Research on the Usability of the LeVAnDa System (Lesson Video Analysis Database)

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Abstract: The present article aims at presenting the usability analysis of the LeVAnDa system, an internet application which supports the indexing of audio-visual information accessed on YouTube through the LeVAnDa system. LeVAnDa has been developed as a response to and a supportive tool to cater for Physical Education Teachers and Coaches' specific educational needs. In particular, it focuses on facilitating their activities related to their next teaching unit delivery preparation, introducing and enriching their cognitive scope with updated knowledge as well as upgrading their educational material diffusion over to their students.

These objectives are enhanced through the description of key-video snippetsattracting the user's individual interest, as well as through organizing and archiving the available audio-visual material into snippets. In order to retrieve useful and reliable results, a usability survey was conducted on the basis of quantitative questionnaire five-Likert scale dispatched to a good number (210) of individual Physical Education Teachers and Coaches.

Upon the research conclusion there has been evidenced supporting the questions related to a) the speed of familiarizing oneself with the LeVAnDa application, b) its usefulness, c) its functionality as well as d) the speed of organizing the audio-visual material, accounted for the end users' highest satisfaction rates and the acknowledged innovation of the system, as a result of the respondents' obviously declared willingness to integrate the LeVAnDa system into their daily vocational routine.

Keywords: LeVAnDa, YouTube, video indexing, video annotation, educational tool for sports

1. Introduction

The present article examines the usability of the LeVAnDa system [6], an internet application which supports the indexing of audio-visual information accessed on YouTube through the LeVAnDa system. Borchertet al. [2] highlighted the importance of video in the educational process. According to them, the contemporary educator often seeks audio-visual information available on internet in order to update their knowledge input.

The LeVAnDa system enables the user to archive those YouTube video URLs of interest to them, after their subscription to the system. It enables the user to create an observational protocol of the different objectives (e.g., different sports, or educational material) with five additional annotation lists created by the user themselves. With these terms users are able to describe accurately the content of every video snippet of interest to them. The annotations operate at the same time as video content search terms, whenever the user wants to search for audio-visual material. The search outcome will appear as video-summary including the content searched previously by the user.
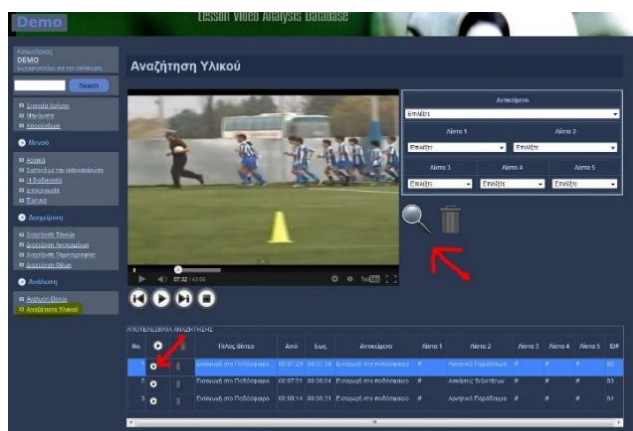
Figure 1: Creating and describing scenes

Figure 2: Searching for scenes with keywords

The LeVAnDa system aim is to operate as a means of support of the Physical Education Professionals (PEP) and Coaches. Particularly, it can aid in isolating video snippets on the internet, allowing for free multiple descriptor naming and simultaneous web archiving of the material. The research was based on the answers that the system users provided on a questionnaire conducted in two phases.

2. Methodology

After the completion of the programming and the creation of the prototype of the LeVAnDa system, a questionnaire was developed to examine the system usability and control its reliability. During this first phase of the research, Physical Education professionals and multi-disciplinary Coaches with prior experience in video analysis were recruited. A significant factor in the establishment of the sample group was communication with social network users, members of groups closely related to the subject. Two hundred invitations for accessing the link application www.levanda.net were dispatched via e-mail addresses following personal communication. The participants were asked to subscribe to the page and watch the 3-min informative video which was posted on the home page of the application; they were also invited to interact with the application and answer the questionnaire embedded in the application. A total of 78 fully completed questionnaires were gathered and were used as the sample for the assessment of questionnaire/survey findings.

