



# Blockchain Technology Empowers the Fan Economy: A Value Chain Analysis

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**Abstract.** Under the social background of pan-entertainment, fan economy as a new economic form has been active in the public's view, but for a long time, due to the capital market control of the fan economy industry and the lack of effective supervision, resulting in a variety of chaotic phenomena, especially in the hit casting, the collection of huge amounts of money, voting data falsification and other issues are common, which makes the healthy development of the fan economy has been seriously impeded. In order to regulate the contradiction between the fan community and the capital market, guide the positive energy of the society, and form a healthy voting mechanism, our team makes full use of the blockchain technology and Internet resources, and tries to establish a network platform integrating voting and regulation; not only can it allow the capital side to be effectively restrained, but also protect the rights and interests of the fan community. In terms of pricing model construction, this paper is based on the existing token settlement mechanism, and chooses the market comparison method to determine the prices of all virtual products on the platform. In addition, when analyzing the cash flow, this paper uses a large number of mathematical algorithms to determine the platform revenue, so as to reflect the feasibility of the platform design and market effects.

**Keywords:** Fan Economy; Blockchain; Regulatory Mechanism; Token Settlement.

## 1 Introduction

With the openness and plurality of network communication in the Internet era, fan groups have built up a distinctive fan culture in a freer mode of interaction<sup>[1]</sup>. The sharp business sense of major entertainment companies has accurately recognized the characteristics of high commitment and participation of fan groups, and developed a fan economy with "idols" as the core point of interest, including fan casting, webcasting, IP adaptation and other profit-making methods. Admittedly, the fan economy has brought new profit points to the cultural industry, but this profit-oriented<sup>[2]</sup> production mode has made it difficult to give full play to the positive benefits of the fan economy.

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K. Zhang et al. (eds.), *Proceedings of the 5th International Conference on Economic Management and Big Data Application (ICEMBDA 2024)*, Advances in Economics, Business and Management Research 313,

[https://doi.org/10.2991/978-94-6463-638-3\\_16](https://doi.org/10.2991/978-94-6463-638-3_16)

In recent years, it has been constantly exposed that the funds for fan support are not transparent, the destination of the funds is unknown, and there are cases of the "head of the fans" running away from the rice circle, and the interests of the fans have not been duly protected. The interests of fans are not properly protected<sup>[3]</sup>.

Therefore, we designed Rainbow Channel, a product that integrates the traditional fan voting platform with blockchain technology to provide fans with a decentralized, open, transparent, and non-retroactive integrated platform for fans to vote. Fans can obtain the corresponding voting rights by completing the task of watching the video, and each voting right forms a unique digital code, which fans can use to vote for their idol, and the voting rights can be used to vote for their idol. When fans use their voting rights to vote for idols, a distributed ledger database will be automatically formed within the platform, and fans can query the distributed ledger database at any time if they have any questions about the idol voting list formed within the platform, so as to track the voting situation in real time.

Under the general environment of pan-entertainment, fans' willingness to spend on idol-related consumption continues to rise, and the scale of the fan economy market is growing rapidly, from 20.82 billion in 2017 to 63.42 billion yuan in 2019. The cultivation-based idol cultivation model has also entered the Chinese market in the past two years, becoming the new type of idol selection that most attracts potential fan groups. Unlike traditional idols<sup>[4]</sup>, whose status is determined by their works, the formation system selects idols from vegetarians and limits their number of troupes to debut, and determines winners and losers by their traffic flow. For the developmental idols, the number of fan ratings will be an important indicator of whether they can successfully debut. In the case of girl groups such as SNH48 and Rocket Girls, the selection of their members is based on the number of fan ratings. In order for their favorite stars to debut as a group, or even to debut in the "C" position, the fan base invests a lot of energy and money day and night. However, platform data falsification incidents occur frequently, and the ranking of the group ranking does not match the actual fan voting data<sup>[5]</sup>.

