Corporate Information Disclosure Strategy Based on Consumer Comments

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Abstract: Online consumer reviews, as a new type of word-of-mouth information, play an increasingly important role in consumer purchasing decisions. At the same time, online consumer reviews can also influence corporate information disclosure decisions. This paper proposes a mathematical model, aiming at the maximum profit of the merchants, and finds the best decision for the disclosure of product quality information under different disclosure levels. The main conclusions are as follows: (1) Under the influence of disclosure costs and online comments, there is a peak in the degree of disclosure of product quality information by enterprises. When the disclosed quality information is less than the optimal value, increasing the disclosure quality information will increase the profit of the enterprise; when the quality information disclosed is greater than the optimal value, the enterprise should choose to reduce the disclosure quality information. (2) The higher the product quality, the company should choose to disclose the product quality information to obtain more market profits.

1. Introduction

According to the 43rd "Statistical Report on the Development of China's Internet Network" released by China Internet Information in February 2019, as of December 2018, the number of online shopping users in China reached 610 million, an increase of 14.4% from the end of 2017, accounting for the overall proportion of Internet users. Up to 73.6%. The number of online payment users reached 600 million, an increase of 69.3 million from the end of 2017, and the usage ratio increased from 68.8% to 72.5%. The emergence of new ways of playing games such as social e-commerce has also added new vitality to the e-commerce sector. At the same time, with the rapid development of the content Internet product model generated by the user, the traditional way of information dissemination has undergone tremendous changes. Based on this, a number of platforms for online commenting on services or products provided by enterprises have emerged. Common online commentary channels include comment platforms (such as Public Comment Network, Epinions, etc.), social platforms (such as Renren, Facebook, etc.) and e-commerce feedback platforms (such as Jingdong, Amazon, etc.).

If the consumer chooses to purchase the product on the e-commerce platform, the consumer will form an initial expected value for the new product based on the product advertisement, the purchase experience of the brand, and the quality of the similar product, and decide whether to purchase according to the expected value of this product [1]. Businesses generally use advertising to increase consumer expectations. However, advertising costs are high, and most consumers believe that online reviews of other consumers are more reliable than the product information conveyed by merchants and other marketing methods. [2,3] For products sold online, consumers often pay attention to online reviews of products. Through the questionnaire survey, 90.6% of the 85 questionnaires considered that the existence of online reviews about the goods was very necessary, and the content in the online comments would affect the consumers' purchasing decisions. Online reviews have become an important source of information for consumers when they choose to buy products or services.

In the current corporate disclosure strategy, the degree of disclosure of product and service

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quality information for the same type of commodity will have different effects on consumer decision-making. For example, in the emerging online shopping industry, when the person who offer procurement service discloses more information about the source of the purchase, the sales volume tends to be higher than the market average. It is worth noting that the product information disclosed by the company is not as good as possible. First, because companies need to disclose information; the second reason is that because the product preferences of different consumers are different, if the company elaborates on the product profile, there will always be some places that do not fit the consumer, which will lead to the situation that arises: such a negative comment as "not consistent with the merchant description."

So how do companies disclose quality information in the presence of consumer reviews? What is the best level of disclosure? Under the above background, this study mainly explores the optimal disclosure threshold for product information disclosure under the premise of maximizing profit and considering the factors of consumer comment.

2. Literature review

Online Reviews, an important form of online word-of-mouth, is a positive or negative evaluation of a product or service published by a consumer on an e-commerce or third-party review site. As an important reference for measuring consumer satisfaction, online commentary has become an important medium for consumers to understand information before purchasing goods, and become an important channel for potential consumers to understand the quality of goods and services. On the other hand, online reviews also help corporates communicate with customers, and improve the sales of goods in a favorable way. The research related to it is mainly focused on the following aspects: how consumer comments affect consumers' purchasing behavior; how to further influence the sales mechanism of related products to explore and establish theoretical models; the impact of consumer comments on e-commerce performance, etc.

2.1 Research on Consumer Online Reviews

The definition of online reviews varies from scholar to scholar. Park and Le [4] pointed out that online consumer reviews are a type of electronic word-of-mouth that is a positive or negative assessment of a consumer's offering of online shopping. Mudambi and Chuff [5] define it as a product of the same identity published on a third-party or corporate website.

