

Marketing Strategy and Customer Engagement Analysis of Catering Brands – From Short Video Perspective

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Abstract. In recent years, with the popularity of short video platforms, more and more people tend to use short videos to share their lives. In the catering industry, many phenomenal pop videos created by many catering brands are continuously shared on the short video platform, which has brought about a doubling of brand revenue. In order to specifically explore the relationship between short videos and catering marketing, in this paper, we first design a questionnaire and collected hundreds of samples. Then, based on the samples, we analyze the users' preferences for catering brands and related short video attributes. We also analyze the correlation between user attributes, sharing behavior, and customer engagement. Finally, we establish a discriminant model, a machine learning method, to predict users' sharing and visiting behaviors according to their attributes. The experimental results show the effectiveness of our method.

1 Introduction

In recent years, there have been some phenomenal catering marketing cases in the Chinese Mainland. In July 2020, the Chinese catering giant Haidilao launched a birthday blessing service, and the "social death" video shot by customers was widely spread on the short video platform. Soon after the service was launched, the number of customers of Haidilao increased significantly. In March 2021, the lesser-known bar brand Helens launched the popular product "Coke Bucket", and many customers shared their happy time after consuming "Coke Bucket" on the short video platform. For a moment, there was a long line at the entrance of the Helens tavern, and the Helens tavern expanded rapidly. On September 10, 2021, Helens International Holding Co., Ltd. was officially listed on the main board of the Hong Kong Stock Exchange. It only took half a year for Helens to go public from the sale of the block-buster. It happens that there is a similar case, in July 2021, with more than 10000 franchise stores in the country, Mixue Ice cream & Tea became popular on the short video platform with a theme song of Snow City, which successfully brainwashed many young people as a magical magic tune. Since then, the popularity and sales volume of the Snow City have reached a higher level. Another example is that KFC China launched "Crazy Thursday" promotion activity in 2018 and quickly spread it through the short video platform in 2019. As a result, Yum!! China (the parent company of KFC China) achieved rapid growth in revenue in 2019, and the growth itself was largely brought by the business of KFC (as illustrated in Figure 1(c,d)). Although Yum China's revenue declined due to the impact of the COVID-19 pandemic in 2020, the

proportion of KFC business in Yum China's revenue has increased year by year (as illustrated in Figure 2).

In these examples, it is not difficult to see that the short video platform plays an important role in revenue growth. On the one hand, as shown in Figure 3, according to CNNIC statistics, the number of users and the user utilization rate of short video platforms in Chinese Mainland are increasing year by year. More and more people like to share their lives through short video platforms. On the other hand, these marketing or shared videos attract potential customers from multiple senses such as vision and hearing.

Gao et al. [2] proposed a possible explanation from the perspective of psychology called Short video customer inspiration (SVCI). Short video customer inspiration (SVCI) is the embodiment of the concept of customer inspiration in the short video context. It is the activation state that customers get from the idea of receiving marketing guidance to the internal pursuit of consumption-related goals in marketing short videos, thus having a positive impact on customer integration.

However, the problem is that there is a lack of quantitative analysis of the impact of short videos on commercial brands and customer engagement. As a result, we cannot formulate effective marketing strategies. In order to solve the above problems, in this paper we first design a questionnaire and have collected hundreds of valid results. Secondly, we analyze the correlation between user (customer) attributes and customer engagement behavior. Finally, we design a linear discriminant analysis (LDA) model, and analyze the short video and marketing types that users potentially like to make more accurate marketing strategies.

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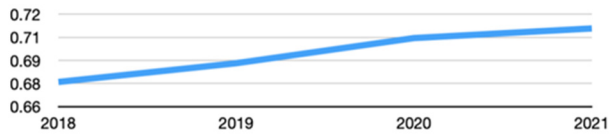


Fig. 1. Proportion of KFC China in Yum China's Revenue

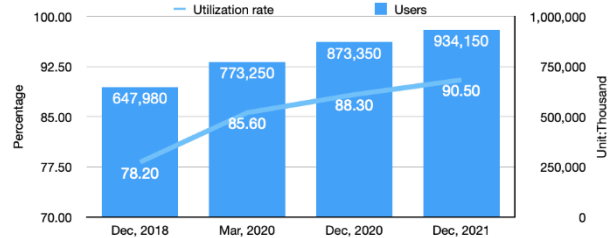


Fig. 2. User scale and utilization rate of short video platform (Data from China Internet Network Information Center, CNNIC.)

