

# The Development of Video Industry in 5G Era

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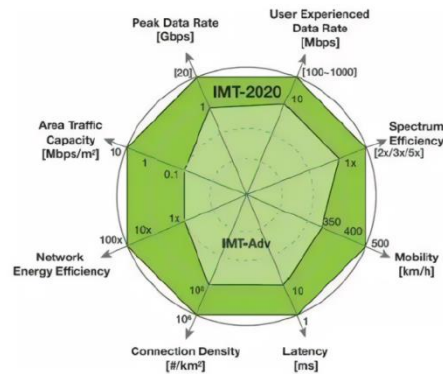
**Abstract.** With the help of 5G and its related technologies, the video industry has further developed. In the 5G era, video content e-commerce market is likely to enter a new growth. Large screens have become an important portal for video content consumption, result in an interactive trend between large and small screens. Long and short videos seek integration in the competition, and users' viewing and consumption behavior have changed. It is suggested to provide immersive experience in family scenes, provide technical support for seamless viewing of different scenes/terminals, strengthen data collection and professional analysis of user behavior, and provide interactive experience to reach more users.

**Keywords:** 5G; Video industry; User behavior

## 1 Introduction

5G mainly has eight key performance indicators, namely user experience rate, traffic density, peak rate, connection number density, air port delay, mobility, spectral efficiency and energy efficiency, as shown in Figure1. The most prominent three performance indicators are user experience rate, air port delay and connection number density. The specific performance is: 5G user experience rate can reach 100Mbps to 1Gbps, more than 10 times that of 4G; the air port delay is as low as 1ms, 1/10 of 4G; the number density of connections can reach 1 million connections/km<sup>2</sup>, which is more than 50 times of 4G under the same spectrum resource conditions; 5G has achieved a new leap in network performance, opening a new era of interconnection of all things and bringing infinite imagination. 5G technologies promotes video development. "High speed" greatly improves the information transmission speed of video form. The 4G network bandwidth is limited, and it cannot support 4K/8K video transmission and online play. 5G will avoid the situation that video playback in the 4G era is stuck, blurred or the resolution automatically drops, so that users can get a better download and viewing experience; At the same time, it also meets the transmission requirements of XR and holographic high capacity. "Low latency" can provide real-time and stable transmission capability for UHD video and mobile live broadcast. In the 5G era, video has replaced written language as the main form of expression for information dissemination and social communication. High bandwidth and low delay will enable high speed mobile and real-time playback of ultra-high definition video at the same time. Ultra HD live video service ushers in broad application prospects, or widely covers sports events, concerts, reality shows and other scenes. "Wide connection" promotes the interconnection of everything, and promotes video to enter the vertical industry [1]. All natural and

man-made objects are likely to become intelligent terminals, which will be connected together in a digital and intelligent way to achieve the transmission, reception and interaction of video information [2]. The high-intensity Internet of all things is expected to enable video forms to penetrate into vertical industries such as smart cities, smart medicine, and smart agriculture, become a carrier of information recording, transmission and interaction, make the “video” of all things come into reality, and enrich video usage scenarios.



**Fig.1.** 5G key performance

5G derivative technologies promote video development. 5G computing power network integrates eight technical elements of rich ABCDNETS to promote the development of video industry. 5G+cloud+edge, cloud computing/edge computing are more widely used. Cloud computing enables cloud computing with large amount of data and high complexity, and user terminals are only responsible for presenting results. With the addition of edge computing, XR and holographic interactive videos have flourished. It will also enable holographic technology, which can be widely used in remote interactive teaching, conferences, medical treatment and many other scenes. This is also conducive to the development and use of haptic feedback equipment, which will add a new perception dimension to XR video and further upgrade the immersive interactive entertainment experience. 5G promotes the evolution of mobile terminals. In the future, mobile terminals will develop in the direction of diversification, intelligence, instantaneity and virtualization. Users may own multiple intelligent devices, and video content will adapt to more diversified intelligent terminals such as car screens, smart glasses, smart watches, and smart speakers to provide users with personalized video information services. 5G promotes intelligent content production. The use of artificial intelligence technology and the visualization of media information can realize the automatic production process from news gathering and editing to the visualization of information presentation; Provide more intelligent, fast and powerful auxiliary creation and accurate distribution support for ordinary users, reduce the threshold, time and economic cost of content output, and release the potential of UGC and PGC content. 5G increase unstructured video type data collection, such as AR, VR, video and other unstructured data. Big data in-depth learning algorithm, automatically matching appropriate scenes and advertising positions, intelligent optimization to achieve the original implantation effect, and achieve accurate delivery. 5G strengthen video copyright protection. The unified registration of original content makes the video transmission traceable, reprinted and monitored. The