2.1 Questionnaire reliability verification

In support of the usability research, a closed ended, 5Likert-type scale questionnaire was developed in order to record the participants' views. A reliability analysis was carried out on the 78 sample filled questionnaires collected during this first stage of the research. The overall reliability of the questionnaire was high with Cronbach's α = .896, indicating its high internal reliability as a means for the LeVAnDa utility evaluation.

Taking into consideration, the participants' answers, certain necessary modifications were made on the application, which resulted in the updated final and comparatively shorter questionnaire, addressing the participants' views for the LeVAnDa platform. The excluded questions concerned the assessment of the

modules that were removed from the application, due to the cause of confusion among a good number of participants. A case of such a functionality includes the diffusion of information shared among users. The final shorter yielded questionnaire was created with the Google Forms application, while responses to all the questions were mandatory.

2.2 Participating sample

An open participation invitation was dispatched through the webpagesof certain Associations of Physical Training Educators (e.g., EGVE[1], OKPE,[2] etc.), sportscoaches as well as students and graduates of Tertiary Education Physical Training Schools; previous experienceinvideoanalysiswasnot a prerequisite for the participating sample, while the common characteristic shared among all the respondents was their relation to Physical Education or Sports.

The questionnaire for the final evaluation of the application was fully answered by 210 user respondents.

2.3 Research Questions

The aim of the questionnaire wastorecordtheusers' opinionsonthe LeVAnDa system and in particular to focus on the following parameters:

a) Collecting user information on the usability of the LeVAnDa system as a performance assessment tool aswellas on thestructure selected for the construction of the LeVAnDa system itself

b) Exploration of the potential problems that might have occurred during the interaction of the user teachers with the LeVAnDa system

c) Exploration of the users' satisfaction closely related to the value of their interaction time spent on the LeVAnDa system.

2.4 Results

A total of 139 men (66.2%) and 71 women (33.8%) answered the questionnaire, these proportions reflect the higher interest of men to participate in the research compared to women participants.

Their professional activity was as follows, 42 participants (20%) were registered as trainers without a university Physical Education degree, compared to 168 participants who had graduated from University Physical Education Schools. The participants whostatedthattheyweresportstrainers were 116 (55.2%) and outweigh in number the 94 PEP without professional training activity (44.8%).

The participants stated their command of ICT and the results showed that 13.3% were proficient users, 39.5% very good users, 38.6% modest users, 8.1% of them stated that had inadequate knowledge and finally one participant (0.5%) stated insufficient knowledge on ICT[3].

As far the question related the duration of the users' interactionwiththeapplication is concerned, 88.6% of the participants stated that they spent more than 10 min with the system. It has been found that 61 participants (29%) interacted with the system for more than 120 min.

2.5 Usability of the application

As far as the users' familiarization with the LeVAnDa system is concerned, the majority of the response were positive; in particular, 36.2% of the respondents answered "very easy", 41% of them answered "easy" while 13.8% stated that the use of the system was "quite easy". However, 9.1% of the participants stated that the use of the system was either "Difficult" or "Rather difficult".

With regard to the question related to the **usefulness** to the selected from YouTube videos indexing,themajorityof the users (58.6%) evaluated the LeVAnDa system with responses ranging between "very useful", 22.4% and "useful", while 16.2% stated that the system was "quite useful" for indexing of the audio-visual material available on YouTube. Only 2.9% of the respondents evaluated the system as "not so useful".

According to the answers regarding the **functionality** of theLeVAnDa system, the majority of the respondents considered the system functional, with ratings ranging between 45.7%, characterizing it as "exceptionally functional" and, 36.2% characterizing it as "very functional", respectively. The system was rated as "quite functional" by 13.8% of the respondents, while a smaller proportion of them (4.3%) characterized it as "not so functional". It is important to clarify, that the answer "not functional" was not selected by the users-respondents.

Regarding the **speed** at which the selected from YouTubevideos are indexed, the majority of the respondents (50.5%), considered it "exceptionally good", 30% of the respondents rated it as "very good" and

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[1]the Association of Northern Greece Physical Education Teachers
[2]the Federation of Primary EducationTeachers
[3]Information and Communication Technologies (ICT)

14.3% of them characterized it as "quite good". Finally, a small proportion of the users-respondents (5.2%) that rated the indexing as "not so good".

