Scholar Publishing Group
International Journal of Sports Technology
https://doi.org/ 10.38007/IJST.2021.020403
ISSN 2789-7141 Vol. 2, Issue 4: 27-44

Standardized Management System of Sports Events Based on Deep Learning Algorithm

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Keywords: Deep Learning Algorithm, Sports Project Management, Construction of Standardized Management System, Project Management Optimization

Abstract: Sports industry has become a new economic growth point, and standardized management of sports events plays an important role in promoting the development of sports industry. Only the scientific and efficient operation of the project can achieve a win-win situation for both economy and society. Sports have typical characteristics of project management, and the development of modern high-level sports events needs more advanced and scientific project management mode and system. Based on the deep learning algorithm, this paper constructs and analyzes the sports project management system, compares and optimizes the deep learning algorithm, and evaluates the satisfaction of track and field competition and the maturity of the management system in a university. The final result shows that the error of the optimized PPO algorithm is the smallest, with a stable mean difference of 1.34, and the simulated score of the optimized management system maturity is 9.17, which is 0.91 points higher than the original one.

1. Introduction

1.1. Backdrop

With the continuous development of economy, the continuous progress of society and the increasing prosperity of cultural undertakings, the development degree of sports industry has become an important indicator of economic development achievements. China is in the critical period of social transformation and the system reform is deepening. Accelerating the development of sports industry and further promoting China to become a sports power are the direction and way of China's sports development in the new period. At present, there is no unified understanding of sports project management in China, and the research on many problems in project management is still insufficient, more modular, without a complete and standardized system, and some standards are still lacking. How to take active and effective measures to integrate project management

knowledge system and various management techniques and methods into sports project management and build a standardized management system is worthy of our in-depth study.

At the same time, with the continuous development of information technology, deep learning algorithms have been applied in all aspects of social and economic development, and emerging technologies such as automation, artificial intelligence and data mining have emerged one after another, which has greatly improved our living and working conditions. Moreover, the application of deep learning algorithm in project management, such as energy, cost, task, risk and evaluation management, can greatly improve management efficiency and ensure the smooth progress of sports events. Therefore, the construction of sports project management system based on deep learning is what this paper wants to discuss.

1.2. Significance

The construction of sports management system is a complex systematic project involving many factors. It involves not only the vertical time dimension management, but also the horizontal management of different dimensions, such as risk management, cost control, quality optimization and so on. In addition, with the economic and social development, a higher level of modern sports is what the public wants. Therefore, the construction of a scientific, advanced and standardized management system is particularly important. Therefore, based on the project management theory as the methodological support and in-depth learning as the technical means, this paper constructs the standardized management system of sports events, so as to provide theoretical basis and action suggestions for the scientific management of medium and large-scale sports events, so as to contribute to the high-quality development of sports industry.

1.3. Related Work

With the continuous development of Internet of things technology, the latest information technology represented by network, digital and intelligence is changing people's way of work, study and life. Deep learning algorithm brings new development space for sports standardization and information management, and many scholars and professionals in the industry have made effective attempts. Min X to effectively solve the problems existing in the operation of university sports venues, he used the Internet plus technology to explore the management mode of combining traditional Internet with sports venues management, and build a sports platform management platform based on "mobile Internet plus", which fully played the role of the platform for college students' Sports facilities and community services. It can effectively give play to the management value of stadiums and gymnasiums, and has practical significance [1]. Aiming at the current situation of backward management and lack of evaluation system of school public sports service, Deng constructed an advanced evaluation system including 4 primary indicators, 12 secondary indicators and 26 tertiary indicators by using CBSC model. The weight of each index is calculated by analytic hierarchy process. Combined with the scores of various indicators, the final evaluation results are obtained. On this basis, this paper analyzes the practice of public sports service management. The performance evaluation index system can help decision makers understand the management status of school public sports services, provide useful guidance and reference for decision makers, improve management efficiency and promote the long-term development of school public sports services [2]. Jianwei s discussed the relevant theories of sports resource information, studied the current situation of sports resource information utilization, put forward the overall construction framework of sports resource information big data platform, and analyzed the

functions of each subsystem in detail. Finally, the performance evaluation of sports resource information big data platform is discussed [3]. Zhang x analyzed the construction of mass sports service information platform based on media communication in Hebei Province. Various multimedia networks can be used to visually display fitness projects and provide more scientific fitness knowledge for the public. It realizes the optimization and integration of the existing sports public resources under the informatization [4]. Pengyu r studied and analyzed the current policies for the planning and construction of sports facilities in residential areas in China, as well as the practical problems existing in the operation and management of sports facilities in China. The methods of literature, investigation and expert consultation were used for analysis. Combined with the actual situation of urban residents' sports participation, this paper puts forward the corresponding improvement measures. Through policy indicators, we can optimize the allocation of public sports resources and give full play to the function of sports facilities in China [5]. Lu S summarizes the data mining technology, analyzes the current situation of college physical education teaching management, and puts forward the construction method of college physical education teaching management system. It also discusses the construction of sports data mining system, the mastery of construction methods and the design of sports database, so as to promote the construction of sports teaching information management system and the development of sports teaching. [6] Ding Y designed a college physical education curriculum management system to ensure the orderly management of sports facilities and equipment, bring convenience to teachers and students, ensure the safety of students in the process of sports and reduce the risk of students' injury in Physical Education [7]. The above research is an effective attempt to standardize the management of sports events in the information environment, but most of them are still aimed at the management of stadiums and equipment and facilities in Colleges and universities, and the research on sports event management directly facing the public and social organizations is still relatively few.