## 2 Research Methods

From the background, it can be seen that the rapid growth of the fan economy market scale is of great significance to the development of China's economy<sup>[6]</sup>, which can promote the development of business and give rise to a variety of commercial profit models; in the era of social media, the extensive "fan entertainment" can solve some of the employment problems; at the same time, it can also lead to the development of public welfare undertakings. Therefore, it is of great theoretical and practical significance to strike a balance between protecting the legitimate rights and interests of fans and constructing a fair platform for fans to play casting, cracking the blockchain technical problems and promoting the innovation of district technology. The innovation point of this paper is to combine the fan voting platform and blockchain technology together, which can effectively solve the trust problem in fan voting, and also guarantee the security of fan voting investment, and at the same time, we will add positive energy videos in the

video task board, which can guide fans to follow stars in a benign way and promote the high-quality development of the fan economy<sup>[7]</sup>.

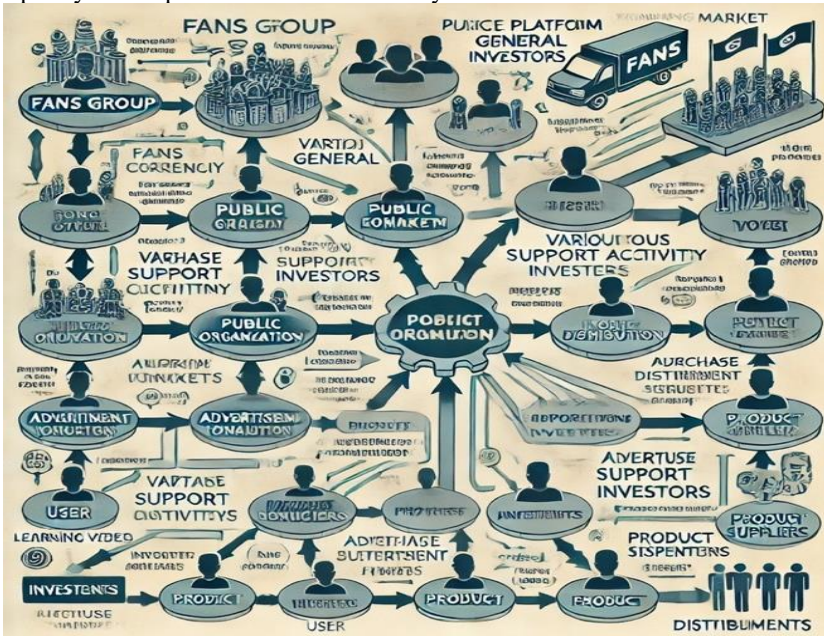


Fig. 1. Project sketch

Form the Fig.1,We integrate all star voting projects into a unified platform for operation, and the fan community obtains the voting rights provided by the platform side through three ways. Utilizing blockchain technology to regulate fan voting and ensure its fairness. Strictly eliminate the behavior<sup>[8]</sup> of inducing fans to buy products, leading to the waste of resources. The platform uses the voting volume as the basis for counting revenue converted into RMB to be transferred in full to each activity funder, and charges it a certain service fee; at the same time, the learning video tasks released by the platform are sponsored by advertisers.

Fan groups buy platform tokens, use the tokens as a means of payment<sup>[9]</sup> to buy virtual gifts and support in kind, set the threshold of the voting right gift triggering mechanism to attract fans to consume; fan users get the right to vote and then vote in the voting system that utilizes blockchain technology in cooperation between the platform and EtherChannel, thus completing the entire<sup>[10]</sup> closed loop of the front end. In the later stage, the platform party will categorize the funds under management and deliver them to activity funders and product suppliers respectively, and pay a certain amount of technical service fees to the Ethernet platform; at the same time, the learning video introduces advertisers, and the platform party collects a certain amount of advertisement fees, and the activity funders and product suppliers are also required to pay the service fees, and the above is the flow of funds in the later stage. The flow is shown in the figure below.

