem. Technology for any purpose and function is actually an option in its application. Therefore, we should do research on the preparation of model selection and use of technology to test physical ability that refers to the level of acceptance and the capability of the coach. The model focuses on the Hardware and Software Tools of Modern Physical Ability Test. The study aims to describe, establish, and facilitate the practical knowledge of the sports coach community in the application of sports science and technology.

The research aims to: (1) describe patterns and access to sports community in terms of sports science and technology transfer processes, (2) analyze the level of familiarity of the sporting community with the tools of the technology-based physical ability test, (3) develop theoretical models of the selection of sports hardware and software technology, especially on modern physical ability test devices in the sports community through the Nominal Group Technique (NGT), (4) develop theoretical models of the utilization of sports hardware and software technology, especially on modern physical ability test devices in the sport community through the Nominal Group Technique (NGT). The first stage of the research process is limited to the achievement of goals (1) and (2) above. While goals (3) and (4) are planned as the research will be continued as future works.

Technological advancement is a natural process, and with its introduction into a sport, athletes simply become “better”. Technologies in sports are man-made means developed to reach human

interests or goals in or relating to a particular sport. Technology in sports is a technical means by which athletes attempt to improve their training in a competitive surrounding in order to enhance their overall athletic performance. It is the knowledge and application of using specialized equipment and the latest modern technologies to perform tasks more efficiently [2]. In the Indonesian Government Regulation No. 16 of 2007, particularly in Chapter IX, Article 74, has been elaborated in a more operational manner, that: (1) the development of sport science and technology is aimed to develop basic science (basic science) and applied science (applied science) in the field of sports, (2) the development of basic sport science intends to describe, understand, and explain aspects of the sport by taking into account the composition of the body of sports science through a multidisciplinary approach, interdisciplinary, or cross-science, (3) development of applied science aimed at improving the quality of coaching and sports development.

Furthermore, sports technology development process should refer to a Grand National Strategy which is integral to the process of technological development in general. The process is illustrated in a systematic scheme in Figure 1.