data content is saved through the chain structure, which effectively reduces the cost of intermediate institutions and labor costs, and provides a low-cost path for rights protection.

Video has become an important media form in the 5G era. Information has exploded in the 5G era, and information expression methods of various media have shifted from text and pictures to video. Online video (including short video) is the second largest Internet application in China after instant messaging, with 974 million users, accounting for 94.5% of Internet users. As a popular media form, video has become an important way for users to obtain information and entertainment. Global traffic will be highly concentrated in the video field. Intel predicts that video will account for more than 90% of the future 5G network data traffic.

This paper studies the impact of 5G on the development of the video industry from competition pattern and user behavior. In the 5G era, large screens have become an important portal for video content consumption. There is an interactive trend between large and small screens. Long and short videos seek integration in the competition, and users' viewing and consumption behavior have changed. Suggestions are made for the development of video industry in the 5G era.

## 2 The Impact of 5G on the Competition Pattern of Video Industry

### 2.1 The market of video content e-commerce keeps growing

This paper constructs a GM (1,1) model to predict the market size of video content e-commerce [3].

Definition 1:

$$X^{(0)} = (x^0(1), x^0(2), x^0(3), \dots, x^0(n)) \quad (1)$$

Among which,  $x^0(k) \geq 0, k = 1, 2, 3, \dots, n$ ,  $X^{(1)}$  is one time cumulative generation sequence of  $X^{(0)}$ , i.e. 1-AGO sequence.

$$X^{(1)} = (x^1(1), x^1(2), x^1(3), \dots, x^1(n)) \quad (2)$$

$$x^1(k) = \sum_{i=1}^k x^0(i), k = 1, 2, 3, \dots, n \quad (3)$$

The original form of GM(1,1) is,

$$x^0(k) + ax^1(k) = b \quad (4)$$

In fact, the original form of GM(1,1) is a difference equation, the parameter vector  $a$  can be estimated by the least square method.

$$\hat{a} = (B^T B)^{-1} B^T Y \quad (5)$$

$$Y = \begin{bmatrix} x^0(2) \\ x^0(3) \\ \vdots \\ x^0(n) \end{bmatrix} \quad (6)$$

$$B = \begin{bmatrix} x^0(2) & 1 \\ x^0(3) & 1 \\ \vdots & \vdots \\ x^0(n) & 1 \end{bmatrix} \quad (7)$$

Definition 2:

$$Z^{(0)} = (z^1(1), z^1(2), z^1(3), \dots, z^1(n)) \quad (8)$$

Among which,

$$z^1(k) = \frac{1}{2}(x^1(k-1) + x^1(k)) \quad (9)$$

The mean mode of GM(1,1) is,

$$x^0(k) + az^1(k) = b \quad (10)$$

Parameter - a is the development coefficient, and b is the grey action quantity.