According to the answers related to the **complexity** of the LeVAnDa system, the majority of the respondents (36.7%) selected the answer "not at all complicated" with another 41.9% of the respondents rating it as "not quite complicated". However, there were some respondents who faced difficulties in their interaction with the system, as the whole of the remaining three responses of the Likert-type scale accounted for 21.5% of the respondents. In particular, 14.76% oftherespondentsevaluatedthesystemas "quite complicated", 4.76% rated it as "very difficult", and 1.90% rated it as "extremely difficult".

As far as the usability of the selected from YouTube videos indexing is concerned, the system was evaluated as user-friendly by 79.2% of the respondents. In particular, 41% of the respondents characterized the system as "exceptionally user-friendly", 38.1% of the respondents characterized it as "very user-friendly". 16.2% of the respondents characterized it as "quite user-friendly", 3.8% characterized it as "not so user-friendly", and only 1% of the respondents characterized it as "not at all user-friendly".

2.6 Functionalities of the LeVAnDa System
Managing the videos via the YouTube platform was quite easy for the participants, with responses ranging between 87.6% rating it either "very easy" or "easy". However, there was a small proportion (4.3%) of the respondents evaluating the functionality of the system as rather difficult.

The **creation of annotations** was characterized "very easy" and "easy" by the respondents with a proportion of 32.4% and 40.5% respectively; on the whole, 72.9% of the respondents answered positively. However, the percentage of therespondents who selectedtheanswer "quiteeasy" (20%) implies their relatively reserved tendency towards this particular question. Moreover, 5.7% of the respondents characterized as "notsoeasy" while therest 1.4% characterized the process "very difficult".

The **video analysis** did not seem to trouble the users. The vast majority of them (81.9%) evaluated positively theprocess, 53.8% of the respondents characterized it as "very easy" while 28.1% of them characterized it as "easy". Only 4.3% of the users seemed to face difficulties during the process.

The question that examined the **search of the audio-visual material** showed a clearly positive stance of the users towards the system expressed through a high percentage (80.9%), followed by 59.5% of the users rating the process as "very easy" and another 21.4% of them rating it as "easy". Nevertheless, a small proportion of the users (4,7%) characterized this functionality as "difficult" and another 14.3% of the users stating that the process was "quite easy".

As for the **creation of the annotations in the six available spaces** the majority of the users answered that the spaces were seemingly adequate. Judging by their answers, 77.1% answered that the spaces of the criteria were adequate, which implies that the particular functionality was comprehensible by the majority of the users. However, 17.1% of the users characterized the six spaces of the annotations as "quite adequate" and only 5.7% of the users seemed rather dissatisfied.

The objective of the question related to **the video's window size** was to examine whether the users would demand to deploy the whole of the desktop at their disposal or just a part of it in accordance to the LeVAnDa system. The answer that was selected by the majority of the users (38.6%) characterized the size as "very satisfactory". Nevertheless, the answer "exceptionally satisfactory" was selected by 35.7% of the users. Summing up the two positive answers, the percentage of 74.3% of the respondents, opting for the size of the window, is positively evaluated. Only 5.3% of the users selected a negative answer, while 20.5% of the users opted for the "quite satisfactory" choice.

The users' answers concerning the **list of the returned video snippets**, clearly showed their satisfaction, 82.4% (expressed through the users' 53.8% and 27.6% preference ranging between the answer "exceptionally satisfied" and "very satisfied" correspondingly. 14.3% of the users answered "quite satisfied", 3.3% answered "not so satisfied" and 1% of them stated that they were "dissatisfied".

Questioning whether the respondents are willing to make use of the LeVAnDa system in their **everyday routine**, the majority of the users selected the answer "probably yes" (37.6%). Consequently, 31.9% of the users confirmed their confidence. Nevertheless, the proportion of the users that were not sure was rather high reaching a percentage of 23.8%. Only 6.6% of the users answered negatively; In particular, 1.4% of the users would definitely not deploy it, while the rest 5.2 % admitted that they would not potentially use it.

As it was expected the answers on the question examining whether **internet access** is important in their professional routine showed a high positive trend, since nowadays internet access is offered in multiple ways and locations. Therefore 90.5% of the users stated that internet functionality is very important to them and illustrates the contemporary prevailing trend of everyone retrieving information this way.

