

Exploring the Path of Digital Technology Enabling Traditional Calligraphy and Seal Engraving

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Abstract: With the rapid development of digital technology, traditional cultural art forms are facing unprecedented development opportunities. Taking traditional calligraphy and seal cutting as the research object, this paper discusses how digital technology empowers traditional calligraphy and seal cutting art, so as to realise its inheritance and development in the context of the new era. Firstly, the basic concepts of digital technology and traditional calligraphy seal cutting are outlined, and the necessity of combining the two is analysed. Secondly, the advantages of digital technology empowering traditional calligraphy seal cutting are elaborated in detail from the aspects of innovating the expression, improving the efficiency of seal cutting, broadening the dissemination channels and promoting the art inheritance. Then, through practical case studies, the effectiveness of the application of digital technology in the field of traditional calligraphy seal carving is verified. Then, it discusses the challenges faced in the process of digital technology empowerment and puts forward corresponding strategies to cope with them. Finally, it looks forward to the future development trend of digital technology empowering traditional calligraphy and seal carving to provide reference for research in related fields.

Keywords: Digital technology; Traditional calligraphy; Seal cutting; Artistic heritage; Innovative development.

1. Introduction

With the rapid development of digital technology, all walks of life are seeking integration and innovation with digital technology. As China's excellent traditional culture, the art of calligraphy and seal cutting is facing the difficulties of dissemination and lack of successors in modern society. In this context, the intervention of digital technology provides new possibilities for the inheritance and development of traditional calligraphy and seal cutting art. The purpose of this paper is to explore the path of digital technology empowering traditional calligraphy seal cutting, analyse its advantages, practice cases and challenges, and provide theoretical support for the innovative development of calligraphy seal cutting art.

2. Overview of Digital Technology and Traditional Calligraphy Seal Carving

2.1. Definition and development of digital technology

Digital technology refers to the technology that uses digital information and electronic technology to process, store, transmit and display all kinds of information. It covers many aspects such as computer technology, communication technology, Internet technology, Internet of Things technology, big data technology, artificial intelligence technology and so on.

The development of digital technology began in the middle of the 20th century, and with the introduction of computer technology, digital technology gradually rose to prominence. The invention of computers made the processing and storage of digital information possible, while the development of the Internet greatly broadened the application fields of digital technology. With the continuous progress of science and technology, digital technology has been constantly updated

and brought about profound changes in people's life, work and social management.

In the past few decades, digital technology has made remarkable achievements. From the popularisation of personal computers, to the introduction of smartphones, to the application of big data, artificial intelligence and other technologies, digital technology has penetrated all walks of life. Nowadays, digital technology is driving the development of global economy, society and culture, and has become an important driving force of the new era.

In China, the development of digital technology has also made remarkable achievements. The government attaches great importance to the development of digital technology and lays it out as a national strategy. After years of efforts, China has made a series of important breakthroughs in computer hardware, software, the Internet, big data, artificial intelligence and other fields. Especially in 5G communication technology, artificial intelligence chips, quantum computers and other aspects, China's technology research and development level has been in the world's leading position.

2.2. Origin and Development of Traditional Calligraphy Seal Cutting

As a unique art form, traditional calligraphy seal cutting originated from the oracle bone inscriptions and inscriptions in ancient China. As early as the Shang and Zhou Dynasties, people began to inscribe characters on tortoise shells and animal bones for divination and recording events. This engraving gradually evolved into inscriptions, which became decorative patterns on bronzes. With the development of history, Calligraphy Seal Engraving gradually moved from practicality to art and became an independent art category [1].

Calligraphy seal cutting was greatly developed during the Qin and Han Dynasties. After the unification of the six states by Qin Shihuang, he implemented the policy of 'writing in the same script', which made the characters of different places

unified into the small seal script. The art of seal carving in this period is known for its standardisation and rigour. After the Han Dynasty, different styles of calligraphy and seal carving were gradually formed, such as official script, regular script and running script. At the same time, seal carvers began to pay attention to individual expression, creating many seal carving works with unique styles.

