Research Article

Research on Collaborative Innovation of Animation Specialty in Colleges under Digital Technology

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1. Introduction

Animation industry is the core industry of global economic development in the 21st century and is also a way of inheriting traditional Chinese culture [1]. The animation technology specialty has strong social practicality, which is of great significance for training animation professionals and promoting the development of the animation industry. At present, the enrollment of animation major in colleges is increasing year by year, with wide coverage and gradually increasing teaching difficulty. How to promote the reform of education in digital animation has become a problem faced by higher vocational colleges in China. The development of the animation field cannot be separated from computer technology, which is an important part of the animation field [2]. Under the influence of economic globalization, the wide application of computer technology in collaborative innovation of animation specialties is not only a sign of the arrival of the era of science and technology but also an effective measure to promote its evolution. The driving effect of computer technology is mainly reflected in computer technology in 3D animation, animation synthesis, paperless animation, and other fields [3]. On the one hand, the technology of virtual reality has been implemented in the animation field through computer technology; on the other hand, it has also achieved the development of other related industries. Therefore, the wide application of computer technology not only expands the expression space of animation, enriches the expression forms of animation works, and improves the efficiency of animation creation but also promotes the innovation of the animation industry, the spread of animation works, and the development level of the animation industry, which is conducive to the further advance of China’s animation design industry.

2. Construction of Collaborative Innovation System of Animation Specialty in Colleges under Digital Technology

At present, the concept of animation design in China is relatively simple, with lack of innovation ability in the animation industry not high, and the design it is monotonous [4]. Science and technology, intelligence, and electronization...
are the main trends of the animation industry in the future. Traditional computer technology can only fulfill 2D animation and graphic animation, while the application of digital media technology makes animation design and production efficient, which greatly promotes the development of China's animation industry.

Collaborative innovation of animation specialty in colleges under digital technology needs to build a third-order practical teaching system, in progress, of professional skill studios (graphic design, animation production, and VR), animation R & D center, and entrepreneurial base for college students based on the curriculum design of animation major in colleges, as shown in Figure 1.

The collaborative innovation system of animation is based on animation practice, which cultivates professionals through skill training, animation research and development, and incubation base construction. Of course, the innovation and development of the animation major require not only the drastic reform of the course teaching in colleges and universities but also the cooperation between the government and enterprises and the collaborative innovation of the three parties above. Only in this way can we achieve the goal of cultivating professionals in animation.

Colleges should make use of digital technology to carry out public courses, professional courses, and postpractice to carry out the training of basic skills. They also need to design open practice for students of different levels and apply three-dimensional software, such as ZBrush and 3Dmax to the design of creative animation, model animation, and the achievement of teaching effect and evaluation [5]. Constantly, colleges are supposed to cultivate the consciousness of integrating diversified science and technology into animation production and design, among students, so as to improve their comprehensive ability and lay the foundation for their entry into the animation industry.

Enterprises should provide internship positions for students majoring in animation and set up three studios [6] for graphic production, 3D animation, and postproduction. They need to fully popularize the teachers by using AR technology according to the requirements of technical staff in enterprise and set up various technical centers such as hand-painted galleries, holographic projection, and animation industry base, to ensure more effective innovation of digital technology from a developmental perspective and the cultivation of professionals learned in the new era.

The government should provide more practical opportunities for students majoring in animation through policy inclination, give full play to the government’s role as an organization and bridge, formulate supporting policies for related enterprises with school-enterprise cooperation, ensure full supervision and evaluation, and ensure the integration of production and education [7].

Under the background of digital technology, only through the deep cooperation of government, universities, and enterprises, the use of modern digital technology, the integration of manpower, material resources, and technology, and the establishment of a collaborative innovation platform of animation production technology can the innovation and practice of animation specialty be promoted.