The fact that **limited access to internet** causes inability to access to the audio-visual material was not an obstacle for the majority of the users (38.6%) who replied that they "are not annoyed at all". Along with the

users that stated that internet inaccessibility "annoys them a little" (22.9%) and the proportion of the users that stated "rather not annoyed" (11.4%) seems that the internet functionality of the LeVAnDa system is satisfactory reaching 72.9% of the participants. However, 17.6% oftheusersstatedthatthisfunctionalityis "very annoying" and another 9.5% of them found the functionality "exceptionally annoying".

The answers on the question related to whether the users would rather **the LeVAnDa system be compatible to other video servers** for the query of audio visual material were almost balanced between the dissatisfied ones ("yes, it annoys me", 25.7%) and the moderately satisfied ("no, YouTube is sufficient", 24.8%). Moreover, the two opposite answers weresupportedby the two extreme positions "it is not annoying at all" and "yes, it is very annoying" that were selected by 20% and 19.5% of the participants, respectively. This fact seemed to balance the two opposing trends. On the whole, 44.8% of the users stated that YouTube is sufficient, while 45.2% of them replied that they rather the LeVAnDa system be compatible with other video servers as well. There were also 10% of the users that remained neutral and selected the answer "probably".

The vast majority of the users (68.1%) characterized as "exceptional" the fact that no storage space for audio-visual material is a prerequisite for the LeVAnDa system. Along with 22.9% of the users rating this function as "useful", the positive stance of the participants towards the LeVAnDa system reached 91%.

Finally, thevastmajorityoftheusers (87.6%) considered the application response time either "very satisfying" (54.3%) or "satisfying" (33.3%). According to the participants' answers, the LeVAnDa system application fully withstoodthetime delay challenge.

3. Discussion of the Findings

Male users showed more interest in the application than females, possibly due to the men's tendency to engage in technology more than women [11]. The result (66.2% men, 33.8% women) has been expected and proved to agree with other similar research [9].

The high percentage of 80% of Physical Education Teachers (with bachelor in sport science), against graduate coaches, falls within the expected results of the research findings; apart from the fact that most of the former were coaches, may also be justified by the fact that the completed actions, related to the diffusion of the application, addressed Physical Education teachers. There had not any actions made with focus on schools for sports coaches. However, the percentage of Physical Education Teachers (PET) above, also included those who confirmed being themselves coaches; hence, the whole of 20% of the coaches added to the percentage of PETs (55.2%), registered also as coaches, eventually resulted in raising the percentage up to 75.2% accounting for the whole of the sample.

The Sports events video analysis has always been and still is an indispensable practice applied by various sports associations aiming at attaining a championship level performance (Kaschak, 2015). It is probable that the particular application might have been more attractive for participation in the research to those sample employed also as coaches. This could possibly explain the comparatively high percentage of 75.2% mentioned above.

Regarding the level of their ICT knowledge, the majority of the respondents admitted moderate to excellent knowledge of IT. It is also likely that part of the recipients of the invitation for participation in the survey, as well as those randomly recruited through their attempts to search into similar to LeVAnDa platform, were deterred from participating due to their limited knowledge in IT; hence, the sample is comprised of respondents mostly interested in other web applications related to video.

When the participants were asked about their time spent on the questionnaire, their retrieved responses confirmed the expected outcome, which was evident in the yielded application statistics. As a result, the conclusion drawn out of their response, fully supports the above assumption about their interest in IT applications; cases of individual users' inability to interact with the system have been taken into consideration as cases of randomly unpredictable, still expected, exceptions; as Nielsen [8] argues, it is within the first 10 to 20 seconds indifferent users usually quit a website.

The positive user responses stating they "easily" or "very easily" familiarized themselves with the system, leads to the conclusion that, besides the potential easiness of its use, the informative video as well as the clarifications provided on the website, further simplified the system function. It is therefore believed that users have been able to interact with the system without any particular difficulties; the low percentage of the sample admitting a "relative difficulty", when accessing the system, has been expected. Although video editing has been simplified over the recent years, it is still conceived as a user-scaring practice, which makes familiarization with the system too difficult to consider it granted [4]. Especially those who admitted not being familiar with the ICT use, are most likely to have found interactivity with the system rather difficult, at least at its first stages.