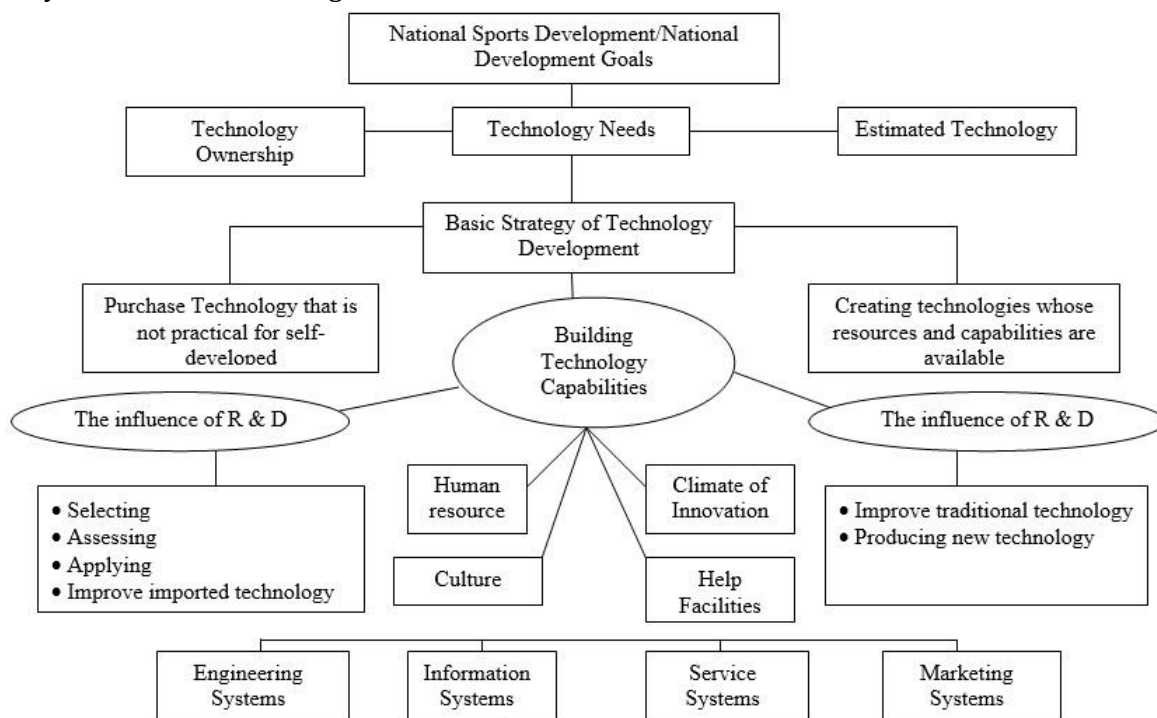


Figure 1. Technology development process

2. Related Work

The general orientation held by developing countries is that the technology created by humans as a means of improving human capabilities with physical and mental characteristics: (1) changing the natural resources into useful goods, (2) as a tool to change the environment to be useful, (3) as a source to increase the prosperity or welfare, (4) as a means of social change, (5) as an important element in speeding up development, and (6) as a commodity that can be traded in the market [3].

The analogy of sports technology management challenges will also lead to the understanding that sports technology was made to enhance physical and mental abilities of human beings in a particular sport, as well as humans in general. To meet the goals of technology, the various dimensions of it need to be managed, which include: (1) charge of technology in the form of

hardware or software, including the ultimate use and capability, (2) connecting the various needs in the community or the sports community that covers the entire HR sports, especially the athletes and coaches at the level of sporting achievement, (3) risk costing and adverse impacts, (4) using the optimum principle, namely to maximize the positive impacts and minimize the negative impacts, and (5) recognize the need for participatory decision making and interdisciplinary.

Technology has affected equipment design at all levels; from low level recreational activities to high level competitive sports. We've already seen that the application of technology to sports serves a role in creating whole new sports events. The use of technological tools such as Computer Assisted Design (CAD) can also play a role in the enhancement of sport equipment. A better example of applied technology in sports is the use of the "smart" equipment that incorporates sensors and computers as a part of their function. Most international caliber athletes typically undergo some form of human performance evaluation as a part of their training regimen [4].

The use of technological applications is now widespread across many major sports science disciplines and the adoption of these tools to gain a 'competitive advantage' is an increasingly important feature of elite sports. These innovations have shaped the way data is collected and processed, how information is relayed between coaches and staff or to athletes, and has had a big impact on the way in which athletes are monitored in the daily training and competition environments [5].

Selection and use of technology, including the technology of sports, really needs a set of readiness-readiness, which by [6] include: (1) the readiness of the community of developers and users of technology, (2) the readiness of the education system to guide the seeds of expertise and mastery of technology, and (3) public cultural readiness to accept change and the consequences of the choice and usage of technology. In conjunction with the development of Science and Technology, without exception sport science and technology there are two groups of options, namely: (1) choices about the type of technology, namely whether "high technology", "low technology", or "mixed technology", and (2) the choice to accept these in the face of the future or the sustainability of these technologies [6].

Further stages of the use of technology, including sports technology, have its own way in which one obtains the degrees and types of learning that will be required, as shown in Table 1. **Table 1.** Alternative Technology Capability Development

Stages	Degrees Technology Capabilities	Learning is needed
Imitation	1. Seeking alternatives available and choose the appropriate technology 2. Utilizing technology selectively	1. Learning by doing 2. Learning by using
Modification	Adapting technology to suit specific production conditions	Learning from changing
Redesign	Develop further an innovation of technology	Learning by searching
Innovation	1. Develop R&D facilities are organized and institutionalized 2. Perform basic research	Learning

Table 2 shows few examples of modern physical ability test devices, i.e. equipment of high technology-based equipment that serves to directly measure the physical ability. This is very different compared with the use of field tests that are generally only gives the number predicted, or physical ability of athletes that is measured indirectly.

Table 2. Physical Ability Test Device (Source: PT. Tripatria Andalan Medika)

Device Name	Usefulness	Merk - Type
Bioanalogs	Body Composition	HMS – ELG III

Martin Type Anthropometer	Anthropometry	TKK - 11242
Grip Dynamometer	Measuring arm muscle strength	TKK - 5401
Back Dynamometer	Measure the back and leg muscle strength	TKK -5402
Push and Pull Dynamometer	Measuring muscle strength of shoulder	TTM - ZU
Jump DF	Measuring the height of jumps	TKK - 5114
Force Plate	Measuring leg muscle strength	AMTI - Accu power
Whole Body Reaction Measuring Equipment II	Measuring reactions to light and sound stimuli	TKK - 1264B
Treadmill	Endurance running	Technogym- excite run
Motion Analysis	Analysis techniques and training	Dartfish Motion Analysis