During the Tang and Song dynasties, the art of calligraphy and seal carving reached a new peak. Based on the inheritance of tradition, seal carvers in this period were brave to innovate, which made the art of calligraphy and seal carving present a diversified appearance. At the same time, literati seal carving gradually became a fashion, and many literati and artists participated in the creation of seal carving, which made the art of seal carving incorporate more cultural connotations. During the Ming and Qing dynasties, the art of calligraphy and seal carving entered a period of prosperity. Seal carvers in this period systematically collated and researched the seal carving techniques of their predecessors, forming many schools. Such as Zhejiang School, Anhui School, Yushan School and so on. They focused on the beauty and meaning of words in their seal carving creations, which made the art of seal carving reach a new height.

Since the 20th century, with the development of modern society, the art of calligraphy and seal cutting has faced unprecedented challenges. Against this background, many seal carvers have devoted themselves to the inheritance and innovation of traditional seal carving, so that this ancient art form has been given a new lease of life in modern society.

The art of traditional calligraphy seal cutting originated from ancient oracle bone inscriptions and inscriptions, and has evolved over thousands of years, gradually forming a unique artistic style. From the rigorous norms of the Qin and Han Dynasties, to the diverse innovations of the Tang and Song Dynasties, to the prosperity of the Ming and Qing Dynasties, the art of calligraphy and seal-carving has always maintained a vigorous vitality. In the context of digital technology empowerment, we have reason to believe that the art of calligraphy and seal cutting will shine even brighter in the new era.

2.3. Combination of digital technology and traditional calligraphy seal cutting

The combination of digital technology and traditional calligraphy seal cutting has injected new vitality into this ancient art form. In the context of the digital era, calligraphy seal carving artists have begun to try to combine traditional techniques with modern technology to create unique works of art [2].

Digital technology provides a new form of expression for calligraphy seal carving. Through computer software, artists can easily create works with traditional flavour and even achieve some effects that are difficult to achieve in traditional seal carving. In addition, digital technology can also help artists to integrate modern elements into their works, making seal cutting in calligraphy more contemporary. Secondly, digital technology improves the efficiency of seal carving. Traditional seal carving requires the artist to carve it personally, which takes a long time. While using digital tools, artists can finish more works in a short time, thus improving the efficiency. At the same time, digital technology also makes the seal-carving process more convenient, so that artists can create their works anytime and anywhere, without

the limitations of venues and materials. In addition, digital technology has broadened the dissemination channels of calligraphy and seal carving. Through the Internet platform, artists can show their works to more people, attracting a great deal of attention and appreciation. At the same time, online exhibitions and exchanges also enable the art of calligraphy and seal carving to cross the geographical limitations, and promote mutual learning and exchanges among artists. Finally, digital technology has played a positive role in promoting the inheritance and development of the art of calligraphy and seal cutting. With the help of digital tools, education and training of seal carving have become more convenient, and more young people have the opportunity to learn and understand this traditional art. In addition, digital technology also makes it easier to preserve and pass on the works of seal carving, which is conducive to the protection and development of this valuable cultural heritage.

The combination of digital technology and traditional calligraphy and seal cutting has injected new vigour into this ancient art. In the future development, we expect to see more traditional art works combined with modern technology, which not only carry the long history and culture, but also show the unique charm of the era of innovation [3].

3. Advantages of Digital Technology Enabling Traditional Calligraphy Seal Engraving

3.1. Innovative Seal Cutting Expressions

The rapid development of digital technology has brought new forms of expression and creative space for traditional calligraphy seal cutting art. First of all, digital technology can realise the virtualisation of seal cutting in calligraphy, enabling artists to create in virtual space through digital tools, breaking the dependence on physical materials in traditional seal cutting. This virtual creation not only reduces the cost of creation, but also greatly improves the flexibility and convenience of creation. Secondly, digital technology provides rich visual effects and style choices for calligraphy seal carving. Through digital software, artists can easily try out different fonts, seal-carving styles and colour combinations to make their works more individual and creative. At the same time, digital technology can also realise the dynamic effect of calligraphy seal carving, so that the static art works can present the beauty of flow and change. In addition, digital technology also promotes the integration of calligraphy seal cutting art and new media art. For example, the artist can combine the calligraphy seal cutting works with modern digital media art to create unique interactive art works, allowing the audience to participate in the art creation process, enhancing the sense of artistic experience and interactivity.

Digital technology empowers traditional calligraphy seal carving to achieve innovation in its expression, providing artists with broader creative space and more possibilities. In the future, with the continuous progress of digital technology, the art of calligraphy seal carving will shine more brightly.