The  $\hat{a} = [a, b]^T$  can be estimated by formula (5), where the element of B is different from formula (7),

$$B = \begin{bmatrix} -z^1(2) & 1 \\ -z^1(3) & 1 \\ \vdots & \vdots \\ -z^1(n) & 1 \end{bmatrix} \quad (11)$$

The whitening differential equation of the mean mode of GM (1,1) is,

$$\frac{dx^1(k)}{dt} + ax^1(k) = b \quad (12)$$

Theorem 1:

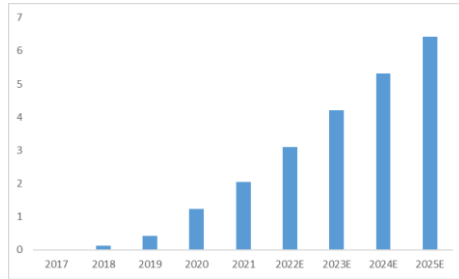
The time response formula of the mean mode of GM(1,1) is,

$$\hat{x}^{(1)}(k) = (x^0(1) - \frac{b}{a})e^{-a(k-1)} + \frac{b}{a}, k = 1, 2, 3, \dots, n \quad (13)$$

The reduction formula is,

$$\hat{x}^{(0)}(k) = (\hat{x}^{(1)}(k) - \hat{x}^{(1)}(k-1)), k = 1, 2, 3, \dots, n \quad (14)$$

Thus, the market size of video content e-commerce can be predicted, as shown in Figure 2. It is estimated that the market size of video content e-commerce will reach 6.4 trillion yuan in 2025.

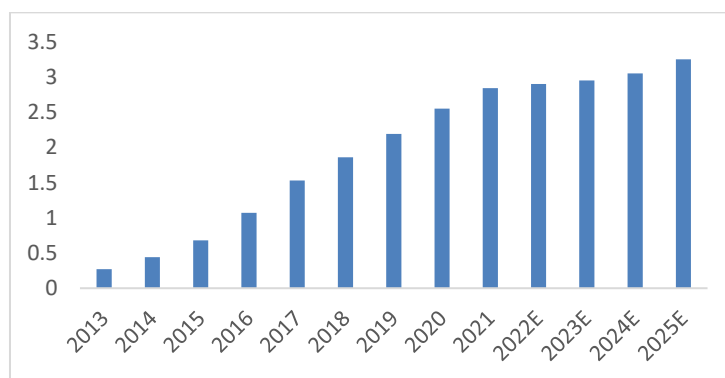


**Fig.2.** Scale of video content e-commerce market (trillion)

## 2.2 5G era video platform opens the battle for large screen users

In the 5G era, all kinds of media are rushing to video. Xinhua launched its video strategy, taking video business as the strategic fulcrum for building a new content ecology. The visualization of Sina Weibo is one of the important directions of development, encouraging users to upload video content. Video content opens a new traffic portal for traditional e-commerce. Taobao, Tmall, JD and other traditional e-commerce companies use video as their main marketing tool.

In the 5G era, the popularity of gigabit broadband will easily carry 4K and 8K high-definition video content. The viewing experience of large screen has been effectively improved. The large screen has become the entrance of home video content consumption, and there are opportunities for interaction between large and small screens. The large screen has become the entrance of home video content consumption, and users compete for upgrading. It is estimated that, the number of smart TVs activated will be close to 0.318 billion in the end of 2022, as shown in Figure 3. IQIYI, Youku and Tencent took the lead in launching large screen terminals. In the first half of 2021, the number of daily active users using large screen in IQIYI and Tencent both exceeded 40 million. Bilibili and Xigua also take the large screen terminal as a new battlefield.



**Fig.3.** The number of smart TVs activated (0.1 billion)

There is an interactive trend between large and small screens. Double screen viewing has become a new custom. As the exclusive interactive partner of the 2020 Spring Festival Gala, Kuaishou pioneered the new play method of “video + likes”. The cumulative number of global audiences participating in the red envelope interaction reached 63.9 billion, breaking the record of video likes, and making “watching the Spring Festival Gala on two screens” a new custom. Large and small screen interaction attracts more viewers. Dongfang Satellite TV’s “Where is the Magic Company” promotes “large and small screen interaction” through live broadcast. When the program is first broadcast on Dongfang Satellite TV, a QR code will appear on the TV. The audience will share the recorded content while watching the program with the program guests by scanning the code to attract more audience to participate. Large and small screen data interaction and integration provide users with refined services. Through data sharing, the large and small screen user behavior data is deeply integrated to form a complete data loop, making user portraits more accurate, building a new family scene smart marketing, and providing users with more refined services in cross screen integration.

