ORIGINAL RESEARCH

Sharing Reward Program Based on Face Consciousness in Social Media

Xiuli Han[1], Chunhua Ju[1,2], Fuguang Bao[1–3], Chonghuan Xu [ID][3,4], Yiling Zhu[5], Yufei Chen [ID][1]

[1]School of Management Engineering and E-Business, Zhejiang Gongshang University, Hangzhou, 310018, People's Republic of China; [2]Contemporary Business and Trade Research Center, Zhejiang Gongshang University, Hangzhou, 310018, People's Republic of China; [3]Academy of Zhejiang Culture Industry Innovation & Development, Zhejiang Gongshang University, Hangzhou, 310018, People's Republic of China; [4]School of Business Administration, Zhejiang Gongshang University, Hangzhou, 310018, People's Republic of China; [5]School of Foreign Languages, Zhejiang Gongshang University, Hangzhou, 310018, People's Republic of China

Correspondence: Fuguang Bao, School of Management Engineering and E-business, Zhejiang Gongshang University, Hangzhou, 310018, People's Republic of China, Email baofuguang@126.com

Purpose: In social marketing, sharing reward program (SRP) is a common way to improve the marketing effect. However, few studies have explored the impact of consumers' self-presentation and face consciousness on enterprise SRP. This study aims to explore the influence of these two factors on the optimal SRP.

Methods: A Stackelberg game between enterprises, sharers and potential consumers is developed to study the impact of sharers' face consciousness on enterprise's SRP. In order to discuss the impact of face consciousness on SRP in detail, we introduced status identity of commodity information, sharer's self-presentation preference and commodity price as exogenous variables in the research.

Results: The results have shown that when the face consciousness of sharers is high, enterprises are advised to adopt the strategy of low reward and low requirement. But when the face consciousness is low, it would be better for them adopt the strategy of high reward and high requirement. In addition, with the low face consciousness, the optimal SRP is also affected by the relationship between the price of goods and the number of WeChat friends of sharers.

Conclusion: The results suggest that when enterprises make incentive policies, considering consumers' self-presentation preference and face consciousness, the profit level can be effectively improved.

Keywords: face consciousness, sharing behavior, marketing strategy, game model, reward program

Introduction

Due to the influence of network externality and interpersonal relationships, the information utility between social media users plays a greater role in promoting consumers' purchase intention of goods in comparison to the traditional advertising marketing model. The empirical study made by Schmittet et al[1] has shown that the value of recommended customers is 16% higher than that of non-recommended customers with similar characteristics, confirming the benefits of recommended reward schemes in marketing practice. Therefore, more and more enterprises try to improve the effect of social marketing by recommending reward programs. Among the numerous social media, WeChat has become the largest platform in China with a penetration rate of 91%. Different from open platforms such as Chat, Weibo and Xiaohongshu, WeChat is a social interaction platform for acquaintances, which users are more likely to purchase for its lower trust costs. But in practice, the marketing effect based on social media is not satisfactory. Most of sharing reward programs in WeChat Moments cannot bring the expected benefits to enterprises. One reason lies in those enterprises think less about how many potential consumers can see and receive shared product information. Influenced by the owner's own attribute – face consciousness, when consumers share product information or commercial information, they would delete the product information soon after sharing to avoid losing face. As a result, less product information can be seen by potential consumers. Thus, enterprises also put forward a variety of strategies to solve this problem. Among these strategies, the Sharing reward program is one of the most common strategies, which requires consumers to collect a specified number of likes before

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receiving the reward. This kind of program can help increase the awareness of potential consumers about product information. In the actual marketing process, the effect of Sharing reward program does not meet the expectation of the enterprise. Since consumers receive rewards, the act of sharing is considered to be profit-driven rather than intrinsically motivated. Such inconsistency would cause consumers to worry more about losing face. As a result, some consumers are unable to complete the task given by the enterprise, and even refuse to accept the Sharing reward program. Therefore, it is necessary to consider consumers' face consciousness when making the Sharing reward program.

Personal behavior motivation is mainly divided into two categories: intrinsic motivation and extrinsic motivation. Intrinsic motivation is related to the satisfaction of certain psychological needs, which constantly influences individual behavior.[2] External motivation has to do with specific outcomes resulting from external factors.[3] Based on this classification, the economic rewards given by enterprises belong to extrinsic motivations, while the identification of goods belongs to intrinsic motivations. Since economic rewards may reduce consumers' willingness to share, in other word, extrinsic motivation has a negative impact on one's willingness to share, it is very important to make good use of intrinsic motivation to improve consumers' sharing motivation in the absence of economic rewards.

Self-presentation is the main intrinsic motivation for users to use social media, that is, users have the desire to display themselves when using social media.[4] The research[5] finds that in the process of information sharing, consumers not only pay attention to the content of information shared, but care deeply about whether the information shared is consistent with their own image, so they selectively convey information about themselves to the audience for positive image management. For example, if I am a fitness enthusiast, I am more likely to share information about fitness related products in order to maintain and strengthen my image of "I am a fitness lover". Commodity information identity is an important product information strategy to stimulate consumers' internal motivation of self-presentation, produce more positive willingness to share and share time. In social media, consumers can show their identity image to their friends by sharing product information on WeChat Moments. Merchants can also add some product information to the package of goods to stimulate identity, enhance the intrinsic motivation of consumers to share and then promote their sharing behavior. However, the academic circles have not paid enough attention to the influence mechanism of product information identity on sharing intention. Therefore, this paper mainly studies how the self-presentation motivation brought by product information identity affects consumers' willingness to share, and how the external motivation and face problems brought by economic reward affect the formulation of enterprise reward plan.

To sum up, this paper introduces self-presentation preference and product information identity to explore when enterprises should use Sharing reward program. By introducing the concept of face consciousness, the paper studies the influence of face consciousness on the Sharing reward program.

Theoretical Background
Types of Reward Mechanisms

According to the division and definition of persuasive WOM and informative WOM,[6] reward mechanisms in actual marketing can be divided into two categories: one is the reward mechanism based on persuasive utility, which gives rewards according to the sales volume brought by the sharing behavior, such as recommendation reward program; the other is the reward mechanism based on informative utility, which gives rewards according to the product views brought by the sharing behavior, such as Sharing reward program, threshold reward program, etc.[7] Jung et al[8] studied which type of referral reward structure was most effective in maximizing word-of-mouth. This research had shown that pro-social referral incentive schemes, namely the equal-split (50–50 split) and generous schemes (invitee gets all the reward), tend to dominate purely selfish schemes in creating WOM. Wolters et al,[9] the first time, investigated the impact of referral reward size on the profitability of referred new customers. Hu and Zhang[10] investigated the effectiveness of utilitarian and hedonic rewards in terms of recommendation generation, and on this basis considered the impact of gender differences. The experimental evidence provided by Zhang et al[11] shows that both the number and type of rewards have a positive impact on customers' subsequent referral of product information. Dose et al[12] demonstrated that rewards had a positive effect on the recommendation intention of recommending low-innovation products.

Jiang et al[13] show that when the relationship strength between sharers and recipients is weak, enterprises tend to reward more sharers. On the contrary, enterprises tend to reward recipients on social media. Jin and Huang[14] suggested that when the sharer receives the reward and it is known to the recipient, in the eyes of the recipient, the recommendation behavior is reward-driven rather than altruistic, and the sharer is self-interested or even opportunistic. Considering that, sharers worry about being seen as self-interested and thus reduce their recommendation intentions.[15]

The above research emphasizes more on the persuasive utility of information interaction between consumers, but less on the reward mechanism based on informative utility. Studies have shown that[16,17] information interaction between consumers affects potential consumers' perceived value of products not only through persuasive utility but also informative utility. With the development of social media, information interaction between consumers has become very convenient and frequent. The informative utility brought by information interaction has been clearly reflected in today's marketing practice. Therefore, based on the reward mechanism of the informative utility of consumers' sharing behavior, this paper studies the optimal decision-making problem of Sharing reward program combined with the characteristics of this program.