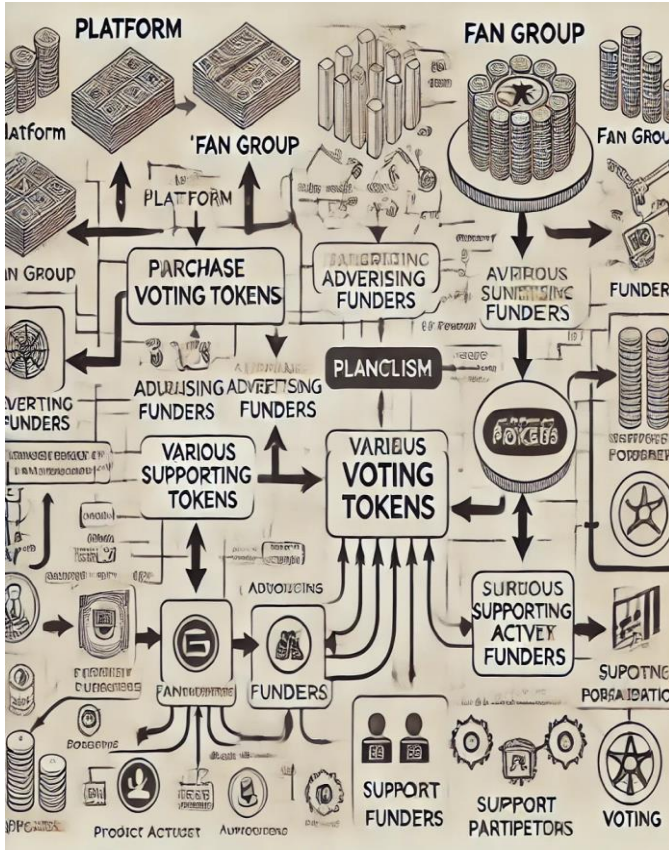
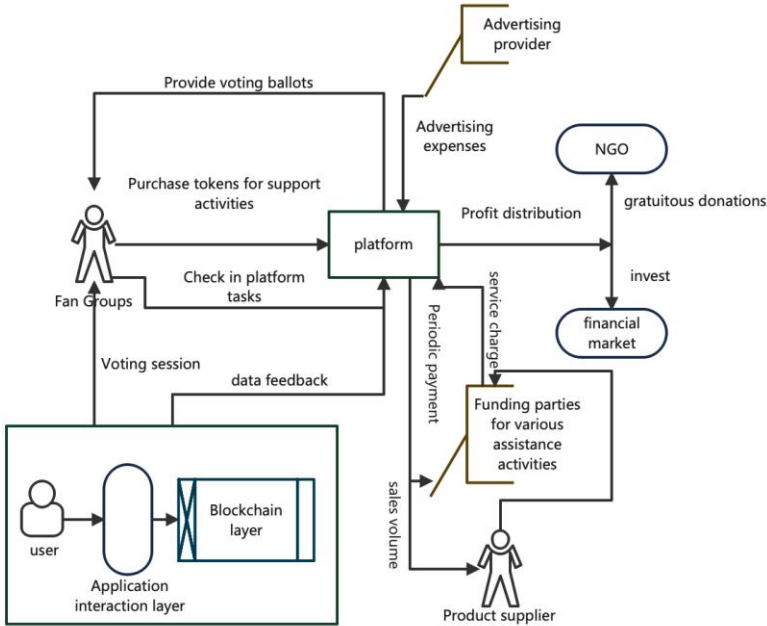


Fig. 2. flow chart

In the Fig 2,Blockchain regulatory mechanism operation design

The user as a node in the Ethernet network only needs to rely on smart contracts to execute and supervise the voting process, and does not need the participation of third-party organizations. The main business realized by this voting system can be reflected by the user's demand<sup>[11]</sup>. According to the user's demand, the realized function is divided into two parts: user management and voting management. Therefore, the system divides the users into two kinds: voting initiators and voting participants, that is, the fan base is the voting participants and the event organizer is the voting initiator. The execution process of the e-voting system is divided into four parts: user registration and login, initiation of voting, voting and vote counting. The voter and the poll initiator perform the corresponding operations in the voting process. According to the requirement analysis, the interactive interface of the voting system can be divided into two kinds: the voting initiation interface and the voting interface. Users can use the system through various devices and call different interfaces to realize different functions according to their needs<sup>[12]</sup>.