3. Methodology

3.1. Research Design

Activities that will be developed are the research activities applying the combination method (combined method) of various approaches. The approaches used includes: Bibliographical Studies, Survey Descriptive, Nominal Groups Technique (NGT), in depth interviews, polls and particular stages of a study on modeling the selection and use of hardware and software tools of modern physical ability test in community sports coach's achievements in Surakarta. The full model of research design is shown in Figure 2. The subject of this research is the coach and assistant coach of the branches of sport achievement is formally supervised by KONI (National Olympic Comittee) Surakarta, KONI Sukoharjo, and KONI Karanganyar which totaled 12 people, drawn by Purposive Random Sampling.

3.2. Research Instrument and Collecting Data

Necessary research instruments include: (1) observation sheet for survey instruments, various modern physical ability test devices owned and used by the parent branches of sporting achievement, (2) observation sheet for inventory of various tools of modern physical ability test which is owned by Sport and Health Department. Sebelas Maret University of Surakarta, Indonesia; includes a set of modern equipment which is a donation or grant from the Office of the Ministry of Youth and Sports of the Republic of Indonesia, (3) a questionnaire for the basic preparation of the model through the Nominal Group Technique (NGT).

While the data collected include: (1) data of the profile of the sports coach achievement branches in Surakarta and surrounding areas, (2) data of the devices of the modern physical ability test that is used to measure and evaluate athletes sporting achievements branches in Surakarta and surrounding areas; (3) data of the tools of the modern physical ability test that is in Sport and Health Department. Sebelas Maret University of Surakarta, Indonesia, which can be accessed by the coaches to develop and evaluate the progress of the results of physical exercise, (4) data on the response of the choices of hardware and software tools of modern physical ability test by community sports achievements coaches in Surakarta, and (5) data of the response of the utilization of hardware and software tools of modern physical ability test by the community sports achievements coaches in Surakarta.