### 2.3 Competition between short and long videos is fierce

High speed communication, intelligent assisted creation and accurate distribution support in the 5G era have promoted the development of short videos, which continue to encroach on the long video market, making it more difficult for long videos to make profits. At present, the number of short video users tends to be saturated, and long and short videos continue to converge to find new growth points. The number of short video users tends to be saturated. In 2021, the number of short video users will reach 934 million, the market size will reach 291.64 billion yuan, and the per capita daily use time will be 125 minutes, while the longer video will be 27 minutes higher, and the gap will grow.

It is estimated that, the number of short video users will reach 1.142 billion in 2025, as shown in Figure 4.

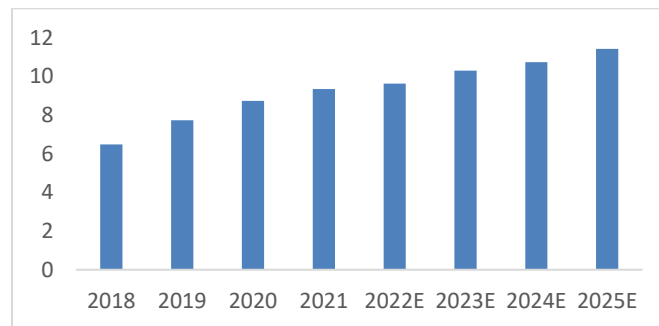


Fig.4. The number of short video users (0.1 billion)

Long video is in trouble in the industry. The cost of content copyright is high. In the third quarter of 2021, the cost of content of iQIYI accounted for 69.8% of the total revenue. In the past four years, iQIYI lost about 30 billion yuan and began to lay off employees. The profit model of the long video platform is mainly advertising fees and membership fees. In November 2021, the Measures for the Administration of Internet Advertising clearly stipulated that advertising should significantly indicate the closure of the logo, posing a challenge to the advertising profit model. The number of paid members of iQIYI and Tencent Video has exceeded 100 million, and the cost of launching new services has become higher and higher. The price of iQIYI and Tencent video members has risen, and the advanced on-demand mode has been questioned by users.

Long and short videos penetrate each other [4]. Short video platform marches into medium and long videos to find the second curve. At the beginning of Tiktok's launch, the video duration is only 15 seconds. Only the users, the number of whose fans exceeds 1000, can release videos within 1 minute. In March 2019, Tiktok began to open 5 minute long video rights for content creators, but the scope was limited to knowledge creators at that time. In August 2019, Tiktok announced that it would gradually open its 15 minute video publishing capability. During the Spring Festival in 2020, "Lost in Russia" was broadcast exclusively on byte media such as Tiktok. Bilibili officially became a shareholder of Huanxi Media, and jointly launched the first home-made long play "Run for Young", with a broadcast volume of 50 million in the first week of launch. Long video platform layout short video, trying to break through the dilemma. In 2020,

Youku announced that it would enter the field of short video, and issued a recruitment order for short dramas, opening up content cooperation to the whole industry within 15 minutes. Tencent fully released the platform resources and capabilities through the short video ecological cooperation plan with video creation number as the main body, helping mass creators to participate in the short video ecological construction. In the field of short video, iQIYI has deployed “Ginger cake short video”, “iQIYI instant sculpture”, and other products, focusing on the entertainment core.

### **3 The Impact of 5G on Video User Behavior**

#### **3.1 Changes in user viewing behavior**

In the 5G era, there are many changes in users' viewing behavior. The bullet screen becomes the standard configuration of the chase drama [5]. The bullet screen has become a part of the movie and television content watched by the public. In 2021, iQIYI platform users will send 670 million bullet screens in total, and Tencent video "You are my glory" and other related bullet screens will send 830 million in total, and 1.635 million likes and+1.

Use other apps while watching videos. In 2021, 19.5% of users will use chat, shopping and other software when watching videos. Especially for young and highly educated users, more than 30% of young and highly educated users will look and talk while buying [6].

Young people prefer collection and editing. Young people like to quickly learn about long videos such as sports events and drama movies through highlights, clips, etc. More than 60% of users watch online programs because of short videos [7].