2 Literature review

2.1 Custom engagement

Customer engagement (CE) has received more and more attention from both businesses and academia recently because it can bring faster revenue growth to enterprises [4]. The mainstream definition is mainly from the perspective of psychology, behavior, and the integration of psychology and behavior. In terms of psychology, CE can be seen as a psychological state generated by the interaction between customers and brands [1]. In terms of behavior, CE can be seen as a kind of incentive that goes beyond buying [5]. According to these concepts, we designed the questions about customer engagement in the questionnaire.

2.2 Linear discriminant analysis

Linear Discriminant Analysis (LDA) [3] is a very common technique for feature extraction and dimension reduction. It has been used widely in many applications such as pattern classification applications [6,7]. The main idea of LDA is to project the data in a high-dimensional space into a lower-dimensional space, and after the projection, ensure that the intra-class variance of each category is small and the mean difference between categories is large, which means that the high-dimensional data of the same category are projected into a lower dimensional space, and the same categories are clustered together, while different categories are far apart. In this paper, we use an LDA model to predict customer engagement behavior.

Table 1. Sample basic information statistics

Item	Choice	Num	Percentage	Cumulative Percentage
Gender	Male	160	53.33	53.33
	Female	136	45.33	98.67
	No-Binary	4	1.33	100
Age	0-18	29	9.67	9.67
	19-22	95	31.67	41.33
	23-28	83	27.67	69
	29-35	47	15.67	84.67
	36-45	18	6	90.67

Location	46-55	23	7.67	98.33
	55+	5	1.67	100
	First Tier City	78	26	26
	New First Tier City	85	28.33	54.33
	Second Tier City	59	19.67	74
Occupation	Others	78	26	100
	Full-Time Student	184	61.33	61.33
Educational Background	In Work	116	38.67	100
	High school and below	54	18	18
	Bachelor's Degree	205	68.33	86.33
	Master's Degree	27	9	95.33
	Doctor's Degree	14	4.67	100

Table 2. Cronbach reliability analysis

Number of items	Sample size	Cronbach's alpha
55	300	0.833

3 Data collection

3.1 Questionnaire design and statics

In order to collect relevant data, we designed a questionnaire. The questionnaire includes four categories (User Attributes, Customer Engagement, Other Information and User Preferences) and 55 questions in total. The details of the questionnaire are in the appendix (Table VI, Section VII).

This design is based on the user attributes of the short video platform and the customer engagement and preferences we need to investigate. In this paper, we mainly focus on the relationship between user attributes and customer engagement, as well as the prompts brought by user preferences.

We collected a total of 300 valid samples. Some basic information is given in the Table I. And We will analyze our data in detail in the next two sections.

Table 3. Validity analysis

KMO and Bartlett's test		
KMO	0.785	
Bartlett's test of sphericity	X ²	5451.306
	df	1485
	p	0

3.2 Reliability and validity analysis

In order to evaluate the effectiveness of the questionnaire, we conduct the reliability and validity analysis.

The reliability of internal consistency was evaluated with Cronbach's alpha coefficient. As reported in Table II, the value of the reliability coefficient is 0.833, greater than 0.8, which indicates that the reliability quality of the research data is high.

Then we analysis the validity of the questionnaire. As shown in Table III, KMO and Bartlett tests were used for validity verification. It can be seen from the above table that the KMO value is 0.785, between 0.7 and 0.8. The research data is suitable for extracting information.

4 Analysis method

4.1 Correlation analysis

We select twelve typical user attributes (marked with z_1, z_2, \dots, z_{12} , as shown in the Table VI) and five customer engagement behaviors (marked with y_1, y_2, \dots, y_5 , as shown in the Table VI) from the questionnaire to try to explore their relationships. Then, We make a correlation analysis between these user attributes z_i and customer engagement y_j (Table IV). In order to be more intuitive, we also conduct a visual analysis, as shown in Figure 4.

We can draw some interesting conclusions from the analysis. 1) Chain brand catering has advantages in customer engagement. There is a significant positive correlation between the preferences of restaurant chain brands and customer engagement behavior. 2) Older people may have more difficulty in customer engagement. For example, even if they see the shared catering short videos, they may not visit this restaurant. 3) People in cities with higher levels are more likely to have customer engagement behavior. It may be because there are more different restaurants and convenient transportation. 4) Those who interact actively on short video platforms (such as those who like to share their favorite videos) are more likely to have customer engagement behaviors. 5) There is no correlation between the behavior of ordering takeout and user engagement. 6) Those who like delicacy short videos are more likely to have customers' behavior. This shows the importance of precision marketing (recommending relevant short videos).

