Research on Influencing Factors and Value Classification of Agricultural Crowdfunding Project Financing Performance
Based on Customer Transfer Value Theory

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ABSTRACT
Crowdfunding for agriculture provides a new social financing channel for agricultural funding, which is of great significance for promoting rural revitalization and targeted poverty alleviation. However, the current research on Chinese agricultural crowdfunding is still relatively backward, lacking quantitative and empirical research. This article selects 629 agricultural crowdfunding projects from April 1, 2019 to April 1, 2020 on the Jingdong crowdfunding platform as research samples, uses multiple regression analysis to finance agricultural crowdfunding projects based on customer transfer value theory, and analyzes the influencing factors of performance and establishes Agricultural Crowdfunding Project_Personnel value & Service value & Image value (ACP_PSI) classification model. The empirical results show that the personnel value, service value and image value of agricultural crowdfunding projects have a significant positive impact on financing performance, and the effectiveness of the ACP_PSI project value classification model is verified through empirical analysis. On this basis, countermeasures and suggestions for improving the financing performance of agricultural crowdfunding projects are proposed.

Keywords: customer transfer value theory, agricultural crowdfunding, influencing factors, multiple regression

I. INTRODUCTION

Agricultural crowdfunding is a new agricultural financing method, which relies on the Internet crowdfunding platform, directly realizes the two-way interaction between producers and investors, and connects people's small investment in projects together. It has the advantages of low financing threshold, small financing scale and flexible financing mode, so it can better match the financing needs of new agricultural business entities. Agricultural crowdfunding has been developed rapidly since it was introduced into China in 2014. At present, the platforms related to agricultural crowdfunding include crowdfunding network, Jingdong crowdfunding, Taobao crowdfunding, dot funding, etc. The Research Report on the development of China's agricultural crowdfunding was released by the crowdfunding data research institute. It shows that by the end of 2017, a total of 3457 agricultural crowdfunding projects had been released by 88 agricultural crowdfunding platforms, with a successful financing of 964 million yuan. At present, the way of online fund-raising, that is, using the Internet to carry out agricultural crowdfunding is becoming the mainstream mode of agricultural financing. Compared with the extensive application of agricultural crowdfunding in actual production practice, the domestic agricultural crowdfunding research is still relatively backward. The research mainly focuses on the qualitative research of the concept, characteristics, financing mode and domestic and foreign comparison of agricultural crowdfunding, [2] [3] [4] [5] [6] but lacks quantitative and empirical research. In view of the shortage of existing literature, this paper empirically analyzes the influencing factors of financing performance of agricultural crowdfunding projects based on customer delivered value theory, and establishes the project value classification model based on this, and then summarizes the effective countermeasures to improve the financing performance of agricultural crowdfunding projects, and provides personalized suggestions for project initiators.

II. LITERATURE REVIEW AND HYPOTHESIS

Foreign scholars began to study crowdfunding early, and the research scope is more extensive, and more quantitative research is carried out through empirical analysis. Belleflamme (2011) and ordanini et al (2011) defined the concept and characteristics of crowdfunding very early [7] [8]. Burtch et al (2013) took "online news project" as an example to explore the role of social influence in crowdfunding market, and found that the duration of crowdfunding and the exposure of publicity activities in crowdfunding process were positively correlated with the number of readers when the story was published [9]. Zheng et al (2014) explored the social network of the sponsors of crowdfunding projects based on the theory of social capital, and found that the identity of project sponsors and social networks have a profound impact on crowdfunding performance [10]. Mollick (2014) found that delay in the delivery of returns will have a negative impact on crowdfunding projects [11].

