# Analysis of Coordination Mode of Dual-channel Experience Service Based on Product Experience

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## Abstract

From the perspective of product experience, product pricing and service strategy models of online sales channels and offline sales channels are established to analyze the influence of product experience and consumer free-riding behavior on the product experience and service level of online sales channels and offline sales channels. Then it analyzes the decision-making of centralized decision-making mode and decentralized decision-making mode of offline and offline dual-channel experience service. The results show that when the product experience coefficient is low, that is, the more consumers need to experience to determine the value of the product, the manufacturer should promote the service cooperation of product experience through both online and offline channels, and adopt a centralized decision-making mode. On the contrary, the decentralized decision-making mode should be adopted. In the centralized decision-making mode, the offline sales channel product experience service level is higher than its online product experience service level; When consumers have a lot of free-riding behavior, the level of dual-channel product experience service should be improved, and vice versa.

**Keywords:** Product experience service, Product experience, Dual channel, Hitchhike, Decision model

## 1. Research Background

Network channels can provide services to consumers anytime and anywhere, but only

through text, pictures, videos and other ways to describe the product, its virtuality will cause consumers to evaluate the value of the product deviation. Although the physical channel is limited by time and region, it can provide consumers with a full range of experience, so that consumers feel the real value of the product. The linkage of online and offline experience services can fully meet the experience needs of consumers and attract consumers who feel satisfied with the immediate needs of experience services. However, the boundary of experience service output is fuzzy, service output has strong intersectionality, and online and offline services both have free-riding behaviors. How to coordinate manufacturers' product experience services is a problem that manufacturers need to solve urgently under dual channels.

P. J. Nelson (1970) Firstly divides products into search products and experience products from the perspective of information economics. For searchable products such as books, audiovisual products, consumers know their characteristics and attributes before use; For high-end clothing, jewelry and other experiential products, consumers need to review and experience before making a purchase decision. J. W. Alba (1987) further pointed out that if consumers judge information based on vision, the information provided by the Internet will have an absolute advantage, that is, search-type products are suitable for network channels. If the information provided online is judged by taste and touch, then the information provided online is not as good as the information provided by traditional retail channels, that is, experiential products are more suitable for physical channels. The experience of the product determines the sales channel that the product is more suitable for, so what impact does the experience of the product have on the service of the sales channel? Through a comprehensive review of the existing studies, it is found that there are few reports on coordinating the channel services of products according to the experience of products.

There are many researches on the influence of service channels. For example, Zhang Fang *et al.* (2018) focused on the impact of service value on the decision-making of the dual-channel supply chain composed of manufacturers and retailers, and also analyzed the evolution process of this system under the long-term price forecasting mechanism. Dan Bin *et al.* (2018) studied the impact of free value-added services on the decision-making of the dual-channel supply chain composed of manufacturers and retailers, and found that both warranty and value-added services would affect customers' purchasing behaviors. Liu Can *et al.* (2018) discussed the spillover effect of retailers' offline channel services on manufacturers' online demand, studied the design of O2O (online to offline) online-offline channel cooperation mechanism, and found that service spillover effect can regulate price competition. Yan Ruiliang *et al.* (2009) believe that retailers can effectively alleviate the competition and conflict between the two channels by improving the service quality of their own channels. Zhang Xuelong *et al.* (2018) studied the influence of e-direct selling channels and traditional retail channels on the demand and profit of dual-channel supply chain from the perspectives of price substitution coefficient disturbance, service level substitution coefficient disturbance, price substitution coefficient and service level substitution coefficient simultaneously disturbance. Pu Xujin *et al.* (2018) studied the complex mechanism of physical store service affecting the operation results of supply chain under the background of manufacturers' supply

chain with online sales channels. Tian Wei *et al.* (2019) studied the service effort of manufacturers and the mechanism of advertising cost sharing, and found that when there is a service free-riding behavior between the two channels, the relationship between online and offline dual channels will change from the previous competitive relationship to a service cooperation strategy. Liu Hao *et al.* (2021) put forward four supply chain decision models according to different service providers, and made a comparative analysis of the optimal decision under different models. The research results show that service cost-effectiveness and online channel market share play a decisive role in mode selection.