3.2. Improve the efficiency of seal cutting

The application of digital technology in the field of traditional calligraphy seal carving has greatly improved the efficiency of seal carving. In the traditional seal carving process, the artist needs to complete the work through a number of tedious steps such as grinding, carving, polishing,

etc., which takes a long time. With the help of digital technology, artists can use computer software to design, and then through CNC machine tools or laser engraving machines and other equipment for seal carving, greatly reducing the creation time. In addition, digital technology also makes the seal carving process more accurate. In the traditional seal carving process, artists often rely on manual operation, it is difficult to achieve a high degree of accuracy. But digital technology can achieve micron-level precision of seal engraving through precise numerical control, making the works more exquisite and delicate [4]. At the same time, digital technology provides infinite possibilities for the innovation of seal carving art. Artists can use digital technology to try a variety of new seal carving techniques and effects, break the limitations of traditional seal carving, and create more individual and contemporary works. Digital technology also solves some technical difficulties in traditional seal carving. For example, in the process of seal carving, artists often need to deal with complex lines and patterns, and these works of high complexity are difficult to complete through traditional means. With the help of digital technology, artists can easily realise the seal carving of these complex patterns, which improves the convenience of creation. Finally, the application of digital technology lowers the threshold of seal carving art. Traditional seal carving requires artists to have a high level of calligraphy and seal carving skills, while digital technology allows non-professionals to create beautiful seal carving works. This has enabled the art of seal carving to be more widely spread and popularised, further promoting the development of the field of traditional calligraphy and seal carving.

Digital technology plays an important role in improving the efficiency of seal carving, which not only makes the seal carving process faster and more accurate, but also provides a broad space for artistic innovation. In the future development process, we should make full use of the advantages of digital technology to promote the prosperity of traditional calligraphy seal carving art.

3.3. Broaden the communication channels

The rapid development of digital technology provides new channels and platforms for the dissemination of traditional calligraphy seal cutting. Firstly, the popularity of the Internet and the rise of social media have made it easy to share the works of calligraphy seal-carving around the globe, breaking the traditional limitations of time and space. Artists can release their works through microblogging, WeChat, Jitterbug and other platforms to attract more attention and appreciation. At the same time, they can also communicate with and learn from other artists through online exhibitions, art forums, online competitions, etc., to inspire and motivate creativity [5]. Secondly, digital technology also provides new possibilities for the education and training of calligraphy and seal carving. Through online courses, video tutorials, virtual reality and other means, more learners can be exposed to this art form, and more flexible and personalised learning methods are provided. At the same time, students can receive guidance and advice from different regions and professional calligraphers through distance learning and online tutoring, thus improving the efficiency and quality of learning. In addition, the application of digital technology can also promote the market development of the art of calligraphy and seal cutting. Through e-commerce platforms, artists can sell their works directly without relying on traditional galleries

and dealers. At the same time, digitised artworks can also be reproduced and licensed in limited quantities, bringing more financial gains to artists. However, digital technology-enabled dissemination of traditional calligraphy and seal cutting also faces some challenges. Firstly, how to incorporate modern technological elements while maintaining the original flavour and unique charm of traditional art is an issue that requires in-depth thinking and exploration. Secondly, the virtual and anonymous nature of the Internet may also lead to the quality and authenticity of works being questioned. Finally, the rapid development of digital technology has also brought about the problems of information overload and distraction, and how to make one's works stand out from the many competitions is also a challenge that artists need to face.

Digital technology provides new opportunities and challenges for the dissemination of traditional calligraphy and seal cutting. We should actively use modern technological means to broaden the channels of dissemination, and at the same time maintain the essence and core of the art to ensure that it maintains its unique value and charm in its inheritance and development.