**Fig. 3.** flow chart

In the fig.3, User engagement: Users first interact with the application's interaction layer, which is the starting point of the flowchart. Users can express their opinions or participate by providing voting ballots (possibly through some form of digital voting or voting activity).

Platform and blockchain layer: User voting or participation behavior is subsequently transmitted to the blockchain layer. The blockchain layer is responsible for processing and recording this data, ensuring its immutability and transparency. This may be achieved through smart contracts or other blockchain technologies.

Checking tasks and advertising costs: On the platform, users can check tasks related to NGO activities. At the same time, advertising providers will pay advertising fees, which may be used to support the operation of the platform or as one of the sources of funding for NGO activities.

Profit distribution: The flowchart mentions a process of profit distribution, which typically refers to the distribution of advertising expenses or other revenue among advertising providers, platforms, and potential other stakeholders. However, here, a more specific focus may be on how to use these profits or funds to fund NGO aid activities.

Donation and Investment: In addition to advertising expenses, the flowchart also shows how donors can conduct financial transactions through the investment market to support NGO activities. This includes purchasing tokens to support specific aid activities, as well as increasing support for NGOs through regular financial transactions.

Fan Groups and Data Feedback: The flowchart also mentions Fan Groups and Data Feedback. This indicates that the activities of NGOs may rely on the participation and

feedback of fans or supporters, which can be used to guide future activities or optimize current strategies.

**Voting Session and Payment:** A voting session may be a way for users or fan groups to participate in decision-making, influencing the allocation of funds or the direction of activities through voting. And payment involves the process of funds flowing from donors, advertising providers, etc. to NGOs.

**Funding aid activities:** Ultimately, all of these processes and interactions are aimed at funding various aid activities. These activities may include but are not limited to education, healthcare, disaster relief, etc., depending on the mission and goals of the NGO.

**Product supplier:** Although the product supplier does not have a clear direct connection with other elements in the flowchart, it can be inferred that they may be entities providing the necessary materials or services for NGO activities. These goods or services may be achieved through sales tasks on the platform, and their sales volume may also be used as an indicator to evaluate the success of the activity.

Product details

Open three modules.

**Module 1: star list** - by all kinds of activities funded by the voting mechanism as a voting mechanism to create the list (voting list), fans can use the number of votes granted for the favorite idol to play the list, the list data updated in real time, the final voting data will be used as the main basis for the fact that the activities funded by the behavior.

**Attachment:** The platform side also set up a gift list, which is funded by the platform side to provide the idols with the highest number of virtual gifts with funds for their dream acting activities, in order to motivate fans to support their behavior.

**Module 2: Support purchase** - product suppliers rely on the platform to place idol support, mimicking the traditional e-commerce structure and interacting with fans in real time.

**Module 3: Knowledge Learning** - Considering that the fan base is mainly composed of teenagers, in order to guide teenagers to set up correct values and learn good cultural knowledge on the premise of pursuing stars sensibly, the platform uses the voting right gift as an incentive mechanism to urge the fan base to complete the video learning task<sup>[13]</sup>.

Product Pricing Model

The average monthly consumption data of stargazers of different age groups in recent years are as follows:

78% of Post-90s spend less than 500 RMB, 6% spend between 500-1500 RMB, 10% spend between 1500-2500 RMB, 5% spend 2500-3500 RMB and 1% spend more than 3500 RMB.

