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Analysis of Population Competition and User Competition between Tiktok and WeChat

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Abstract: *Competition exists in many fields of nature and human society. In the current diverse new media competition in economic and life, precise and detailed user research is conducive to improving the competitiveness of enterprises. Whether Tiktok or wechat, their rise is inseparable from embracing the market demand. Competition for the number of users of the two is conducive to understanding the user needs, clarifying the development positioning, and defining the orientation of future product design. Therefore, it is necessary to study in depth the competition between Tiktok and wechat. Based on the empirical facts and the consideration of the appropriate simplified model, this paper first proposes four basic assumptions. Based on the two group competition models in the presence of competition, we transform the —— based on the special movement rules of market economy, introduce the concept of effective competition, and make it conform to the user competition between Tiktok and wechat. Then, according to the ratio relationship between user growth rate and competitive factor, the linkage law between Tiktok and the number of wechat users is discussed. Since both belong to the social application software of video communication, the core of which is manipulation and feedback, the user "psychological factor" is further introduced into the model to increase durability, playability and other indicators. Integrate the update of the application platform, discuss the situation and get the balance point. At the same time, we mined the user data of the platform, and discussed the user number competition between Tiktok and wechat based on the update situation of the platform and the user experience classification. It is found that the change curve of the number of users of Tiktok and wechat follows the s-shaped curve. In order to improve the user dependence, it is necessary to increase the maximum sample size of ——, that is, to improve the experience of user manipulation and feedback, rather than playing a zero-sum game between the two. The persistence and play of the APP are positively correlated with the change in the number of users, which is positively correlated with the increase and decrease of the user experience brought by the number of version updates, rather than simply depending on the number of updates. Only from the perspective of users, to improve the use experience of applications, and to clarify their own marketing strategy and strategic positioning, can they remain invincible in the competition of the number of users. The model established here is simple and feasible. They can be extended to competitive analysis of multiple groups and even a broad field of competitive analysis of various economic entities. According to the different conditions, the equilibrium level and the coexistence situation can be combined. After analytical verification, the model established in this paper has reasonable and practical significance.*

Keywords: *Two competition models between groups, Psychological analysis, User competition*

1. Introduction

Competition is a very common phenomenon in nature. It is not only found in the dense primeval jungle and vast oceans, but also reflected in various areas of human social and economic life. On the one hand, in a given marine environment, a given environment can only provide a limited number of resources needed for the organisms to survive. The checks and balances between trout and bass growth is a good example. On the other hand, in a market economy, all economic actors, driven by their own material interests, will exclude similar economic actors to enhance their own economic strength. It is the internal law of the market economy and the basic feature of the market system. Fair, just and open competition can form a reasonable price signal and effectively guide the rational flow and allocation of resources. Tiktok is a short music creative short video social software incubated by ByteDance. It is a short video community platform for all ages, through which users can choose songs, shoot music works and form their own works. Wechat is a free app launched by Tencent on January 21, 2011, providing

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instant messaging services for smart terminals. Users can send voice messages, videos, etc., or use service plug-ins such as "moments" and "official accounts."In the era of mobile Internet, the competition between Tiktok and WeChat [1-2] in the field of users and is also becoming a hot spot in economic life. This paper combines the market rules based on the competitive hunter model, and analyzes the user competition between --Tiktok and wechat, the hot issue of current economic life.

2. Assumptions and Justifications

2.1 Assume the rate of change of x and y is respectively a linear function with respect to x and y

(1) Follow the engineer principle: transform nonlinear and complex models into linear and simple models by integral transformation or other means (build ideal models or micro- variant equivalent models). Reduce the interference of abnormal data, improve the universality of the model, and make x and y predictable.

(2) Assume the coefficient of competition between x and y is constant.

Justification: According to the principle of species evolution, the relationship between two species in the ecosystem will not change in a short period of time, and their diet and nature will not change significantly, so the competition coefficient between x and y can be regarded as a constant.

(3) No intentional human interference and rare major natural disasters and epidemics in the research time.

Justification: Because the model considers the impact of the external conditions of stable ecosystems with limited resources, and then compares and analyzes the competitiveness between the two species, so as to predict the trend of change between the two populations. This comparison and prediction only makes sense if the external conditions coincide. Only when the external conditions are consistent can such a comparison be meaningful.

(4) Assume x and y has a maximum capacity.

Justification: Since the environmental resources of actual biological growth are limited, there will be the maximum environmental capacity that can be accommodated. Due to limited resources and space, the number of creatures that can be accommodated is not unlimited. So we can establish a more reasonable quantitative model based on setting the maximum capacity.

