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Analysis of optimal referral reward programs for innovative offerings

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Abstract: A nested Stackelberg game among a provider of a product, a sender (existing customer), and a receiver (new customer) is developed to explore the optimal referral reward programs (RRPs) for innovative offerings. The results indicate that the provider should forsake RRPs and purely rely on customers' organic word-of-mouth communication under certain conditions. In particular, when the innovativeness of the referred product is extremely high, the provider should forsake RRPs completely, even though few customers will make organic referrals for the product. When the innovativeness is on other levels, the provider should make optimal RRPs decision depending on both the sender's persuasion effectiveness and the tie-strength between the two customers. Moreover, the optimal rewards increase with the innovativeness of the referred product when the provider opts to use RRPs. These results seem contrary to the existing empirical finding to some extent, and it is due to the high referral cost for making a successful referral for the high innovative offerings.

Key words: referral reward programs; innovativeness; social value; social media marketing; Stackelberg game

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The offerings with high innovativeness are so novel in the market that customers are unfamiliar with these offerings or lack the knowledge and skills to make use of them. Although the providers invest much in traditional marketing forms which rely on business-to-customer communication, the potential customers still perceive high risk cost with the innovative offerings after they receive the information about them. It seems more effective for the innovative offerings promotion to depend on word-of-mouth marketing which relies on customer-to-customer communication. Referral reward programs (RRPs), in which providers encourage the existing customers to recommend a product or service to their friends by offering rewards (e.g., coupons, gifts, cash) strategically, act as popular means of word-of-mouth marketing strategies[1-2].

RRPs are not new in marketing practices. The popularity of social media, such as Facebook, Wechat and Microblog, greatly promotes the implementation of online RRPs in electronic commerce, such as share for rewards on Taobao.com, carving up mobile traffic packages from China Mobile, and inviting for prizes on other online platforms. Despite the prevalence of RRPs, the providers often voice opinions that RRPs are not as effective as desired. Hence, providers need to answer the following questions before making decisions on RRPs: Do RRPs work under current conditions for providers? If RRPs work, how do the providers design the most effective reward programs? By reviewing the existing literature addressing RRPs, we find that few of them focus on the RRPs for innovative offerings. Therefore, we try to bridge the gap by investigating the impact of innovativeness of offerings on the providers' decision-making for optimal RRPs.

The existing research on RRPs mainly focused on examining the effectiveness of provider-offered rewards through empirical studies and exploring the optimal decision on RRPs by developing mathematical models. From the outset, the empirical works focus on the sender's response to provider-offered rewards, and find that the rewards are effective in increasing the sender's referral likelihood[3]. Reward programs also influence the receiver's acceptance to the referred offerings[4]. Compared with the organic word-of-mouth, the provider-stimulated word-of-mouth produces less positive effects on receiver's purchase likelihood due to the receiver's skepticism of the rewarded sender[1,4]. Furthermore, the skepticism increases the sender's perceived social risk, and thereby reduces the sender's referral likelihood in turn[5-8]. Wang et al.[9] investigated the impact of the reward programs on receivers' response from the perspective of behavior norms, and pointed out that the reward structures impact customers' behavior norms transformation between the social norm and market norm, which further influences the referral's effectiveness. Dose et al.[10] were the first to investigate how innovativeness of the offerings affects the effectiveness of RRPs, and found that the innovativeness positively influences customers' referral likelihood.

To our knowledge, Biyalogorsky et al.[11] were the first to examine the conditions under which it is optimal

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for the provider to reward the existing customers for making referrals. Consequently, there has been a surge of interest in managing word-of-mouth. Godes et al.[12-13] proved that social interactions and social networks can influence the effectiveness of word-of-mouth spread, and providers play an important role in it. RRPs, the effective mechanism of managing word of mouth with explicit reward programs, have been examined in many analytical studies. These studies have hitherto focused on providing guidance about when rewards should be offered to existing customers[14-17], giving advice about the referral payment policies (linear payment or threshold payment)[17], and the impact of RRPs on traditional forms of marketing strategies or on the mixed strategies[18-21].

