Current Situation Research on Integrated Development and Application of China's "Publishing + VR/AR"

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Abstract

As the development of information technology and change in people's reading habits, the publishing industry is integrating with the modern information technology and transforming to the digitization. The virtual reality (VR) and augmented reality (AR) technologies have been developed rapidly since 2016, which have begun to be applied in some areas and made remarkable achievements in just a few years. Multiple publishing units in China respond to the call of the times, and conduct the innovative development by combining with their own resource advantages. In this paper, the application status of VR/AR technology in book publishing, newspaper media, periodicals and magazines is summarized, and some representative cases are illustrated the application of VR/AR technologies in the publishing industry does give readers an extraordinary reading experience, and promotes the interaction among readers, authors and publishing units, which finds a new innovation point for the innovation of the whole publishing industry.

Keywords VR/AR · Publishing integrated development · Current situation research

Introduction

As the development of information technology and change in people's reading habits, the publishing industry is integrating with the modern information technology and transforming to the digitization. The virtual reality (VR) and augmented reality (AR) technologies have been developed rapidly since 2016, which have begun to be applied in some areas and made remarkable achievements in just a few years. Multiple publishing units in China respond to the call of the times, and conduct the innovative development by combining with their own resource advantages.

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For now, the integration of VR/AR technologies and the publishing industry has neither brought about the disruptive development of the industry, nor created a huge economic growth point for the industry. However, the application of VR/AR technologies in the publishing industry does give readers an extraordinary reading experience, and promotes the interaction among readers, authors and publishing units, which finds a new innovative point for the innovation of the whole publishing industry. Even though the development of VR/AR industry suffered an ice period in 2017 and 2018, the whole industry has begun a slow recovery in 2019. The publishing industry has also embraced the VR/AR technologies, and promotes each other forward. In 2020, the VR/AR industry greatly enhanced the experience of virtual reality equipment by virtue of the rapid development of 5G, Artificial Intelligence (AI), Ultra HD Video, cloud computing and big data, and the users' recognition of virtual reality has been increased continually. Meanwhile, the publishing industry has also quickly followed up these new developments, which presents the overall characteristics of steady, pragmatic and good development. New models and new business forms constantly emerge, providing a rich and colorful reading experience for readers.

Specific Application of Book Publishing + VR/AR

Since the second half year of 2018, the application of virtual reality technology in manufacturing, education, medical, publishing and other fields has been significantly accelerated, with constantly emerged typical cases. For example, in the manufacturing field, Jiangling Motors has applied the AR technology in the aspects of engine assembly instructions, key process error prevention, after-sale typical troubleshooting, which greatly increases the labor productivity. In the educational field [1], China Mobile and VIVEDU jointly show the 5G + VR smart education system to support the teachers and students in poverty-stricken areas of Liangshan, Sichuan Province to synchronize the classroom teaching and learning together with the teachers and students at Paotongshu Primary School of Chengdu City, making the education no longer be limited by geographical boundaries. Specific to the publishing field, the application of the VR/AR technologies in the industries of books, newspapers and periodicals was remarkable in 2020, which brought lots of new experience for the majority of readers.

Publishing units apply the VR/AR technologies in books, and bring a new way of reading for readers by virtue of head mount display (HMD), which is the initial starting point for the integration of virtual reality technology and the publishing industry, and also the main innovative point at present. In this aspect, as the main force and vanguard of the traditional publishing industry, the major publishing groups have played a leading role in introducing and applying new technologies.

Many publishing groups in China, including Phoenix Publishing & Media Group, Beijing Publishing Group, Jilin Publishing Group and Shandong Publishing Group, have carried out the overall arrangement for VR/AR digital publishing, and explored a new growth point for publishing. Many higher education presses in China, including Tsinghua University Press, Peking University Press, Fudan University Press,

Publishing House of Electronics Industry, Architecture & Building Press, China Labor & Social Security Publishing House, Science Press and Higher Education Press, have also quickly converted the textbook contents into the new 3D visual knowledge products based on VR/AR technologies.