72% of Post-95s spent less than \$500, 6% spent between \$500-\$1500, 10% each spent between \$1500-\$2500 and \$2500-\$3500 and 2% spent more than \$3500.

68% of Post 00s spent less than \$500, 20% spent between \$500-\$1500, 10% spent between \$1500-\$2500 and 2% spent between \$2500-\$3500.

### 3 Results & Discussion

According to the weighted arithmetic mean formula  $\mu = \sum x \cdot \frac{f}{\sum f}$  obtainable

Average spending on stargazing in the post-80s:

$$\mu = 0.78 \times 250 + 0.06 \times 1000 + 0.1 \times 2000 + 0.05 \times 3000 + 0.01 \times 4000 = 645 \text{ yuan}$$

Post-90s average stargazer spending:

$$\mu = 0.72 \times 250 + 0.06 \times 1000 + 0.1 \times 2000 + 0.1 \times 3000 + 0.02 \times 4000 = 820 \text{ yuan}$$

Average post-00s stargazing spending:

$$\mu = 0.68 \times 250 + 0.2 \times 1000 + 0.1 \times 2000 + 0.02 \times 3000 = 630 \text{ yuan}$$

Summarize the above can be obtained

Per capita monthly spending on stargazers = (average spending on stargazers after 80s + average spending on stargazers after 90s + average spending on stargazers after 00s) / 3  $\approx$  698 yuan

Research Method: The research method used in this paper for the product pricing model is the market comparison method, i.e., when the appraisal object itself has the current market price or the reference object which is basically the same as the appraisal object has the current market price, the appraisal can utilize the current market price of the reference object to make the corresponding comparison to arrive at the appraisal value of the appraisal object. In this paper, a pricing method for platform tokens is proposed. The market comparison method selects items similar to the target item in the market and accounts for its fair price in the market as the price of the target item. In the self-media platform, the fans can purchase the virtual products on the platform to get the right to vote for the celebrities by recharging the tokens on the platform. Depending on the number of tokens corresponding to the virtual products, different amounts of voting rights are determined<sup>[14]</sup>.

Calculation method

The first step is to choose 3-5 representative self-media platforms as the object of study. The second step is to choose the price of a set of virtual products in each of the above platforms, which is denoted as *a*, and the unit is the unit of tokens of the platform. The third step is to determine the ratio of the tokens of the respective platforms, and the fourth step is to calculate the ratio of the real currency and the platform's tokens in the information channel of the self-media platforms, which is denoted as *P*. Specific data are shown in tables 1-3 below.

**Table 1.** Shakeology Virtual Products and Pricing

VIRTUAL PRODUCTS	TOKEN TRADING PRICE
FLOWERS, JOY BLIND BOXES	10 Jitter
GIFT CYLINDER	199 Jitter
HOT AIR BALLOONS	520 Jitter
HELICOPTERS	2999 Jitter

**Table 2.** Dojo Live Virtual Products and Pricing

VIRTUAL PRODUCTS TOKEN TRADING PRICE	VIRTUAL PRODUCTS TOKEN TRADING PRICE
LUCKY BAG 1 SHARK'S FIN	LUCKY BAG 1 SHARK'S FIN
CARD 6 SHARK'S FIN	CARD 6 SHARK'S FIN
AIRPLANE 100 SHARK'S FIN	AIRPLANE 100 SHARK'S FIN
ROCKET 500 SHARK'S FIN	ROCKET 500 SHARK'S FIN

**Table 3.** Tiger Live Virtual Products and Pricing

VIRTUAL PRODUCTS	TOKEN TRADING PRICE
LOLLIPOP	100 GOLD BEANS
MAGIC BOOK	99000 GOLD BEANS
MONEY GUN	300000 GOLD BEANS
TIGER ONE	1000000 GOLD BEANS

$$\mu_i = \sum_{j=1}^n \frac{A_n \times N_n}{\sum_{i=1}^n B_n \times N_n} \quad (1)$$