The majority of the works mentioned above purely concentrate on the incentive effect of provider-offered rewards on customers. In particular, there is no analytical work further taking the innovativeness of offerings into account. Besides the provider-stimulated referrals motivated by the rewards, organic referrals which occur in absence of reward programs are common on social media. What motivates the customers to make organic referrals? It can be explained from the aspects of behavioral economics and psychology which suggest that the motives behind people's social activities include not only self-interest motives but also altruism motives[22]. The customers making organic referrals purely aim to help others by providing knowledge about the offerings for the interpersonal incentives produced by altruism. Taking this kind of interpersonal incentives into consideration, we assume that the utilities of customers obtained from successful referrals include provider-offered rewards and the interpersonal incentives called social values in this paper. Combined with the findings of Ref. [10], we further assume that customers will obtain higher social value from successful referrals for more innovative offerings. Based on the above two assumptions, we try to answer the following questions in this paper.

- Under which condition should the provider use RRPs?
- If the provider opts to use RRPs, how does the innovativeness of offerings influence the provider's decision on optimal RRPs?

We develop a nested Stackelberg game model among a provider of an innovative product, a sender and a receiver to explore the optimal decision on RRPs for the innovative product by taking the social value of customer referral into consideration.

1 Model Setup

Suppose that an existing provider offers its product with innovativeness h at price p to all of the existing customers. The provider intends to attract new customers by stimulating the existing customers to make referrals. In our model, p is given exogenously. The provider can offer a RRP to a random existing customer with rewards r ($r \geqslant 0$). If the provider uses reward programs, then $r > 0$; if the provider forsakes reward programs, then $r = 0$.

We develop a one-period model to capture the actions of the three players: a provider P, an existing customer (the information sender S) and a friend (the information receiver R) of the existing customer in a complete process of a RRP. The provider determines a specific reward program according to the market status of the product and announces it to the sender. After that, the sender decides whether to recommend the product to the receiver according to the provider-offered rewards r, the intrinsic social value s and the referral efforts e. If the sender opts to make a referral, the receiver decides whether to purchase the referred product. Finally, under the condition that the receiver pays p for the referred product, the provider obtains the sales revenue, and gives the rewards r to the sender at the same time. Moreover, the sender also obtains the social value s from the successful referral.

As depicted in Fig. 1, a nested Stackelberg game among the players is presented, so we proceed backward through the sequence to analyze the players' utilities in the game.

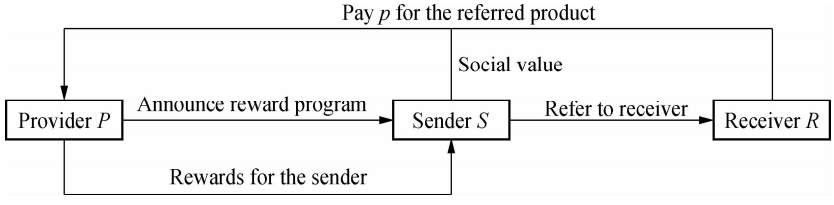

Fig. 1 A Process of a RRP

The utilities of players all depend on whether the receiver purchases the referred product. Firstly, according to Refs. [11, 15], we assume that the receiver's initial valuation v is a random variable with uniform distribution, $v \sim U[0, 1]$. For the given rewards r and the given persuasive efforts e of the sender, the receiver's utility u_R is given as

$$u_R = v + \alpha e - p - h \tag{1}$$

Parameter α ($\alpha > 0$) represents the sender's persuasion effectiveness which reflects the sender's trustworthiness and expertise. As the recent results point out, the sender's social influence is significantly related to expertise and trustworthiness[23-24]. Therefore, αe represents the

persuasion effect of the sender on the receiver. The innovativeness of referred product h also reflects the customers' implicit costs associated with customers' perceived risk due to unfamiliarity with the referred product. Therefore, the receiver will buy the referred product with the probability:

$$\Pr(u_R \geqslant 0) = 1 - p - h + \alpha e \tag{2}$$

According to Ref. [25], the marginal cost of effort is incremental, and we assume that the cost of sender $c(e) = e^2/2$ is convex in the sender's efforts e. Given rewards r, the sender's expected payoff for the referral efforts e is represented as

$$E(u_S(e)) = \Pr(u_R \geqslant 0)(r + s) - \frac{e^2}{2} \tag{3}$$

We define that the sender's social value for referral is produced by the sender's perceived helpfulness degree for the receiver. According to Ref. [10], innovativeness positively influences the customers' referral likelihood, and we assume that the sender's social value is proportional to the innovativeness of the referred product. The details are described as follows.

The receiver's initial utility without any persuasive efforts is represented by $u_{IR} = v - p - h$. If his/her initial valuation is lower than price, i. e., $v - p < 0$, he/she will not make a purchase no matter how effective the sender's persuasive efforts are. When $u_{IR} \geqslant 0$, he/she purchases the innovative product directly. The sender's persuasive efforts help the receiver to make purchase decision only when $u_{IR} < 0$. That is, the sender's persuasive efforts are helpful only for the receiver whose initial value satisfies $p < v < p + h$. If the innovativeness of the referred product is not high, i. e., $h \leqslant 1 - p$, only the segment of receivers whose initial value satisfies $p < \bar{v} < p + h$ need help from the sender. The sender's helpfulness $\Delta\bar{h}$, satisfies $\bar{v} - p - h + \Delta\bar{h} = 0$. Thus, $\Delta\bar{h} \sim U[0, h]$, and $E(\Delta\bar{h}) = h/2$. Under the condition that the receiver purchases the referred product, the sender's expected helpfulness is represented as $E(\Delta h) = \dfrac{0 \times (1 - p - h) + \frac{h}{2}h}{1 - p} = \dfrac{h^2}{2(1 - p)}$. If the innovativeness of the referred product is high enough; i. e., all the receivers' initial value satisfies $v - p - h \leqslant 0$. Similarly, for the receiver with initial value $p < \bar{v} < 1$, the sender's helpfulness $\Delta\bar{h}$ satisfies $\bar{v} - p - h + \Delta\bar{h} = 0$. Thus, $\Delta\bar{h} \sim U[p + h - 1, h]$, and $E(\Delta\bar{h}) = h - \dfrac{1 - p}{2}$. Under the condition that the receiver purchases the referred product, the sender's expected helpfulness is represented as

$$E(\Delta h) = \frac{(h - (1 - p)/2)(1 - p)}{1 - p} = h - \frac{1 - p}{2}$$

Thus, the social value, denoted by s, is described as

$$s = \begin{cases} \beta \dfrac{h^2}{2(1 - p)} & h \leqslant 1 - p \\ \beta\left(h - \dfrac{1 - p}{2}\right) & h > 1 - p \end{cases} \tag{4}$$

where β $(0 < \beta \leqslant 1)$ is the tie-strength between the sender and receiver. We need to determine the sender's optimal referral efforts e^* to maximize the expected payoff:

$$\max E(u_S(e)) = \begin{cases} (1 - p - h + \alpha e)\left(r + \beta \dfrac{h^2}{2(1 - p)}\right) - \dfrac{e^2}{2} \\ (1 - p - h + \alpha e)\left(r + \beta\left(h - \dfrac{1 - p}{2}\right)\right) - \dfrac{e^2}{2} \end{cases} \tag{5}$$

Considering the maximization conditions, i. e., $\dfrac{\partial u_S(e)}{\partial e} = 0$, $\dfrac{\partial^2 u_S(e)}{\partial e^2} < 0$, the sender's equilibrium referral efforts satisfy

$$e^* = \begin{cases} \alpha\left(r + \dfrac{\beta h^2}{2(1 - p)}\right) \\ \alpha\left(r + \beta\left(h - \dfrac{1 - p}{2}\right)\right) \end{cases} \tag{6}$$

The sender will make referral if $E(u_S(e^*)) \geqslant 0$.