1.4. Innovation Points

With the continuous development and maturity of deep learning algorithm, it has been applied in all aspects of production and life. The development of deep learning algorithm and various management theories promotes the scientific and standardized construction of sports management system. The novelty of this paper is as follows: (1) the novelty of the algorithm. Based on the deep learning algorithm and measurement algorithm, this paper summarizes the supervised and unsupervised learning algorithms, and puts forward the optimization algorithm small batch standardization to compensate the outliers in the algorithm, which improves the learning efficiency and accuracy. (2) The novelty of research perspective. Break the single procedural or plate research of the original sports event project management, and start from the life cycle sequence of sports events, combined with the nine knowledge fields of management theory, so as to make the management more operable. (3) The novelty of project management system construction and evaluation. Using Delphi method and modern project management theory, this paper puts forward that the management system is composed of seven modules: time, communication, cost, quality, risk, performance and post game evaluation management, and uses supervised deep learning algorithm for feature learning; And use OPM3 combined with weight construction to evaluate the maturity and professionalism of the actual sports events.

2. Construction Method of Sports Standardized Management System Based on Deep Learning Algorithm

2.1. Deep Learning Algorithm

Deep learning algorithm is a subset of machine learning. It is a learning method based on unsupervised feature learning and feature hierarchy. It can be defined as a neural network with a large number of parameters and layers in the basic network framework [8]. The basic network framework includes unsupervised training network, convolution neural network, cyclic neural network and recursive neural network [9]. There are many kinds of algorithms based on deep learning, and in recent years, deep learning has achieved good results in data mining, information retrieval and quality detection [10]. Taking energy management optimization as an example, this paper gives the strategy fitting diagram based on LSTM neural network in deep learning algorithm, as shown in Figure 1.

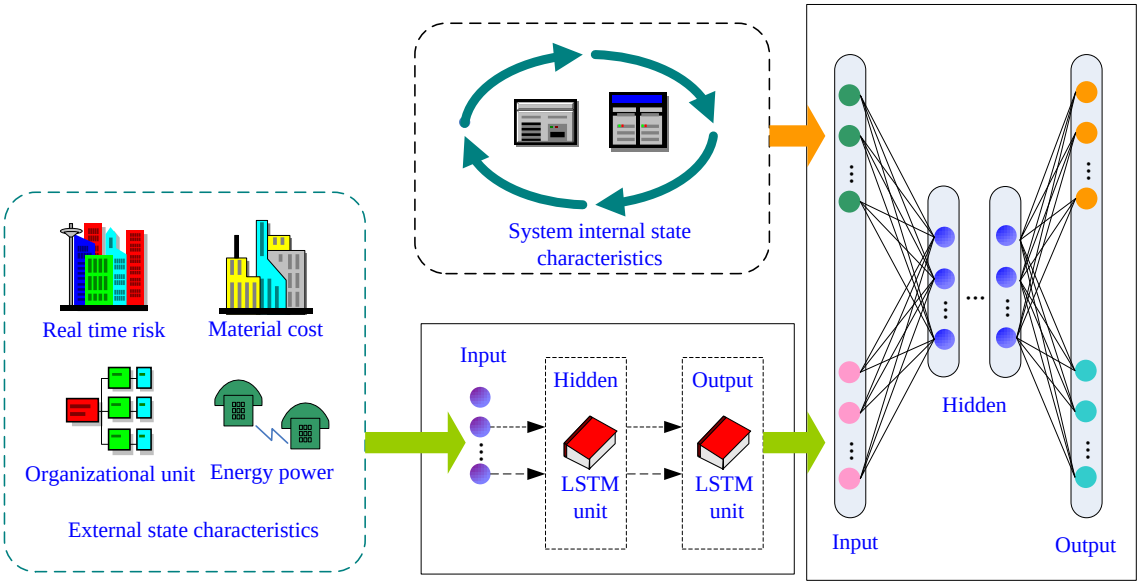

Figure 1. Deep learning feature hierarchy

(1) RBM algorithm

RBM is an unsupervised learning algorithm. The binary vector of this method has only two-layer structure, which can automatically find the best characteristic root, and the neurons between the levels are completely connected [[11]. For an RBM system, assuming that the state has been given as (a, b), the energy of the system is as shown in formula (1), where the number of visible units is A, the number of hidden units is B, the binary state of the ith visible unit is expressed as a_i, and the state of the jth hidden unit is b_i,w_{ij} representing the weight between a_i and b_j. Then, the joint probability distribution of (a, b) is equation (2), and the normalization factor (partition function) is equation (3).

$$E(a,b|\delta) = z^M W s - d^M z - g^M b = \sum_{i=1}^{A}\sum_{j=1}^{B} w_{ij} a_i b_j - \sum_{i=1}^{A} d_i z_i - \sum_{j=1}^{B} g_j b_j \quad (1)$$

$$P(a,b|\delta) = e^{-E(a,b|\delta)} / Z(\delta) \quad (2)$$

$$(\delta) = \sum_{a,b} e^{-E(a,b|\delta)} \quad (3)$$

RBM neurons in the same layer are not connected, so one layer state formula is selected, and each neuron in the second layer unit is conditionally independent [12]. The formula is as follows:

$$P(a, b|\delta) = \prod_{i=1}^{a} P(a_i, b|\delta) \quad (4)$$

$$P(b, a|\delta) = \prod_{j=1}^{b} P(b_j, a|\delta) \quad (5)$$

$$\sigma(x) = {}^{1}\Big/_{1+\frac{1}{e^x}} \quad (6)$$

(2)ECM algorithm

Deep learning neural network contains many mainstream model structures and is applied in many fields [13]. Different from unsupervised learning, it needs the guidance of supervised information to complete effective feature learning, which undoubtedly improves the threshold of clustering learning under deep learning. Dec algorithm is a model that continuously improves information reliability by optimizing clustering loss [14]. In this algorithm, the auxiliary clustering distribution and soft clustering distribution are represented by F and R respectively, and the specific definition formula is 7-9. Distributed r establishes the distance relationship between eigenvalue K and cluster center for t distribution, which is the number of samples contained in cluster class, and distribution f_{ij} is to strengthen the prediction of the confidence relationship in distribution R, so as to realize evolutionary cluster allocation by minimizing the visibility of cluster distribution R and cluster strengthening distribution f_{ij} [15].