3.4. Promote the inheritance and development of the art of calligraphy and seal cutting

The rapid development of digital technology provides new possibilities for the inheritance and development of traditional calligraphy seal cutting art. First of all, digital technology provides new forms of expression for the creation of calligraphy seal cutting, which enables artists to break through the limitations of traditional materials and carry out freer and richer artistic exploration with the help of digital tools. For example, through digital seal carving software, artists can create seal carving in virtual space, which can not only realise the traditional seal carving techniques, but also explore new visual effects and artistic styles. Secondly, digital technology has greatly improved the dissemination efficiency of calligraphy seal carving. Through the Internet and social media platforms, works of seal carving in calligraphy can be quickly disseminated around the world, allowing more people to understand and come into contact with this traditional art form. Meanwhile, online exhibitions and exchange activities also provide a platform for calligraphic seal-carving artists to display their talents and learn from each other, which promotes communication and cooperation among artists [6]. In addition, digital technology also plays an important role in the field of calligraphy seal carving education and training. Through digital teaching resources and methods, more young people can be exposed to and learn Calligraphy and Seal Carving, stimulating their interest and love for traditional art. At the same time, the application of digital technology can also provide a more intuitive and convenient way to teach the techniques of calligraphy and seal carving, helping students to better master the traditional skills. However, the process of digital technology empowering calligraphy and seal carving also faces some challenges. How to incorporate the innovative elements of digital technology while maintaining the traditional aesthetic concepts is an issue that needs to be thoroughly explored. In addition, excessive digitisation may lead to the loss of the original art, and how to find a balance between innovation and inheritance is also a challenge that needs to be faced in the development of the art of calligraphy and seal-carving.

Digital technology provides new opportunities and

possibilities for the inheritance and development of the art of calligraphy and seal cutting. Only in the process of continuous exploration and innovation can the art of seal carving in calligraphy be revitalised and glamorous in the digital age.

4. Practical Cases of Digital Technology Enabling Traditional Calligraphy Seal Engraving

4.1. Application of digital seal-carving tools

The rapid development of digital technology has injected new vitality into the art of traditional calligraphy seal carving. In terms of seal carving tools, the application of digital technology is mainly reflected in the following aspects.

Digital seal cutting tools have greatly improved the efficiency of seal cutting. Traditional seal carving requires artists to carve by hand, which is a tedious and time-consuming process. The emergence of digital seal carving tools allows artists to use computer software for design, and then complete the seal carving process through CNC machine tools or laser engraving and other technologies, which greatly improves the efficiency of work. Secondly, digital seal carving tools enrich the seal carving expression. Traditional seal carving mainly rely on artists hand-carved, the form is relatively single. While digital seal cutting tools can achieve a variety of complex patterns of carving, and even can simulate a variety of different seal cutting styles, providing artists with more creative space. In addition, digital seal carving tools also broaden the dissemination channels of seal carving art. Through digital technology, artists can display and disseminate seal carving works in digital form, enabling more people to appreciate and understand the art of seal carving, further promoting the dissemination and development of seal carving art [7]. However, the application of digital seal carving tools also brings some challenges. On the one hand, over-reliance on digital technology may lead to the degradation of artists' manual skills. On the other hand, there may be a gap between digital seal carving works and traditional handmade seal carving works in terms of artistic value. Therefore, how to use digital technology to improve the efficiency and creative expression of seal carving while maintaining the artistic value of traditional seal carving is an important issue that needs to be faced when digital technology empowers traditional calligraphy and seal carving.

4.2. Online Seal Script Exhibition and Communication

Online calligraphy seal cutting exhibition and communication is an important form of digital technology to empower traditional calligraphy seal cutting. Through the Internet platform, artists and enthusiasts of calligraphy and seal carving can display their works, share their creative ideas, learn from each other and communicate with each other anytime and anywhere.

Online exhibition breaks the geographical limitation of traditional exhibition, enabling the art of calligraphy and seal cutting to be appreciated and understood by more people across time and space. Artists can present their works to the audience in the form of three-dimensional models through the virtual exhibition hall, so that the audience can appreciate the works in close proximity and from multiple perspectives, and even realise interactive operations, such as adjusting the lighting, zooming in and out of the works, and so on. The

online communication platform, on the other hand, provides a space for calligraphy and seal-carving artists to interact, share and co-create. Artists can post their works here, get feedback and suggestions from others, and engage in artistic exchanges and collisions. In addition, the online exchange platform can also hold tutorials on seal-carving techniques, calligraphy lectures and other activities, providing a new way for the dissemination and popularisation of the art of calligraphy and seal-carving. Online exhibitions and exchanges also bring some challenges. Firstly, due to the lack of the live atmosphere of a physical exhibition, it may be difficult for the audience to develop deep empathy. Secondly, there may be a gap between the visual presentation of online exhibitions and physical exhibitions, and the original appearance and details of the works may not be fully restored. In addition, the quality of online communication platforms varies, and some platforms may have problems with copyright protection and network security.