2.2 Competitive model

In the case of population competition, where simple stunted growth models no longer apply, we propose a Loteka-Volterra interspecific competition model[3].

$$\begin{cases} \frac{dx}{dt} = a\left(1 - \frac{x}{k_1} - \frac{x}{k_2}\right)x \\ \frac{dy}{dt} = m\left(1 - \frac{x}{k_2} - \frac{nx}{k_2}\right)y \end{cases} \quad (1)$$

In this case, combined with the actual physical significance of the competition between the two populations, the meanings of the constants are as follows:

- a represents the natural rate of change of population x
- n represents competition factors of y to x in the case of competition
- m represent the natural rate of change of population y
- n represents the competition factors of x to y in the case of competition
- k1 represents the maximum environmental capacity for species x
- k2 represents the maximum environmental capacity for species y

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3. User competition model between Tiktok and Wechat

3.1 Competition model under market economy

Different from the natural environment, market economy has its special rules of movement. The competitive relationship and status among market players will change over time. Therefore, we need to add a new concept—effective competition. That is, based on the concept of competition coefficient, we should change its fixed assumption to make it change with the changes of x and y, so as to better fit the law of market development. The equation changes into the following form:

$$\begin{cases} \frac{dx}{dt} = a\left(1 - \frac{x}{k_1} - b * (1 - \frac{x}{k_1}\right) xy \\ \frac{dy}{dt} = m\left(1 - \frac{x}{k_2} - n * (1 - \frac{x}{k_2}\right) xy \end{cases} \tag{2}$$

Merge and simply

$$\begin{cases} \frac{dx}{dt} = (a - by)x(1 - \frac{x}{k_1}) \\ \frac{dy}{dt} = (n - by)y(1 - \frac{x}{k_2}) \end{cases} \tag{3}$$

a represents the user growth rate of Tiktok

b represents the competition factors of Wechat to Tiktok in the case of competition

m represent the user growth rate of Wechat

n represents the competitive factors of Tiktok to Wechat in the case of competition.

K1 represents the maximum market capacity of Tiktok

K2 represents the maximum market capacity of Wechat

3.2 Classification discussion

In order to simplify complex problems and consider them comprehensively, we will discuss them in the following five cases according to the size relationship of x, y, a/b and m/n:

(1) Case 1: At time t1, when x=m/n, y=a/b, the following formula holds in this case.

$$\frac{dx}{dt} = 0, \frac{dy}{dt} = 0 \tag{4}$$

The two systems reach a state of dynamic equilibrium where the number of users on both platforms does not change.

(2) Case 2: At time t2, when x>m/n, y>a/b, the following formula holds in this case.

$$\frac{dx}{dt} < 0, \frac{dy}{dt} < 0 \tag{5}$$

The number of users on both platforms decreases until the equilibrium point is reached (x=m/n, y=a/b)

(3) Case 3: At time t3, when x<m/n, y<a/b, the following formula holds in this case.

$$\frac{dx}{dt} > 0, \frac{dy}{dt} > 0 \tag{6}$$

The number of users on both platforms will increase until y the equilibrium point is reached (x=m/n, y=a/b)

(4) Case 4: At time t4, when x<m/n, y>a/b, the following formula holds in this case.

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$$\frac{dx}{dt} < 0 , \frac{dy}{dt} > 0 \tag{7}$$

At this point, the number of users of Wechat will increase while the number of users of Tiktok will decrease. This phenomenon will further accelerate the decrease of the number of Tiktok users, and the increase of the number of Wechat users will slow down from fast. The final result is that the number of Tiktok users will gradually shrink to zero, and then the number of Wechat users will follow the previous S-shaped curve, which follows the law of first fast and then slow growth.

(5) Case 5: At time t5, when x>m/n, y<a/b, the following formula holds in this case.

$$\frac{dx}{dt} > 0 , \frac{dy}{dt} < 0 \tag{8}$$

At this point, the number of users of Tiktok will increase while the number of users of Wechat will decrease. This phenomenon will further accelerate the decrease of the number of Wechat users, and the increase of the number of Tiktok users will slow down from fast. The final result is that the number of Wechat users will gradually shrink to zero, and then the number of Tiktok users will follow the previous S-shaped curve, which follows the law of first fast and then slow growth.