$$\gamma = KL(F||R) = \sum_i \sum_j r_{ij} \log {}^{r_{ij}}\Big/_{f_{ij}} \quad (7)$$

$$f_{ij} = \frac{(1+{}^{||k_i-\mu_j||^2}\Big/_{\alpha})^{-\frac{\alpha+1}{2}}}{\sum_{j`}(1+{}^{||k_i-\mu_{j`}||^2}\Big/_{\alpha})^{-\frac{\alpha+1}{2}}} \quad (8)$$

$$r_{ij} = \frac{{}^{f_{ij}{}^2}\Big/_{c_j}}{\sum_{j`} {}^{f_{ij`}{}^2}\Big/_{c_{j1}}} \quad (9)$$

(3)PPO algorithm

PPO is also a deep learning reinforcement algorithm based on policy gradient, with good stability and convergence [16]. The algorithm adopts AC architecture, including evaluator and actuator neural network. During algorithm learning and training, a small batch of samples are selected from the experience playback set for neural network parameter update [17]. The calculation formula is shown in equation (10), where ∂ is the timing difference error, which $T_\partial(N_t)$ is the state value function, and the actuator network updates the network parameters by converting the objective function ξ.

$$\vartheta = \Upsilon T_\partial(N_{t+1}) + r_{t+1} - T_\partial(N_t) \quad (10)$$

The objective function of TRPO algorithm is equation (11), where ρ_{π^i} is the access state probability of the old policy, $\pi_{\xi^{+1}i}$ is the new policy, π_{ξ^i} is the old policy, $B_{KL}(\pi_{\xi^i}//\pi_{\xi^{i+1}})$ is the

dispersion of the old and new policies,σ is the confidence and $I_{\xi^i}(v,q)$ is the advantage function.

$$\max E_{v\sim\rho_{\pi_{\xi^i}},q\sim\rho_{\pi_{\xi^i}}}\frac{\sum_q \pi_{\xi^{i+1}}(q|v)}{\sum_q \pi_{\xi^i}(q|v)} I_{\xi^i}(v,q) \tag{11}$$

$$E_{v\sim\rho_{\pi_{\xi^i}}} B_{KL}(\pi_{\xi^i}//\pi_{\xi^{i+1}}) \leq \sigma \tag{12}$$

After the first-order approximation of equation (11) and the method is used to approximate the expectation, it is equation 13-16, where ω_t is the ratio of old and new strategies, which $\widehat{I_t}(q,v)$ is the advantage function q_t obtained by the return value estimation of step B in the state v_t.

$$\max E_t[\omega_t \widehat{D_t}(q,v)] \tag{13}$$

$$\omega_t = {\pi_{\xi^{i+1}}(q|v)}\Big/{\pi_{\xi^i}(q|v)} \tag{14}$$

$$\widehat{I_t}(q,v) = r_t + \Upsilon r_{t+1} + \cdots + \Upsilon^{B-t+1} r_{B-1} + \Upsilon^{B-t} T_\partial(N_t) - N_t \tag{15}$$

In order to simplify the algorithm, we cut the above formula to obtain a new objective function N^{clip}, which can be realized in the confidence interval correction method of random gradient descent. This function has two constraints, so that the ratio of old and new strategies is constrained to a certain range under the control of clipping rate. Ensure that it works within the confidence region. The formula is as follows (16), where τ is the clipping rate.

$$N^{clip} = max\ E_t[\min(\omega_t \widehat{I_t}, \text{clip}(\omega_t, 1-\tau, 1=\tau)\widehat{I_t})] \tag{16}$$

$$\text{clip}(y, y^{\min}, y^{\max}) = \begin{Bmatrix} y & y^{\min} \leq y \leq y^{\max} \\ y^{\min} & y < y^{\min} \\ y^{\max} & y > y^{\max} \end{Bmatrix} \tag{17}$$

(4)Batch standardization

The deep neural network is ill conditioned. Small changes in single-layer input will affect the results of the latter layer. Whether the initial weight value is set randomly or empirically, the weight difference is very large before and after learning [18]. Considering a small number of weights, there may be many outliers for the required feature activation initially. In the back propagation process, these phenomena will lead to the offset of the gradient, which means that the gradient must compensate for outliers before learning the weight to produce the required output. Batch standardization can adjust abnormal values to normal values to make them converge towards common goals.

Set the small batch value to $\omega = \{\omega_1, \omega_2, \ldots \omega_n\}$; The characteristic factors of being learned are:α amd β; If the output is $t_i = BM_{\alpha,\beta}(\omega_i)$, then the small batch mean is equation (18), the small batch variance is equation (19), the standardized result is equation (20), and the proportion and displacement are equation (21).

$$\mu_\omega = {\sum_{i=1}^{n} \omega_i}\Big/{n} \tag{18}$$

$$\sigma^2{}_{\omega} = \sum_{i=1}^{n}(\omega_i - \mu_{\omega})^2 / n \quad (19)$$

$$\widehat{\omega_i} = (\omega_i - \mu_{\omega}) / \sqrt{\sigma^2{}_{\omega} + \epsilon} \quad (20)$$

$$t_i = \alpha\widehat{\omega_i} + \beta \equiv BM_{\alpha,\beta}(\omega_i) \quad (21)$$

2.2. Project Management

Project management is a theoretical and practical system about project operation. It is an activity that uses management theories, methods and technical means to plan, implement and comprehensively control the project to achieve the expected objectives [19]. Project management is a systematic management method with the project as the object. Through a temporary and special flexible organization, it carries out efficient planning, organization, leadership and control of the project, so as to realize the dynamic management of the whole process of the project and the comprehensive coordination and optimization of project objectives.