China's agricultural crowdfunding started relatively late, and there is a lack of quantitative and empirical research. There are only a few quantitative studies on the influencing factors of agricultural crowdfunding performance in China. Ruan Sumei and CAI Ruxue (2019) used the multiple linear regression model to analyze the influencing factors of the financing performance of agricultural products crowdfunding projects under the mode of "content social networking + crowdfunding". The research results show that the effect of social media publicity, the number of project reviews and the number of pictures have a significant positive impact on the financing performance of agricultural crowdfunding projects [12]. Tian Jie et al. (2020) from the quality signal, investor participation, project economy three dimensions of agricultural products It is found that compared with the quality signal, the "herding effect" in agricultural product crowdfunding is significant, and the target financing amount will affect the achievement rate of agricultural crowdfunding [13]. Based on customer delivered value theory, Huang Jianqing et al. (2015), Huang Manyu and Li Ruonan (2018) explored the main influencing factors of project financing performance from product, personnel, service, image value and monetary cost [14], [15].

With the aggravation of enterprise competition, customer demand-oriented business philosophy has been more widely used, and the theory of customer delivered value has also attracted the attention of scholars. The theory of customer delivered value refers to the actual value that the enterprise transfers and customers can feel, which is generally expressed as the difference between the total customer purchase value (including product value, service value, personnel value and image value) and the total customer purchase cost

(currency cost, time cost, spiritual cost and physical cost) [16]. Most of agricultural crowdfunding is reward crowdfunding. Project participants are more similar to consumers, and they will pay more attention to product returns. The actual value they can feel determines their participation behavior and investment, which coincides with the core idea of customer delivered value theory. Based on previous studies, combined with customer delivered value theory and characteristics of agricultural crowdfunding projects, the following assumptions are put forward.

Hypothesis H1: the higher the product value of agricultural crowdfunding project, the better its financing performance.

Hypothesis H2: the higher the value of agricultural crowdfunding project personnel, the better its financing performance.

Hypothesis H3: the higher the service value of agricultural crowdfunding project, the better its financing performance.

Hypothesis H4: the higher the image value of agricultural crowdfunding project, the better its financing performance.

Hypothesis H5: the higher the monetary cost of agricultural crowdfunding project, the worse its financing performance.

The assumption does not consider the cost of time, spirit and physical strength in the total cost of customers, because the participants of crowdfunding projects usually have clear personal preferences and needs, and can quickly select the target, and the project classification information and search function provided by the crowdfunding platform can effectively reduce the time and energy cost of screening.

III. RESEARCH DESIGN

Based on the above analysis of the factors influencing the financing performance of crowdfunding projects, combined with the theory of customer delivered value, the product value, personnel value, service value, image value and monetary cost of agricultural crowdfunding projects are selected as explanatory variables, and the financing performance is taken as the explanatory variable. The data of "Jingdong crowdfunding" was collected by the method of Octopus data collector and manual collection. The measurement indexes were selected, and the empirical and quantitative analysis was conducted by entropy weight method and multiple regression to verify the hypothesis.

A. Variable selection and assignment

In this paper, the explained variables are the financing performance of agricultural crowdfunding, and the explanatory variables are product value,

personnel value, service value, image value and currency cost. The selection and assignment of each

measurement index are shown in the following "Table I":

TABLE I.　　SELECTION OF MEASUREMENT INDEX AND EXPLANATION OF ITS ASSIGNMENT

Variable type	Metrics	Variable name	Assignment description
Financing performance (Y)	Financing ratio	Y_1	The ratio between the final amount raised and the target amount raised
Product Value (X_1)	Return product type	X_{11}	Finally, the return product types obtained by project investors are set as 1 for grain, grain and oil, 2 for tea and wine drinks, 3 for fruits and vegetables, 4 for fresh fish and meat, and 5 for leisure snacks
Personnel value (X_2)	Number of projects initiated by sponsors	X_{21}	Number of financing projects initiated by sponsors on the platform
	Number of sponsored projects	X_{22}	Number of times sponsors invest in projects on the platform
Service value (X_3)	Project progress update times	X_{31}	Number of times the project progress has been announced
	Is there a video	X_{32}	Whether the project has publicity video, yes = 1, no = 0
	Number of pictures	X_{33}	If the number of pictures is less than 5, it is set as 1, 5-10　Set to 2, more than 10 to 3
Image value (X_4)	Number of concerns	X_{41}	The number of times that the project is concerned by platform users
	Number of likes	X_{42}	The number of times the project was liked by platform users
	Number of topics	X_{43}	The number of times the project was commented by platform users
Monetary cost (X_5)	Minimum participation amount	X_{51}	The minimum amount to be paid to participate in the project