As an emerging form of digital empowerment, online calligraphy and seal carving exhibitions and exchanges have brought new opportunities and challenges to the development of the art of calligraphy and seal carving. To give full play to its advantages, it is still necessary to continuously optimise the exhibition and exchange platform, improve the quality of works, pay attention to copyright protection, and strengthen the construction of network security and other aspects.

4.3. Innovation of Calligraphy Seal Script Education and Training

The rapid development of digital technology has had a profound impact on the education and training of calligraphy seal cutting. Firstly, in terms of teaching resources, the application of digital technology has made it possible to digitise a large number of works and materials on seal cutting in calligraphy, providing students with rich learning resources. Through the network platform, students can access and study these resources anytime and anywhere, breaking the geographical and time limitations of traditional education [8]. Secondly, digital technology provides brand-new tools and means for the teaching of calligraphy and seal cutting. In the traditional education mode, students need to master the skills through actual engraving and writing, while digital technology provides a more convenient way for students to learn. For example, using digital seal-carving software, students can practice carving in a virtual environment, which not only saves the cost of materials, but also improves learning efficiency. In addition, digital technology also provides students with more diverse platforms for display and communication. Students can display their works through social media and online exhibitions to get more attention and feedback. This kind of interaction and communication not only enhances students' learning motivation, but also promotes mutual learning and progress among students. However, digital technology-enabled calligraphy and seal cutting education also faces some challenges. For example, how to use digital technology for innovative teaching while maintaining traditional skills, and how to cultivate students' aesthetic ability and artistic sensibility in a digital learning environment are all issues that require in-depth thinking and practice by educators.

Digital technology has brought new opportunities and challenges to calligraphy seal cutting education and training, and educators need to actively respond to these changes and

continue to explore and innovate to meet the educational needs of the new era.

4.4. Digital Calligraphy Seal Carving Product Development

Digital calligraphy seal cutting product development is one of the important paths for digital technology to empower traditional calligraphy seal cutting. With the continuous development of science and technology, digital technology has penetrated into all fields, and the art of calligraphy seal cutting is no exception. Digital calligraphy seal cutting products can not only meet people's needs for calligraphy seal cutting art, but also provide a broader creative space and more creative possibilities for calligraphy seal cutting artists [9].

Digital calligraphy seal carving products mainly include seal carving font library, online seal carving platform, seal carving APP and so on. Seal carving font library is to digitise traditional seal carving fonts and provide designers and artists with rich seal carving elements. Online Seal Carving Platform and Seal Carving APP allow users to create seal carvings anytime and anywhere, which not only improves the efficiency of seal carving, but also allows more people to understand and come into contact with the art of seal carving. The development of digital seal carving products can not only provide more creative possibilities for seal carving artists, but also provide a new way for the dissemination and promotion of the art of seal carving. Through digital technology, the art of calligraphy and seal carving can better get out of the traditional constraints and move towards modern life, so that more people can feel the charm of the art of calligraphy and seal carving. However, the development of digital calligraphy and seal cutting products also faces some challenges. How to maintain the characteristics of traditional calligraphy seal cutting art on the basis of innovation and digital processing is an issue that needs in-depth research and discussion. In addition, the competition in the market of digitised calligraphic seal-carving products is becoming increasingly fierce, and how to stand out in this market also requires artists and designers to explore and innovate continuously.

Digital calligraphy seal cutting product development is one of the important paths for digital technology to empower traditional calligraphy seal cutting, which provides new possibilities and opportunities for the development of the art of calligraphy seal cutting. We expect that in the future, digital technology can bring more innovation and development to the art of calligraphy and seal cutting.