1) Project management standards

There are different definitions of project standardization standards, but the traditional view is that there should be three measurement standards: time, cost and performance; moreover, with the continuous improvement of the system, there are more dimensions for standardized standards: customer acceptance, project efficiency, business success and future potential should be taken into account [20]. However, time is the most basic and important, because time is a prerequisite for the existence of the project. The relationship between the importance of project success and time is shown in Figure 2.

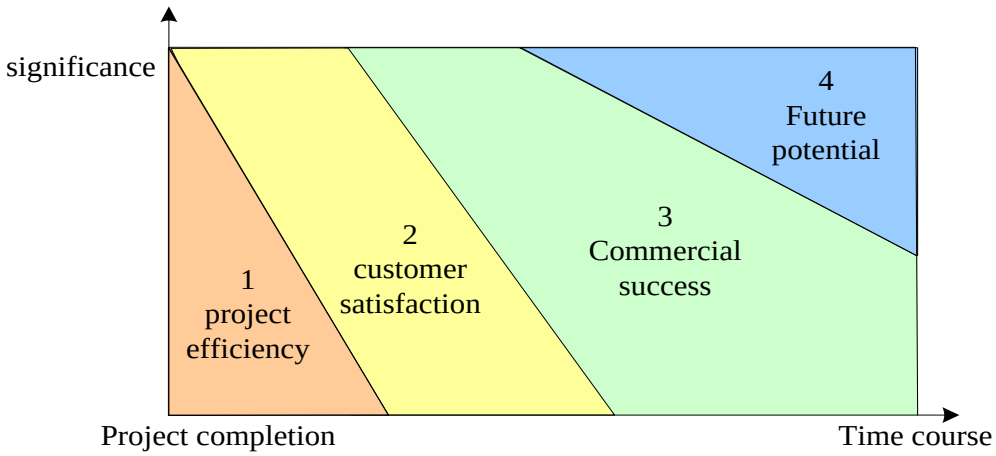

Figure 2. Project success importance dimension

2) Project life cycle theory

The importance of time to project management is mentioned above. The time-based project management theory is called project life cycle theory, and project management activities run through the whole project life cycle [21]. The theory holds that most projects have roughly similar processes, which can be roughly divided into four stages: project initiation, planning, implementation and closure. As shown in Figure 3, the work of the next stage can be started only

after the previous stage of the project meets the requirements. In the whole cycle, the control work runs through the whole process.

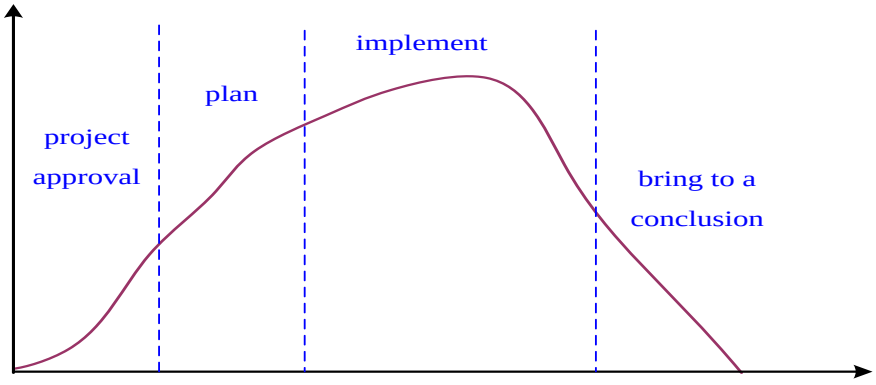

Figure 3. Project life cycle

(3)Project management evaluation

The standardization and maturity of the project management system require certain evaluation standards and evaluation models. For the judgment of the maturity of the whole organization and the success of project management, the most representative is OPM3, which is not only a tool for evaluating, improving and improving the organization's project management ability, but also an international standard for evaluating the organization's project management ability, Be able to assess the level of the organization's project management capability, and then improve and optimize it according to the actual situation [22]. It is common to use the cobweb chart of project maturity, as shown in Figure 4, to evaluate the standardization degree of the eight components of project management. 0 indicates that there is no standard or very poor, 1 indicates that there are constraints but not standardized, 2 indicates that it meets the standard, and 3 indicates that it is the forefront of the industry.

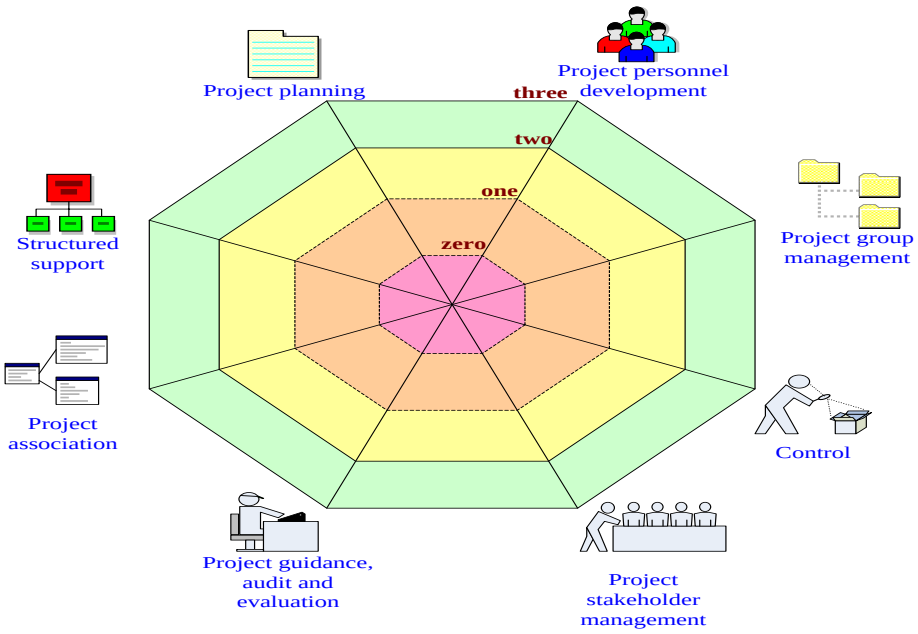

Figure 4. Project evaluation network

(4)Project management knowledge system

In the PMBOK guide compiled by the American Project Management Association (PMI), 42 management processes in project management are summarized into five management process groups and nine knowledge fields, which constitute the theoretical system of project management. This includes 75 deliverables and 129 management tools [23]. In the actual operation of project management, it is not necessary to use all management tools. The most appropriate management tools and methods should be adopted according to the actual situation. Figure 5 shows the nine knowledge areas of project management, mainly including overall project management, scope management, time management, cost management, communication management, human resource management, quality management, procurement management and risk management.