On the research between online comment and purchase intention, Xuemei Du, Zhihong Xie et al. [6] constructed and verified the impact model of online reviews on consumers' willingness to purchase based on existing research, and obtained the number of comments, the quality of comments, etc., all positively affect consumers' willingness to purchase will positively affect the willingness to purchase. Yan Xie [7] conducted a questionnaire survey on the consumer purchasing decision process through online evaluation, and concluded that online reviews will participate in every stage of consumer purchasing behavior and become an important reference factor for consumers. Most consumers will return online commentary information in their post-purchase behaviors, and these online comments will become an important reference and influence factor for other consumers in the purchase behavior, thus forming an information cycle.

Online reviews have an impact on the sales of corporate products. Lee [8] studied the relationship between online reviews and product sales, and showed that the number and rating of online reviews may significantly affect product sales. Cao et al. [9] found that comments containing extreme opinions are more helpful to consumers' decision-making and can significantly increase sales of the company. Chen et al. [10] also found that the quality of comments displayed by the usefulness vote can have a positive impact on product sales. Some scholars have used empirical tests to confirm the impact of consumer online reviews on product sales. For example, Clemons et al. [11] conducted an empirical test on the relationship between online consumer reviews and beer sales, and the results showed that the score of the review has a significant positive correlation with the sales of the beer. Chevalier and Mayzlin [12] used the data in Amazon's online consumer review system to find that the online score of the book can effectively increase the sales of the book.

The above articles explain in detail the consumer's online comments on the consumer's willingness to purchase and the impact on product sales. They consider from the aspect that consumers to use online reviews to get information about products and how to make purchasing decisions, instead of considering how companies use product online reviews to contribute to the disclosure of proprietary product information.

2.2 Research on Enterprise Information Disclosure

A key result of the early literature on disclosure is that privately informed sellers voluntarily disclose all information that can be verified without cost. From the perspective of corporate costs, Matthews and Postlewaite [13], Farrell [14] and Shavell [15] pointed out that if the disclosure is voluntary, the seller will obtain information at a lower cost and will also Disclose information in an advantageous situation. A large number of literatures have now studied the motives of monopolistic sellers for voluntary disclosure of verifiable quality information. For example, Jovanovic [16] shows that if disclosure costs are high, favorable information will be disclosed, and unfavorable information will be partially concealed. Viscusi [17], Grossman [18] showed that if disclosure costs are high, sellers will only disclose when the quality exceeds a certain threshold level; below this level, the disclosure cost exceeds the consumer expectations improvement belt. When the potential benefits come, the seller will choose not to disclose. Therefore, cost is an important consideration in the company's decision to choose to disclose information. Yubo Chen and Jinhong Xie [19] get the best response from sellers to consumer reviews for different types of products through stage games. Sellers will increase product attribute information based on consumer comments on low-cost products, but will decrease for high-cost products.

According to the above literature, it can be explained that online commentary has an important influence on consumers' shopping decisions, and the degree of product information disclosure is critical due to the existence of asymmetric information. This study will consider companies and consumers online to comment on two product information sources, and set the cost of corporate information disclosure to study information disclosure decisions. This can optimize the enterprise information disclosure strategy based on the combination of consumer reviews and provide a new perspective for business operations.

3. Theoretical modeling

3.1 Model assumptions

Consider a company that has been in the e-commerce platform (such as Taobao, Jingdong, etc.) for a certain period of time and is selling a product. The e-commerce platform provides a consumer-to-product evaluation function for purchased products, which enables customers who have purchased the product to express their opinions about the product. The content in the online review can be a confirmation of the description of the product, as well as more information about the product.

Assume that the company can't lie on the quality of its products; online reviews represent the real experience of individual users, there is no malicious slander, merchants spend money to buy praise and so on. Product quality information can be disclosed by the product's online reviews or by the company itself. Consumers’ initial expectations for products are formed by online reviews and corporate disclosures. Since the company has been in the e-commerce platform for a certain period of time, there are already a certain number of online reviews of consumers on the product. Consumers will review the comments left by consumers who have purchased the product before purchasing. We assume that consumers in the market are homogeneous, and that each consumer buys only one product. Therefore, consumers who have commented on the product will not choose to buy it again. The future product demand comes from the unpurchased consumer which has a certain will to buy its product. When a consumer purchases a product that has a greater utility than if the product was not purchased (if not purchased, the utility is 0), he will choose to purchase one product.