The provider sets rewards r to maximize his/her profit π based on the sender's referral efforts e^*. Hence, for any rewards r, the provider's expected profit is

$$E(\pi(r)) = \Pr(u_R \geqslant 0)(p - r) = \begin{cases} \left(1 - p - h + \alpha^2 r + \dfrac{\alpha^2 \beta h^2}{2(1 - p)}\right)(p - r) \\ \quad h \leqslant 1 - p \\ \left(1 - p - h + \alpha^2 r + \alpha^2 \beta\left(h - \dfrac{1 - p}{2}\right)\right)(p - r) \\ \quad h > 1 - p \end{cases} \tag{7}$$

We can determine the provider's equilibrium reward programs by solving the following optimization problems:

$$\max E(\pi(r)) \quad \text{s. t.} \begin{cases} E(u_S(e^*)) \geqslant 0 \\ h - \alpha e^* \geqslant 0 \\ p - r \geqslant 0 \\ r \geqslant 0 \end{cases} \tag{8}$$

2 Analysis and Results

In this section, we determine the optimal reward programs under different conditions. We solve the optimization problems in Section 1 by constructing the Lagrangian function and further consider the Kuhn-Tucker conditions. As it turns out, the provider's optimal reward programs depend on the innovativeness of the referred product h and

the sender's persuasion effectiveness α. We present the results according to different innovativeness levels.

2.1 Optimal RRPs for low innovative product $h \leqslant 1-p$

Proposition 1 When sender's persuasion effectiveness is very low or very high, i.e., $\alpha^2 \leqslant \frac{1-p-h}{p}$ or $\alpha^2 > \frac{1-p+h}{p}$, the provider should forsake reward programs. When the sender's persuasion effectiveness is in the medium range, the provider should determine the optimal reward programs based on the tie-strength between the sender and the receiver. Specifically, the optimal reward programs satisfy

1) When $\alpha^2 \leqslant \frac{1-p-h}{p}$ or $\alpha^2 > \frac{1-p+h}{p}$, $r^* = 0$.

2) When $\frac{1-p-h}{p} < \alpha^2 \leqslant \frac{1-p+h}{p}$, if $0 < \beta \leqslant \max\left\{\frac{2(1-p)(\alpha^2 p-(1-p-h))}{\alpha^2 h^2}, \frac{2(1-p)(1-p+h-\alpha^2 p)}{\alpha^2 h^2}\right\}$, then $r^* = \frac{p}{2} - \frac{1-p-h+\alpha^2\beta h^2/2(1-p)}{2\alpha^2}$; otherwise, $r^* = 0$.

It can be interpreted as follows. In this case, the innovativeness of the referred product is within the low range. Accordingly, the perceived social value of the sender for making a successful referral, $s = \beta\frac{h^2}{2(1-p)}$ is also low. Conversely, the low innovativeness produces high probability of a successful referral for the sender, denoted by $\Pr(u_R \geqslant 0) = 1-p-h+\alpha e$. Thus, the sender's expected social value denoted by $E(u_S(e)) = \Pr(u_R \geqslant 0)(r+s) - e^2/2$ is not effective enough to motivate the sender to make an organic referral. The optimal reward program depends on the sender's persuasion effectiveness and the tie-strength between the sender and the receiver.

When the sender's persuasion effectiveness is very low, i.e. $\alpha^2 \leqslant \frac{1-p-h}{p}$, the sender may have to make many persuasive efforts for a successful referral due to his/her low persuasion effectiveness. Furthermore, the ineffective expected social value of the sender forces the provider to give more rewards to compensate the sender. Thus, using reward programs will be less effective than forsaking reward programs. However, when the sender's persuasion effectiveness is very high, i.e. $\alpha^2 > \frac{1-p+h}{p}$, the sender will make few persuasive efforts due to his/her high persuasion effectiveness. Thus, the sender's expected social value is high enough to motivate him/her to make an organic referral. Therefore, the provider should forsake reward programs when the sender's persuasion effectiveness is very low or very high.