3. Design of Collaborative Innovation Platform for Animation Projects Based on Digital Technology

Economic globalization promotes the development of technological innovation and the design of animation industry towards globalization, decentralization, and synergy, while knowledge is becoming an important element of the development in animation [8]. The animation industry involves the integration of technologies in computers, networks, process of graphics and images, signal processing, and other fields. It also includes basic techniques of digital media, a platform of digital media, service technology, and technology of application in the digital media field [9]. Combined with the collaborative innovation system of animation major, it is necessary to integrate the assets of universities, enterprises, and governments into their own systems and reorganize the animation assets of these parties in the form of knowledge, so as to really play their role and to build an ontology-based collaborative innovation platform for animation projects, which provides an online communication channel for universities, enterprises, and governments.

3.1. Demand Analysis. In the process of collaborative innovation of animation, knowledge is distributed in universities, governments, enterprises, and other units, involving a wide range. Knowledge about animation is also distributed in various departments, such as personal computers, enterprise servers, archives, personal minds, backup data, and the Internet. [10]. How to integrate scattered knowledge and realize exchange and sharing is a difficulty [11]. This study tries to integrate the animation resources of universities, governments, and enterprises and provides diversified paths for collaborative innovation of animation majors in universities by constructing a collaborative innovation platform; therefore, the platform needs to implement the following basic functions:

1. Expression of animation knowledge: individual knowledge is one of the important sources of unit knowledge. Animation knowledge in universities, governments, enterprises, and other departments has its unique storage format. If animation knowledge is expressed and formalized randomly, it will cause the problem of knowledge heterogeneity [8]. Therefore, it is necessary to clarify the expression and formalization of animation knowledge, form a specific format of sublanguage and ontology library, and build a common ontology so as to provide a theoretical basis for the expression and formalization of individual knowledge, thus effectively reducing the heterogeneity of knowledge.

2. Maintenance of animation knowledge: the maintenance of a date is an indispensable function for any knowledge application [12]. Collaborative innovation of animation major in colleges is a dynamic
process, and the discovery and updating of knowledge in the development process are inevitable. It is usually impossible to abstract and solidify all knowledge at the beginning of a project. Therefore, it is necessary to maintain and handle animation knowledge in good time. Therefore, this improves the expandability of the collaborative innovation platform of projects.

(3) Animation knowledge retrieval: the knowledge retrieval function of animation is the main means for users to acquire animation knowledge from the system, which is realized by querying, and it is also the main function of the collaborative innovation platform of animation projects that needs to be implemented.

(4) Animation knowledge sharing: actually, animation knowledge does not exist independently of data. Animation knowledge and data complement each other in supporting decision-making or information sharing. Universities, governments, enterprises, and other departments have different demands for animation resources, and their own animation resources may be lacking in other units [13]. Therefore, animation knowledge sharing is the core function of a collaborative innovation platform for animation projects, which can provide effective support for the innovative behaviors of universities, governments, and enterprises.

3.2. Overall Deployment. Through the design of the collaborative innovation platform of the animation project, all units involved in the collaborative innovation of animation specialty are connected with related knowledge (including explicit knowledge and tacit knowledge). Also, through the organization, management, and sharing of animation knowledge, participants can comprehend the dynamic development of animation specialties in time and all kinds of animation knowledge needed by their own, which provides a good managing platform for the spread of animation experience and knowledge.

There are many units and participants in the professional collaborative innovation of animation, and there exists independence among participants in time and space. Therefore, under the network environment, establishing a collaborative innovation platform for animation projects based on WEB can effectively realize the integration of knowledge flow, information flow, and business flow, which can promote sharing and management. If it is the general knowledge of animation project ontology or the hidden animation knowledge published on Wiki, blog, forums, etc., it needs to be packaged into the knowledge portal to meet the needs of users [14].

The animation collaborative innovation platform includes a physical network layer, infrastructure layer, basic service layer, service layer, user layer, and terminal, and the specific deployment is shown in Figure 2. Among them, the terminal is the basic interface between users and the system, which needs to reflect the basic needs of users [15]. Applications in the basic service layer are the core of the whole system [9].