Figure 5. Project management knowledge areas

2.3. Standardized Management System of Sports under Deep Learning

In order to promote the scientific management of sports events, this paper introduces the deep learning algorithm into the construction of sports standardization system. Firstly, combined with the relevant theoretical knowledge of project management, it is determined that the management system is composed of seven modules: time, communication, cost, quality, risk, performance and post game evaluation management. These will be the core content of the system, and other factors will be adjusted according to the actual situation; Secondly, supervised feature learning and training are carried out with deep learning clustering algorithm to determine the important weight of each factor of each module; Finally, the optimized sports project management system is obtained, as shown in Figure 6. The system is very effective for the optimal control of cost, performance and risk.

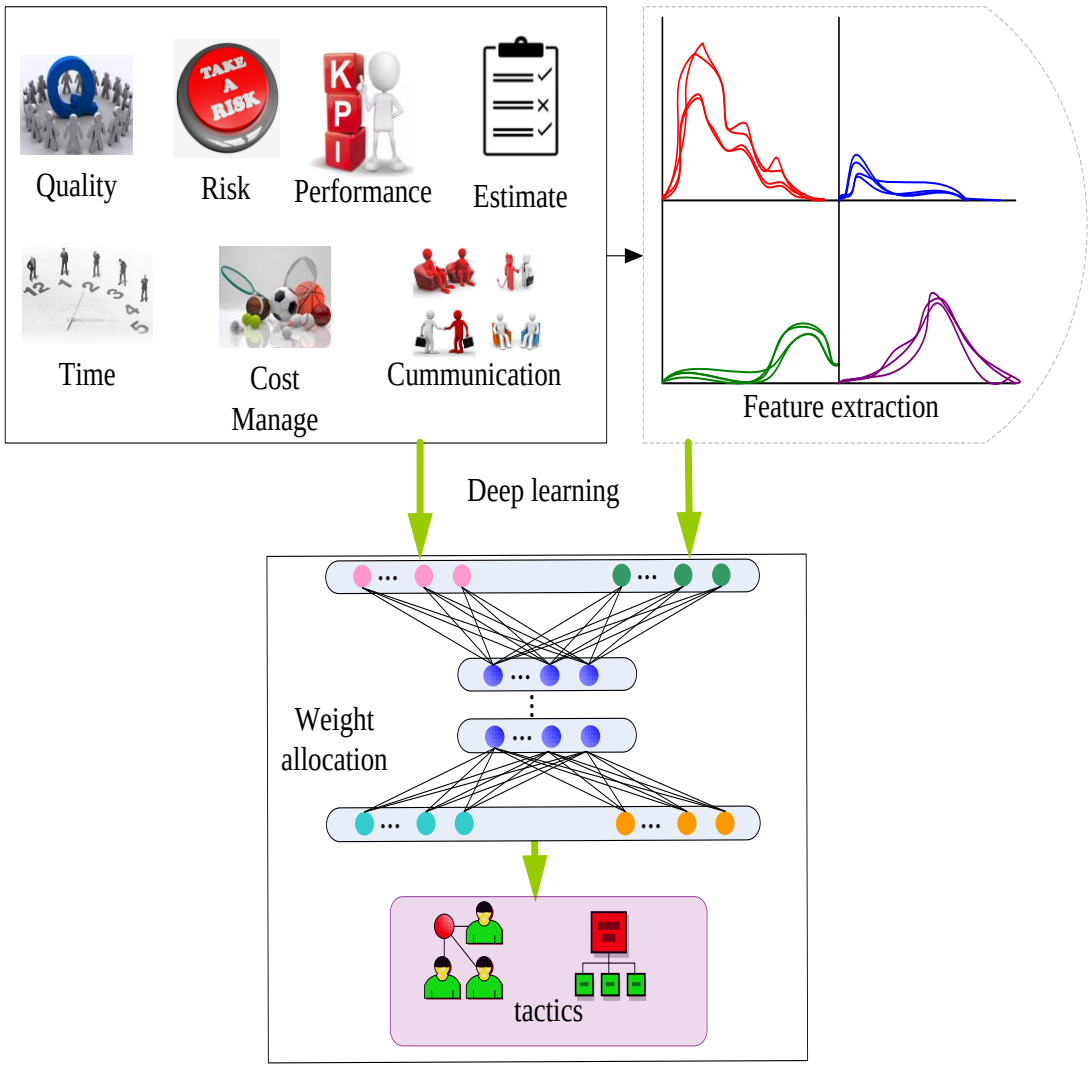

Figure 6. Standardized management system of sports under deep learning

3. Experiment and Analysis

In the method part, this paper has described in detail the deep learning algorithm and related management theory, and preliminary established a standardized sports management system. In order to apply the theory to practice and optimize and supplement the system, we selected the table tennis competition in a city and the track and field competition in a school as the main research object, conducted a questionnaire survey and collected the data related to the competition process, and then conducted data analysis based on this, and finally obtained the experimental results. The content includes the algorithm selection of deep learning algorithm and the optimization of specific modules of sports standardized management system.