3.3 User analysis from a psychological perspective

3.3.1 Psychoanalysis and model optimization

From a psychological perspective, the most critical core of an APP is manipulation and feedback.[5] When people spend too much time on one APP and too little time on another, they get bored, and the time spent on one app is lowered accordingly. When that number goes down, people also "change things up" -- which leads to an increase in the amount of time spent on the other APP. If both apps are used for a very short time, then people will feel a little boring. At this time, x and y will be promoted simultaneously (to consider the amount and amount of promotion). If they use the APP for a long time, then people will shorten the app use time to reduce the two simultaneously based on the consideration of "damaging eyes and wasting time". The usage time of the APP reflects the usage time of the user to some extent, and correspondingly, the usage time of the user also reflects the usage time of the APP to some extent. Thus a new differential equation can be formulated[4]:

$$\begin{aligned} \frac{dx}{dt} &= (a - by)x\left(1 - \frac{x}{k_1}\right) - c_1\left(\frac{x}{k_1} - \frac{y}{k_2}\right) \\ \frac{dy}{dt} &= (m - nx)y\left(1 - \frac{x}{k_2}\right) - c_2\left(\frac{x}{k_2} - \frac{y}{k_1}\right) \end{aligned} \tag{9}$$

Suppose that p and q are the average usage time considered reasonable by the whole population, and p and q are proportional to x and y respectively. From this equation, we can see that if the usage time of an APP exceeds the average usage time of the corresponding value, the usage time of the APP will decrease, and correspondingly, the usage time of the APP will also decrease. And the equilibrium point of this equation is, that is to say, under the existing conditions, people will consider it appropriate to spend p time on Wechat and q time on Tiktok. If the developer wants to increase the usage time of the developer's APP, that is, increase p or q, it needs to increase the corresponding maximum capacity. In general, if no new version of an APP is released, the sum decreases nonlinearly, first faster and then slower, until it approaches zero. To satisfy the requirement of first fast and then slow, the above expression can improve the equation to be

$$\begin{aligned} \frac{dx}{dt} &= (a - by)x\left(1 - \frac{x}{k_1 e^{\lambda(n)t} + K_1(n)}\right) - c_1\left(\frac{x}{k_1 e^{\lambda(n)t} + K_1(n)} - \frac{y}{k_2 e^{\mu(n)t} + K_2(n)}\right) \\ \frac{dy}{dt} &= (m - nx)y\left(1 - \frac{y}{k_2 e^{\mu(n)t} + K_2(n)}\right) - c_2\left(\frac{y}{k_2 e^{\mu(n)t} + K_2(n)} - \frac{x}{k_1 e^{\lambda(n)t} + K_1(n)}\right) \end{aligned} \tag{10}$$

In the above equations, the meanings of relevant parameters are as follows:

n represents the number of updates or the format number (assume the number of updates);k1(n)and k2(n) are series, and the first term k1(0)= k2(0) =0, which reflects the user experience of the current version.$\lambda(n)$ $\mu(n)$ Reflects the durability and playability of the APP, both of them are positive numbers.

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3.3.2 Classification discussion

There are two scenarios, depending on whether the platform is updated or not.In the case of no update, there will be a balance between the use time of the two apps, andthe equilibrium coordinate value will gradually decrease. The rate of reduction depends. The better the APP's durability and playability, the smaller these two values are. In the case of update, at some point, if the APP is updated, λ(n) will be reduced to another positive number in a flash, and the time spent on the APP will be increased. Assuming that each update always brings a new experience, this effect on the experience can be expressed by the functions K1(n) and K2(n). If the user experience is enhanced after the update, Form like media cross-media competition effect [5] K1(n) or K2(n) will increase, which is beneficial to the development of the platform. If the update is gilding the cake, or even self-defeating, then either K1(n) or K2(n) will decrease, or even become negative.

3.3.3 Equilibrium point

The equilibrium point of the above equation can be calculated as

$$x = k_1 e^{-\lambda(n)t}, y = k_2 e^{-\mu(n)t} \tag{11}$$

In order to gain competitive advantages over other apps in the market, it is necessary to increase the x value and decrease the y value of the equilibrium point. For example, updates and patches can enhance APP usage experience. These operations can increase the size of expressions, increase user usage and average user usage time. The adjustment of a,b,m and n is related to the marketing strategy of developers and the strategic competition between developers and developers.

3.4 Further discussion

In order to further combine the model with reality, we obtained the latest monthly active user data from 2020 to 2021 for qualitative analysis combined with the formula (Data Sources:iiMedia Polaris) , as shown in Figure 1 and Figure 2.