3.3. Functional Design. Combined with the demand analysis and overall design of the animation collaborative innovation platform, its core functions are divided into animation knowledge integration, animation knowledge retrieval, animation knowledge maintenance, and animation knowledge sharing.

3.3.1. Animation Knowledge Integration. The animation collaborative innovation platform needs to gather information from universities, governments, and enterprises, which is stored in their respective databases and exists in the form of various business systems. In order to unite these units and integrate the advantages of animation resources, they ought to introduce the concepts of enterprise's dynamic alliance and project's cooperative subcontracting and integrate the process of animation knowledge [10]. At present, the animation industry's information systems of universities, enterprises, and governments are still mainly supported by relational databases. D2RQ provides a complete set of APIs to realize the access of relational databases to the semantic Web [16]. For us to transform the legacy data into RDF data [17], which has a higher semantic level and can be processed by knowledge processing, with the help of D2RQ, the animation knowledge of universities, enterprises, and governments is integrated and transformed, as shown in Figure 3.

In addition, during the development of the collaborative innovation platform for animation projects, many metadata, metaknowledge, business rules, and so on of animation majors are based on XML. Therefore, the animation knowledge contained in XML occupies a large proportion and takes up an important part of the collaborative innovation platform for animation projects, which must be considered. On this basis, an XML-based file is proposed to describe the organization and functions of enterprises, and it is integrated into the collaborative innovation platform of animation projects. The relationship between XML files and entities is constructed by MAPONTO technology, and the mapping is implemented by the Company owl ontology, and the mapping of the collaborative innovation platform of animation projects is realized on this basis [18]. The mapping from the XML document to ontology is shown in Figure 4.

3.3.2. Maintenance of Animation Knowledge. It takes a long time to develop animation projects in colleges, and animation knowledge is constantly updated and changing. Therefore, how to make ontology adapt to the changes of the outside world and maintain it in time [19] is an unavoidable problem in the management of animation knowledge by using ontology at present.

With respect of colleges and universities, the development of animation projects is a temporary process. After the development cycle of each project, the temporary alliance
Training goals of animation professionals in colleges and universities: creative ability, innovation ability, entrepreneurial ability

Entrepreneurship Incubation Base
Internships
Teacher leads students Core competence training
Animation R&D and Service Center
Periodic inspection Data management
Public curriculum learning Basic skills training
Skill training studio
Policy preference Support project fund
Practice platform
Position function Carry out skill training
Colleges
government
Enterprise

Animation project collaborative innovation platform

Figure 1: Collaborative innovation system of the animation specialty in colleges and universities based on digital technology.

Client
terminal
terminal

Knowledge Management Portal
Knowledge map

User layer

Animation knowledge integration
Animation knowledge maintenance
Animation Knowledge Dimension Retrieval
Animation Knowledge Sharing

Service layer

Ontology
Knowledge
Evolutionary program
database

Basic service layer

Mail system
file server
Database server

Infrastructure layer

internet

Physical network layer

Figure 2: Deployment of collaborative innovation platform for animation projects.
3.3.3. Animation Knowledge Retrieval. Establishing collaborative innovation platform for animation projects is to fully tap and utilize animation knowledge mastered by organizations and apply animation knowledge to project development so as to achieve the purpose of improving the efficiency of animation production. An excellent knowledge management system requires not only massive structural knowledge but also a good platform, which can convey the best knowledge to people who need it most in the shortest time, and the key is how to search and query. The knowledge query of the animation collaborative innovation platform is based on ontology, and the design of the knowledge retrieval module should fully consider the actual needs of users so that users can better understand the semantics of the knowledge they have learned and carry out the semantic query according to the vocabulary, semantic relations, and restrictions [22].