In recent years, the dual-channel service strategy considering the free ride of consumers has also attracted the attention of many scholars. For example, Zhou Y. W. *et al.* (2018) considered that manufacturers sell products through online channels and traditional retailers, and discussed the influence of free rider effect on pricing, service strategy and profit of the two members when the two channels use differential and non-differential pricing schemes. Cao Yu *et al.* (2019) established a dual-channel supply chain model consisting of a manufacturer and a retailer, and studied the influence of "free-rider" behavior and inter-channel out-of-stock substitution behavior on inventory competition and promotion decision-making in the supply chain under random demand. Deng Z. *et al.* (2016) studied the impact of free riding cost, technology or market uncertainty on cross-border e-commerce. Tao Jingtian *et al.* (2018) studied the pricing strategies of members in the O2O channel supply chain and the influence of the free ride effect on channel profits based on the phenomenon of free ride provided by online platforms with the help of offline physical stores, and mainly explored the influence of service level, free ride effect coefficient and subsidy strategy on channel pricing decisions and profits. Considering the relationship between service cost and channel price competition, Gong Yonghua *et al.* (2020) studied the influence of two-way free-riding behavior on product price and service effort level under different entity and network channel relationships, and proposed a decision-making strategy for retailers to optimize service effort level.

Through the review of the above literature, it can be seen that service, as a non-price influencing factor, is the hot spot of dual-channel research, but it focuses on the study of service cooperation or service competition. In fact, different product characteristics have different channel selection and service requirements. However, there are few literatures on channel service research based on product characteristics. Therefore, this paper intends to study the impact of product experience characteristics on channel service, and then analyze the impact on the service coordination mode of manufacturers. In order to provide reference for supply chain experience service decision.

## 2. Problem Description and Hypothesis

### 2.1 Problem Description

Consider that a manufacturer has online sales channels and offline sales channels (offline sales channels can be expanded in two modes: franchise and self-operation. Due to space, this paper only considers the franchise mode), and both online sales channels and offline sales channels sell products as independent entities. The product experience services of online

sales channels include information retrieval, product video display, free trial, etc., plus the popular virtual reality technology that allows consumers to be immersive; The product experience services provided by offline sales channels include product trial, food tasting, clothing fitting, and service enthusiasm. Through product experience services, consumers can deepen their experience of products before making purchase decisions, so as to attract consumers and enhance their sense of identity. The dual-channel supply chain structure of e-commerce enterprises is shown in Figure 1, where s1 is the product experience service level of online sales channels, s2 is the product experience service level of offline sales channels, and we is the wholesale price of products that manufacturers wholesale to offline sales channels.
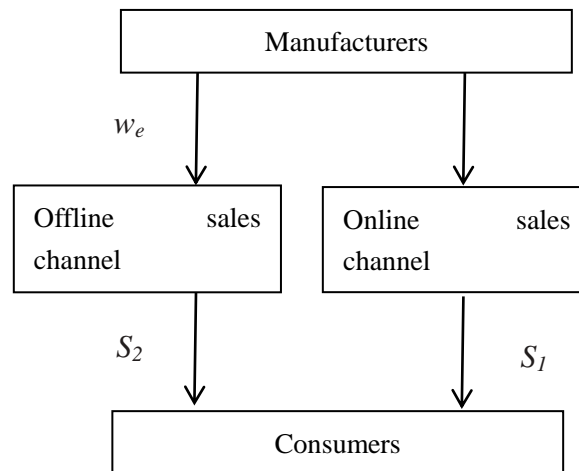


Figure 1. E-commerce enterprise dual-channel supply chain structure chart

In the dual-channel supply chain environment, based on the different power of each channel, the decision-making mode can be divided into centralized decision-making mode and decentralized decision-making mode. In the centralized decision-making mode, manufacturers take online sales channels and offline sales channels as a whole to make unified centralized decision-making. In the decentralized decision-making mode, the manufacturer only develops online sales channels, and the offline sales channels are taken care of by the agents. At this time, the online sales channels and offline sales channels are Stackelberg game led by the manufacturer.

The important function in this study is the product experience index β, β ∈ (0, 1). The closer the β value is to 1, the more consumers can judge the true value of the product based on text and pictures and other information, and the product is more suitable for online sales, such as standard ballpoint pens. The closer the beta value is to 0, the more consumers want to judge the true value of the product through personal experience, and the product is more suitable for offline channel sales under the current technology, such as a newly launched new product perfume, or shoes that need to be tried on.

In this paper, the superscript "*" represents the optimal decision, the superscript "c" represents the centralized decision mode, and the superscript "d" represents the decentralized decision mode. In the centralized decision-making mode, the dual channel is regarded as the

unified overall centralized decision-making, and the decision goal is to maximize the total revenue of the online and offline dual channels. In the decentralized decision-making mode, online sales channels and offline sales channels make decentralized decisions as independent departments, with their respective revenue maximization as the decision-making goal.