Face and Face Consciousness

The research on "face" is mainly carried out from the perspective of sociology and psychology. In terms of sociology, face is a kind of social construction that emphasizes the role of others on face, usually related to reputation, status and social norms. For example, Goffman[5] believes that face represents not only the social value advocated by an individual in a specific social interaction, but also the social value held by others. In terms of psychology, face is defined as an individual's internal self-image, evaluation, self-esteem or external image.[18,19] For example, Brown and Levinson[19] believes that face is a public self-image that an individual requires others to recognize. It is an emotional input that can be lost, maintained or increased, which requires constant attention in communication. Combining the points of both sides, Cheng[20] put forward a definition of face: objectively, face refers to "the social status recognized by members of the same society or other members of the community, which is commonly expressed as the social status or value recognized by special people on special occasions" Subjectively, face reflects "the value of individual self-esteem and its own importance to social relations or the whole society". To sum up, face is not only "social value or image recognized by others", but also an individual's perception and pursuit of image.

In addition, scholars also paid extensive attention to individuals' face consciousness. Face consciousness represents an individual's attention to face in various social behaviors. It is an individual's own property, not affected by a particular situation, and has a long-term and stable influence on individual's behavior. Chan et al[22] defined face consciousness as an individual's concern for the protection and promotion of face. Bao et al[21] defined face consciousness as the desire to enhance face, maintain face and avoid losing face in social interactions with others. The desire to gain face represents the individual's pursuit of a positive impression of others, while the fear of losing face represents the individual's fear of making a negative impression. The more sensitive individuals are to the consciousness of gaining or losing faces, the greater the impact of losing or gaining face will be, and the higher their face consciousness will be. Individuals with higher face consciousness pay more attention to their own image and social status, and they worry more about whether their behavior is recognized by others.[21] When they perceive that face is threatened, they have greater psychological and social concerns. Combined with the motivation extrusion effect, in the recommendation reward program, the external reward will weaken the internal motivation of the sharer.[23] As a result, the motivation of recommendation behavior changes from altruism or self-expression to interest-based motivation. Sharers may fear suspicion of their motives and feel their face is threatened. Cupach and Carson[24] showed that when a person loses face, he will take psychological defense measures. To save face, he may take pro-social behaviors, like reducing recommendation intention or the time of sharing.

Status Identity of Product Information and Self Representation

Status identity product information is a type of information that connects product information with a certain feature and identity, which helps improve product recognition of potential consumers, and then promotes consumers' participation.[24] Self-presentation, also known as impression management, refers to the process in which social individuals construct self-

images by presenting contents, methods and strategies when facing different objects and circumstances.[26] Individuals want others to see themselves in a more positive way.[27] In order to create and maintain a good image in the mind of others, people usually tend to engage in behaviors and performances consistent with their images.[28] Previous studies[29,30] have shown that displaying products through social media has become an important way for individuals to maintain and display their images. The research[2] confirmed that social media users will infer the image and identity of others through the product information released. The definition of self-presentation, also known as impression management, was first proposed by the sociologist Erving Goffman.[31] His "Dramaturgical Theory" compares an individual's self-presentation to stage performance. The stage is divided into front stage and back stage. The former is a place where individual actors idealize themselves with a group of specific audience, and the latter is the place where individuals show their true selves with no audience. In the front stage, people are more likely to give performance which caters to audience and creates a positive self-image. Piwinger and Ebert[32] believed that self-presentation referred to individuals' efforts to show themselves or influence others in order to make others see them in a way as they wish. Schlenker[33] defined self-presentation as the impression reflected in real or imagined social interactions. Brown[34] believed that self-presentation, as a common phenomenon in interpersonal communications, was a conscious process of impression control, which referred to people's efforts to establish, change or maintain their image in the eyes of others. Baumeiter[35] hold the opinion that self-presentation was a series of behaviors which individuals employed to communicate about themselves with others, with the intention of establishing, maintaining or improving their image in others' minds. People often regard social media as a stage for self-presentation and users of social media tend to present themselves in a specific way and enhance desired identity traits through carefully constructed profiles and published content.[36] Studies have found that people with a strong sense of self-presentation are more likely to adopt positive strategies of impression management and are more willing to share product information with others. Influenced by self-presentation, consumers are likely to be attracted by a particular type of product or brand. Qiang et al[25] demonstrated that status identity product information can improve the sharer's desire for self-presentation, and promote the sharer's recommendation behavior. Human behavior is driven by both extrinsic motivation and intrinsic motivation. Between them, intrinsic motivation is related to personal preference or satisfaction from participation behaviors.[2] Therefore, the recommendation behavior based on the need of self-presentation is driven by intrinsic motivation, and intrinsic motivation can lead to more persistent behavior.[37] As a result, for the sake of product recognition and self-presentation, shared product information may last longer.

The Motivation Crowding Theory Presented in Social Media

From the source of motivation, motivation can be divided into internal motivation and external motivation. According to the definition of intrinsic motivation in the "Self-Determination Theory" of Deci,[38] intrinsic motivation refers to the motivation to perform a certain behavior out of the interest or pleasure it can bring. While extrinsic motivation refers to the motivation to perform an action in order to obtain some external rewards that can be separated from the self. In 1997, Frey[2] proposed the "Motivation Crowding Theory", which describes the relationship between internal and external motivations. Its core idea is that according to the degree to which an individual perceives being controlled by external motivation, his or her external motivation will weaken or strengthen their internal motivation to perform a task. Then if the affected individuals think that they are under the control of external intervention, the external intervention will crowd out their internal motivation. That's the time when the motivation crowding theory works. At this point, both self-determination and self-esteem are weakened, and individuals choose to reduce their internal motivation to control activities.

Many scholars have studied the influence of the motivation crowding theory on users' behavior in social media. Vilnai-yavetz and Levina[39] combined self-report and experimental operation to study the motivation of users to share commercial information on social networks. The research results revealed the contradiction between self-report and experimental operation. The former indicated that internal motivation took a dominant place. The latter suggested that external motivation (like financial rewards) could evoke more willingness to share. The author believed that the motivation crowding theory could account for such phenomenon. In other words, under the motivation crowding theory, even though users' initial motivation to share is an internal motivation, the financial reward weakens their internal motivation and gradually transforms it into an external motivation. Rehnen, Bartsch and Kull et al[40] found through

empirical researches that monetary rewards might weaken users' autonomy, thus negatively affecting their willingness to do oral spreading on social media.

Consumers' sharing behaviors include spontaneous sharing, friendship sharing and reward sharing. We take the strategy of Sharing reward program as the research object based on this literature.[25] And the strategy mainly includes two aspects: the number of likes and the amount of reward. In this paper, we discussed the influence of sharer's self-presentation preference, face consciousness and status identity product information on the Sharing reward program. The specific analysis process is as follows: firstly, this paper discussed that when the sharer has a high self-presentation preference, enterprises do not need to provide economic incentives because the sharer would spontaneously release product information on the WeChat Moments; secondly, we analyzed the impact of face consciousness on Sharing reward program when the self-presentation preference is low and enterprises need to give rewards. This paper constructed a Stackelberg model between enterprise, sharer and recipient to calculate the optimal Sharing reward program under the circumstances that the enterprise is in game equilibrium.

Problem Description and Fundamental Assumption
Problem Description
An enterprise sells a product at the price of p, and there are already a number of basic consumers who have bought the product. Now, the enterprise plans to implement the Sharing reward program to expand marketing to its basic consumers. The enterprise promises that if the consumer releases product information on WeChat Moments and collects the specified number of likes, the enterprise will give the sharer a reward M. In the paper, we use the notation J to denote the number of likes.

The implementation process of the Sharing reward program is shown in Figure 1

Fundamental Assumption
Some of the basic symbols used in this article and their meanings are shown in Table 1.

H1: The reward structure of the enterprise's Sharing reward program is *(M, J)*. When the sharer releases product information on WeChat Moments and obtains the number of likes required by the enterprise, the enterprise will give the sharer rewards.