Actually, when the concept of virtual reality just emerged in 2016, the major publishing groups and publishing units were itching to try, rushed to publish new books, and published lots of books that were out of touch with the market, without destination. As a result, many books were not received by readers. After the years of market baptism, the publishing units begin to explore the precise innovative point of the VR/AR technologies in the book publishing field, and focus on three segments, namely children's books, education publishing and professional book publishing.

Children's Book Publishing

In the children's book publishing, the AR/VR technologies can realize the more intuitive, concrete and touchable display of scientific knowledge for children whose abstract thinking is not fully developed. Under the premise of well dealing with the use frequency and time length of electronic products, the value-added services, such as animation effects, sound effects and interactive design, offered by the AR/VR technologies will lead the majority of children into a new mode of reading. Especially in 2019, the AR technology became a new favorite of the capital and market. Compared with the VR technology, the AR is featured with the low dependence on devices and can even be viewed with naked eyes. It doesn't need the device support and doesn't have the delay and spinning sensation, almost no damage to the eyes. Therefore, the integration of AR technology and children's books quickly became popular among children and parents. The VR/AR children's books on the market are selling well, and the publishing units involving in VR/AR publishing basically focus on developing the field of children's books.

In the past two years, the emerging of the 5G concept makes the major publishing units pay more attention to the connection of books and smart phones. Some of the latest VR/AR children's books are closely tied with smart phones, which brings the all-round experience to children readers [2]. For example, *Science Live out Series—Explore the World of Space* published by Haitian Publishing House combines the AR/VR technologies with popular science knowledge, and each book includes 8 double-page spreads, which can activate the interactive augmented reality (AR) animations and the VR virtual reality scene, and allow children to experience the fun of the interactive reading with a new technology. By starting the App and aligning the camera lens of their smart mobile devices on the book lying flat, readers can learn about the black holes, nebula and stars of all sizes, and experience the magical feeling of walking in space that they never experienced before.

Except for combining with smart phones, some innovative publishing units also take advantage of the latest MR technology and holographic image, for example the *Dreamlike Future Reality* published by Tiandi Press. Readers can create a virtual world combined with reality by virtue of AR, VR, MR, holographic image and motion capture technology [3], and place themselves in it to enjoy the immersive

experience. Open the book, and use your mobile phone, you can see the 3D images jumping out from the book. The motion capture technology can make virtual characters look more realistic and natural. In addition, readers can also interact with these virtual characters.

Education Publishing

The education industry firstly takes advantage of the virtual reality technology and put it to practical use, with the continuously growing market and the promising prospect under the comprehensive influence of the policy incentives and market driven. The application of virtual reality technology in the educational field mainly includes the primary and secondary school education, vocational education and higher education. In terms of primary and secondary school education [4], by combining with the immersive teaching experience of the virtual reality, this technology can solve the abstract and difficult knowledge points in classroom teaching, and change the traditional learning mode of "teaching to promote learning" into the mode of learners through their own interaction with the information environment to obtain knowledge, arousing students' interest in courses. In terms of vocational education [5], the virtual reality technology is used for the personnel training in the fire, logistics, aerospace and other fields combined with the teaching and real practice, and the interactivity of the virtual reality achieves the hands-on operation by students, avoids the practical training risks, reduces the operational costs, meets the requirements of teaching and practical training outline, and improves the quality of education and teaching. In terms of higher education, the deployment in the virtual laboratory and virtual design workshop can break the limitations on venues and costs of the experiment teaching, and proactively promote the application of the virtual display technology in the scientific research and innovation.

Textbooks and teaching aids are the media of the application of the virtual reality technology in the educational field [6]. Without appropriate teaching materials and teaching aids, even if a better virtual reality technology cannot be applied, which is difficult to achieve the ideal effect. For this reason, the major publishing groups begin to transform to publishing new VR/AR textbooks from traditional paper textbooks. For now, the VR/AR textbooks are more used in the primary and secondary schools. For example, People's Education Press established the cooperative relationship with Tencent. They took the primary school English textbooks as a pilot, and launched the first textbooks that can be identified based on the AR technology in China; Sichuan Education Press proposed the "Solution for Textbooks and Teaching Materials Based on AR Technology" and the in-depth integration of the K12 teaching system, which makes the learning more interesting, understanding easier and memory faster.