The impact on the quality of consumers' expectations is composed of two parts, one is the information disclosed by the company; the other is the existing consumer reviews. It is not clear that online reviews affect consumers' willingness to purchase, so there is a speculation about the proportion of consumers' initial expectations for quality. One corporate can think that their disclosure of product quality information completely affects the effectiveness of consumers, and online comments have no impact on consumers; or online reviews can also affect consumers completely, and their quality information disclosure has no effect; or they think both can influence consumers. Here we introduce parameters θ. It indicates that the company speculates on the degree of influence of product consumer reviews on consumer product quality expectations. The company can obtain the most profit when it pursues the quality information disclosure of the product.

When a company makes a disclosure, there is a disclosure cost, and the cost function is $\mathrm{C}(q') = q'^2$.[20] q' represents the quality update of the product by the consumer after the company discloses the information, which does not include the influence of the consumer's comments on the quality of the product. That is, if a company wants to improve the quality expectations of consumers after renewal, he needs to cost more.

The logical sequence of this paper is as follows: There are three options for companies to disclose product quality information: full disclosure, non-disclosure, and partial disclosure, corresponding Case 1, Case 2, and Case 3. If the company chooses to fully disclose, that is, the company believes that online comments will not affect the consumer's initial expectations; the company chooses not to disclose, that is, the company believes that online comments have a complete impact on consumers' initial expectations of product quality, and their quality information disclosure is useless. The company decides how to disclose the product and observes the purchase situation of the consumers in the market at this time in order to pursue the maximum profit in the market. We establish models for each of the three situations, and find the optimal speculation of the expected proportion of the consumer products, the optimal income of the enterprise and the corresponding pricing under the corresponding circumstances.

Table1 Model parameters and meaning

Symbol	Description
q	Product actual quality, $q > 0$
t	Unit mismatch cost
x	The degree of consumer matching
$D(p)$	Consumer demand function
q_c	The quality of expectations that consumers generate on consumer reviews,$q_c \in (0, q)$
q'	Quality update of consumers after the company discloses the information
$C(q')$	Corporate disclosure cost function
p^i	Product pricing in the case *i*, *i*=1,2,3
$\pi_i(p)$	Profit function, *i*=1,2,3
Decision variables	
θ	Companies speculate on the extent to which consumer reviews affect consumer product quality expectations

3.2 Model establishment and solution

This paper considers that consumer expectation quality $E(q)$ is affected by two aspects. The company speculates that the degree of influence of existing consumer comments on product quality is θ, and the degree of influence of information disclosed by the company itself on consumers' product quality expectation is $1-\theta$. Changes in the degree of disclosure of corporate information will enable consumers to update the expected quality, that is $q' = (1-\theta)q$, and the initial expected quality of the consumer's comments on the consumer is q_c, so the company can speculate on the initial quality of the consumer expectation $\mathrm{E}(q) = (1-\theta)\mathrm{q} + \theta q_c$.(Among them, $q_c < q$, because consumer reviews cannot fully disclose the quality information of the enterprise, or the product quality information revealed by the consumer reviews will not be more than the quality

information that the enterprise understands.)

In summary, the total utility obtained by the consumer to purchase the product is $\mathrm{U} = (1-\theta)\mathrm{q} + \theta q_c - p - tx$.For the sake of simplicity, it is assumed here that the consumer unit does not match the cost to 1, and the enterprise profit function is available. $\pi = [\theta q_c + (1-\theta)q - p]p - \mathrm{C}(q')$, here $\mathrm{C}(q') = q'^2 = [(1-\theta)\mathrm{q}]^2$.

According to the degree of disclosure selected by the company, it is divided into three situations:

Case 1: The company speculate that consumer reviews have a complete impact on consumer product quality expectations. When the company believes that consumer expectations will only be affected by consumer reviews, the information disclosure of the company is irrelevant, that is, $\theta = 1$: $\pi_1 = pq_c - p^2$, and maximizing the solution can obtain $\mathrm{p}^1 = \frac{q_c}{2}$, $\pi_1 = \frac{{q_c}^2}{4}$. Case 2: The company speculate that consumer reviews have no impact on consumer product quality expectations. When the company believes that its information disclosure is very important, and believes that consumer comments do not affect consumer expectations, that is $\theta = 0$: $\pi_2 = pq - p^2 - q^2$, and the corresponding pricing strategy is $\mathrm{p}^2 = \frac{q}{2}$. The profit available to the company is $\pi_2 = \frac{q^2}{4}$. Case3: When the company believes that two sources of information can work together on consumer expectations, that is $\theta \in (0,1)$: $\pi_3 = [\theta q_c + (1-\theta)q - p]p - [(1-\theta)q]^2$.We obtain the result: $\theta = 1 + \frac{p(q_c - q)}{2q^2}$,which is the optimal value of the consumer's opinion on the consumer product quality expectation, the optimal pricing: $\mathrm{p}^* = \frac{2q^2}{4q^2+q-q_c+2(q_c)^2-2qq_c}$.

The above conclusions of π_3 are shown graphically drawing with MATLAB: Since the relevant quality parameters q_c and q are known values, assuming that the product pricing p is a fixed value:

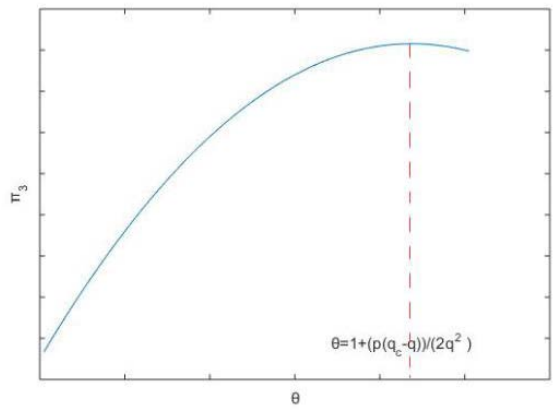

Fig1 π_3 profit function graph of determined quality

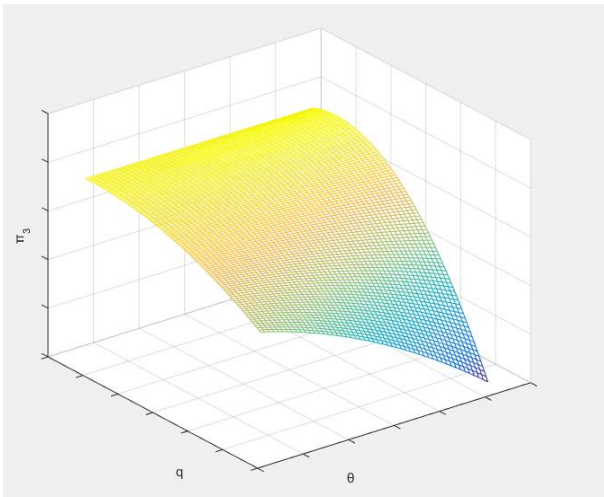

Fig2 π_3 profit function graph without determined quality

Lemma 1 Optimal pricing and optimal returns for firms in three cases (see Table 2).

Table2 Optimal pricing and optimal returns for the next three companies

	Case 1	Case 2	Case 3
θ optimal speculation	1	0	$1+\frac{p(q_c-q)}{2q^2}$
Optimal pricing	$\frac{q_c}{2}$	$\frac{q}{2}$	$\frac{2q^2}{4q^2+q-q_c+2(q_c)^2-2qq_c}$
Maximum return	$\frac{{q_c}^2}{4}$	$\frac{q^2}{4}$	$\frac{(4q_cpq^2+2q_cp^2-2q_cp^2q-3p^2q^2-{q_c}^2p^2)}{4q^2}$

3.3 Model Analysis

Lemma 1 summarizes the three decisions that companies can take: consumer reviews have a complete impact on consumer product quality expectations, consumer reviews have a partial impact on consumer product quality expectations, and consumer reviews have no impact on consumer product quality expectations. The optimal pricing strategy to adopt and the maximum profit that can be achieved.

As can be seen from the results, the optimal pricing is determined by two parameters, one is the true quality q of the product, and the expected quality q_c produced by the other consumer to the consumer review section. Pricing is related to the true quality of the product, because if the true quality of the product is high, it means that the manufacturing cost of the enterprise is high. Since the pricing of the product is based on the cost of coverage, the pricing of the product will be high. If the true quality of the product is low, but the company chooses to set a higher price, the consumer can choose a higher quality product than the same price product, and will not choose the product of the enterprise. Another parameter related to pricing is q_c. In the case where the true quality of the product is constant, we can conclude that when the online review makes the quality expectation of the consumer product q_c closer to $\frac{q}{2}$, the product price of the enterprise is higher.