Among them,  $i = 1, \dots, 3$ ,  $j = 1, 2, \dots, 4$ ,  $u_i$  Ratio of the value of virtual tokens representing platform  $i$  to the value of socially necessary labor,  $A_n$  denotes the virtual token transaction price of virtual product  $j$  in platform  $i$ ,  $B_n$  denotes the value of socially necessary labor represented by virtual product  $j$  in platform  $i$ ;  $N_n$  denotes the number of transactions of  $j$  in platform  $i$ . The socially necessary<sup>[15]</sup> labor time and the number of transactions need to be queried in the server database and are not specifically listed here. Substituting the data into equation (1) yields the value of virtual currency:

**Table 4.** Virtual Token Online Offer

PLATFORM	TOKEN UNIT	P (CONVERSION RELATION)
JITTERBUG	Jitterbug	P1=1/7 (RMB/Jitterbug)
DOUYU LIVE	Shark's Fin	P2=1 (RMB/Shark's Fin)
TIGER TOOTH LIVE	Golden Beans	P3=1/700 (RMB/Golden Beans)

In the Table 4, The ratio between tokens is calculated from Table 4:  $\frac{1}{p_1} : \frac{1}{p_2} : \frac{1}{p_3} = 7 : 1 : 700$ .

Find the value of  $u$  through equation (1) and replace the ratio of  $(1/p)$  by the ratio of  $u$ . Thus, an approximation of  $P_i$  can be calculated from a known value of  $P_i$ , and then the virtual product is priced according to equation (2):

$$d_n = 1 \cdot A_n \cdot P_i \quad (2)$$

Among them,  $d_n$   $v$  denotes the value expressed in real money, now set the conversion relationship between the virtual tokens of the platform we built and the RMB as 1RMB = 10 units of tokens, the average monthly cost of the fans chasing the star from the previous 698 yuan into the formula (2) to get  $A_n$  for 6980 units of tokens.



We set the platform token name to Rainbow Candy, and the corresponding virtual gifts correspond to the number of tokens as shown in the table below: Specific data are shown in tables 5 below.

**Table 5.** Rainbow Channel

RAINBOW CHANNEL	NUMBER OF TOKENS (RAINBOW CANDY)
FLOWERS / SMALL HEARTS / THAN HEART	1
BUBBLE MACHINE / GAME MACHINE	5
RAINBOW BRIDGE	10
LEAP OF THE DOME / PRAYER	20
SUGAR CANNONBALL / DANCE DANCE DANCE DANCE DANCE	50

Route 1: Purchase of physical supports (physical supports include tickets, celebrities' peripheral posters and other products).Fans purchase the corresponding number of physical support items by recharging tokens on the platform, which gives each person an additional twenty votes per month. In order to ensure the platform's profitability, we have set the minimum consumption of fans at 4,000 tokens, and fans who reach the consumption number of 4,000 tokens will be able to obtain the right to vote for 20 times.

Way 2: Give virtual gifts to stars. Fans can get the right to vote by purchasing virtual gifts and giving them to the corresponding stars. The platform stipulates that fans who give virtual gifts up to 20 tokens can get the right to vote once, and the number of times fans can vote on the platform per day is limited to 5 times.

Revenue Analysis

According to the market, most of the price range of the relevant aid is 30-155.

According to the survey, the cost price of such aids should range from 5-40. Specific data are shown in tables 6 below.