There are three retrieval methods of animation knowledge in the collaborative innovation platform of animation projects:

The first is an inquiry by browsing [23]. The system uses the visual interface, takes the animation project ontology as the main body by the built-in retrieval function, and passes the existing retrieval function to retrieve the current content. For example, when the user clicks “Personnel,” the system will provide feedback information about people, such as who is in this project, which department it belongs to, and what is its responsibility? Compared with traditional information retrieval, it uses ontology-based semantic relations more and integrates scattered information, thus facilitating users’ understanding of existing projects.

The second is customized inquiry. The user selects the corresponding words and associations and then generates a semantic query [11] on the interface given by the system. Compared with traditional methods, it is more flexible for users who do not need to know the syntax details of ontology queries. However, users must better understand the ontology and customize the query conditions and restrictions.

Third is advanced inquiry [24]. Advanced queries refer to advanced users who have some knowledge of the SPARQL language. It can directly organize and input SPARQL to
query, analyze, and process them. Compared with the previous two methods, it requires users to be more familiar with SPARQL syntax and be able to write corresponding queries according to their own query requirements.

The basic flow of animation knowledge retrieval of the animation collaborative innovation platform is shown in Figure 5.

When searching for knowledge, the animation project ontology is like a conceptual view, and users do not need to know its internal structure. Ontology can hide the differences in animation professionals’ knowledge, and it can become the source of animation knowledge by connecting with ontology through reasonable ways.

3.3.4. Animation Knowledge Sharing. In order to realize the collaborative innovation of animation major in colleges, we should not only achieve the interchange of data but also share and exchange knowledge levels. Due to a poor function of semantic expression, it is very difficult to exchange and cooperate knowledge among various units, while Web technology based on ontology and semantics can effectively solve this problem [25].

Knowledge sharing is the most important demand and one of the most important functions in the process of collaborative innovation platform. Compared with the traditional business model, the interactive relationship among enterprises, departments, and individuals in animation projects is a thorny issue [26]. In this study, the general animation knowledge of collaborative innovation platforms for animation projects is structured and formalized, which provides a basis for sharing and describing other knowledge and realizes the unification of knowledge. On the one hand, sharing animation knowledge refers to the ability to provide relevant information to different characters, which, on the other hand, is the sharing and dissemination of personal animation knowledge [27]. Therefore, the animation knowledge sharing process is designed as shown in Figure 6.

From Figure 6, it can be seen that animation knowledge can be published and pushed through the Web page, and users can give timely feedback according to the pushed information, which forms a circular data sharing process.

3.4. Database Design. The database is the cornerstone of the collaborative innovation platform of the animation project. In the development of the platform, many descriptions need to be supplemented by data.

On the one hand, all kinds of structured data about projects in collaborative innovation platforms of animation projects need to be stored in database. Only when data are used in combination with the knowledge described in ontology or business rules can they truly reflect the value. Therefore, it is necessary to create a mechanism to unify the management between data and knowledge, which provide a basis for users to better understand and use them. The collaborative innovation platform of animation projects mainly involves the ecological chain of animation Industry-University-Research, including design technology of animation modeling, researching mechanism of animation product, Chuangzhi Microsoft Technology Center, animation research and development center, laboratory of application in digital media technology, institutions of animation technology research, etc. The table of collaborative innovation platforms for animation projects is constructed, as shown in Figure 7.

On the other hand, the collaborative innovation platform of animation projects needs to be connected with the original system of colleges. The data accumulated in legacy systems contain much information related to the development of animation projects. Reusing and integrating of this information is also very important. To this end, the animation collaborative innovation platform should own an interface with the database so that users can simultaneously get the corresponding data when accessing knowledge; thus, the efficiency and quality of decision-making are improved. The database and ontology linked by mapping can implement the data sharing between the collaborative innovation platform of animation projects and other systems, as shown in Figure 8.

4. Application of Collaborative Innovation Platform for Animation Projects Based on Digital Technology

The development of an animation collaborative innovation platform has practical value and a broad prospect in the application.