(1) Case 1: The company speculates that the consumer comment has a complete impact on the consumer product quality expectation: since $q > q_c$ the profit in Case 1 is less than Case 2, and Case 1 does not hold. That is, companies should not rely solely on online comment disclosure methods.

(2) Case 2 and Case 3 are compared $\pi_3 > \pi_2$, that is, the enterprise should make the assumption that the consumer comment has only partial influence on the consumer product quality expectation, then when the enterprise is at $\theta = 1+\frac{p(q_c-q)}{2q^2}$ obtains the maximum profit, at this time $\pi_3 = \frac{4q_cpq^2+2q_cp^2-2q_cp^2q-3p^2q^2-(q_c)^2p^2}{4q^2}$, priced as $p^3=\frac{2q^2}{4q^2+q-q_c+2(q_c)^2-2qq_c}$.

Analysis of the above conclusions, in case 1 the company speculates that consumer reviews have a complete impact on consumer product quality expectations, and believes that the company's product information disclosure does not affect consumer expectations, and it does not exist in reality. Suppose a company does not disclose product quality information, and only a few online reviews have been purchased by consumers of the product. Consumers rely on online reviews to obtain too little quality information. Second, as long as another company discloses a little more information on its products, consumers will turn to the purchase of goods instead of buying one without company information. Disclosure of goods.

In Case 2 and Case 3, we conclude that companies should speculate that consumer reviews have a partial impact on consumer product quality expectations, rather than having no impact. The disadvantage of case 2 is that in order to increase the consumer's expectation of the product, the

enterprise needs to invest a lot of funds for information disclosure, which increases the cost of the enterprise. Second, in reality, consumers generally look at the introduction of products on the one hand in online shopping. On the other hand, they look at online reviews to verify the disclosure of the company, to prove that the company does not exaggerate the publicity effect and describe the product. Wait. Therefore, speculative consumer reviews that companies should make have a partial impact on consumer product quality expectations. The quality information disclosure of the product shall be based on the online commentary, and the appropriate information shall be disclosed by the enterprise.

4. Conclusions and implications

This study considers the information disclosure strategy of the enterprise, constructs the consumer expectation utility under the influence of the dual factors of consumer review and enterprise disclosure, and then obtains the enterprise profit function, and analyzes and solves the model. Through model calculation and analysis, it mainly discusses the impact of consumer evaluation and information disclosure on the optimal pricing and profit of enterprises.

The research shows that: (1) Under the influence of online comments, the degree of disclosure of product quality information by enterprises has a peak. When the disclosed quality information is less than the optimal value, increasing the disclosure quality information will increase the profit of the enterprise; when the quality information disclosed is greater than the optimal value, the enterprise should choose to reduce the disclosure quality information. For companies, online reviews and their own information disclosure have complementary relationships to consumer behavior. From a business perspective, disclosure requires cost. Excessive amount of information is disclosed, corporate costs are rising; disclosure information is too small, consumers are less willing to purchase products, and lower sales. Therefore, based on existing consumer reviews, companies can consider the quality of their products, determine product pricing and the best disclosure level, so that they can get the maximum profit. (2) The higher the product quality, the company should choose to disclose more products. Quality information. Regarding the optimal speculation of business-to-consumer expectations, we have the result $\theta = 1 + \frac{p(q_c - q)}{2q^2}$. When q_c and the product price p are known values, θ is inversely proportional to the true mass q. Therefore, the larger q, the smaller the θ, that is, the higher the true quality of the product, the more the company can speculate that the impact of consumer reviews on consumer product quality expectations is lower. In the real world, we have an example: consumers buy a product through the e-commerce platform, the quality of the product is good, so that consumers are not easy to report errors or malfunctions in the process of using the product, and naturally will receive many network praises. When the number of favorable reviews reaches a certain level, the sensitivity of consumers to the number of favorable comments will be reduced. For example, 1000 praises and 1010 praises have no significant difference in the quality of expected products formed by consumers, so online reviews can change the quality of consumers. The expected information has reached the limit. If the company chooses to disclose more product information at this time, it will enable consumers to understand more product quality information and increase their willingness to purchase.

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