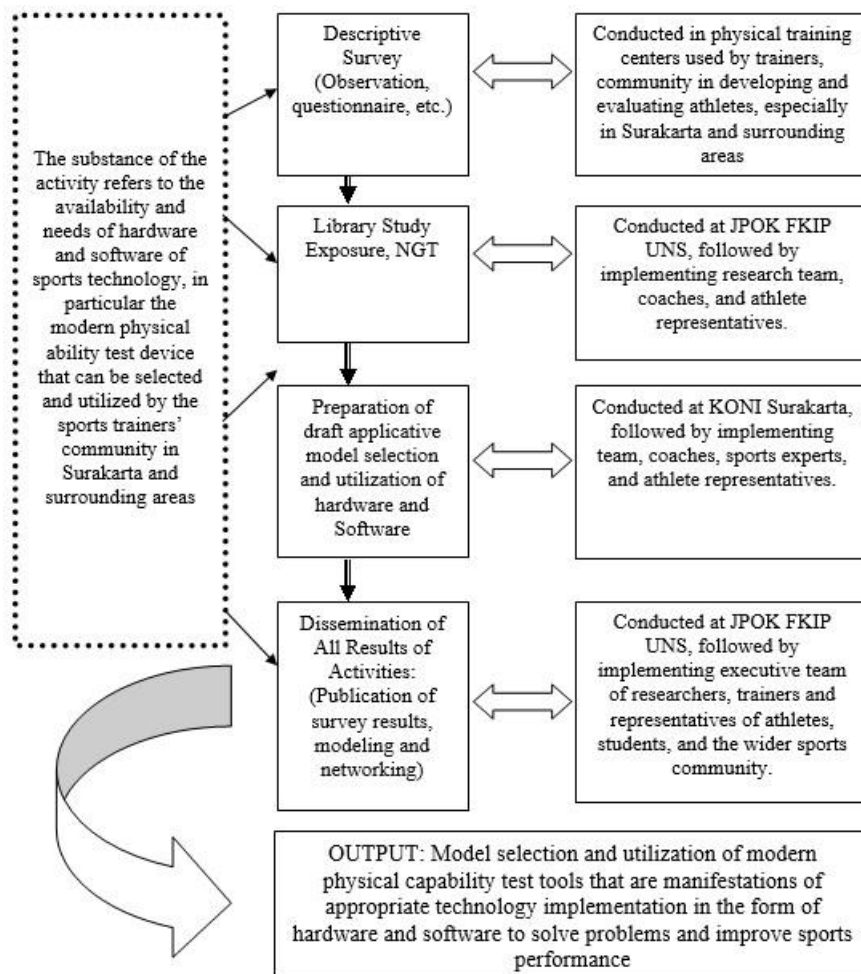


Figure 2. Research design

4. Results

The results can be reported beginning with the response community sports coaches and scientists associated with the issue of receptivity (access) to the sports science and technology. Based on the response of 12 people rater judgment consisting of community coaches, athletes and sports scientist's research results can be described in Table 3. The fluctuation of rater judgment response can be expressed as illustrated in Figure 3. In addition, Table 4 presents data of the response of the community sports coaches of the modern Physical Ability Test Tool. Finally, level of familiarity with modern physical ability test devices in sport's community-coaches are illustrated in Figure 4.

5. Discussion and Conclusions

This study described the technology transfer process to community as well as the level of accessibility and familiarity of the technology-based physical ability test among coaches and sport community. The research showed that coaches have a tendency as follows: (1) 98.7% of respondents think that most coaches are ready to make improvements by training using sports science and technology, (2) 97.3% think that a refreshing model of science and technology-based exercise planning process organized by the stakeholder group exercise can be followed periodically and coached evenly, (3) Respondents did not agree with the statement that

community sports **Table 3.** Rater Judgment's response about access to sports science and technology

Item No.	Respondent Number															Amount
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	74
2	5	4	3	5	5	5	5	5	4	4	5	5	5	5	5	70
3	5	5	4	5	5	4	5	5	3	4	4	5	4	5	4	67
4	5	5	3	5	5	4	5	5	5	5	5	5	4	5	4	70
5	4	5	5	4	5	4	3	5	4	4	5	5	5	4	5	67
6	4	5	5	5	5	4	5	5	5	5	5	5	5	5	5	73
7	5	5	4	4	5	4	3	5	4	4	5	5	4	3	3	63
8	5	4	4	4	5	4	5	5	3	4	4	5	5	4	4	65
9	4	5	5	5	5	4	3	5	4	4	5	5	4	5	3	66
10	4	5	5	5	5	4	5	5	3	5	5	5	4	5	5	70
11	5	4	3	4	4	3	4	5	5	3	4	4	4	4	2	58
12	5	5	3	4	5	5	5	5	4	4	5	5	4	5	5	69
Total	56	57	49	55	59	50	53	60	48	51	57	59	53	55	47	799

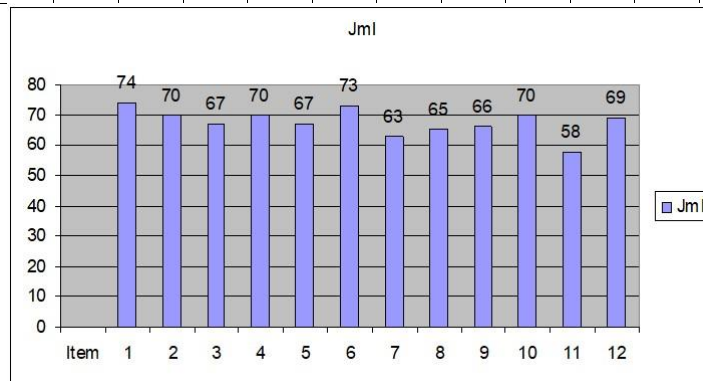


Figure 3. Each item response strength based on 12 people rater judgments

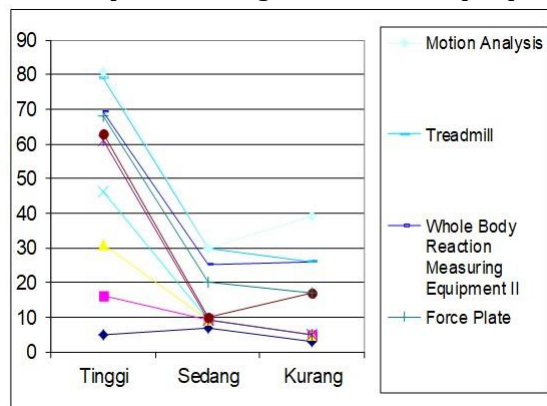


Figure 4. Levels of physical ability test familiarity with modern appliances in the sport's community coach