4.1. Innovating Animation Teaching Mode. The animation collaborative innovation platform of the project contains abundant animation knowledge. By docking with the learning platform of animation courses in colleges, it can form a display platform of teaching achievement in animation. The platform includes the creation of 2D short films, 3D short films, and microfilm, as well as the appreciation of students’ works and other columns. Students can learn the basic knowledge of 2D animation, create a two-dimensional animated short film, and upload it to the learning platform. With the basic learning of 3D animation, students can apply 3D animation technology to complete the production and demonstration of 3D animation. At the same time, special columns can be set up for students to shoot short videos and display animation technology at a higher level after mastering the basic knowledge of micromovies, which will be evaluated by teachers and classmates to show their capacity.

In addition, with the help of the collaborative innovation platform of animation projects, teachers can further extend and form a modular teaching process of computer animation specialty, which integrates basic theory teaching, creation of 2D animation short film, comprehensive design of 3D animation short film, creation of microfilm, design of digital illustration, and practical training, so as to cultivate students’ professional interest and innovation and improve their professional skills in practical operation, which...
provides a practical teaching mode for training technology professionals.

4.2. Promote the Development of the Animation Industry. The collaborative innovation platform for animation projects integrates the communities of shared interest among government, enterprises, universities, etc., which takes the training of animation professionals as the starting point, serves society as the value orientation, and integrates society, industry, and education in the same field. Among them, the government, as a manager, provides policy and institutional and environmental support for the cooperation between universities and enterprises through “tangible hands.” As the core element of the market economy, enterprises provide financial support for technical research through technology industrialization and use modern industrial colleges to transform human capital into economic profits. As the primary body in modern industrial colleges, colleges and universities pursue social values and are responsible for training high-quality skilled talents, delivering talents to society, and meeting the market demand for talents. So, balance the value orientation of the three is an important premise for collaborative innovation of the animation specialty.

The collaborative innovation platform of the animation project has formed a collaborative innovation model where the government takes the leading role and the school-enterprise is the main body. It has fully played the coupling effect of the industrial chain and the education chain, which enhance the dominant position of the school-enterprise in the collaborative innovation and collaborative education of modern industrial college, and then realized the effective allocation of innovation resources.

Animation project collaborative innovation platform should not only meet the needs of the government, enterprises, and universities but also be the fundamental guarantee for the survival and development of the animation industry. Through modern computer technology and communication technology, we can build enterprises a collaborative innovation platform for animation projects, which may customize a platform environment with information interaction, collaborative cooperation, and management for the government, enterprises, and universities. It is meant for
Figure 6: Sharing of ontology-based animation knowledge.

Figure 7: Structure of collaborative innovation platform database of animation project (part).
strengthening extracurricular practice, innovating animation design, training managers, developing characteristic industries, etc., which is an inevitable measure for the development of the animation industry in digital media.

5. Conclusion

Under the trend of economic globalization, competition among industries is becoming more and more fierce, so is the animation industry. Animation industry plays a very important role in the development of China’s national economy. Under the background of digital technology, China’s animation industry will gradually develop in the directions of science and technology, intelligence, and electronics. As the pioneer of the animation industry, the animation specialty in college needs to integrate a variety of technologies, strengthen extracurricular practice, and innovate in animation design. The collaborative innovation system of animation specialty in colleges under digital technology requires that the curriculum design of animation specialty in colleges and universities should be based on the curriculum design to strengthen the deep cooperation among government, universities, and enterprises. Based on this, the collaborative innovation platform for animation projects is constructed through the integration of technology in animation design and digital media, which can realize the integration, maintenance, retrieval, and sharing of animation knowledge. The application of a collaborative innovation platform can improve the soft environment of an animation project’s development, promote the innovation of knowledge, accelerate the development of animation projects, improve the quality of animation works, and stimulate the overall competitiveness of the animation industry, which then effectively advance the region of the animation industry.

Data Availability

The dataset can be obtained from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References