3.1. Experimental Process

(1)interview with an expert

Based on the scientific, the above formulated management system needs further analysis and

demonstration. Combined with the literature consulted and the opinions of some professionals, this paper formulates the project management questionnaire of sports events. And through the way of participating in a municipal table tennis competition as a volunteer, we investigated the experts. The statistics of the surveyed experts are shown in Table 1, including municipal athletes, national referees, project managers and police officers.

Table 1. Statistics of experts

Type	Number	Percentage
City athletes	3	25%
National referee	3	25%
Project Administrator	4	33.33%
Police	2	16.67%

During the expert interview, the questionnaire was distributed to the experts, and the content validity and structural validity of the questionnaire were tested. The test results are shown in Table 2. From the results, it can be seen that no experts think the validity and reliability of the questionnaire are unreasonable or very unreasonable. Therefore, it can be concluded that the experts have a high evaluation on the rationality and effectiveness of the content validity and structural validity, It shows that the questionnaire has high validity. After the project, 34 experts in the city were retested. The time interval was one and a half months, and the measured correlation coefficient was 0.87, indicating that the validity of the questionnaire was high.

Table 2. Questionnaire validity evaluation

Evaluation results of content validity.					
validity	Very reasonable	More reasonable	General	Unreasonable	Very unreasonable
Num	4	7	1	0	0
Percentage	33.33%	58.33%	8.34%	0	0
Structural validity evaluation.					
validity	Very reasonable	More reasonable	General	Unreasonable	Very unreasonable
Num	5	6	1	0	0
Percentage	41.67%	50%	8.33%	0	0

(2)Second round questionnaire distribution and recovery

Participated in the field investigation of a school track and field competition, a total of 56 questionnaires and 18 online questionnaires were distributed. The recovery rate was 93.2% and the effective rate was 94.1%. A total of 74 questionnaires were distributed, including 35 contestants, 16 stakeholders, 9 event volunteers, 5 international and 9 National Track and field referees (including 4 professors, 8 lecturers and 1 competition director). The main content of the questionnaire is to

evaluate the satisfaction of sports competition, post competition feedback and the standardization of the whole organizational process. The reliability and validity of the second round questionnaire are shown in Table 3.

Table 3. Reliability test

Case Processing Summary		
	N	%
Effective	65	94.1
Excluded	4	5.9
SUM	69	100.0
Reliability statistics		
Cornbach's Alpha	Num of terms	
.877	74	

(3)Data analysis

Combined with the events and questionnaire survey results, this paper will specifically analyze the data of several dimensions in the process of project management, such as time, risk, efficiency, cost, business success and post game evaluation. In addition, it will also compare from the perspective of different subjects to measure the standardization of project management by their weight, The specific data analysis is shown in the next section, Section 3.2.

3.2. Application of Project Management System and Data Analysis

(1)Algorithm error test

In the previous method part, three feature learning methods are introduced, mainly RBM, EVM and PPO algorithms, and batch standardized processing methods to reduce errors and improve learning efficiency are also given, which can compensate outliers and gather towards common goals, which is more conducive to the improvement of management accuracy. In order to detect whether the algorithm error after batch standardization is reduced, the simulation comparison experiment is carried out. 5000 epochs are trained for each algorithm, and every 20 epochs are used as the evaluation value, so as to detect the error changes of the three algorithms before and after batch standardization, sort the errors of the three algorithms in project management, and select the deep learning clustering algorithm with stable error and small value. The comparison results are shown in Figure 7. It can be concluded from the chart that after batch standardization, the errors of the three algorithms are significantly reduced, and the average error reduction of the three algorithms is about 0.68, indicating that the standardized algorithm is more in line with the requirements. At the same time, among the three algorithms, whether the original method or the optimized method, the algorithm error of PPO is significantly less than that of RBM and EVM algorithms, with an average error of 0.67 less than that of RBM, The average error is 0.56 less than that of EVM algorithm.