Social exchange theory points out that individual behavior decisions in social relations are based on the maximization of individual interests. Therefore, when there exist financial rewards, they will become the primary motivation for users to conduct their behaviors. In addition, Vilnai-Yavetz and Levina[39] combined self-report and experimental operation to study the motivation of users to share commercial information on social networks. The research results revealed the
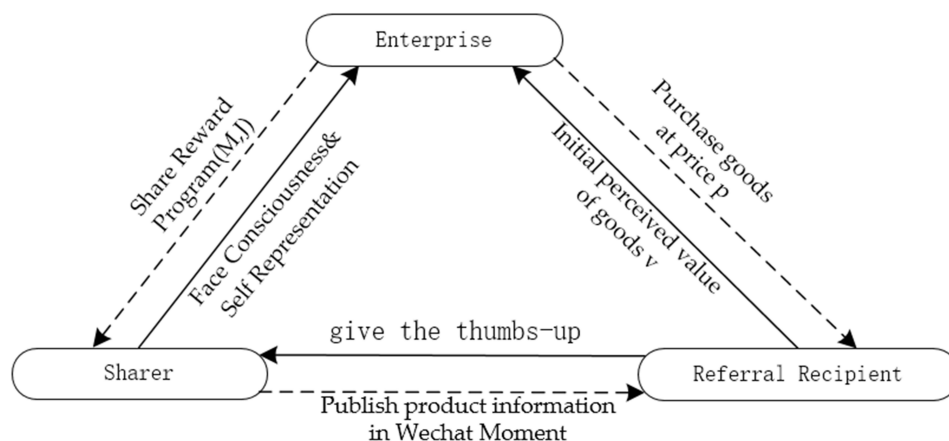

Figure 1 The implementation process of Sharing Reward Program (the dotted line indicates that the process may not occur).

Table 1 Basic Symbols and Parameter Description

Variable Name	Variable Meaning
ρ	Commodity price
α	Self-presentation preference
B	Commodity status identity degree
n	Face consciousness intensity
γ	Ratio of the maximum number of friends that a certain message can reach to the total number of friends without interference
δ	Sharer's influence in the circle of friends
P_r	Purchase probability of referral recipient
M	Reward amount
J	Number of collective likes required by enterprise
Π	Enterprise profit

contradiction between self-report and experimental operation. The former indicated that internal motivation took a dominant place. The latter suggested that external motivation (like financial rewards) could evoke more willingness to share. The author believed that the motivation crowding theory could account for this phenomenon. In other words, under the motivation crowding theory, even though users' initial motivation to share is an internal motivation, the financial reward weakens their internal motivation and gradually transforms it into an external motivation. The main purpose for users to use social media is to present themselves. People often regard social media as a stage for self-presentation and users tend to present themselves in a specific way and enhance desired identity traits through carefully constructed profiles and published content.[36] Based on it, we make hypothesis 2 and hypothesis 3:

H2: In the absence of economic rewards, the sharer's motivation to share commodity information all comes from self-presentation.

H3: With economic rewards, the sharer's motivation to share commodity information all comes from economic rewards.

H4: Without the Sharing reward program, the utility of sharers comes from the self-presentation effect R. Self-presentation utility is the self-perceived value of the sharer, which is jointly determined by the sharer's self-presentation preference α on online social media and the sharer's status identity B of the shared goods, that is $R = \alpha B$ When accepting the Sharing reward program, the utility of the sharer comes from the economic reward M of the enterprise.

The sharer's cost of sharing content on social media comes from presenting their own image.[41] When the information shared is inconsistent with their identity image, for example, if there is a commercial product with a reward message, the sharer will worry about whether the message will lead to the dissatisfaction of friends and thus result in the loss of face. To avoid losing face, sharers tend to reduce the time of sharing.[42] On this basis, we make the hypothesis 5:

H5: In the case of sharing reward, the sharing cost is the sum of image loss cost and fixed labor cost. The cost of image loss is determined by the self-image perception preference n and the number of likes J. According to Chu and Desai,[43] the effort cost satisfies the law of diminishing marginal output. In this paper, the number of likes J is regarded as the effort made by the sharer. Thus, the image loss cost of the sharer is nJ^2. And we use the notation e to denote the fixed labor cost, which includes the cost of photographing and uploading goods and editing copywriting. So the sharing cost of the sharer is $c(J) = nJ^2 + e$. Without economic reward, the motivation to share comes from the desire for self-presentation. The shared information is highly consistent with their own image, so the image loss cost is zero. That means the sharing cost is $c(J) = e$.

Differences among consumers' personal habits of using WeChat are not considered, such as whether they have the habit of deleting Moments on a regular basis. Due to the identification of the product or the matching of self-image with the product, sharers with higher self-presentation preference will not lose face by sharing information, but will strengthen their positive images, and bring themselves great satisfaction. Based on this, hypothesis 6 is made:

H6: The information released in WeChat Moments for self-presentation motivation can stay in Moments for a long time, and WeChat friends satisfying the maximum range can all receive the shared information.

Altruistic behavior is a kind of social behavior, whose motivation is to help others selflessly.[44,45] Individuals with higher altruistic preference are more likely to make prosocial behavior.[46] In addition, it is pointed out that altruistic behavior is more likely to occur in intimate relationships, such as family, relatives and friends.[47] In order to quickly reach the required number of likes after accepting the Sharing reward program, it is common for the sharer to share the product information attached with the request of "like". When WeChat friends see the request of "like", they will like it for altruistic motives. Therefore, the number of likes represents the number of friends who have seen this piece of information. Based on this, hypothesis 7 is made:

H7: The number of likes represents the number of friends who have seen this piece of information.

Without receiving the product information from the sharer, the initial value v brought by the same product to different consumers can be different, which accords with people's common sense. It can be assumed that the initial perceived values of potential consumers for the shared goods are uniformly distributed, ie, $v \tilde{U}[0,1]$. Moreover, the assumption that consumers' product values are distributed evenly has been widely used in many literatures related to operations management.[48–50] In addition, according to previous research results, potential consumers' perceived value of goods is positively influenced by the sharer's influence δ in WeChat Moments. Based on this, hypothesis 8 is made:

H8: After the product information shared by the share is received, the perceived value of goods to potential consumers is $v\prime = v + \delta$.

Construct and Analyze the Model of Sharing Reward Program

Utility function of referral recipients. After receiving the commodity information shared by the sharer, recipients make purchase decisions at the price of p, which is based on the initial perceived value v of the product and the sharer's influence δ in WeChat Moments. The utility function is:

$$u_R = v + \delta - p \tag{1}$$

Only when $u_R > 0$ can recipients purchase and enterprises make profits. The probability of the consumer's purchase is:

$$P_r(u_R > 0) = 1 - p + \delta \tag{2}$$

Utility function of sharers. According to hypothesis 2, 3 and 4, the utility function of the sharer has the following two situations:

One is when there exist economic rewards, the utility of the sharer comes from the economic reward of the enterprise, and there are certain personal image loss cost and fixed labor cost to be paid. Given the Sharing reward program of the enterprise (M, J), the utility function of the sharer is:

$$E(u_s(J)) = M - nJ^2 - e \tag{3}$$

The other is that in the case of no economic reward, the utility function of the sharer comes from the self-satisfaction utility of self-presentation motivation, and there are fixed labor costs to be paid. At this point, the utility function of the sharer is:

$$E(u_s(J)) = \alpha B - e \tag{4}$$

To sum up, the utility function of the sharer is:

$$E(u_s(J)) = \beta \left(M - nJ^2 - e \right) + (1 - \beta)(\alpha B - e) \tag{5}$$

$$\text{Among them, } \beta = \begin{cases} 0, when\ there\ is\ no\ economic\ incentive \\ 1, when\ there\ is\ econnomic\ incentive \end{cases}.$$

Profit function of enterprise. Enterprises take profit maximization as the principle, and formulate a reasonable strategy of Sharing reward program. The enterprise profit function is:

$$\Pi = \beta[pJPr\ (ur > 0) - M] + (1 - \beta)\ Pr\ (ur > 0)\ p\gamma m \tag{6}$$

Where, m—— the number of WeChat friends of the sharer

By solving the following model, the optimal incentive strategy is determined

$$\max \ \Pi = \beta \left[pJPr(ur > 0) - M\right] + (1 - \beta) \ Pr(ur > 0) \ p\gamma m$$

$$s.t. \begin{cases} E \ (u_s(J^*)) > 0 \\ p - M \geq 0 \\ M \geq e \end{cases} \tag{7}$$

Theorem 1: When the sharer's self-presentation preference is higher, i.e. $\alpha > \frac{e}{B}$, enterprises should not give incentives.