**Table 6.** Profit Ratio of Supplies

PHYSICAL SUPPORTS	PHYSICAL SUPPORTS	PHYSICAL SUPPORTS	PHYSICAL SUPPORTS	PHYSICAL SUPPORTS
POSTCARD/PHOTO	70	15	366.67	a
POSTER	40	10	300	b
RELATED PERIPHERALS	89	23	286.97	c
HAND LAMPS	30	11	172.73	d
SUPPORTING CLOTHES	70	27	159.26	e
BANNER	57	16	256.25	f
LIMITED EDITION	155	40	287.5	g

$$\mu_i = \frac{(\sum_{i=j}^n n_i) \times (b_n \times \Delta b_n - n_j j b_n + a_n + b_j + a_j)}{\sum_{i=j}^n n_i \times n_j \times a_n} \tag{3}$$

Among them,  $\mu_i$  for the services required to be paid by the vendor, at a cost of  $a_n$ . The selling unit price is  $b_n$ ,  $j$  is the type of commodity and  $X$  is the ex-factory price.  $n_i$  is the amount of this type of merchandise sold. The unit is the dollar.

Specific data are shown in tables 7 below It is calculated by bringing in the formula:

**Table 7.** Cost of goods and services

NO.	NO. SERVICE CHARGE
A	$5.63n_a$
B	$2.37n_b$
C	$6.94n_c$
D	$1.45n_d$
E	$5.37n_e$
F	$3.18n_f$
G	$8.11n_g$

$$S = \sum_{i=1}^n \frac{\delta_2}{\delta_1} n_i \times \vartheta \tag{4}$$

$\delta$  is the product consumption rate and  $S$  is the total advertising cost, then there is an increase in the rate of  $\alpha = (\frac{\delta_2}{\delta_1} - 1)$ , Product Unit Price  $\vartheta$ , The base number of people on the platform is  $\beta$ . After the advertisement is placed, the effective advertisement promotion rate is  $\gamma$ . It is not difficult to conclude that the expected effective number of people to promote the advertisement after the advertisement is placed is  $(\alpha+1)*\beta*\gamma$ .

The service fee  $\Omega$  that the platform has to give to the viewing individual is:

$$\Omega = \frac{\frac{S-\mu_i}{\alpha+1} \beta \gamma}{(\sum_{i=j}^n n_i) n_j X a_n} \times \sum_{i=1}^n \frac{(\delta_2)}{\delta_1} n_i \vartheta - [(\sum_{i=j}^n n_i) \times (b_n \Delta b_n - n_j j b_n + a_n + b_j + a_j)] \times \delta_2 \beta \gamma \tag{5}$$

where the platform headcount base is  $\beta$ . After the advertisement is placed, the effective advertisement promotion rate is  $\gamma$  After the platform is running, such data will be recorded in the backend for calculation purposes.

Since tokens are a new type of network token in circulation, the platform needs to concur with third-party entities and locate the tax rate of the currency with the banking sector. Analyze the quantitative relationship between cash flow and tokens. Specific data are shown in tables 8 below

**Table 8.** Total value of stars

CELEBRITIES	FACEBOOK FOLLOWERS	TWITTER FOLLOWERS	TOTA
CAIRO	122,612,595	65,310,193	187,922,788
SHAKIRA	104,150,244	49,630,822	153,781,066
VAN DIESEL	100,989,838	1, 690,000	102,679,838

<b>KATYPERRY</b>	69,496,007	107,147,243	176,643,250
<b>JUSTINBIEBER)</b>	78,661,877	104,131,077	182,792,954
<b>BEYONCÉGISELLEKNOWLES</b>	108,000,000+	/	108,000,000+
<b>ARIANAGRANDE</b>	115,000,000+	/	115,000,000+
<b>SELENAGOMEZ</b>	130,000,000+	/	130,000,000+