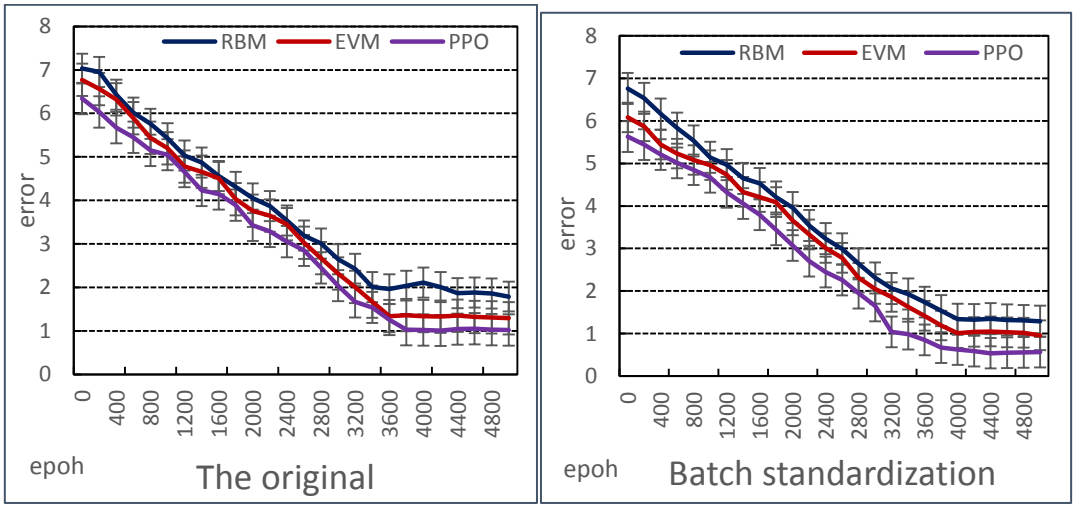

Figure 7. Error experiment of deep learning algorithm

(2)Analysis on the construction of sports management system

1) cost analysis

The method used for event cost budgeting is similar to cost estimation. Generally, there are two methods, one is to allocate according to the life cycle, also called segmental allocation, such as allocate one-fifth during the project preparation phase, and five-point allocation during the implementation and execution phases. Third, one-fifth is allocated at the end stage; one is allocated by modules, also called block allocation, such as allocation according to procurement, human resources, bidding, and publicity. In actual competitions, in fact, the combination of the two allocation methods may give the best results. Specifically, the fixed cost part of the event is divided into blocks and the variable cost part is divided into pieces. Of course, the standard of cost management is not as low as possible, but to control project costs and maximize the utilization rate of funds. Therefore, we use the utilization rate of project funds to measure the level of cost management. The higher the utilization rate, the higher the cost. The better the management level, the results obtained by collecting data are shown in Figure 8. From the figure, it can be seen intuitively that the capital utilization rate of each stage and each module is around 90%, and the comprehensive capital utilization rate reaches 92.08%.

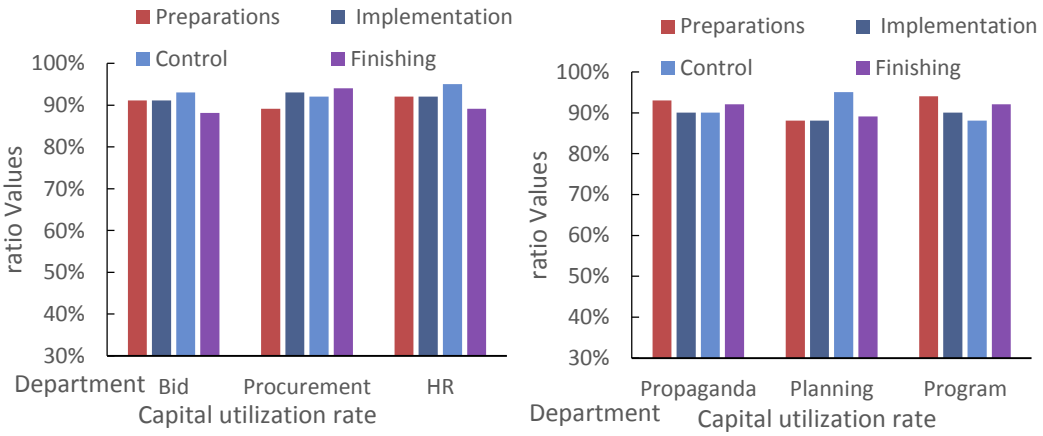

Figure 8. Fund utilization

2) Risk control

Risk control is particularly important in the event, which is directly related to the life safety of project personnel. Strict and high-standard risk prevention measures are necessary to ensure the safety of the event and the smooth holding of the event. With the continuous expansion of the scale of sports events, the risk probability also increases gradually. Once an emergency occurs and is not effectively controlled, it will bring huge losses to the organizers and participating units. Therefore, it is very necessary to carry out risk identification and formulate response plans in advance. Risks are divided into risks outside the project and risks inside the project. Risks outside the project cannot be avoided or controlled by the organization, and only the ability is required to minimize the loss. Risks in the project can be prevented and controlled with a high level of management. The data of risk control in this paper is mainly analyzed from the second round of questionnaire, and the dimensions and parts of risk control are determined from the perspective of professionals. Table 4 shows the identification effect of experts on risks.

Table 4. Experts' views on emergencies of track and field events

Risk	Absence of athletes	Audience disorder	Bad weather	Athlete injury	Referee disputes	Equipment failure	Space conflict
Magnitude	6	15	37	34	36	38	43
Proportions	9.23%	23.08%	56.9%	52.31%	55.38%	58.46%	66.15%

3) Satisfaction analysis

The quality of an event depends not only on its success and benefits, but also on the satisfaction of stakeholders. Project stakeholders refer to "individuals or organizations that actively participate in the project or whose interests may be positively or negatively affected by the implementation or completion of the project." the satisfaction of stakeholders is also an important part of the event evaluation. Stakeholders of sports events can be divided into internal and external stakeholders from the perspective of organization; from the perspective of the impact on the pros and cons of the project, it can be divided into positive, neutral and negative stakeholders. Specifically, it usually includes organizers, spectators, athletes, sponsors, suppliers, managers, etc. we mainly collected several satisfaction questionnaires from these subjects, in which satisfaction is expressed in different values, and the level from low satisfaction to high satisfaction is divided into 0-5. The final results are shown in Figure 9. It can be seen that for the holding of this track and field event, the satisfaction rating given by all stakeholders is still high, above 4, and the average value reaches 4.3.

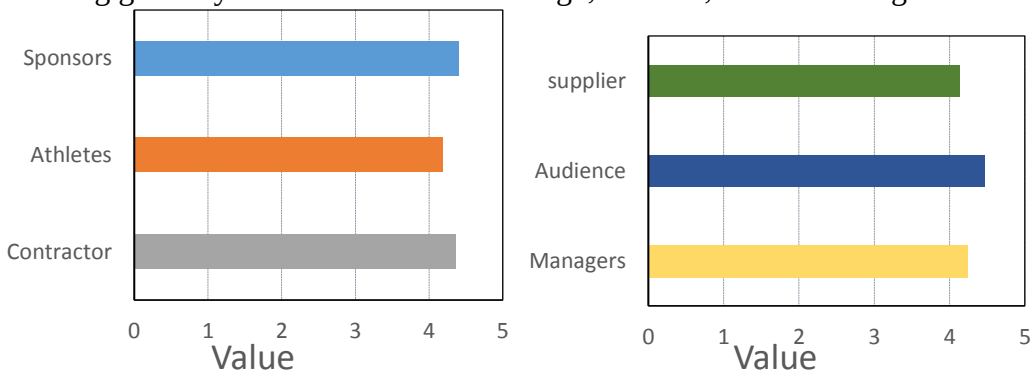

Figure 9. Satisfaction data

3.3. Maturity Analysis of Project Management System

The so-called project management maturity refers to the organization's ability to complete the project with high efficiency and high standards under specific conditions and objectives. The measurement of project maturity is an effective method and way to evaluate and improve the management system. Project maturity management consists of four parts: management capability, results, evaluation methods and improvement methods. This part of this paper is to analyze the maturity of track and field sports management system based on the project evaluation network mentioned in the method part. This section mainly includes three parts: weight construction, maturity analysis and optimization and improvement.