Theorem 1 proof: When $\alpha > \frac{e}{B}$, β is equal to 0. At this point, the profit function of the enterprise is:

$$\Pi = (1 - p + \delta) \ p\gamma m \tag{8}$$

Since the profit function does not involve the reward amount M and the required number of likes J, the profit in this case has nothing to do with whether the enterprise carries out the Sharing reward program. Therefore, the best reward strategy is not to implement any reward plan at all.

Obtain certificate.

Theorem 1 shows that when the self-presentation preference is high, the enterprise does not need to give additional economic rewards to the sharer, and the sharer will voluntarily choose to share product information on WeChat Moments due to the self-presentation motivation. Moreover, when there is no economic reward, the sharer would not constrain by face consciousness. And with no cost of image, the product information is able to remain in the moments longer.

It gives the enterprise an inspiration that as for the sharer with higher self-presentation preference and lower identity of goods, the enterprise should first promote the sharing behavior by improving the identity of goods based on the personal characteristics of the sharer, rather than giving economic rewards.

This inspiration can also be applied to other fields. For example, in the dissemination of public welfare information, the content producer of such information should first clarify the social identity of the information recipient and figure out the characteristics of the recipient so as to better design the content. In terms of the content of public welfare information, information like identity and emotional identity should be strengthened so that it can help promote the sharing behavior of public welfare information and improve the communication effect of the information.

The following content considers that the self-presentation preference is not enough to support the sharing behavior, and the enterprise needs to carry out the Sharing reward program to promote the sharing behavior:

Theorem 2: When the sharer's face consciousness is high, it exerts a negative impact on the optimal reward amount and the number of likes. When the sharer's face consciousness is low, the optimal reward strategy is not only related to face consciousness, but also related to the relationship between the price of goods and the number of WeChat friends of the sharer.

In order to make the conclusion more coherent, theorem 2 is expressed as theorem 2-1 and theorem 2-2 based on face consciousness. Details are as follows:

Theorem 2-1: When the sharer's face consciousness is high, i.e $n \geq \frac{p^2 \ (1 - p + \delta)^2}{4 \ (p - e)}$, the optimal reward strategy of the enterprise is $(M^*, \ J^*) = \left(\frac{p^2 \ (1 - p + \delta)^2}{4n} + e \ , \frac{p \ (1 - p + \delta)}{2n}\right)$.

Theorem 2-2: When the sharer's face consciousness is low, i.e $n < \frac{p^2 \ (1 - p + \delta)^2}{4 \ (p - e)}$, the optimal reward strategy of the

enterprise is $(M^*, \ J^*) = \begin{cases} (p, \sqrt{\frac{p - e}{n}}), p < n(\gamma m)^2 + e \\ (n(\gamma m)^2 + e, \gamma m), p \geq n(\gamma m)^2 + e \end{cases}$

Theorem 2-1 proof: When the self-presentation preference of the sharer is low, the internal motivation can not fully support the sharing behavior. At this point, the external economic reward of the enterprise is needed to increase the sharer's willingness to share. In this case, $\beta = 1$, the profit function of the enterprise is:

$$\max \ \Pi = pJ \ (1 - p + \delta) - M \tag{9}$$

The utility function of the sharer is:

$$E(u_s(J)) = M - nJ^2 - e \tag{10}$$

To ensure the maximization of enterprises' interests, the value of J should be as large as possible. Therefore, the value of J should be the maximum value of J when $E(u_s(J)) > 0$. Namely:

$$J = \sqrt{\frac{M - e}{n}} \tag{11}$$

Substitute Formula (11) into Formula (9), and the optimization model can be obtained as follows:

$$\max \ \Pi = p(1 - p + \delta)\sqrt{\frac{M - e}{n}} - M$$

$$s.t.\begin{cases} E \ (u_s \ (J^*)) > 0 \\ p - M \geq 0 \\ M > e \end{cases} \tag{12}$$

Take the derivative of profit Π with respect to M, and set $\frac{\partial \Pi}{\partial M} = 0$ to obtain the corresponding value of M when profit maximizes:

$$M^* = \frac{p^2 \ (1 - p + \delta)^2}{4n} + e \tag{13}$$

Combining formula (11), the optimal J value is:

$$J* = \sqrt{\frac{p^2 \ (1 - p + \delta)^2}{4n^2} + \frac{e}{n}} \tag{14}$$

According to the constraint condition $p - M0$, the value range of face consciousness applicable to this model can be obtained:

$$n \geq \frac{p^2(1 - p + \delta)^2}{4 \ (p - e)} \tag{15}$$

Obtain certificate.

Theorem 2-2 proof: Considering the actual situation, the sharer's face consciousness may not always satisfy the constraint of formula (12). For the sharer with low face consciousness, i.e. $n < \frac{p^2 \ (1-p+\delta)^2}{4(p-e)}$, the enterprise's reward amount M is always greater than the commodity price p. In this case, enterprises can choose appropriate reward strategies according to their own risk preferences. For enterprises with higher risk preference, the optimal reward strategy is theorem 2-1. For enterprises with low risk preference, the optimal reward strategy is theorem 2-2.

In order to ensure the basic profits of enterprises, theorem 2-1 stipulates that the maximum reward amount is equal to the commodity price, i.e $M_{\max} = p$.

In the case of low face consciousness, the enterprise reward amount is higher. Usually the higher the reward, the more likes are needed. Thus, the number of likes required may be greater than the maximum number of friends that can receive the moment message without interference, resulting in the sharer failing to meet the requirements of the enterprise. Therefore, when determining the reward amount, it is necessary to make a comparison between the price of the item and the maximum reward amount that the sharer can receive (when γm is required), and take the smaller value as the optimal reward amount.

According to formula (11), the sharer can receive the maximum reward amount:

$$M_{\max} = n(\gamma m)^2 + e \qquad (16)$$

Compare the values of M_{max} and p, and take the smaller as the optimal reward amount, that is $M^* = \min(M_{\max}, p)$. When $p < n(rm)^2 + e$, the optimal reward amount $M^* = p$, and the optimal number of required likes is $J^* = \sqrt{\frac{p-e}{n}}$; When $p \geq n(\gamma m)^2 + e$, the optimal reward amount is $M^* = n(\gamma m)^2 + e$, and the optimal number of required likes is $J^* = \gamma m$;

Obtain certificate.

Theorem 2 shows that when the sharer is highly sensitive to face, the enterprise can obtain certain benefits through this model regardless of the price of goods. But there is an upper limit to the benefits, which are directly proportional to the price of goods and inversely proportional to the face consciousness of the sharer.

When face consciousness and commodity price are low, enterprises with different risk preferences have different optimal reward strategies. For enterprises with low risk preference, the best reward amount is the commodity price. For enterprises with high risk preference, the best reward amount is the amount deduced from the model which is greater than the commodity price. When the price of goods is high, the optimal strategy is affected by the relationship between the price of goods and the number of WeChat friends of the sharer.

For the sharer with low face consciousness, getting a like costs less. In order to achieve a higher level of marketing effect, the optimal reward amount would be high. In this case, there are different choices for enterprises with different risk preferences. For enterprises with high risk preference, the best choice is to take the optimal reward amount deduced from the maximum profit model, which exceeds the price of the commodity itself. For enterprises with low risk preference, in order to ensure their basic interests, the best choice is to take commodity price as the amount of reward. The higher the price of goods, the higher the optimal reward amount becomes. What's more, since the face consciousness is low, the optimal number of likes required by the enterprise is higher, which may cause the number of likes required to be greater than the maximum number of friends that a piece of information can reach, and result in the sharer failing to meet the requirements of the enterprise, causing unnecessary waste to the enterprise. Therefore, in this case, we need to compare the relationship between the price of goods and the maximum reward amount (when $J = \gamma m$, and take the smaller value as the optimal reward amount. Accordingly, the best required number of likes is γm).

Sensitivity Analysis
Commodity Price
Figures 2 and 3 respectively analyze the change trend of reward amount with face consciousness when the price of goods is $p \leq \frac{1+\delta}{2}$ and $p > \frac{1+\delta}{2}$ under the condition of high face consciousness. Both figures show that the reward amount decreases with the increase of face consciousness, and the decreasing speed is from fast to slow.