B. Sample selection and data sources

In this paper, "Jingdong crowdfunding", one of the largest Internet crowdfunding platforms in China, is selected as the experimental sample. The reason why this platform is chosen is that most of the public welfare sectors provide agricultural crowdfunding projects of "benefiting the people and helping the poor", which ensures the objectivity and representativeness of the research results. In this experiment, data of 825 agricultural poverty alleviation crowdfunding projects launched on the website platform between April 1, 2019 and April 1, 2020 were collected by using Octopus data collector and manual collection method. In order to make the research more accurate, the project data whose financing ratio (raised amount / target raised amount) is less than 0.1 and greater than 50 is removed, and 65 abnormal values in the research variables are removed. Finally, 629 valid samples are obtained.

IV. EMPIRICAL ANALYSIS

A. Data analysis method

1) The entropy weight method is used to determine the index weight and calculate the value of each variable: Entropy weight method is an objective weighting method, and its evaluation results are mainly based on objective data, which largely avoids the interference of human factors [17]. In the actual use process, the entropy weight method calculates the entropy weight of each index by using the information entropy according to the variation degree of each index, and then modifies the weight of each index through the

entropy weight, so as to obtain the more objective index weight. The specific calculation steps are as follows:

Step 1: determining the evaluation object, establish the evaluation index system, and construct the index level matrix R'

Step 2: standardizing the evaluation matrix R' to get the matrix

$$R = \left(X_{ij} \right)_{m \times n}$$

J is a positive index:

$$X_{ij} = \frac{X_{ij} - \min\{X_j\}}{\max\{X_j\} - \min\{X_j\}}$$

J is negative index:

$$X_{ij} = \frac{\max\{X_j\} - X_{ij}}{\max\{X_j\} - \min\{X_j\}}$$

Step 3: calculating the proportion of the j index value of the i-th project

$$Y_{ij} = \frac{X_{ij}}{\sum_{i=1}^{m} X_{ij}}$$

Step 4: calculating the information entropy of the jth index

$$e_j = -k \sum_{i=1}^{m} \left(Y_{ij} \times \ln Y_{ij} \right)$$

Step 5: calculating the weight of the jth index

$$W_j = \frac{1 - e_j}{\sum_j 1 - e_j}$$

Step 6: calculating the single index evaluation score

$$S_{ij} = W_i \times X_{ij}$$

Finally, the secondary index variables of the index $X_1 - X_5$ are integrated into a first level index variable. The calculation results of the index weight W_i are shown in the following "Table II":

TABLE II. CALCULATION RESULTS OF INDEX WEIGHT W_I

	X_1	X_2		X_3			X_4			X_5
		X_{21}	X_{22}	X_{31}	X_{32}	X_{33}	X_{41}	X_{42}	X_{43}	
W_i	—	0.149	0.851	0.566	0.407	0.027	0.232	0.530	0.238	—

2) Correlation analysis: Pearson correlation analysis of the independent variable X_1 -X_5 shows that the independent variables X_1 and X_4 , X_2 and X_4, X_1 and X_5, and X_3 and X_4 have weak correlation, and the correlation coefficients are less than 0.3, and the other independent variables can be regarded as uncorrelated.

3) Establishing multiple regression model: Let Y be the dependent variable and X_1, X_2, X_3, X_4 and X5 as the independent variables, and the error term is ε. The equation can be described as follows:

$$Y = B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + \varepsilon$$

Where B_0, B_1, B_2, B_3, B_4, B_5 are the parameters of the model.