Table 4. Response of familiarity level of the modern Physical Ability Test

No	Device Name	Usefulness	Familiarity Level
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			High	Medium	Low
1	Bioanalogs	Body Composition	5	7	3
2	Martin Type Anthropometer	Anthropometry	11	2	2
3	Grip Dynamometer	Measure arm muscle strength	15	0	0
4	Back Dynamometer	Measures muscle strength of the back and legs	15	0	0
5	Push and Pull Dynamometer	Measuring the strength of shoulder muscles	15	0	0
6	Jump DF	Measure the height of a jump	2	1	12
7	Force Plate	Measure leg muscle strength	5	10	0
8	Whole Body Reaction Measuring Equipment II	Measure reactions to light and sound stimuli	1	5	9
9	Treadmill	Endurance run	10	5	0
10	Motion Analysis	Technical analysis and training	2	0	13

coaches give appreciation for applied sports science and technology development, the lowest mean item score is the issue of “appreciation of sports science and technology development”.

Next, familiarity is a manifestation of the proximity of modern physical ability test device specified by community coaches. Important information on how community sports coaches are dealing with technological products can be obtained based on the level of familiarity, particularly related to the tools of modern physical ability test. The results showed that the level of familiarity of the community sports coaches with the tools of modern physical ability test are as follows: (a) community coaches are very familiar with such equipment; Grip Dynamometer, Dynamometer Back, Push and Pull Dynamometer, Martin Type Anthropometer, and treadmill, (b) Community coaches are not familiar with the device; Bio analogy, Jump DF, Force Plate, Whole Body Reaction Measuring Equipment II, and Motion Analysis.

Several suggestions can be proposed whereby it is necessary to develop effective ways to increase appreciation of science and technology development among the community sports coaches. Coaches accept the community despite the advancement of technology, but tend to not show adequate levels of appreciation. Next, the desire of coaches to improve and train in a more scientific way is a capital that is essential to conduct collective debriefing of science and technology in the sports community in the future, therefore the level of familiarity on the type of physical ability test devices need to be done with more depth.

Acknowledgements

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From: Helmy Kamal <helmy@uthm.edu.my>
Sent: 25 June 2019 11:42
To: Kukuh Wahyudin Pratama <kukuh@siswa.um.edu.my>
Cc: Agus Kristiyanto <agus_k@staff.ums.ac.id>
Subject: RE: JICETS 2019 Sport Community

Dear Kukuh,

Congratulations! Based on the reviews by 2nd JICETS 2019 Technical Committees, your submission (2ND JICETS: 001-143) entitled "Access to The Utilization of Science and Technology of Sports and Familiarity of the

Sports Community towards Technologically Based Devices" has been ACCEPTED for oral presentation at the conference.

You are therefore requested to submit the "Revised/Camera-ready paper" in Ms-Word file together with the "Similarity Report" before Thursday, October 31st, 2019. Revised/Camera-Ready paper is the revised full paper after considering the comments from reviewers. It is in full paper format as per sample from the conference website. The reviewers' comments, if any, are provided to assist you in preparing your revised/camera-ready paper. You may submit the Camera Ready paper via email.

We would like to remind you that the conference fee shall be paid before October 31st, 2019. Failing to pay during the stipulated period will result in ineligibility to have your paper published. Please email us the proof of payment once the payment has been made. The 2nd Joint International Conferences on Emerging Computing Technology and Sports (JICETS) 2019 will be held on 25 - 27 November 2019 in Aston Tropicana Hotel Bandung, Bandung, Indonesia.

Thank you for your cooperation and attention.
We are looking forward to seeing you at the conference.

Best Regards,
Helmy

ANNUAL LEAVE PLAN :

From: Kukuh Wahyudin Pratama <kukuh@siswa.um.edu.my>
Sent: 14 May 2019 11:17
To: Helmy Kamal <helmy@uthm.edu.my>

Cc: Agus Kristiyanto <agus_k@staff.uns.ac.id>
Subject: JICETS 2019 Sport Community

Dear Dr. Helmy

I do apologize for disturbing.

Through this email, I send you our research article entitled "Access to The Utilization of Science and Technology of Sports and Familiarity of the

Sports Community towards Technologically Based Devices" to be submitted in The 2nd Joint International Conference on Emerging Computing Technology and Sports 2019. Thank you.

Best Regards,

Kukuh Wahyudin Pratama
Researcher
University of Malaya