For Figure 2, when $p \leq \frac{1+\delta}{2}$, the amount of the reward increases as the price increases. In actual marketing activities, the lower the price of goods, the higher the probability that potential users will buy it in general. When the price of goods increases slightly, the probability of purchase probability will drop slightly. The enterprise should make sure that the product information can be received by more potential consumers, so as to make up for the economic loss caused by the slight decline in purchase intention which is caused by the increase in commodity price. And the increase of commodity prices also improves the ability of enterprises to reward funds, so enterprises should appropriately increase the reward amount. On the whole, if the prices of goods is relatively low, the probability of potential customers to buy will be at higher levels. Even if the enterprise expands the scope of marketing by increasing the reward amount, the increase of the reward amount will not reduce the profitability of the enterprise. On the contrary, as more potential consumers receive the product information, the profitability will increase.

For Figure 3, when $p > \frac{1+\delta}{2}$, the reward amount decreases with the increase of commodity price. The reason is that when the price of goods is at a high level, the purchase probability of potential consumers is at a low level. Even if the enterprise expands the scope of marketing by increasing the reward amount, the purchase conversion volume will not increase significantly. With the further increase of the price of high-priced goods, the purchase
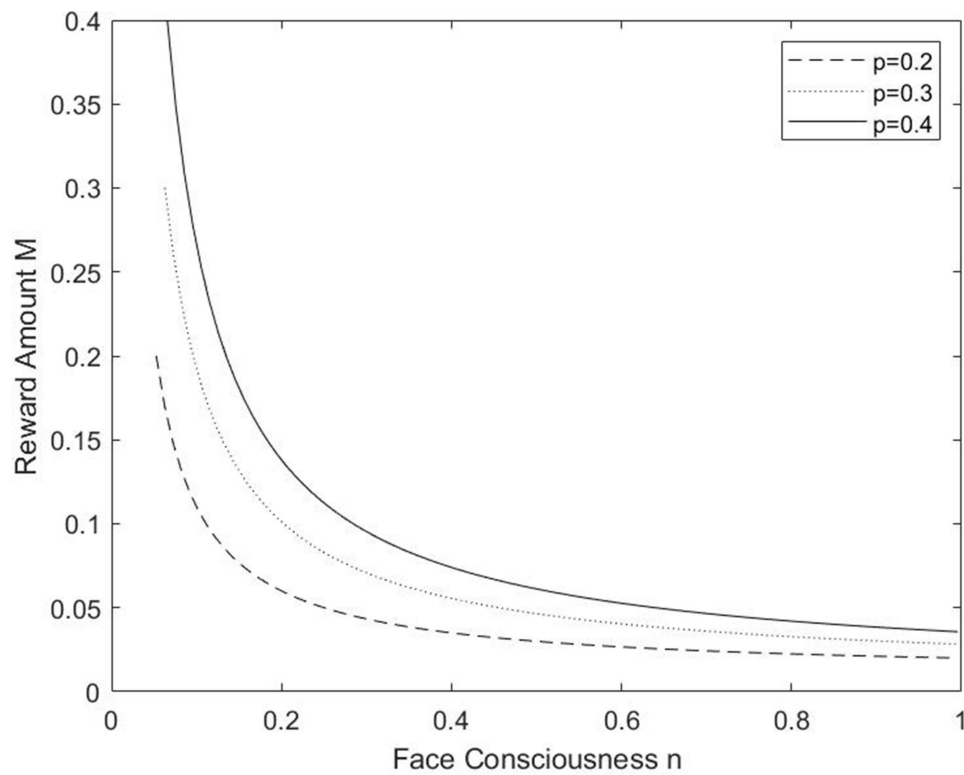
Figure 2 In the case of low price, the amount of reward varies with face consciousness.
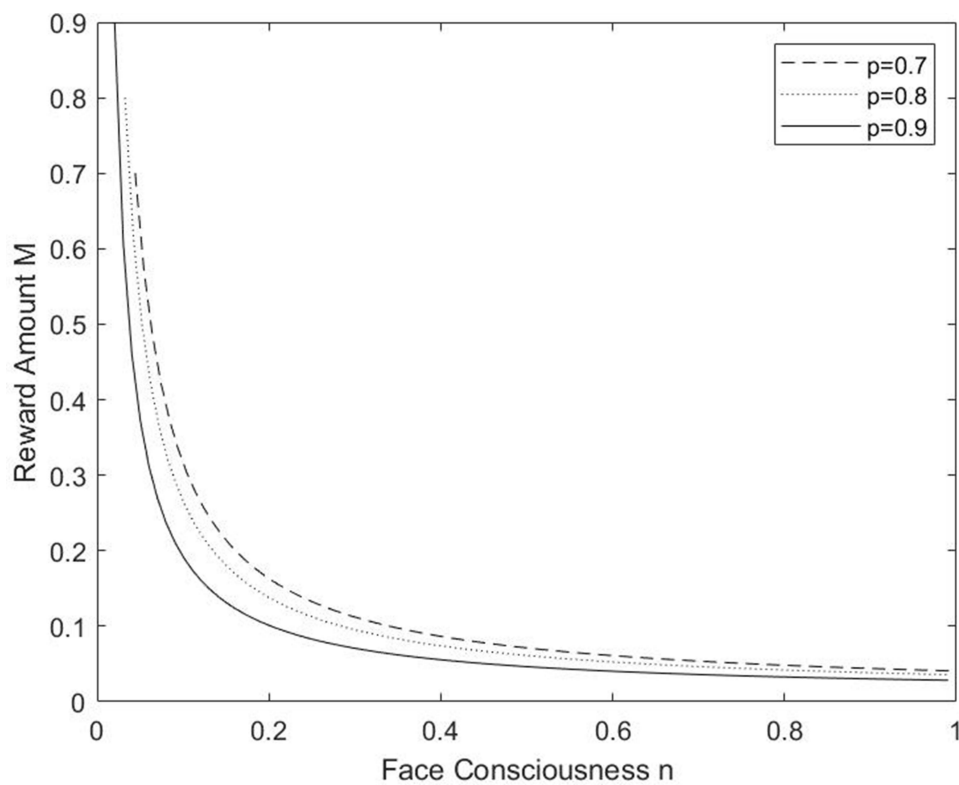

Figure 3 In the case of high price, the amount of reward varies with face consciousness.

probability of potential consumers decreases, so enterprises should be cautious to adopt a high-reward strategy for high-priced goods.

With different product prices, the change of the amount of likes J and the profit Π with face consciousness shows a similar trend to the reward amount. Their sensitivity is not analyzed here.

Face Consciousness

Figures 4 and 5 show how the reward amount and profit vary with the price of goods at different levels of face consciousness. When face consciousness is high, the reward amount remains low. When face consciousness is low, the reward amount fluctuates significantly, and the profit level is high. Therefore, for sharers with low face consciousness, enterprises are advised to adopt high-reward and high-demand strategies.

In addition, as can be seen from the Figure 5, the amount of rewards increases first and then decreases as the price increases. This is consistent with the conclusion of price sensitivity analysis above, that is, when the price is low, the amount of rewards increases with the increase of commodity price, while when the price is high, the amount of rewards decreases with the increase of commodity price. According to the calculation results of theorem 2-1, the commodity price corresponding to the maximum reward amount is $p = \frac{1+\delta}{2}$, which is also the one corresponding to the maximum profit. Therefore, $\frac{1+\delta}{2}$ is the optimal price of commodity.

Corollary 1: $p = \frac{1+\delta}{2}$ is the commodity price that maximizes the reward amount and profit, that is, $\frac{1+\delta}{2}$ is the optimal price of the commodity.