However, when the sender's persuasion effectiveness is within the medium range, and the sender's persuasive effect on the receiver is more effective but still not effective enough, the provider should further depend on the tie-strength between the sender and the receiver to determine the optimal reward programs. With a weak tie-strength, the sender's perceived social value for a successful referral, denoted by $s = \beta\frac{h^2}{2(1-p)}$ is accordingly in the low range. Hence, the sender will not make an organic referral in this case. For the sender's higher persuasion effectiveness, the sender will not have to make too persuasive efforts for making a successful referral. In proportion, the provider may give a few rewards to compensate for sender for a successful referral. Using reward programs is more effective than forsaking them. On the contrary, with a strong tie-strength, the sender's perceived social value for a successful referral is relatively high. Coupled with the sender's medium persuasion effectiveness, the perceived social value is high enough to cover his/her persuasive efforts for a successful referral. That is, the provider should depend on the sender's organic referral.

2.2 Optimal RRPs for high innovative product $h > 1-p$

In this case, we need to discuss the results by dividing the level of innovativeness into two regions.

Proposition 2 When the innovativeness is high but not extremely high, i.e., $1-p < h \leqslant 2(1-p)$, the provider's optimal decision on RRPs is determined by the sender's persuasion effectiveness α and the tie-strength between the sender and the receiver β. Specifically, the optimal reward programs satisfy

1) When $\alpha^2 < \frac{h-(1-p)}{p}$, $r^* = 0$.

2) When $\frac{h-(1-p)}{p} \leqslant \alpha^2 \leqslant \frac{1-p}{p}$, if $\beta < \frac{3(h-(1-p))-\alpha^2 p}{\alpha^2(h-(1-p)/2)}$ or $\beta > \frac{\alpha^2 p+h-(1-p)}{\alpha^2(h-(1-p)/2)}$, then $r^* = 0$; otherwise, $r^* = \frac{p}{2} - \frac{1-p-h+\alpha^2\beta(h-(1-p)/2)}{2\alpha^2}$.

3) When $\alpha^2 > \frac{1-p}{p}$, if $\beta < \frac{3(h-(1-p))-\alpha^2 p}{\alpha^2(h-(1-p)/2)}$, then $r^* = 0$; if $\frac{3(h-(1-p))-\alpha^2 p}{\alpha^2(h-(1-p)/2)} \leqslant \beta \leqslant \frac{h+(1-p)-\alpha^2 p}{\alpha^2(h-(1-p)/2)}$, then $r^* = \frac{p}{2} - \frac{1-p-h+\alpha^2\beta(h-(1-p)/2)}{2\alpha^2}$; otherwise, $r^* = p - \frac{1-p}{\alpha^2}$.

Proposition 2 indicates that when the innovativeness is high but not extremely high, the optimal decision about RRPs is more complex. Although, the medium innovativeness may produce the comparatively higher perceived social value for the sender, denoted as $s = \beta\left(h - \frac{1-p}{2}\right)$,

it also leads to the lower probability of making a successful referral for the sender, denoted as $\Pr(u_R \geqslant 0) = 1 - p - h + \alpha e$. Moreover, the medium innovativeness comparatively increases the persuasive efforts that the sender has to make, denoted as $e^* = \alpha(r + \beta(h - (1-p)/2))$. Thus, the sender's expected social value for a successful referral may not be effective enough to justify his/her organic referral. Consequently, the provider should further depend on the sender's persuasion effectiveness and the tie-strength between the sender and the receiver.

When the sender's persuasion effectiveness is very low, i.e., $\alpha^2 < \frac{h-(1-p)}{p}$, the probability of making a successful referral for the sender will further decrease. The sender will not make an organic referral for the insufficiently high perceived social value. For the provider, it is not necessary to use reward programs. That is because the provider may give too many extra rewards to the sender for the stimulated referral to achieve the expected marketing effect.