4.2 LDA model

In order to further explore the relationship between these user attributes and customer engagement, we use LDA model to predict customer engagement y_1, y_2 . Given data set $D = \{(x^i, y^i)\}_{i=1}^m, y^i \in \{0,1\}$, let X^i, μ^i, Σ^i represent the $i \in \{0,1\}$ set, mean vector and covariance matrix respectively. If the data is projected onto the line ω , the projections of the centers of the two types of samples on the line are $\omega^T \mu^0$ and $\omega^T \mu^1$ and the covariance are $\omega^T \Sigma^0 \omega$ and $\omega^T \Sigma^1 \omega$.

The optimization goal of the model is, on the one hand, to make the projection points of similar samples as close as possible, so the covariance of the projection points of similar samples should be as small as possible; on the other hand, to make the projection points of different samples as far as possible, so that the distance between the

class centers is as large as possible. Considering both, the goal is to maximize:

$$J = \frac{|\omega^T \mu_0 - \omega^T \mu_1|^2}{\omega^T \Sigma_0 \omega + \omega^T \Sigma_1 \omega} = \frac{\omega^T (\mu_0 - \mu_1)(\mu_0 - \mu_1)^T \omega}{\omega^T (\Sigma_0 + \Sigma_1) \omega}$$

Table 4. Peaeson correlation between user attributes and customer engagement

	y1	y2	y3	y4	y5
x1	-0.079	-0.009	0.031	0.174**	0.084
x2	-0.127*	0.035	-0.006	-0.06	0.051
x3	-0.141*	-0.005	-0.212**	-0.117*	-0.042
x4	0.076	-0.126*	-0.01	0.093	-0.066
x5	0.04	0.004	0.129*	0.081	0.026
x6	0.143*	-0.013	0.03	0.109	0.072
x7	0.103	0.036	0.159**	0.054	0.149**
x8	0.02	-0.004	0.108	0.058	0.033
x9	0.154**	0.205**	0.575**	0.437**	0.468**
x10	0.200**	0.147*	0.084	0.126*	0.139*
x11	0.237**	0.473**	0.298**	0.400**	0.471**
x12	0.157**	0.111	0.157**	0.057	0.142*

* $p < 0.05$, ** $p < 0.01$

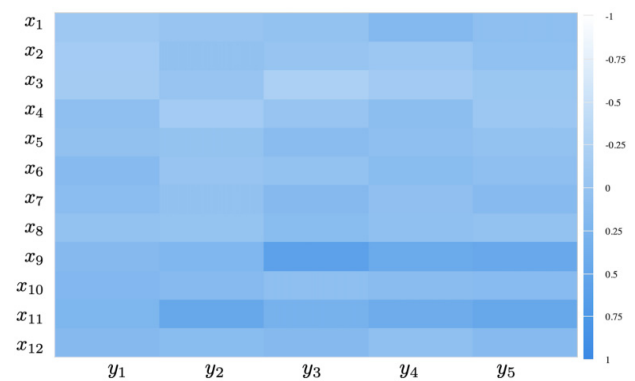


Fig. 3. Visualization of Pearson Correlation between User Attributes and Customer Engagement

In this linear discriminant analysis, we use 300 samples as our dataset. We randomly selected 80% data as the training set to train the discriminant analysis model. The remaining 20% data is used as a test set to verify the effectiveness of the model. We can evaluate the effectiveness of the model by three indicators: accuracy, recall and F1 score. First, the accuracy rate refers to the proportion of samples that belong to a certain category in the actual situation when the prediction is made. Second, recall rate refers to the proportion of samples correctly predicted for a category when it is actually a category. Third, the F1 score value refers to the weighted comprehensive index of accuracy and recall.

The experimental results are shown in Table V, which reflect that we can predict user engagement behavior (y_1, y_2) through user attributes, and the results are satisfied.