The average consumption of a fan chasing a star is about 700RMB/month, then the daily average can be calculated to be about 25RMB/day. From the data below, it can be seen that the price of the album ranges from 3-26RMB. From this, it can be seen that the fans buy about one album a day. Calculate the purchasing power of fans buying albums as

$$\Delta \frac{\text{Album price}}{\text{average daily consumption}} \quad (6)$$

This gives a purchasing power of 92%. So a day's fan's remaining chase disposable balance to buy platform tokens is about 20 coins. And so on. We can set  $\Delta\pi$  to be the product price difference, so the chaser disposable balance is

$$\tau = 25 - \Delta\pi \times 25 \quad (7)$$

A star is  $\sigma$ , and the number of its fans with purchase desires is  $\varepsilon$ . It can be shown that chasing a star consumes  $\rho$  on the platform for about

$$\rho_{\sigma} = \sigma_{\varepsilon} \times \tau \quad (8)$$

It is easy to conclude that the total consumption of tokens purchased on the platform is about

$$\aleph = \sum_{i=1}^n \sigma \rho_{\sigma} \quad (9)$$

According to the data survey, the number of fans following a star using this platform is about 29.97% of the total number of fans of a star, so the revenue generated by the platform brought is 29.97% $\aleph$ .

Then de-averaging the number of fans of each star, it is calculated that a single star within the platform can benefit about  $2.3976 \times 10^7$  yuan/year (the data processing is only for the popular stars, niche stars are not taken into account)

Ether is considered a decentralized computing network, when the platform sends Token, executes a contract, transfers Ether, or does something else on this block, the computer needs to perform calculations consuming network resources when processing this transaction, so that you have to pay a fuel fee to buy fuel in order to make the computer work for you. Eventually the fuel fee (technical service fee) is paid to Ether as a processing fee.

The service fees to be paid to Ether are

$$\varphi = 20 \cdot 10^{-9} \cdot \sum_{i=1}^n \sigma \rho_{\sigma} \quad (10)$$

The unit is Ether.

According to the above formula, the average revenue generated by a single star, i.e., the service fee paid, is  $2.3976 \times 10^{-2}$  Ether/year.

(i) Based on the increasing diversity of self-media platforms nowadays, we have to consider the difficulties we will encounter in the future in the promotion of our approach, whether it will be welcomed by consumers, whether it will be able to get enough financing and other issues.

(ii) At present, our fan economy is still in the research and development stage, and there is still instability in all aspects. For example, merchants use capital and profit for the purpose of excessive squeezing of fans, which leads to the decline of fan vitality. The variety show "The Birth of an Actor" in 2017 used one-sided editing to force the creation of hot topics to trigger the audience's hot comments and dissatisfaction; and then the talent show "Creation 101" used the form of high votes of members to prompt the consumption of fans, which made the fans feel deeply uncomfortable after the sensibility. The idea of the product side to make profits through various ways in the cultural industry chain cannot be faulted, but the behavior of overly squeezing the fans is prone to cause problems such as moral principles and the dilution of cultural connotations, resulting in the unstable development of the fan economy.

(C) Nowadays, the audience of self-media platforms is becoming more and more solidified, and the space for fan growth is getting smaller and smaller, so we are facing the problem of how to increase the space for fan growth.

(d) Since this approach will require advertisers' capital to build, advertising will be introduced, and users need to be taken as the first priority, taking into account the real psychological needs of users, constantly exploring potential users, aiming at providing the most suitable product advertising. It is necessary to strengthen the interactivity with users, accept user feedback and make timely adjustments to enhance the user's sense of participation.

## 4 Conclusions

Blockchain is a shared distributed database technology with four characteristics: decentralization, de-trust, collective maintenance, and reliable database. Blockchain can simply be understood as a complete, tamper-proof, multi-party participatory and supervised record. It consists of a list of records, called blocks, that are continuously growing and neatly organized. Each block contains a link to the previous block and a timestamp, which is designed to make the data of the blockchain tamper-proof, and once recorded, the data in a block will be irreversible. It is precisely by virtue of its decentralization, high transparency, and tamper-proof information that the blockchain meets the needs of building a fair and transparent platform for fan betting. By studying the application of blockchain technology in the beat casting platform can maximize the solution to the problems of unclear flow of funds from fans' fundraising and falsification of the data of beat casting.

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