With different face consciousness, the change of the number of likes with price shows a similar trend with that of reward amount and profit. The sensitivity analysis is omitted here.
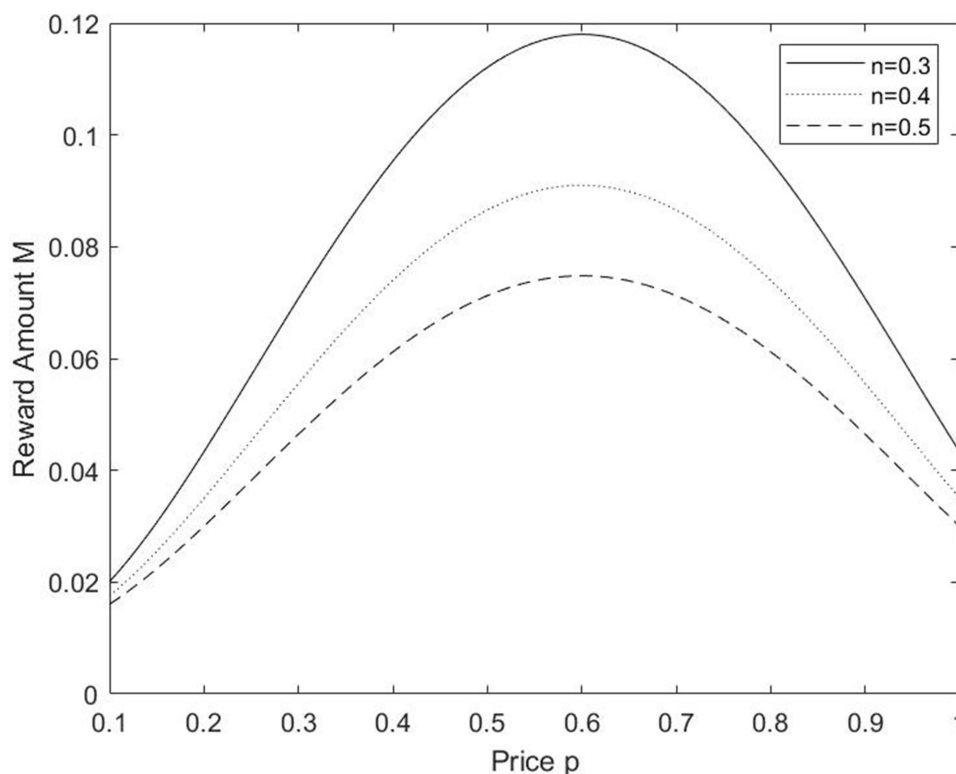

Figure 4 The variation trend of reward amount with price under different face consciousness.
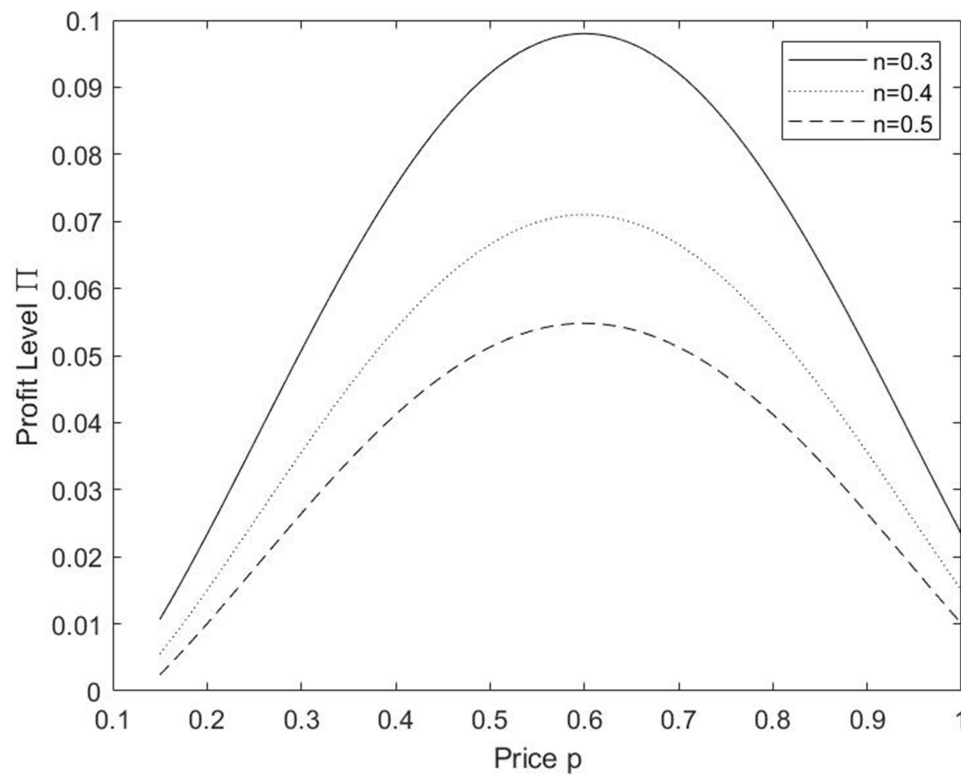
Figure 5 The variation trend of profit with price under different face consciousness.

Comparative Analysis

The advantages of the reward strategy in this paper are revealed through the comparison and analysis of the reward strategy in this paper and the general one adopted by enterprises in the actual situation.

Through investigation, it is found that in reality, the reward amount and the number of required likes are mostly influenced by the price of goods. In order to simplify the analysis, only the commodity price is considered as the influencing factor of the Sharing reward program in the actual situation. Based on the above situation, the following assumptions are made for the Sharing reward program:

Hypothesis 1: There is a linear relationship between the amount of rewards and the price of goods, and between the number of likes and the price of goods, the reward amount is $\omega_1 p$, and the number of required likes is $\omega_2 p$.

Where, ω_1 and ω_2 are the coefficients of the reward amount and the number of likes required.

Comparison Between Theorem 2-1 Strategy and Actual Strategy

The comparison of the optimal reward structure and the enterprise's expected profit level between theorem2-1 strategy and the actual strategy is shown in Table 2.

Table 2 The Comparative Result of the Optimal Reward Structure and the Enterprise's Expected Profit Level Between Theorem 2-1 Strategy and the Actual Strategy

Strategy	Reward Structure (M^*, J^*)	Profit Level $E(\Pi^*)$
Theorem 2-1 Strategy	$(\frac{p^2 (1-p+\delta)^2}{4n} + e, \frac{p (1-p+\delta)}{2n})$	$\frac{p^2(1-p+\delta)^2}{4n} - e$
Actual Strategy	$(\omega_1 p, \omega_2 p)$	$\omega_2 p^2(1 - p + \delta) - \omega_1 p$

In practice, there is no clear relationship between the reward amount, the number of likes and the price of goods, so it is difficult to determine the values of ω_1 and ω_2. In order to ensure the reliability of the results, this paper collects the reward strategy data of 200 merchants from the official website of Dianping and analyzes the relationship between the number of likes and the reward amount. The Figure 6 shows the distribution of the ratio of the number of likes to the amount of rewards.

From the Figure 6, it can be seen that the ratio of the number of likes to the amount of rewards generally follows a normal distribution, with the ratio mainly concentrated between 0.5 and 1.5, ie, $\omega_2/\omega_1 \subset [0.5, 1.5]$. In addition, according to actual data, the reward amount generally accounts for 0% to 20% of the price of the goods, ie $\omega_1 \subset [0, 0.2]$. To make ensure that there are sufficient reasons to ensure the validity of the model in this strategy, this paper takes the values of different combinations of ω_1 and ω_2 so as to make the profits of the actual strategy as large as possible. The values of ω_1 and ω_2 can be determined as follows:

$$\max \ \Pi = \omega_2 p^2 \left(1 - p + \delta\right) - \omega_1 p$$

$$
\begin{cases}
\omega_1 p - n(\omega_2 p)^2 - e \geq 0 \\
n \geq \frac{[\, p\,(1-p+\delta)\,]^2}{4\,(p-e)} \\
0 \leq \omega_1 \leq 0.2 \\
0.5 \leq \frac{\omega_2}{\omega_2} \leq 1.5
\end{cases}
$$

.

By solving the above model, the best values of ω_1 and ω_2 are 0.2 and 0.3, respectively.

Combined with Table 2, simulation experiments are conducted to verify the validity of theorem 2–1 strategy. The specific simulation process is as follows:

In simulation experiment I, a total of 91 sets of data were selected, that is, the number of sharers increased from 100 to 1000 at intervals of 20.