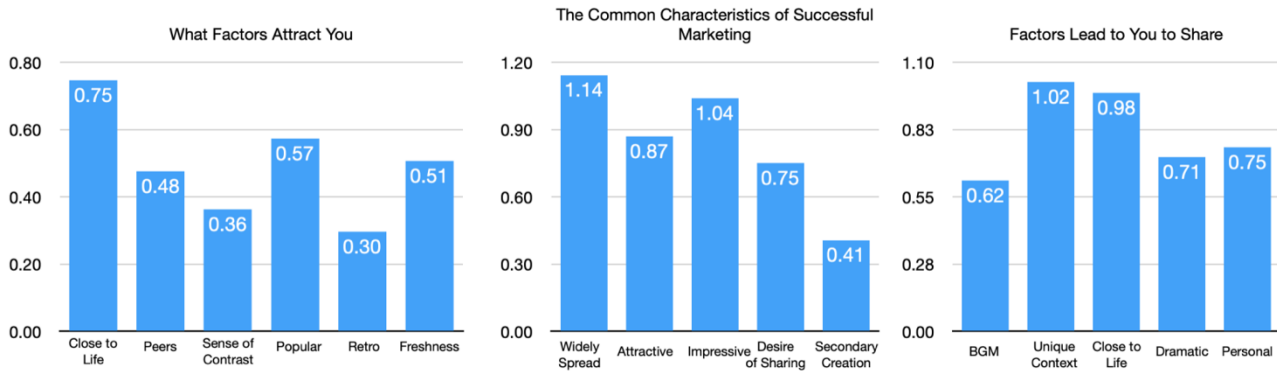


Fig. 4. User preferences of short videos

Table 5. LDA results

Task	Dataset	Sample Size	Precision	Recall	F1-score
y ₁	Train	240	82.61%	77.50%	79.97%
	Test	60	66.69%	81.67%	73.43%
y ₂	Train	240	74.57%	72.08%	73.30%
	Test	60	77.78%	78.33%	78.05%

5 Results and analysis

5.1 Discussion 1: Are short videos important to customer engagement?

According to our survey, more than 95% of the people have watched short videos related to catering, and about 81.2% of these people will go to relevant restaurants because of these short videos. This actually reflects that short videos can bring more customers.

Now that we know the importance of short videos, how to push relevant videos to specific people in the marketing strategy is even more important. In the previous section, we specifically analyzed this problem. We can use our LDA model to predict what kind of people are more likely to share and be affected (i.e., customer engagement) by short videos. When the target group is determined, we can spend less money to obtain better marketing results.

5.2 Discussion 2: What short videos do customers prefer?

When we determine the target audience, what style of short videos to make is also an significant issue. In order to better understand user preferences, we counted the results of User Preferences category in the questionnaire. As shown in Figure 5, the majority of people think that the reason for the successful marketing of these catering brands is wildly spread and impressive (brainwashing). It is worth noting that they do not think the user's secondary creation is critical. This actually reflects from the side that we need to focus on the widely spread point. As we mentioned before, it is important to learn how to predict target users. Whether from videos that attract users or those that arouse users' desire to share, their common features are close to life and have unique content, which

actually requires us to grasp the current popular elements and be close to life when marketing.

6 Conclusion

In this paper we first designed a questionnaire and collected hundreds of samples. Then, based on the samples, we analyzed the correlation between user attributes and customer engagement behavior. The LDA model is built to provide a model that can predict customer engagement behavior. The experimental results show that the method is effective. Finally, we also analyze users' preferences for short videos and give specific suggestions.

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Appendix

The following Table VI is the detail of our designed questionnaire, including categories, questions, choices, remarks and symbols in this paper.