B. Analysis and interpretation of regression results

1) Overall results analysis: The ANOVA of the regression model shows that the F value of the model is 15.359, P < 0.01, which indicates that the support of the original hypothesis, that is, the linear regression equation is significant. The specific results are shown in "Table III". The P values corresponding to the explanatory variables X_1 (product value) and X_5 (monetary cost) were greater than 0.05, which failed the test; the P values corresponding to X_2 (personnel value), X_3 (service value) and X_4 (image value) were all less than 0.05, with strong significance. The specific results can be referred to the table below.

TABLE III. ANALYSIS OF VARIANCE OF REGRESSION MODEL

Model	Sum of squares	F value	P value
multiple regression	3948.215	15.359	0.000

TABLE IV. TEST OF COEFFICIENT OF EACH VARIABLE IN REGRESSION MODEL

Explanatory variables	coefficient	T value	P value
constant	One	1.280	0.201
X_1	0.030	0.795	0.427
X_2	0.098	2.567	0.010
X_3	0.091	2.327	0.020
X_4	0.268	6.804	0.000
X_5	-0.006	-0.163	0.0871

2) The product value of agricultural crowdfunding projects has no significant impact on its financing performance: Product value is the value produced by the comprehensive influence of product function, characteristics, quality, variety and style, which is the key and main factor to determine the total purchase value of customers. However, due to the diversification and individuation of the current consumer demand, consumers have different product preferences and different value cognition for the same product; moreover, due to its own characteristics, agricultural products are easily restricted by natural conditions, with obvious seasonal and regional characteristics, which aggravates the inconsistency of project investors'

cognition of product value. There is no significant relationship between the product value of agricultural crowdfunding projects and its financing performance, assuming H1 is denied.

3) The personnel value of agricultural crowdfunding projects has a significant impact on its financing performance: Because the investors of agricultural crowdfunding projects can only understand the products through the text, pictures, videos and other information provided by the project sponsors, they can not actually contact the products and then make an effective evaluation of the product quality. Therefore, investors are more likely to believe the project sponsors who have project experience and are more familiar with

agricultural crowdfunding. In the topic area of the project, we can often see some investors who said that they had a good experience and were ready to support again when they bought the product of the project sponsor last time. This shows that the trust of investors on the project sponsor can be accumulated on the same crowdfunding platform.

4) The service value of agricultural crowdfunding projects has a significant impact on its financing performance: Compared with text, pictures and videos contain more information and can effectively show the characteristics of the project, which can bring more intuitive cognition and experience to investors. The more pictures and videos, the more information the investors get about crowdfunding projects and products, which effectively improves the willingness of investors to participate.The more frequent the project progress updates, the more investors will feel that the project is authentic, which can effectively enhance the willingness of potential investors to participate.

5) The image value of agricultural crowdfunding projects has a significant impact on its financing performance: The more people pay attention to, like and initiate topics, the more potential investors there are.At the same time, due to the information asymmetry, uncertainty and other factors in the process of crowdfunding, herd behavior is obvious in agricultural crowdfunding projects. If a project has been highly concerned, praised and evaluated by more investors, subsequent project visitors are more likely to be attracted and invest.Therefore, the financing performance of crowdfunding projects can be effectively improved by increasing the number of people who pay attention to the project, praise the project and initiate the topic.

6) The monetary cost of agricultural crowdfunding projects has no significant impact on its financing performance: Although reducing the investment threshold can attract more potential investors to a certain extent, investors often consider their own needs, products, services, image and other factors before making investment. Compared with the investment cost, the overall value of the project is more likely to be given priority. If the project does not meet the needs or the overall value of the project can not reach the level of satisfaction of investors, the perceived value to investors will be regarded as zero or even negative. And at present, the return products provided by agricultural crowdfunding projects are mostly food products, and the low monetary cost is easy to cause investors to doubt the quality and safety of products. Therefore, the performance of agricultural crowdfunding will not be affected too much by monetary cost.