5. Challenges and Strategies for Digital Technology Enabling Traditional Calligraphy and Seal Engraving

5.1. Challenges at the technical level

The challenge of technology is one of the important problems that need to be faced in the process of digital technology empowering traditional calligraphy seal cutting. First of all, the continuous updating of digital technology makes traditional calligraphy seal carving artists need to learn new technology constantly, which puts higher requirements on their professional ability and learning adaptability. At the same time, the application of digital technology also makes the creation and dissemination of calligraphy and seal cutting works more dependent on hardware equipment and software platforms, which may lead to the loss and mutation of some

traditional calligraphy and seal cutting skills. Secondly, digital technology in the process of empowering traditional calligraphy seal carving may lead to the problems of technology abuse and over-reliance. Some artists may excessively pursue the piling up of technology and the flaunting of effects to the neglect of the aesthetic and philosophical connotations of the art of calligraphy and seal-carving itself. This phenomenon may lead to the commercialisation and entertainment of the art of calligraphy seal cutting, making it lose its original artistic value and depth [10]. In addition, the application of digital technology also brings some technical difficulties, such as how to replicate and restore the strokes and rhythm of traditional calligraphy seal cutting on high-precision digital equipment, and how to deal with the problems of colour distortion and loss of details brought about by digital technology. These technical challenges require the joint efforts of artists, technicians and research institutions to solve them through technological innovation and artistic practice.

Challenges at the technical level are issues that cannot be ignored in the process of digital technology empowering traditional calligraphy and seal cutting. We need to respect and protect the art of traditional calligraphy seal carving while making reasonable use of digital technology, and continue to explore and innovate in order to achieve the harmonious integration of traditional art and modern technology.

5.2. Impact of traditional aesthetic concepts

While digital technology empowers traditional calligraphy seal cutting, it also inevitably brings about an impact on traditional aesthetic concepts. Firstly, with the development of digital technology, the forms of expression of seal carving art have become more diversified, and are no longer limited to traditional material carriers, such as stone and paper, but can be created and displayed on different media through digital means. While this innovation in form brings new possibilities to the art of calligraphy and seal cutting, it also challenges the traditional aesthetic concepts. Secondly, the application of digital technology has greatly broadened the communication channels of calligraphy seal cutting. Through the network platform, the art of calligraphy and seal cutting can spread rapidly and be understood and appreciated by more people. However, this rapid dissemination also exposes the art of seal cutting in calligraphy to the risk of over-commercialisation, which may affect the purity of its art. Furthermore, the development of digital technology has provided a new platform and means for education and training in calligraphy and seal carving. Through online teaching, more people can come into contact with the art of calligraphy and seal cutting and learn the related skills. However, at the same time, this educational method may also lead to the loss of traditional calligraphy seal carving skills, as online teaching cannot completely replace traditional manual practice [11]. Finally, the application of digital technology makes the art of calligraphy and seal carving face great pressure between innovation and inheritance. How to maintain the original characteristics of traditional art while using digital technology for innovation has become an important issue for artists and scholars to face.

The process of digital technology empowering traditional calligraphy and seal cutting has brought many positive changes, but it has also challenged the traditional aesthetic concepts. In the face of these challenges, we need to actively explore the integration with digital technology while

maintaining the characteristics of traditional art, with a view to finding a balance between innovation and inheritance.

5.3. Contradiction between excessive digitalisation and original art

With the continuous development and popularisation of digital technology, the art of traditional calligraphy and seal cutting has also ushered in new development opportunities. However, in the case of excessive digitisation, the original qualities of the art of calligraphy seal carving face certain impacts and challenges.

The application of digital technology in calligraphy seal carving makes the creation of works more convenient and efficient. Through a variety of digital tools and software, artists can easily create a large number of works, and even achieve automated creation. This makes the art of calligraphy and seal carving change from the original manual creation to digital creation, which to a certain extent weakens the original qualities of the art. Secondly, digital technology has changed the way of dissemination of calligraphy and seal cutting. Traditionally, the works of calligraphy and seal cutting are mainly disseminated through physical exhibition and communication, while digital technology makes it easy to display and disseminate the works on online platforms. This makes the appreciation and dissemination of calligraphy and seal-carving artworks more convenient, but at the same time, it may also lead to the absence of the original offline communication, which makes the original qualities of the artworks weakened to a certain extent. In addition, the development of digital technology has also had an impact on the education and training of calligraphy and seal carving. Through digital technology, it is possible to provide online education and training in seal carving, allowing more people the opportunity to learn and understand the art form. However, this type of education may focus too much on the technical aspects of teaching and neglect the understanding and transmission of the original qualities of seal carving in calligraphy [12].