Table 6. Details of the questionnaire

Categories	No.	Questions	Choices	Remarks	Symbols
	1	Gender	Male(1) / Female(2) / No-Binary(3)		X1
	2	Age	0- 18(1) / 19-22(2) / 23- 28(3) / 29-35(4) / 36-45(5) / 46-55(6) / 56+(7)		X2
	3	You are currently living or studying in	First Tier City (1) / New First Tier City(2) / Second Tier City(3) / Others (4)	Refer to Chinese Mainland city classification	X3
	4	Your occupation	Full-time Student(1) / In- Work(0)		X4
	5	Educational Background	High school and below(1) / Bachelor's degree(2) / Master's degree(3) / Doctor's degree(4)		X5
	6	The time that you use short video apps a day	0 mins - 30 mins(1) / 31 mins - 59 mins(2) / 1hr - 2hrs(3) / 2hrs +(4)		X6
	7	Average monthly disposable amount	0- 1000 RMB(1) / 1001- 3000 RMB(2) / 3001-6000 RMB(3) / 6000+ RMB(4)		X7
	8	Number of take-out orders in a week	0-3(1) / 4-5(2) / 6-10(3) / 10+(4)	Unit: Times	X8
	9	Preference for restaurant chain brands	From 0 to 10	From Dislike to Enjoy	X9
	10	Per capita consumption amount of the most frequently visited restaurant brands	0-50 RMB(1) / 51-100 RMB(2) / 101- 150 RMB(3) / 150+ RMB(4)		X10
	11	Do you sometimes share your daily life with friends on short video platforms?	Yes(1) / No(0)		X11
	12.1	Do you like the short video category: Delicacy?	Yes(1) / No(0)		X12
	12.2	Do you like the short video category: Funny?	Yes(1) / No(0)		
	12.3	Do you like the short video category: Anecdote?	Yes(1) / No(0)		
	12.4	Do you like the short video category: BGM Oriented?	Yes(1) / No(0)		
	12.5	Do you like the short video category: Cute?	Yes(1) / No(0)		
	12.6	Do you like the short video category: Life?	Yes(1) / No(0)		
	12.7	Do you like the short video category: Travel?	Yes(1) / No(0)		
	12.8	Do you like the short video category: Beauty?	Yes(1) / No(0)		
	12.9	Do you like the short video category: Tech&3C?	Yes(1) / No(0)		

	12.10	Do you like the short video category: News?	Yes(1) / No(0)		
	12.11	Do you like the short video category: Education?	Yes(1) / No(0)		
User Attributes	12.12	Do you like the short video category: Pets?	Yes(1) / No(0)		
	12.13	Do you like the short video category: Sports?	Yes(1) / No(0)		
	12.14	Do you like the short video category: Games?	Yes(1) / No(0)		
	12.15	Do you like the short video category: Cars?	Yes(1) / No(0)		
	12.16	Do you like the short video category: Others?	Yes(1) / No(0)		
	Custom Engagement	13	Have you ever went to a restaurant or drink store mentioned in a short video that you watched?	Yes(1) / No(0)	
14		Have you ever shared a restaurant or drink store on the short video plat- form?	Yes(1) / No(0)		y ₂
15		How likely are you to try it after watching ten short videos mentioning the same restaurant brand in five days?	From 0 to 10	From Impos- sible to Certain	y ₃
16		How likely are you to share videos that attract you?	From 0 to 11	From Impos- sible to Certain	y ₄
17		What are the chances of you trying to do what people do in short videos? -Take Haidilao birthday party as an example	From 0 to 12	From Impos- sible to Certain	y ₅
Other Information	18	Do you pay more attention to short videos that you can imitate?	Yes(1) / No(0)		
	19	Do you try to shoot short videos that you like?	Yes(1) / No(0)		
	20.1	Have you ever watched short videos about Haidilao?	Yes(1) / No(0)		
	20.2	Have you ever watched short videos about Helens?	Yes(1) / No(0)		
	20.3	Have you ever watched short videos about Mixue Ice Cream & Tea?	Yes(1) / No(0)		
	20.4	Have you ever watched short videos about KFC?	Yes(1) / No(0)		
	20.5	Have you ever watched short videos about Other brands?	Yes(1) / No(0)		
User Preferences	21.1	What paricular factors in the short video attract you, Close to life?	Yes(1) / No(0)		
	21.2	What paricular factors in the short video attract you, Peers?	Yes(1) / No(0)		
	21.3	What paricular factors in the short video attract you, Sense of contrast?	Yes(1) / No(0)		
	21.4	What paricular factors in the short video attract you, Popular?	Yes(1) / No(0)		

	21.5	What particular factors in the short video attract you, Retro?	Yes(1) / No(0)		
	21.6	What particular factors in the short video attract you, Freshness?	Yes(1) / No(0)		
	22.1	The common characteristics of successful marketing: Widely spread	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		
	22.2	The common characteristics of successful marketing: Attractive	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		
	22.3	The common characteristics of successful marketing: Impressive	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		
	22.4	The common characteristics of successful marketing: Desire of sharing	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		
	22.5	The common characteristics of successful marketing: Secondary creation	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		
	23.1	Factors lead to the your desire to share: BGM	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		
	23.2	Factors lead to the your desire to share: Unique content	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		
	23.3	Factors lead to the your desire to share: Close to life	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		
	23.4	Factors lead to the your desire to share: Dramatic	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		
	23.5	Factors lead to the your desire to share: Personal reason	Very inconformity (-2) / Somewhat inconformity (- 1)/ Hard to say(0) / Some- what conformity (1) / Very conformity (2)		