In terms of secondary education, Time Publishing and Media Co., Ltd. has greatly developed the integration publishing, and jointly built the demonstration base of "virtual reality VR experimental teaching application" together with Hefei No. 8 Middle School and Siyi Technology (Wuhan)Co., Ltd. The virtual experimental teaching application system has completed a total of 564 teaching experiments in

physics, chemistry and biology courses from middle schools to high schools, covering all experimental contents of 3 subjects as well as all key points of this series of course teaching examinations. This is one of the important achievements of the research and development of the virtual experimental resources publishing and teaching service system, a key laboratory project of China's publishing integrated development (Time Publishing).

Professional Publishing

In the transformation development process of the book publishing industry, the professional book publishing has always been the conqueror of the digital transformation. The digital application in the professional book publishing field has also gone deeper, the knowledge service objectives become more clear, and the user group tends to be stable and is willing to pay. The in-depth application of the virtual reality technology has brought new opportunities to many professional book publishers. Supported by new technologies and new methods, these new professional books reveal its powerful presentation capacity, and give the unprecedented experience to users. As the continuous improvement of the virtual reality technology, especially the accelerated application of 5G and the artificial intelligence technology, the virtual reality technology has been gradually increasing its influence on the professional book publishing.

For the professional book publishing, the integration of VR/AR and medical books is a successful example. It is well known that the medical specialty pays great attention to the accuracy. However, traditional medical books are two-dimensional books, lacking of the stereo perception and operability. Readers see the words but cannot actually experience, and can only imagine for some professional knowledge. So, the experience of reading traditional medical books is not good. The application of the VR/AR technologies in medical books can well solve this problem. For example, People's Medical Publishing House Co., Ltd., Sichuan University, Third Military Medical University and Chengdu Huayu Tianfu Digital Technology Co., Ltd. jointly created a series of VR tutorials—*3D Systematic Anatomy of People's Medical Publishing House* researched and developed for the human anatomy teaching, with more than 5,000 human structures of each set, and students of medical schools become the main target users. After importing the complete 3D digital human anatomical structures in the virtual environment, the students of medical schools can pick up, rotate, hidden and restore models by operating the controller towards the left and right in the virtually-constructed medical anatomy laboratory, which makes them quickly master the knowledge points and obtain the all-round, three-dimensional and intuitive feeling.

Except for medical field, the virtual reality technology can be applied in professional books of construction, engineering, petrochemical and other industries. The *Indoor VR Scene Making Tutorial* published by Publishing House of Electronics Industry combines the virtual reality technology with the relevant professional knowledge in the construction industry, helps construction practitioners quickly master the drawing methods and processes of indoor VR scenes, and makes users

obtain 360° experience through entering the virtual building by virtue of the real interaction. The petroleum vocational training simulation system developed the Petroleum Industry Press adopts the VR, 3D animation, database and advanced technology, and actually simulates the working environment and key equipment in the oil production well site, metering rooms and pumping units. In the virtual "simulation studio", operators just like enter the real environment of the project operation site, which solves the problems of the on-site and realistic interactive operation in the dangerous environment involved in the vocational training. It can be said that the virtual reality technology has brought a good opportunity for publishers to complete the transformation from content providers to information content providers.