The particularly high positive percentage related to the question addressing the application usability, leads to the conclusion that the LeVAnDa application has actually met the intended acceptance by the users.

With regard to functionality, the distribution of positive responses ranging between "too" and "a lot" may lead to the conclusion that the User Experience (UX) should be emphasized, in case there is an attempt for further development of the software, in a future edition of LeVAnDa.

The positive responses yielded by the sample addressing the speed at which the videos selected from YouTube were archived, have also been validated by the fact that the shared audio-visual material is supported by the YouTube platform, with its own integrated hardware system. Assuming that any speed limitation would be closely related to the LeVAnDa software framework, that is, the system's response to the users' individual actions and, consequently, to the internet connection accessed by them. However, this has not been confirmed by the users as they considered the system response time very satisfactory.

As far as the system complexity is concerned, although the majority of the sample have considered it easy, there was a percentage of 6.7%, whose responses ranged from "a lot" to "too" complicated. With regard to this particular issue, a potential future LeVAnDa edition is necessary to focus on the design of the interface in order to improve the user experience (UI/UX). Moreover, certain users are expected to interact, for some reason, with difficulty in any system; the very small percentage of such cases is positively assessed on the LeVAnDa basis.

In terms of ease of use, the high positive rate is considered encouraging, as the responses addressed users who have recently interacted within the LeVAnDa system environment, regardless of their previous experience. An important element especially in new applications is the very first contact; as soon as the users "get used to" a process, whatever that might be, their degree of satisfaction increases, since they can easily conclude their interaction with the system [5].

YouTube users have been found managing YouTube videos without difficulty. This may be linked to the fact that YouTube use and the sharing information through sending the video address is now a process well known to today's users [1].

On the other hand, the creation of annotation criteria or analysis protocol comprise rather uncommon processes [3]. This functionality was of a major differencefromany other application, especially for the users that were unfamiliar with video analysis. The users' difficulty in creating and selecting keywords would be rather expected. However, it is definitely positive that finally the proposed procedure found the desired acceptance by the system users, since the majority of them considered it "easy" or even "very easy".

More positive was the respondents' attitude on video analysis. According to the confirmed average user's difficulty in analyzing videos deploying the usual applications (e.g. MovieMaker[4], etc.), this result was not expected. However, the particular functionality achieved the users' desired acceptance at a percentage of 81.9% with regard to the two positive answers; this implies that it offered them the simplicity they needed; besides, it implies it could be used as it is in a future version of the application. Similar findings have been published in corresponding research carried out by Yousef et al. [12], [13], [14].

The users' answers clearly depicted the search for the recorded material. It has been assumed that after the entry-description of the previous scenes, searching for the related material possibly left the sense of familiarity. This may justify the positive attitude of the participants at 80.9%, which together with the answer "quite easy" reached 95.2% in this question.

Regarding the adequacy of the LeVAnDa system annotation terms, the users seemed satisfied. This practice usually keeps users back, especially when they do not have a clear picture of what they would like to analyze or keep from a video snippet. The process is easier to follow when the key words "derive" from the content of the audio-visual material based on what has just been shown. The clustering of words, however, creates problems for the less experienced users [12]. It is probable that any difficulty in choosing and archiving key-words is closely related to the fact that many participants were eventually proved unfamiliar with the process, which required time for them to adapt to it.Another practice would be to have predefined words, but this would limit the creativity and scope of the system, which resulted in the rejection of this idea during the system design.

The video window size within the LeVAnDa system was found satisfactory, but not exceptional. The message possibly implied by the responses retrieved from that question is that the larger the video window, the greater the users' satisfaction. This is confirmed by a similar research carried out by Maniar et al. [7]. However, there is also the impression that the size of the window does not comprise a major issue, since the action can be integrated on a smaller surface.

Users expressed their utter satisfaction out of the results retrieved with regard to questions, posed on their behalf, in relation to video capture. The videosnippetsreturnedcomprised predictable inventories. This is considered to be very important since it is the functionality that differentiates the LeVAnDa system from other applications. It is the element that, if working properly and being approved by the users, can give great

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[4]Windows free application for video processing

satisfaction to the end user. Based on the results of the returned video capture inventory, the Physical Education Teacher will be able to re-watch parts of the videos that interest him. Alternatively, trainers (male and female) will be able to promptly feedback athletes (male and female) with audio-visual material whenever and wherever it is necessary, on the basis of this option.