The sample quantity of each data is the number of sharer, and each sample data includes sharer's face consciousness, sharer's integrity level, commodity price, and effort cost.
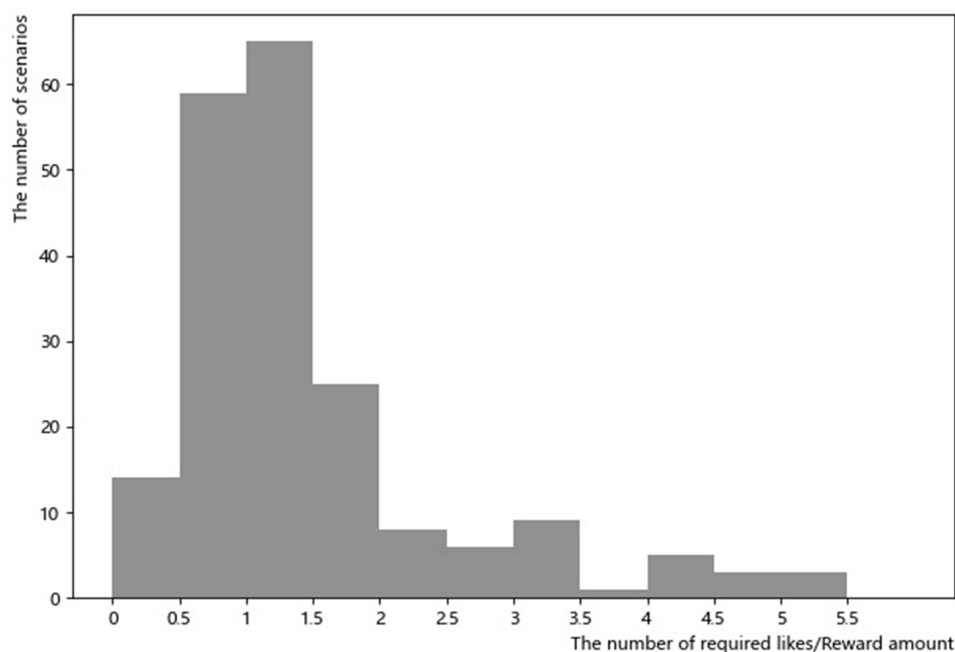
Each group of data is processed as follows:

Figure 6 Distribution map of the ratio of likes to Awards.

The first step is to randomly generate the values of the sharer's face consciousness, integrity level, commodity price and effort cost on a scale of 0–1. The sample number is the number of sharers.

The second step is to determine the reward amount and the number of likes required for the sharer in the actual strategy according to the values of ω_1 and ω_1 determined above.

The third step is to calculate the profit level brought by this group of sharers when the strategy in theorem 2-1 is adopted.

The fourth step is to calculate the profit level brought by this group of sharer when the actual strategy is adopted. The specific steps are as follows: For each sharer, judge whether the current reward strategy is effective, that is, judge whether the sharer's utility function $E(u_s(J)) = (\omega_1 p)^2 - n(\omega_2 p)^2 - e$ is greater than 0. If so, calculate the profit brought by the sharer according to the profit level function of the actual strategy $\omega_2 p^2(1 - p + \delta) - \omega_1 p$; If not, increase the number of people who refuse to accept the reward strategy by 1. Loop until all sharers in the group are iterated. Then go back to the first step.

The simulation results are shown in Figure 7:

As can be seen from the Figure 7, in the case of high face consciousness of the sharer, the profit level of the enterprise does not increase with the increase of the number of sharers, but fluctuates around a fixed profit level. But on the whole, the profit level of theorem 2-1 strategy is always higher than that of the actual strategy. This is mainly because the actual strategy ignores the sensitivity of consumers' face consciousness. Since it does really exist, some consumers will reject the enterprise's reward program of collecting likes for this reason, which is in fact the loss that the enterprise ignores in the actual strategy.

In conclusion, when the face consciousness of the sharer is high, that is, the face consciousness $n \geq \frac{p^2 (1-p+\delta)^2}{4(p-e)}$, considering the factor of face consciousness when making the Sharing reward program can effectively improve the profit level of the enterprise.
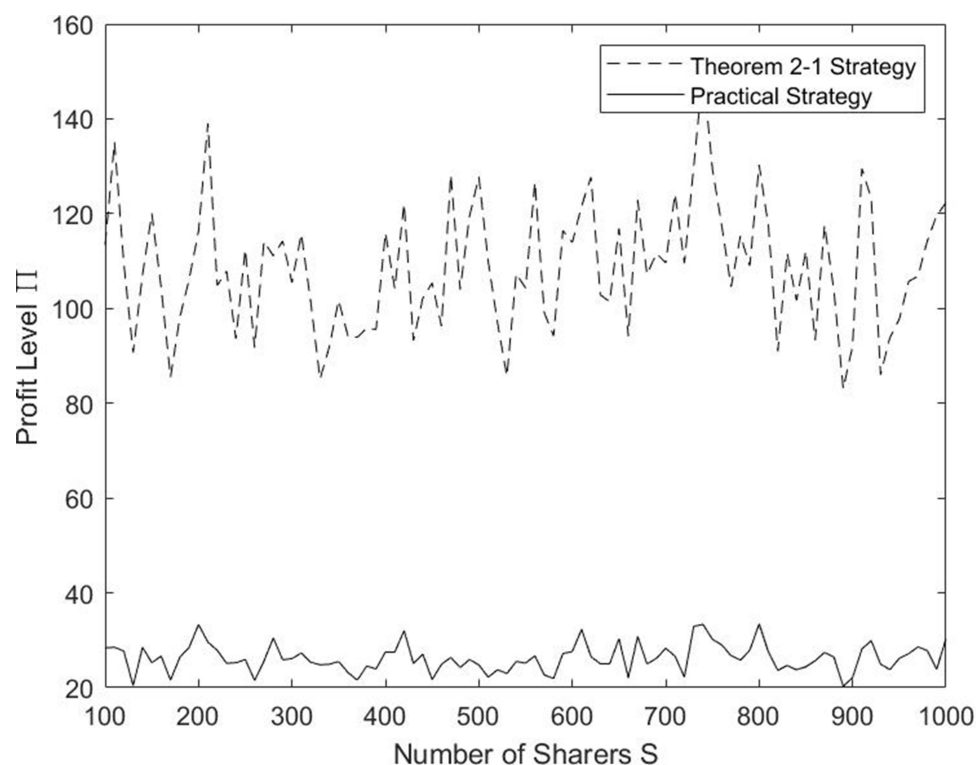

Figure 7 The profit level comparison between Theorem 2-1 strategy and actual strategy.

Comparison Between Theorem 2-2 Strategy and Actual Strategy

The comparison of the optimal reward structure and the enterprise's expected profit level between theorem2-2 strategy and the actual strategy is shown in Table 3

Here the values of ω_1 and ω_2 can be determined by the model below:

$$\max \Pi = \omega_2 p^2 (1 - p + \delta) - \omega_1 p$$

$$\begin{cases} \omega_1 p - n(\omega_2 p)^2 - e \geq 0 \\ n \leq \frac{[p (1-p+\delta)]^2}{4 (p-e)} \\ 0 \leq \omega_1 \leq 0.2 \\ 0.5 \leq \frac{\omega_2}{\omega_2} \leq 1.5 \end{cases}$$

By solving the above model, the best values of ω_1 and ω_2 are 0.2 and 0.3, respectively.

In simulation experiment ii, a total of 91 sets of data were selected, that is, the number of sharers increased from 100 to 1000 people at intervals of 10. The sample number of each set of data is the number of sharers, and each sample data includes sharer's face consciousness, sharer's integrity level, commodity price, and effort cost. Each set of data is processed as follows:

In the first step, the values of the integrity level, the number of WeChat friends and the price level of goods in the range of 0–1 are randomly generated, and the fixed effort cost of the sharer is determined as a small fixed value.

The second step is to determine the reward amount and the number of likes required for the sharer in the actual strategy according to the values of ω_1 and ω_2 determined above.

The third step is to calculate the profit level brought by this group of sharers when the strategy in theorem 2-2 is adopted.