In response to these challenges, we need to focus on maintaining the original qualities of the art in the process of empowering traditional calligraphy seal carving with digital technology. In terms of creation, artists should grasp the relationship between innovation and tradition, and make full use of digital technology to improve the efficiency of creation, while sticking to the traditional aesthetic and spiritual connotations of calligraphy and seal cutting. In terms of dissemination, we should give full play to the advantages of digital technology, and at the same time focus on offline communication and experience, so that the audience can better feel the original charm of calligraphy and seal cutting. In terms of education and training, we should incorporate the teaching of the original qualities of seal cutting in calligraphy into online teaching to cultivate students' traditional aesthetics and cultural literacy.

5.4. Balance between innovation and inheritance

In the process of digital technology empowering traditional calligraphy seal carving, the balance between innovation and inheritance is an important issue. The application of digital technology brings many new possibilities for calligraphy seal carving, such as innovative forms of expression and improved efficiency of seal carving, but it may also impact on

traditional aesthetic concepts and techniques. Therefore, while promoting the development of the traditional art of calligraphy and seal carving, how to maintain its inheritance in the midst of innovation is a subject that needs to be solved urgently.

We need to use the power of digital technology to push the art of traditional calligraphy and seal cutting to new heights. For example, through digital technology, we can present the works of calligraphy seal-carving to the audience in a new form, making them more modern and attractive; at the same time, digital technology can also help us to improve the efficiency of seal-carving, so that the artists have more time and energy to pursue the artistic creation itself. On the other hand, we should also be alert to the problems that may be brought about by the excessive application of digital technology. In the pursuit of innovation, we cannot neglect the respect and inheritance of traditional aesthetic concepts and techniques. We need to find a balance between innovation and inheritance, so that the art of calligraphy and seal carving, empowered by digital technology, can maintain its traditional flavour and at the same time bring out new vitality [13].

In order to achieve this goal, we can make efforts in the following aspects: firstly, strengthen the theoretical research on the art of calligraphy and seal-carving, and deeply excavate the cultural connotation and aesthetic value behind it, so as to provide theoretical support for the innovation; secondly, strengthen the inheritance and protection of the traditional calligraphy and seal-carving techniques, and make sure that they will not be damaged in the process of innovation; lastly, encourage the artists to not only dare to try out the new forms of expression in their creation but also maintain the respect for the traditional and the new life. while maintaining the respect and inheritance of tradition.

In the process of digital technology empowering traditional calligraphy and seal carving, the balance between innovation and inheritance is a crucial issue. Only by finding a proper balance between the two can we make the art of calligraphy and seal cutting shine more brightly in the digital age.

6. Outlook for the Future Development of Traditional Calligraphy and Seal Cutting Empowered by Digital Technology

6.1. Development Trend

With the continuous progress of science and technology and the arrival of the digital era, the integration of digital technology and traditional calligraphy and seal carving will become closer and closer. In the future, we can foresee the following development trends.

Digital technology will continue to promote the development and innovation of the artistic expression of calligraphy seal cutting. Through the application of virtual reality, augmented reality and other technologies, viewers can experience the art of calligraphy and seal cutting in an immersive way and feel its unique charm. At the same time, digital technology can also help artists break the traditional constraints and create more personalised and diversified works. Secondly, digital technology will improve the dissemination efficiency and influence of calligraphy and seal cutting. Through the online platform, the art of calligraphy and seal cutting can be quickly spread to all over the world

and be understood and appreciated by more people. This globalisation of communication will help to promote the prosperity and development of the art of calligraphy and seal carving. Again, digital technology will promote the inheritance and education of the art of calligraphy and seal cutting. Through digital teaching resources and online courses, more people can learn and pass on the skills of calligraphy and seal carving and improve their own artistic cultivation. At the same time, digital technology can also help artists better preserve and protect their works to avoid damage and loss of traditional seal carving works [14]. Finally, digital technology will bring more business opportunities and business models. Through digital technology, a variety of products and services related to calligraphy seal carving can be developed to meet the market demand. For example, digital seal-carving tools, online calligraphy exhibitions, virtual reality art experience and so on will become popular directions in the future.