In the question about the use of the LeVAnDa system on a daily basis, the answer that prevailed was "probably yes" but not absolutely "yes". One possible explanation would be that one does not daily search for videos on the internet. However, when looking for related material on a subject, one would like to have the corresponding tools at his/her disposal. This explains perhaps 69.5% of the positive replies. Significantly, users' answers showed that only 6.6% responded negatively to the question. A first estimation of the result would be that the respondents would be willing to use the application, thus with potential adjustments of the system in terms of usability of the interface would develop a more positive attitude. That is to say, in a future edition, emphasis should be placed on the design and the positive experience of using UI/UX design[5].

Given the contemporary trend, as it was expected, the online design won the positive attitude of the participants. The same trend, as well, supports the success of the cloud-based applications having the potential to extract information from the internet, justifying exactly, the reason of their existence.

In the question about the possible discomfort caused by the fact that the LeVAnDa system cannot be used offline, the prevailing answer was "not at all". The particular attitude can be explained in various ways. Obviously, contemporary users have "accustomed" to watching videos on the internet and particularly from YouTube, which probably seems a common practice for them [10]. Another reason could be that they might have been experienced in the use of video files holding a large amount of data; in order to avoid storing the accessed material on each computer, or even on an external disk, Internet access looks very convenient. Eventually, the overwhelming majority of the respondents seemed satisfied with the online operation of the LeVAnDa system. For those seemingly frustrated users, due to their inability to keep all related material locally available, there has been the assumption they need to keep full control and ownership of all material of their interest; it could be either because they might have had some bad experience of weak or no internet connection either at their workplace, or on the sports court for example.

Regarding the question of the LeVAnDa system functionality with other video servers, the responses were shared. It would be definitely convenient to allow the hosting of all audiovisual data on the internet through the LeVAnDa system. However, technically speaking, this feature might reserve several difficulties which should be taken into consideration in the case of including any kind of video server in the same application;

The fact that no storage is required was considered as "excellent" by the respondents. This demonstrates that obviously there was a prior experience of using large video files, while the fact no storage space is necessary for indexing and storing audio-visual material, was indeed very convenient.

Clarifications: The response time of the videos depends primarily on the end user's available internet connection speed.However, a secondary role of the LeVAnDa information server addresses issues of speed response, namely, where the site is hosted.A potential delay could be caused due to the response of the YouTube server, although such an occasion is rather unlike to occur because of the latter's existing infrastructure. Consequently, since no time delay was encountered in the node response, the system has effectively responded to the challenge. On the other hand, when someone wants to upload their own videos on YouTube, there is a time lag depending on the user's internet connection.

As for the speed of uploading more videos from the LeVAnDa playlist, the structure of the application itself could also be responsible; however, as previously mentioned, on the basis of the responses retrieved out of the quantitative analysis questionnaire, this has not been confirmed.

4. Conclusions
The main conclusions drawn out of the usability research are as follows:

• The LeVAnDa system has greatly satisfied the users such as Physical Education Professionals and Coaches, that interacted with it, with the men outnumbering women as far as their preference and deployment of the application is concerned

• LeVAnDa applies to Physical Education and sports issues related to research, all education levels and training clubs

• The LeVAnDa original functionality as well as the system profitability have been recognized by the users.The majority of the users, regardless of their professional status and gender, evaluated LeVAnDa as an easy, user friendly and useful tool for indexing audiovisual information retrieved from the YouTube platform.

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[5]Userinterface / userexperience

• The most typical functionality of the system, i.e. the creation of video snippets, was evaluated by users as very important and very helpful.

• The creation of the annotation criteria or the analysis protocol, were elements that underlined the innovation of the application, and were well approved by the users, despite their little or no familiarity with the specific functionalities.

The fact that the LeVAnDa system focused on the provision of the necessary material for the users' needs fulfillment has helped them with receiving feedback both in Physical Education as well as training.

As the majority of the respondents' confirms, the LeVAnDa platform is recommended as the most appropriate digital tool applied by researchers, teachers and coaches for searching and organizing educational material related to Physical Training and Sports.

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6. Author profile

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