With the sender's persuasion effectiveness improving, the sender's persuasive effect on the receiver becomes higher. Accordingly, the reward programs become more effective. Then, the provider should further depend on the tie-strength between the two customers, which is directly related to the sender's perceived social value. When the sender's persuasion effectiveness is within the medium range, i.e., $\frac{h-(1-p)}{p} \leqslant \alpha^2 \leqslant \frac{1-p}{p}$, the sender's persuasive effect on the receiver is high but not very high. Hence, the provider should be prudent when using reward programs. If the tie-strength between the two customers is extremely weak $\beta < \frac{3(h-(1-p)) - \alpha^2 p}{\alpha^2(h-(1-p)/2)}$ or extremely strong $\beta > \frac{\alpha^2 p + h - (1-p)}{\alpha^2(h-(1-p)/2)}$, it is not necessary for the provider to use reward programs. With an extremely weak tie-strength, the sender's perceived social value cannot justify him/her making an organic referral and the provider may have to give many extra rewards for the stimulated referral due to the sender's insufficiently high persuasion effectiveness. With an extremely strong tie-strength, the sender's perceived social value is high enough for him/her to make an organic referral. Therefore, the provider should forsake reward programs under the above conditions. Otherwise, the tie-strength is within the medium range, and the sender's perceived social value is not very low but not high enough to cover his/her persuasive efforts for a successful referral. Under this condition, the provider only needs to offer a few extra rewards to the sender for the stimulated referral. Therefore, using reward programs is more effective for the provider than forsaking the reward programs.

When the sender's persuasion effectiveness is within the extremely high range, i.e., $\alpha^2 > \frac{1-p}{p}$, the sender's persuasive effect on the receiver accordingly becomes high. Similar to the results in the situation with the medium persuasion effectiveness, the provider should forsake reward programs if the tie-strength is extremely weak $\beta < \frac{3(h-(1-p)) - \alpha^2 p}{\alpha^2(h-(1-p)/2)}$, and use reward programs if the tie-strength is within the medium range $\frac{3(h-(1-p)) - \alpha^2 p}{\alpha^2(h-(1-p)/2)} \leqslant \beta \leqslant \frac{h+(1-p) - \alpha^2 p}{\alpha^2(h-(1-p)/2)}$. The reasons are also similar for the situation with the medium persuasion effectiveness. However, the provider should still offer extra rewards to the sender, even though the sender's perceived social value is high enough for the sender to make an organic referral under the conditions with an extremely strong tie-strength $\beta > \frac{h+(1-p) - \alpha^2 p}{\alpha^2(h-(1-p)/2)}$. This is due to the extremely high persuasion effectiveness. The high persuasion effectiveness improves the surplus value of the sender's referral for the provider. It is more profitable for the provider to pay the extra rewards to further encourage the sender's referral efforts.

Proposition 3 When the innovativeness is extremely high, i.e., $h > 2(1-p)$, the provider should forsake the reward programs completely.

The extremely high innovativeness of the referred product produces a high perceived social value for the sender, denoted as $s = \beta\left(h - \frac{1-p}{2}\right)$. However, the extremely high innovativeness leads to the extremely low probability of the sender for making a successful referral, denoted as $\Pr(u_R \geqslant 0) = 1 - p - h + \alpha e$. Furthermore, the extremely high innovativeness forces the sender to make many persuasive efforts, denoted as $e^* = \alpha\left(r + \beta\left(h - \frac{1-p}{2}\right)\right)$, for the successful referral. Thus, the sender's expected social value is not high enough to justify the sender making an organic referral. If the provider offers extra rewards to the sender for stimulated referral, the provider may give too many rewards to cover the sender's extremely high referral cost. Thus, using reward programs may not be more effective than forsaking the reward programs. Therefore, the provider should forsake reward programs completely when the innovativeness is extremely high.

2.3 Comprehensive analysis of the above two cases

By comparing the optimal reward programs in the above two cases, we can establish the following intuitive results formally.

Corollary 1 When the provider opts to use reward programs, the optimal rewards increase with the innova-

tiveness of the referred product.

Corollary 2 It is more likely for the sender to make an organic referral for the low innovative product than for the high innovative product.