6.2. Development Opportunities

With the continuous progress of science and technology, the development of digital technology in the field of traditional calligraphy and seal carving is also facing unprecedented opportunities. Firstly, in terms of creation, the application of digital technology can greatly expand the expression and creative space of calligraphy and seal cutting. Artists can combine traditional calligraphy and seal cutting with modern design elements through digital tools to create unique works of art. In addition, digital technology can also realise the automation and intelligence of calligraphy seal carving, making the seal carving process more efficient and precise. Secondly, in terms of dissemination, the empowerment of digital technology enables the art of seal carving to transcend the limitations of geography and time and achieve global dissemination. Through the online platform, the works of calligraphy and seal carving can be appreciated and collected by more people, thus increasing their popularity and influence. At the same time, digital technology also provides new possibilities for the education and training of calligraphy and seal cutting, enabling more people to come into contact with and learn this traditional art. Finally, digital technology also plays an important role in preservation and inheritance. Through digital means, calligraphy seal cutting works can be reproduced and preserved with high precision, effectively preventing wear and tear and damage to the works due to the passage of time. In addition, digital technology can also facilitate the research and preservation of calligraphic seal cutting, helping scholars to deeply explore and understand the essence of this traditional art [15].

Digital technology brings infinite possibilities for the development of traditional calligraphy seal cutting. In terms of creation, dissemination, preservation and inheritance, digital technology has provided the art of calligraphy seal carving with a broad space and opportunities for development. However, how to balance innovation and tradition, and how to maintain the original characteristics of calligraphy seal cutting in the process of digitisation are still issues that we need to think deeply and explore.

6.3. Development Challenges

With the continuous development and popularisation of digital technology, the art of traditional calligraphy and seal cutting has also ushered in new development opportunities. However, in the process of digital technology empowering

traditional calligraphy seal cutting, we also face some challenges.

The challenge of the technical level is a problem that cannot be ignored. Although digital technology provides new forms of expression and tools for calligraphy seal carving, the complexity of the technology and the threshold of operation may be an obstacle for traditional artists. Traditional artists need time and energy to learn and adapt to these new technologies, otherwise they may be eliminated. Secondly, the development of digital technology has also caused a certain impact on traditional aesthetic concepts. The novel expressions and styles brought by digital technology may affect people's aesthetic concepts of traditional calligraphy and seal cutting, and may even be regarded as a betrayal of traditional art. The impact of such aesthetic concepts may lead to a deviation in the direction of the development of the art of calligraphy and seal cutting. In addition, excessive digitisation is also an issue of concern. Although digital technology provides more communication channels and display platforms for calligraphy seal carving, excessive digitisation may lead to a gradual loss of the original characteristics of the art. Calligraphy seal carving, as a handicraft, has unique strokes and flavours that cannot be fully replaced by digital technology. An over-reliance on digital means may cause calligraphy seal-carving to lose its unique charm. Finally, how to maintain a balance between innovation and inheritance is also a major challenge. The application of digital technology undoubtedly brings new development opportunities for the art of calligraphy and seal cutting, but the excessive pursuit of innovation may neglect the inheritance of traditional skills. How to innovate on the basis of maintaining the characteristics of traditional art, and how to adapt the traditional art of calligraphy and seal carving to the development needs of modern society while passing on and carrying forward the traditional art is a problem that needs to be solved in the future development.

In the process of digital technology empowering traditional calligraphy seal carving, we should not only see the development opportunities, but also face up to the challenges we are facing. Only by overcoming these challenges can the art of calligraphy seal carving be revitalised and energised in the digital age.

7. Conclusion

This paper discusses how digital technology enhances the traditional art of calligraphy and seal cutting. It begins with an overview of the history of digital technology and seal carving in calligraphy, and goes on to emphasise the advantages of digital technology in terms of innovative expression, increasing efficiency, expanding dissemination and facilitating artistic inheritance. Through case studies, the application and potential of digital technology in the field of calligraphic seal carving are demonstrated. Despite technical limitations, aesthetic conflicts, the contradiction between digitalisation and traditional art, and the challenge of balancing innovation and inheritance, the trend of digital technology empowering calligraphy and seal carving is irreversible through in-depth research and exploration. Advances in technology will continue to drive innovation and provide richer experiences for artists and audiences. At the same time, we also need to pay attention to the problems in the process of digitisation and seek a balance between innovation and tradition, so that the art of Calligraphy Seal

Engraving can be revitalised in the digital era.

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