Specific Application of Newspaper Media + VR/AR

The digital transformation in the traditional printed media industry has been conducted for more than ten years. Up to this day, the printed newspaper has almost faded out of people's daily life. Young people are the insulators of the printed newspapers, and their main information sources come from the media APP and the major social media platforms on smart phones and the tablet computers. In this context, it is undoubtedly logical that the application of the latest virtual reality technology in the traditional printed media industry can attract readers. Therefore, at the beginning of the virtual reality technology in 2016, many traditional media have invested in developing new ways of reading newspapers. After several years of development, the practice has proved that the integration of AR technology based on artificial intelligence (AI) and media is better than the integration of the VR technology and media. AR technology integrates the virtual and real images by virtue of the image processing technology, and intersects the real environment and the virtual world in the same space. Compared with the traditional words and video data, AR can better expand the presentation space, convert the original one-way information transformation into the two-way man-machine interaction, make the print media "move" on the basis of its virtual and real combination, real-time interaction characteristics, and provides the information increment in three-dimensional, expanded and interactive ways, which makes reports more insightful, increases the possibility of diversified information transmission, and bring readers more diverse reading experience [7].

In March 2019, the People's Daily Online launched the AR scanning function on the People's video. Users should download and open the People's Video Mobile Client, click the AR icon at the upper right corner, and scan the AR to identify images. After completing these steps, users can see the real field situations, annotation information, data visualization, extended and insightful information, which enables the traditional printed media, and explored the possible path of newspapers to upgrade the holographic media. At the 14th Shenzhen International Cultural Industries Fair (ICIF), one project of Henan Daily caught people's eyes. The "AR newspaper" was developed. Audiences can obtain the presentation mode by using the QQ-AR scan to present the information to be interpreted. Such high-tech way of reading newspaper breaks the boundary between 2 and 3D, and realizes the unbounded conversion between the plane reading and stereoscopic image. Chinese civilization of

7000 years ago has the collision with the cutting-edge technology of modern China by virtue of the AR technology, bringing a new audio-visual experience to readers, and attracting lots of audiences to stop to watch.

The meeting reporting is one of the main tasks of traditional newspapers. The Xinhua News Agency APP is the first batch of news media that applies in-app native AR technology to report the NPC and CPPCC. During the two sessions in 2018, the Xinhua News Agency released the *AR View on Two Sessions|People's Livelihood and Welfare in the Government Work Reports* based on the support of the augmented reality (AR) technology. Users can read the government work reports on their mobile phone through clicking the corresponding "Xiaoxin Robot" and completing the identity authentication. Xinhua News Agency Client APP 5.0 can fully support the AR function, and users can conduct the interactive operation in the corresponding scenes by scanning pictures and things and using the phone to watch the corresponding reports. For example, the News 2.0 "Tiandi Project" is created with the augmented reality functions. Users can match the video of rocket launching to any plane on their phones, click the launch button based on the title they want to water the complete rocket launching procedures. Both the practical experience and the viewing experience are ideal. AR reading may become the norm in the future.

Specific Application of Journals and Periodicals + VR/AR

As the development of information technology and change in people's reading habits, traditional paper magazines and paper journals are integrating with the modern information technology and transforming to the digitization. E-magazines and electronic periodicals in China have sprung up one after another, and various periodical offices and periodical presses launch the APP software especially by virtue of smartphones. The digital reading has become the mainstream. However, compared with the newspaper media, the degree of digitization of journals and periodicals has yet to be improved. Especially in the fields of scientific and technological periodicals as well as professional periodicals, people still rely on the traditional printed periodicals. The integration of virtual reality technology and journals and periodicals turns static into dynamic, and extends the extremely limited paper layout to the wider digital space, which imperceptibly extends the propagation space and time. Such new change in the forms and contents of periodicals effectively sets up an interactive platform between readers and publishers, and its immersive experience way brings a sensory stimulation to readers. Therefore, fashion magazines and some popular periodicals are the main force that firstly applied the virtual reality technology.