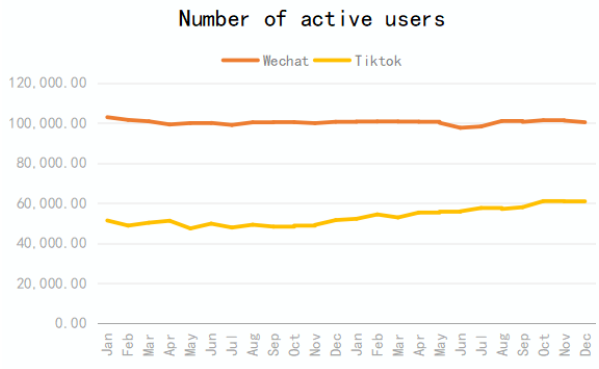

Figure 1: Number of active users curve (2020-2021)

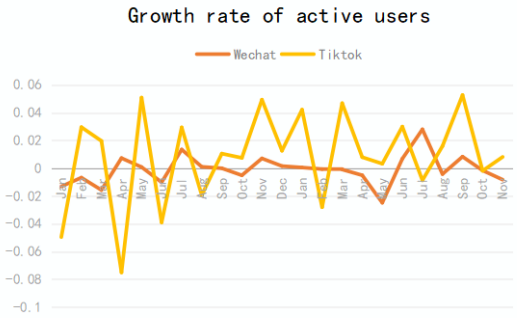

Figure 2: Growth rate curve of active users (2020-2021)

As can be seen from the picture, the number of active users of Wechat has remained relatively stable in the past two years, with a growth rate close to 0, indicating that it is close tosaturation. The number of

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active users of Tiktok still showed a stable growth trend, with a positive growth rate and a large fluctuation range.

In fact, although the two mobile Internet platforms have a tendency to penetrate each other, there are huge differences in many aspects such as online time, strategic positioning and marketing strategies, which are more fundamental and direct factors affecting the number of platform users.

In terms of launch time, Wechat was launched in January 2011. After decades of development, it has entered a mature stage and the number of users is relatively stable. Tiktok, which launched in May 2017, has risen rapidly in recent years, and its content ecosystem is still being heavily refined, attracting more and more groups to become users.

In terms of strategic positioning, Wechat focuses more on building a simple and convenient chat platform, while Tiktok focuses more on building a short video platform for creative music. Because it is inevitable for people to communicate with others in their daily life and work, the growth rate of Wechat users fluctuates gently and is relatively stable.

However, the demand for entertainment and leisure has a larger growth space and will increase rapidly with thedevelopment of economic society and the evolution of The Times. However, with regard to the launch time, strategic positioning, marketing strategy and other factors, there is no uniform conversion standard, which is difficult to convert into the available data of the model. Therefore, the model directly starts from the core of app—user experience and feedback, and analyzes the user competition between the two platforms.

4. Conclusion

In the market economy environment, the complex factors affecting the competition analysis of Tiktok and wechat users, such as platform positioning, life cycle, organizational structure, technology, etc., are difficult to be transformed into quantifiable data through unified standards. Therefore, we chose to skip the representation, directly using the application's core—"manipulation and feedback" as the explanatory variable, and improve the equation by combining psychoanalysis to bring it closer to the market rules. However, due to the limitations of data, the model cannot fully cover all the important factors in real economic life, and there is still considerable room for improvement in the user competition analysis between Tiktok and wechat.

The model established in this paper is operable, can change the parameter information of model to predict the final result, thus is more flexible and convenient; with strong scalability and wide application. It can extend the competition between two species to competition between three or more species. The principle does not change, the general model is generally applicable; this model is closer to the reality of modern technology life and the competition between enterprises. However, there are some deficiencies: the collection and selection of data are subjective by certain operators, and there is no unified standard for the process of converting the data into the corresponding parameters of the model (quantification process), so there are certain uncertainties in the prediction results. The model is limited by assumptions, but the various influencing factors in real life are more complex and therefore cannot be effectively included. Future studies with more complete data and the analysis of competition between Tiktok and wechat users would be more accurate. Secondly, more influencing factors can be added to the improved model, such as the capital structure, platform positioning and marketing strategy behind the two, so as to establish a more comprehensive framework to analyze the competition between Tiktok users and wechat users.

References

[1] Li Dong, Xu Zhiming, Li Sheng, et al. Information diffusion in online social networks [J]. Journal of Computer Science, 2014, 37 (1): 189-206.
[2] Xu Xiaoke, Hu Haibo, Zhang Lun, et al. Computational communication studies on social networks [M]. Beijing: Higher Education Press, 2015.
[3] Extension and application of Yang Qian 2022 Lotka-Volterra model.
[4] Jin M, Zhang J, Huang T, et al. Research on Human Action Recognition Based on Global-Local Features of Video[C]// International Conference on Pattern Recognition and Machine Learning. IEEE, 2021.
[5] Shi Liping. Analysis of the effect of media cross-media competition based on the bilateral market [J]. Journal of Hunan University (Social Science Edition), 2013, 27 (1): 156-160.