Double speed viewing has become the trend. After the video platform introduced 1.5, 2.0 times and other program viewing/listening adjustment functions, the plot and efficiency become the main reasons that affect the user's speed selection. 28.2% of the users chose to watch at double speed, and the padding was skipped with one click. Quick viewing is only for “avoiding the sections that you don't like and are not interested in” and “improving the efficiency of watching plays”.

#### **3.2 Influence of consumer behavior**

Young people have strong ability and willingness to pay. Gen Z is willing to pay for high-quality content and personalized needs [8]. In 2021, China will have 975 million online names, and users will have a stronger demand for high-quality content in the short and medium video market; In addition to top up members, 40% of the ending will have a long tail consumption demand, such as buying programs/around stars, entertainment products, etc. There are likes of Edu endorsements/recommendations that are more attractive to Generation Z women. The "post millennial generation" with good payment habits is gradually becoming the mainstream consumers in the future. In the high-quality material life, the post-00s have strong purchasing power and independent consumption awareness; 80% of Gen Z users pay for videos; Be the first to watch and enjoy higher definition, better sound effects, and pursue the current viewing experience [9].

Paid members are price sensitive. Long video platform users are sensitive to price. After iQIYI announced the price increase, nearly 70% of the recharge members from October 21, 2020 to

November 20, 2020 were "rush charging" before the price increase; In addition, users usually buy at a discount or a joint member instead of the original price. The annual discount rate for Youku members is as low as 50%, and the discount rate for other products is about 92% - 96%. Long video users prefer to share accounts. At present, most streaming media are played exclusively, which causes users to open multiple platform accounts. A family of three or four only needs to open a paid account on a single platform by sharing passwords; 20% to 27% of Netflix users prefer to share their subscription accounts with others.

Short video user consumption is mainly e-commerce consumption, and 70% of users are extremely sensitive to price. Cheap prevails everything. More than 70% of live broadcast e-commerce users have less than 5000 yuan in income, and the "cheap" shopping is overwhelming and extremely sensitive to price. High and medium income users leave the site quickly. After the freshness, medium and high income live broadcast e-commerce users quickly left the site, returning to the pursuit of online shopping efficiency and service quality.

#### **4 Conclusions and suggestions**

5G and its derivative technologies provide technical support for the development of the video industry, promote the development of the video industry, and make video an important media form in the 5G era. 5G has an impact on the development of the competition pattern and user behavior of the video industry. It is estimated the market size of video industry keeps growing. This paper provides suggestions for the development of the video industry as follows.

The family scene provides an immersive experience. Focus on high-definition video of home scene TV terminal to improve viewing experience. Influenced by the epidemic situation, offline game watching and other entertainment behaviors decreased dramatically, and family watching behaviors on large screen increased; Through the ultra-high definition technology, the audience will be presented with more beautiful pictures to improve the audience's sense of presence in participating in the event and the film maker's plot. Layout VR form video. VR is a new media. Compared with ultra-high definition video, VR has a higher sense of immersion; Multi perspective switching, so that the sense of participation and immersion in watching the game and watching movies and TV plays is stronger.

Different scenes terminals can be viewed seamlessly. Large and small screens are linked to create a seamless viewing experience. Users have more personal space in the living room when watching football games or movies and TV plays on TV; It can display player/actor information, fan/drama comments/bullet screen, event data analysis, etc., and even IP derivatives (such as purchase links of players' team uniforms and leading role costumes) on the small screen. Cross screen viewing, seamless switching between mobile and fixed scenes. Users pay more attention to the smoothness of using non UHD resolution on the mobile terminal, pay more attention to the definition when entering the large screen terminal of the living room, and automatically present UHD events; Based on the cross screen experience, fans/viewers can seamlessly watch any game/movie and TV play at anytime and anywhere.

Strengthen data collection and professional analysis of user behavior. Collect the audience rating and audience of the program, the audience's viewing behavior during the hot episode, the



use of social media and the published content; Provide real-time professional data and analysis for the audience.

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