C. Classification research based on project value

The process of agricultural crowdfunding can be summarized as follows: the project initiator publishes the project on the website, and the investors log on the website to select the project they are interested in and spend money to support the project. This process is similar to the online shopping process of customers. Customers with high loyalty or high value will visit the e-commerce website frequently and spend more money to buy goods on the e-commerce website. Similarly, projects with high value can attract more supporters and get more financing. This paper will use the RFM model widely used in the e-commerce field to identify and classify the value of agricultural crowdfunding projects [18], [19], [20].

1) ACP_Construction of PSI project value classification model: RFM model is one of the most representative models in customer segmentation model. The model describes the customer value status by three indicators: the recency of the customer's latest purchase, the frequency of the customer's purchase in a limited period of time, and the total amount of money purchased in a certain period. According to the above research and analysis, the personnel value, service value and image value of agricultural crowdfunding projects have significant impact on financing performance.

Therefore, the three index dimensions of RFM model are revised to ACP_P (agricultural crowdfunding project personnel value), ACP-s (service value of agricultural crowdfunding projects), ACP_I (image value of agricultural crowdfunding projects), and then get the value classification model ACP of agricultural crowdfunding projects_Psi is defined as follows ("Table V"):

TABLE V. ACP_PSI PROJECT VALUE CLASSIFICATION MODEL

Index	Index definition	Index characterization	Significance of indicators
ACP_P The Personnel value of agricultural crowd funding projects	Personnel value of agricultural crowdfunding projects	The value generated by the experience, qualification and professional ability of the sponsors of agricultural crowdfunding projects includes the number of projects initiated and the number of supported projects	ACP_There was a positive correlation between P value and project value_The higher the a value is, the more project experience the project sponsor has accumulated The higher the potential value
ACP_S The Service value of agricultural crowd funding projects	Service value of agricultural crowdfunding projects	The value of product introduction and product guarantee provided by the project to investors includes three factors: the number of project progress updates, whether there are videos and the number of pictures	ACP_There was a positive correlation between s value and project value_The higher the s value, the better the quality of service provided, and more likely to obtain more More financing
ACP_I The Image value of agricultural crowd funding projects	The project image value of agricultural crowdfunding	The value generated by the overall image of the project among platform investors includes the number of concerns, the number of topics and the number of likes	ACP_There was a positive correlation between ACI and ACI_The higher the I value, the better the image of the project in the minds of investors The higher the financing performance may be

2) Project value classification using k-means clustering algorithm: Means clustering algorithm is an unsupervised learning method, its main purpose is to minimize the sum of distances between points and their respective cluster centroids [21]. After repeated clustering, it is found that the classification number of 4 is the most reasonable. The specific classification results are as follows ("Table VI"):

TABLE VI. EXPLANATION OF PROJECT VALUE CLASSIFICATION RESULTS

Classification number	Number	Explain	Index values	Value judgment
1	330	The sponsors of this kind of project are lack of project experience, the projects initiated or supported are relatively few, the project and product introduction provided for investors are also insufficient, and the number of project concerns, likes and topics is relatively small	ACP_P (lower) ACP_S (very low) ACP_I (lower)	Low value
2	241	This kind of project can timely update the progress of the project and introduce the project to potential supporters through rich pictures or videos. However, the project sponsors are lack of project experience and the overall image of the project needs to be improved	ACP_P (lower) ACP_S (higher) ACP_I (lower)	Low value
3	51	This kind of project is very active on the platform and has received a lot of attention. The service such as project and product introduction provided by the project also has high quality, and the project sponsor also has certain project experience	ACP_P (higher) ACP_S (very high) ACP_I (very high)	High value
4	7	The sponsors of such projects have rich experience and experience of crowdfunding projects, and there may be word-of-mouth effect. Potential investors will pay more attention to the projects released by them. However, the product introduction and copywriting of such projects need to be improved	ACP_P (very high) ACP_S (lower) ACP_I (higher)	General value