The well-known *National Geographic* firstly embraced the virtual reality technology. In 2016, the National Geographic Magazine announced to set up its own VR division, named NG VR Studio. This VR team would go to the [frontline] to collect information and materials. A group of explorers from the National Geographic Magazine would shoot 360°contents, and record an upcoming TV program—MARS. Users have the opportunity to experience how to build settlements on the distant planet. They also invited the famous photographer Brian Skerry and film producer Renan Ozturk to offer help. This project achieved a great success. This

studio released the first 3D VR video shot in the space, which was taken from the international space station. It gives us a view of outer space that very few people can see. To complete this video, the National Geographic Magazine established the cooperative relationship with Humaneyes Technologies of the International Space Station, and used the very professional Vuze VR, which is the "best companion" for astronauts to take pictures. After its release, this video is popular among geography and astronomy enthusiasts, and obtains a very good market response. In 2019, the National Geographic Magazine cooperated with the Force Field of Dutch VR studio to develop the VR Antarctic Expedition Experience. This experience will give you a magical journey across the Antarctica, and the ultimate goal is to find the lost penguin habitats. Users will take a kayak through the water area covered with ice, then climb the ice cliffs, and resist against the storm. This can be a passive experience, or the interactive experience for experienced users. Users can set up the camp, erect the wind shutter, and zip up the tent by using the controller.

Except for the National Geographic Magazine, the fashion magazines *ELLE* and *Auto Parts Observation* launched the new AR special editions. Readers can obtain a new 3D magazine experience by using the AR scanning function on the mobile phone without installing the APP. It can be said that the virtual reality technology has been widely applied in the fashion magazines and popular periodicals. However, the degree of digitization of scientific and technological periodicals as well as professional periodicals is still not high [8], and there are few scientific and technological periodicals that proactively use the virtual reality technology. In fact, the application of virtual reality and other new media technologies can not only increase the transmission speed of scientific and technological information, but also enlarge the transmission effect of scientific and technological periodicals as well as professional periodicals. Especially compared with the traditional paper magazines or previous digital periodicals, the VR/AR technologies show a great superiority in the aspects of instrument and equipment display, experimental process review and expression of experimental results of science and technology these [9]. It is believed that, as the continuous maturity and progress of VR/AR technologies, the virtual reality will certainly realize its potential in the fields of scientific and technological periodicals as well as professional periodicals.

Broadly speaking, bookstores are one part of the publishing industry. With the increase of VR/AR books, various bookstores begin to utilize the virtual reality technology and create the immersive reading environment. For example, the China's first VR bookstore—the physical bookstore "Reading Channel" of Shanghai Jiaotong University Press unveiled its nameplate in 2016. This is the innovative bookstore version 3.0 with the positioning of "good books + fragrant coffee + VR + culture = happy". Readers can enter the virtual bookstore to read and buy books by virtue of VR devices, get rid of the paper form of traditional books to read 3D readings through the "VR Book Showroom", and can even "walk" into the scenarios in the book to conduct the real-time interaction with characters and objects in the book.

As the 5G concept has swept across the country in recent years, the cloud VR bookstore was officially established in combination with 5D technology and the cloud technology. In this year, few people visited the brick-and-mortar bookstores due to the influence of the Covid-19. On April 23, the annual China Digital Reading

Conference came at the appointed time, and timely offered the spiritual "relief food" for book lovers. Different from the previous ways, the all-round "5G + , new reading, new experience" was fully displayed online in the form of H5 in this conference, and the first VR cloud bookstore was launched. In the mobile cloud VR bookstore, the experience scene of the offline bookstore is truly restored to us in 360°. Users can have an immersive view of "China's most beautiful bookstore"—Hangzhou Zhongshuge by clicking the mobile phone screen. The mobile cloud VR bookstore also included Xiaofeng Bookstore and Digital Media Xixi Bookstore which are on the list of Hangzhou's most literary bookstores. There are more than 20 interactive books set in the cloud VR bookstore panoramic environment. Users can immediately enter the full reading mode by just clicking on it. There are also diversified interactive books with videos, audios and image-text, covering cartoon books, popular science readings, humanities & social sciences, poetry, foreign literature, artistic designing, films and dramas and Chinese literature. In addition, the mobile cloud VR bookstore also launched the online ordering, one-key search, guide for book selecting and other functions. Users can directly place an order to buy books they want, and then just wait for the expresses at home. It can be said that 5G + VR makes the reading experience truly "go to the moving scenes from fixed scenes".

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