(1) Weight construction

Based on the principles of scientific and system optimization, we mainly consider the startup, planning, implementation, control and closing process of the project management system. In addition, we also consider other management modules such as communication, quality, risk, evaluation and performance. Therefore, we take six processes as the primary indicators, and there are corresponding secondary indicators of track and field events under each primary indicator. The final primary and secondary index weight distribution is obtained by combining qualitative and quantitative methods. The primary index weight distribution is shown on the left of Figure 10.

(2) Maturity analysis

According to the set of established index systems, the management system adopted in the competition is also evaluated by experts, which can greatly ensure the rationality and scientific of the data. It mainly shows the maturity evaluation with level-1 indicators as explicit, which is converted into ten decimal. The specific data are shown in Figure 10. It can be seen that among the five processes, the implementation stage has the highest importance and the closing stage has the lowest importance: in terms of level-1 indicator score, the planning stage has the lowest score, the closing stage has the highest score, followed by the implementation part, Finally, the comprehensive score is 8.26, indicating that the maturity of the management system is still high.

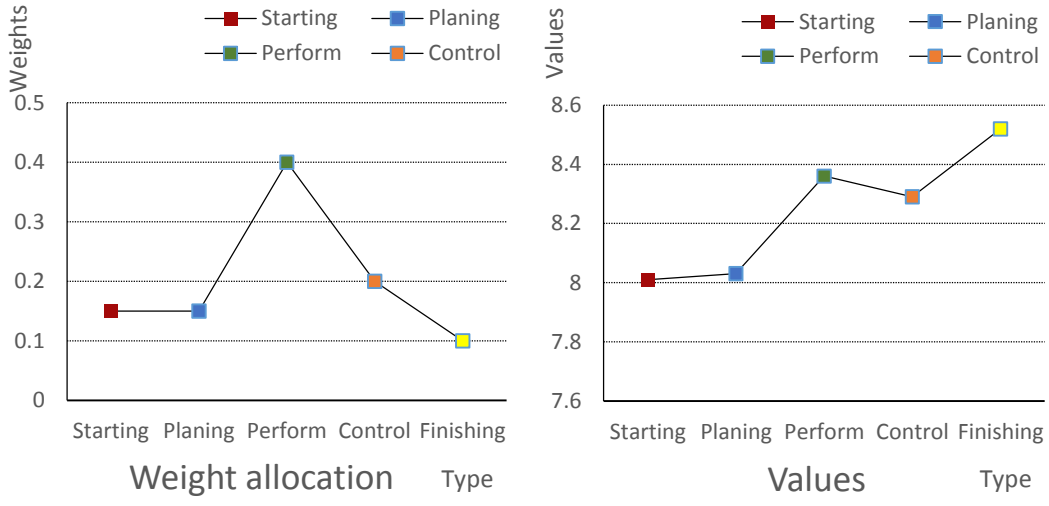

Figure 10. Primary weight and score

(3) Project management optimization

In the method part of the article, we preliminary determine the work breakdown of the management system based on seven modules: time management, communication management, cost

management, quality management, risk management, performance management and post game evaluation management. After the above experimental analysis, combined with expert opinions, it is considered that the track and field event management system still has deficiencies and needs to be further refined in management. Therefore, we subdivide two modules in the system, namely human resources management and procurement management, subdivide work breakdown and set up standby scheme management. After the model application analysis, the comprehensive score of the optimized project management system maturity is 9.17, 0.91 points higher than the original.

4. Discussion

This paper is committed to the construction and analysis of sports standardized management system with deep learning algorithm. This paper includes the introduction of more widely used deep learning algorithms RBM, ECM and PPO algorithm, as well as the theoretical overview of project management theory, such as life cycle theory, project evaluation method, project management standard and project management knowledge system. Using the relevant knowledge of project management theory, the holding of sports events is divided into five processes and seven modules. The five processes are preparation, planning, implementation, control and closing stages, and the seven modules are process management, risk management, cost management, communication management, performance management, evaluation management and performance management. In the experimental part, with the help of the table tennis competition held in a city, this paper makes an investigation and research, collects the views of some professionals on sports management, and makes a specific analysis on the track and field competition management system of a university.

In order to make the analysis more reasonable and accurate, the deep learning algorithm is optimized. The optimization method is batch standardization, and the PPO algorithm is more in line with expectations. Subsequently, the risk of the project was studied, the cost was analyzed, and the satisfaction and maturity of track and field events held in Colleges and universities were comprehensively investigated and evaluated. The cost index was mainly the utilization rate of funds rather than the cost. The satisfaction result was obtained in the form of questionnaire, Maturity is obtained through fuzzy comprehensive evaluation method combined with project network evaluation.

5. Conclusion

This paper analyzes and evaluates the sports project management system of a university, analyzes and studies the track and field competition held by it, the investigation process is from the beginning to the end of the competition, comprehensively uses a variety of investigation methods to investigate the satisfaction of different subjects such as referees, spectators and organizers in sports projects, and invites experts to evaluate the maturity of the system. The final results show that the batch standardized algorithms of the three deep learning algorithms have higher accuracy and smaller error. After the standardized processing of the three algorithms, the average error is reduced by 0.68, and the simulation score of the optimized management system maturity is 9.17, which is 0.91 points higher than the original.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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