TABLE VII. EMPIRICAL TEST RESULTS OF ITEM VALUE CLASSIFICATION

Classification number	Index values	value judgment	Actual crowdfunding
1	ACP_P (lower) ACP_S (very low) ACP_I (lower)	Low value	Of the 330 projects, nearly 30% of the project financing ratio is less than 1; The average value of project financing ratio is 3.261, which is the lowest among the four types of projects.
2	ACP_P (lower) ACP_S (higher) ACP_I (lower)	Low value	Nearly 30% of the 240 projects have financing ratios less than 1, but the average financing ratio of projects is slightly higher than that of category 1 Project, reaching 3.602
3	ACP_ACP (ACP) was higher_S (very high) ACP_I (very high)	High value	The financing ratio of 51 projects exceeded 1, and the average value of project financing ratio reached 8.836
4	ACP_P (very high) ACP_S (lower) ACP_I (higher)	General value	Among the 7 financing projects, the financing ratio of one project is less than 1, and the others are greater than 1. The average project financing ratio reaches 8.428. The reason may be that the number of such projects is small, and the financing ratio of one project exceeds 40, which makes the whole project financing ratio higher than 1 The body average is high

3) Empirical test results: The results of K-means clustering algorithm are analyzed with the collected data. ("Table VII")

Through empirical test, we can find that the results of project value classification are basically consistent with the actual results, which proves the established ACP_PSI project value classification model is effective.

V. CONCLUSION

Agricultural crowdfunding can effectively reduce the intermediate circulation links of agricultural products in the sales process and reduce the circulation cost, which is regarded as poverty. Regional characteristic agricultural products create new sales channels and effectively reduce agricultural risks, which is an important innovative measure of targeted poverty alleviation in China. Based on the customer delivered value theory, this paper studies the main factors influencing the performance of agricultural crowdfunding by using the agricultural crowdfunding data of "benefiting agriculture and poverty alleviation" on Jingdong crowdfunding platform. The results show that the personnel value, service value and image value of crowdfunding projects have a significant positive impact on the performance of agricultural crowdfunding projects. ACP was established based on the results of this study. The first mock exam is based on PSI value classification model. K is used to classify the project into 4 types. Finally, the validity of the model is verified by empirical analysis.

Based on the analysis of the factors influencing the financing performance of agricultural crowdfunding projects and the research results of project value classification, the following countermeasures and suggestions are put forward. First, if the personnel value, service value and image value of the project are found to be in a low-value state, the project is likely to be classified as a low-value project, and the financing performance may not reach the ideal state. In order to get rid of this dilemma, in the case of unable to quickly enhance the value of personnel, we can deeply excavate the story behind the agricultural products and sponsors, and present this real and touching story to investors by using exquisite pictures and videos, so as to convey more effective information to investors as much as possible, so as to enhance their trust in the project and enhance their willingness to invest, and pay attention to timely and detailed information Detailed update project progress. Moreover, it is necessary to make full use of the publicity effect of the media, enhance the attention and popularity of crowdfunding projects, and deeply understand the specific reasons for users' attention and praise, so as to increase the number of project topics, the number of people concerned and liked, and guide the positive "herd effect". Second, if the project sponsor has rich project experience, is very familiar with the

various processes of agricultural crowdfunding, and the project also has high image value, but the service value is in a low state, then we can consider adding the original investor's favorable pictures or food videos to the copywriting, which can not only improve the understanding of the project by potential investors, but also form a word of mouth effect that can improve the publicity effect and enhance the trust of investors. Third, if the sponsors are relatively inexperienced and the image value of the project needs to be improved, and only the service value reaches the ideal state, we can attract more potential investors to pay attention to the project through the activity of "focus + praise" to attract more potential investors to pay attention to the project and enhance the popularity of the project, so as to improve the financing performance of the project.

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