These two results seem contrary to the existing empirical finding that innovativeness positively influences customers' referral likelihood. It is due to the high referral cost for the sender to make a successful referral for the high innovative product. Although the high innovativeness produces the high perceived social value for the sender, the probability of a successful referral for the sender decreases more significantly. Accordingly, the sender's expected social value may be not high. Furthermore, the sender needs to pay a much higher referral cost for the successful referral for more innovative product.

For Corollary 1, under the conditions that the provider should use reward programs, the sender's referral cost for making a successful referral increases with the innovativeness of the referred product, and the sender's expected social value for a successful referral is not effective. Thus, the provider has to offer the extra increasing rewards to compensate the sender. Consequently, the optimal rewards increase with the innovativeness of the referred product.

For Corollary 2, when the innovativeness of the referred product is within the low range, the sender will tend to make an organic referral as long as his/her persuasion effectiveness is not very low. That is because the low innovativeness results in the high probability of successful referral for the sender. Coupled with the sender's persuasion effectiveness, the low innovativeness of the referred product makes the sender only need to pay little referral cost, which further makes the sender's expected social value effective enough to justify his/her organic referral, even though the low innovativeness produces the low perceived social value for the sender. Conversely, when the innovativeness of the referred product is in the high range, the significantly high referral cost of the sender makes him/her be less willing to make an organic referral. Under the conditions that the provider forsakes the reward programs, the sender will not make an organic referral with low persuasion effectiveness or with weak tie-strength. In particular, when the innovativeness of the referred product is extremely high, the provider should forsake the reward programs completely. Moreover, the sender makes an organic referral with low probability in this case.

These results provide guidance for social marketing practices for innovative offerings. Based on the finding that the innovativeness positively influences customers' referral likelihood but increases customers' referral cost for successful referrals, the provider should concentrate on reducing the referral cost to attract more customers to engage in referral programs. For example, the provider can consider lowering the threshold of obtaining rewards for the customers by designing new reward rules. With the new rules, the existing customers obtain the rewards as long as their referrals produce new pageviews rather than new sales. The provider should also design the mixed reward rules for new pageviews and new sales, and make the existing customers control their referral cost flexibly. Thus, the provider may achieve the desired marketing effect by taking full advantage of the positive influence of the innovativeness on the customer referral likelihood and avoiding a significantly increasing referral cost for customers.

3 Conclusions

1) The findings show that the provider should rely on organic word-of-mouth communication rather than the RRPs to acquire customers under certain conditions. It concretely depends on the innovativeness of the referred product, the persuasion effectiveness of the sender and the tie-strength between the sender and receiver.

2) Our analysis also reveals that the optimal rewards increase with the innovativeness of the referred product, which seems contrary to the existing empirical finding that innovativeness positively influences customers' referral likelihood. It is due to the high referral cost for the sender to make a successful referral for the high innovative product.

3) Future research will extend the assumption that the sender recommends to only one friend and will consider the case in which the sender should recommend to multiple friends, and extend the one-period model to consider the continuous process of customer referrals. It may also be interesting to focus the design of reward rules aiming for high innovative offerings.

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考虑产品创新程度的推荐奖励策略分析

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摘要: 通过构建关于产品提供商、已有消费者(推荐者)、潜在消费者(接收者)的 Stackelberg 博弈模型,研究了创新性产品的推荐奖励策略. 研究结果表明,在一定条件下,产品提供商应该放弃奖励策略而单纯依赖消费者自发口碑. 尤其在产品创新程度极高时,提供商应该完全不考虑奖励策略,但此时消费者也很少发生推荐行为. 在其他创新水平下,提供商应进一步根据推荐者的劝说能力以及推荐者与接收者之间的关系强度,来进行推荐奖励策略的优化决策. 在提供商选择奖励策略的情形下,最优奖励水平随产品创新程度的提高而增加. 研究结论在一定程度上与已有实证结论相反,这是因为消费者成功推荐创新程度较高的产品,实际也要付出较高的推荐成本.

关键词: 推荐奖励策略;创新程度;社交价值;社交媒体营销;Stackelberg 博弈

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