Fourth, calculate the profit that the sharer brings to the enterprise when the actual strategy is adopted. The specific steps are as follows: judge whether the reward strategy of the sharer can take effect, that is, and judge whether the utility function of the sharer is greater than 0 under the reward strategy. If so, calculate its profit according to the formula $\omega_2 p^2 (1 - p + \delta) - \omega_1 p$; If not, the number of people who refuse to accept the reward strategy will be increased by 1. Then go back to the first step.

The simulation results are shown in Figure 8.

The Figure 8 shows that in the case of low face consciousness, no matter which strategy is adopted, the profit level increases with the number of sharers. And the profit level of theorem 2-2 strategy is significantly higher than that of the actual strategy. Also, with the increase of the number of sharers, the advantage of theorem 2-2 strategy is more obvious.

To sum up, in the case of theorem 2-2 strategy, namely, face consciousness, $n < \frac{p^2 (1-p+\delta)^2}{4 (p-e)}$ considering the factor of face consciousness can greatly improve the profit level and marketing effect when enterprises design the Sharing reward program.

Corollary 2: Based on the above comparative analysis, it is concluded that taking face consciousness into consideration when formulating the Sharing reward program will greatly improve the profit level of the enterprise. And when the number of sharers is large and the face consciousness is low, the profit of the enterprise reaches the maximum.

Table 3 The Comparative Result of the Optimal Reward Structure and the Enterprise's Expected Profit Level Between Theorem2-2 Strategy and the Actual Strategy

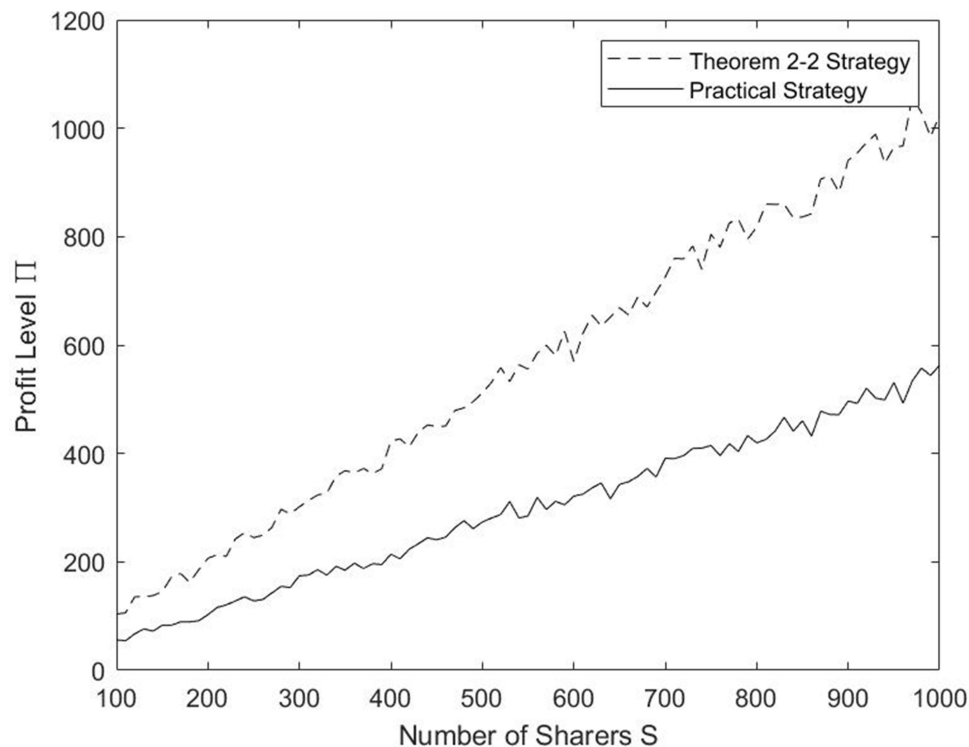| Strategy	Condition	Reward Structure (M^*, J^*)	Profit Level $E(\Pi^*)$
Theorem 2-2 Strategy	$p < n(\gamma m)^2 + e$	$(p, \sqrt{\frac{p-e}{n}})$	$p (1 - p + \delta)\sqrt{\frac{p-e}{n}} - p$
	$p \geq n(\gamma m)^2 + e$	$(\gamma mn^2 + e, m)$	$p\gamma m(1 - p + \delta) - n(\gamma m)^2 - e$
Actual Strategy	None	$(\omega_1 p, \omega_2 p)$	$\omega_2 p^2 (1 - p + \delta) - \omega_1 p$

Figure 8 The comparison of the profit level between Theorem 2-2 strategy and the actual strategy.

Discussion
Supporting for the Findings

Previous research on recommendation reward programs has shown that financial rewards somewhat weaken the motivation of sharers to share. Through empirical research, Rehnen, Bartsch and Kull et al[40] found that monetary rewards may weaken users' autonomy, thus negatively affecting their willingness to do oral spreading on social media. This is consistent with the research results of this paper, that is, when consumers' internal motivation is enough to support their sharing behavior, businesses should not give them economic rewards, otherwise it will discourage consumers' willingness to share. In addition, in the actual marketing, consumers with high face consciousness are usually very cautious to post information in Moments and they try to avoid releasing information that may cause them to lose face. Normally, enterprises will not give consumers some tough tasks, considering that they are unlikely to complete the task due to their face consciousness. However, for consumers with low face consciousness, they are more likely to post information in Moments and have less worries about whether it will make them lose face. Enterprises usually offer reward programs of collecting likes to these consumers and ask them to collect as many likes as possible. All these real facts confirm the conclusion of this paper.

Contributions

This research has certain theoretical and practical significance. From the perspective of theoretical significance, this study expands the scenario of recommendation reward program, analyzes the influence of internal and external motivations on one's willingness to share, and focuses on how the face consciousness affects the enterprise's reward program of collecting likes. From the perspective of practical significance, this paper focuses on exploring the influence of self-presentation and face consciousness on the enterprise's reward program of collecting likes. This will further help enterprises optimize their reward programs. For example, when choosing sharers, the enterprise should actively seek those with higher preference for self-presentation. Also, when writing product information, the enterprise is supposed to write the content that can reflect users' identity and their unique

preferences in order to stimulate user's motivation for self-presentation. When formulating the reward program, the enterprise should use different strategies for sharers with different intensity of face consciousness.

Limitations

However, we have only analyzed the optimization problem at the stage of completing the task and receiving the reward, which does not involve the subsequent attention of the sharer and his willingness to share goods of the enterprise. In addition, the Sharing reward program is a marketing strategy with strong contractual characteristics. Some studies[51–55] showed that the marketing strategy with strong contractual characteristics is not conducive to sharers' subsequent attention and promotion of the enterprise. Therefore, how to reduce the "contractual" nature of similar programs like threshold reward program and strengthen the attention of sharers to the enterprise is the direction of our future research. And we also will apply the research results into various fields including business data processing,[56–59] sustainable tourism[60,61] and so on.

Conclusions

Considering the face consciousness in the Sharing reward program, this paper establishes an optimization model of the behavior rules of enterprises, sharers and potential consumers, and studies the optimal combination of reward amount and the number of likes in the Sharing reward program. The main conclusions are as follows:

i. When the face consciousness is high, enterprises should carefully adopt the strategy of high reward and high demand. For commodities with higher price, the optimal reward amount should decrease with the increase of commodity price, while for commodities with lower price, the optimal reward amount should increase with the price of goods.

ii. When the sharer's face consciousness is low, it is suitable for the enterprise to take the strategy of high reward and high demand. Moreover, for commodities with low price, enterprises with different risk preferences have different optimal strategies: for enterprises with high risk preferences, the optimal reward amount is higher than the commodity price calculated by the optimization model, while for enterprises with low risk preferences, the commodity price is the optimal reward amount. For commodities with higher price, it is necessary to make a comparison between the price of goods and the reward amount corresponding to the maximum number of likes, and take the smaller value of the two as the best reward amount.

To sum up, the Sharing reward program based on the sharer's face consciousness is complicated to some extent. This paper analyzes the changing rules among commodity price, self-presentation preference, face consciousness and profit level, and then studies and designs the optimal Sharing reward program, which has a high guiding significance for marketing practice. In actual marketing, this strategy can be widely applied to the threshold reward program.

Data Sharing Statement

The data used to support the findings of this study are available from the corresponding author upon request.

Disclosure

The authors declare that there is no conflict of interest.

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