*2.2 Prerequisite of Assumption*

1) When consumers make purchase decisions, there is offline experience and online purchase behavior, that is, there is free-riding behavior. At the same time, consumers will also compare prices and consult products through online sales channels, and then buy products through offline sales channels, and there is a certain free-riding phenomenon.

2) According to the service cost function proposed by A. A. Tsay *et al.* (2004), it can be assumed that the service cost function is $C(s) = \eta s^2/2$. The greater the service cost coefficient of A product, the higher the cost of the seller to experience the service level of A product.

3) The demand market is a unit market, and there is no demand transfer caused by product shortage.

## 3. Channel Demand Analysis Based on Consumer Utility

In the study of dual-channel supply chain, the consumer's channel demand is determined by comparing the consumer's utility U between the two channels. When consumers buy products through online sales channels, their value evaluation of the products will be more or less affected due to their different experience of the products. For example, when consumers buy products through online sales channels, they can only understand the product through graphic introduction, and the value evaluation of the product exists or is high or low. Therefore, when consumers buy products through online sales channels, the value of the product obtained by the consumer is $\beta v$.

When consumers buy products through offline sales channels, consumers can personally experience the product, so that the texture, shape, color and other attributes of the product have a more real feeling, through the experience can get the full value of the product $v$. When there is a free-riding behavior between online sales channels and offline sales channels, consumers will enjoy product experience services through offline sales channels, and then transfer to online sales channels, with a demand transfer volume of $ks_2$. Similarly, the demand transfer from online to offline sales channels is $ks_1$. From the above discussion, it can be concluded that the utility obtained by consumers buying products through online sales channels is $U_1 = \beta v - P + ks_2 + (1-k)s_1$; The utility obtained by consumers buying products through offline sales channels is $U_2 = v - P + (1-k)s_2 + ks_1$. Consumers will make purchase decisions by comparing the consumer utility between online and offline channels.

According to the above analysis:

1) When $U_1 = 0$, there is a critical value $v_1 = (P - s_1 + ks_1 - ks_2)/\beta$, then when $v \geq v_1$, so that $U_1 \geq 0$, consumers will choose to buy products through online sales channels;

2) When $U_2 = 0$, there is a critical value $v_2 = P - ks_1 - s_2 + ks_2$, then when $v \geq v_2$, so that $U_2 \geq 0$,

consumers will choose to buy products through offline sales channels.

3) When $U1=U2$, there is a critical value $v12=(2ks1+s2-s1-2ks2)/(\beta-1)$, then when $v=v12$, there is no difference between online sales channels and offline sales channels, and consumers can choose either channel to buy products.

By comparing the critical value (v1, v2 and v12) of the evaluated value of products purchased by consumers in different channels, we can see that when v1>v2, v1>v2>v12, in this case, when the evaluated value of products by consumers is in the interval [v2, 1], consumers will choose to purchase products through offline sales channels. That is, when P>[s1+ks2-ks1-β(ks1+s2-ks2)]/(1-β), all consumers will choose to buy products through offline sales channels, and manufacturers do not have online and offline dual channels. When v2>v1, v12>v2>v1, in this case, when consumers' assessed value of the product is in the range [v12, 1], consumers will choose to purchase the product through offline sales channels. When consumers' evaluation value of the product is in the range [v1, v12], consumers will choose to buy the product through online sales channels. When the consumer's valuation of the product is in the range [0, v1], the consumer will not choose any channel to buy the product, that is, when P<[s1+ks2-ks1-β(ks1+s2-ks2)]/(1-β), the manufacturer will have a dual-channel situation. Therefore, this paper only discusses the service coordination mode between online and offline channels of manufacturers. Through the above analysis, we can get the demand function of the manufacturer's online and offline dual-channel sales model.

## 4. The Example of the Algorithm

### 4.1 The Influence of Product Experience Coefficient

The relationship between product experience coefficient β and product price, product experience service level, total demand and channel revenue of online and offline dual channels under different decision modes is analyzed, and the centralized decision model and decentralized decision model under different product experience coefficients are compared and analyzed respectively. Online service is mainly the introduction of product information. If it is necessary to improve the experience of consumers at a higher level, it needs to meet the needs of touch, taste and other aspects, while offline service can meet the requirements through more enthusiastic service personnel. Therefore, the cost coefficient of online service is set to be higher than that of offline service. Let $\eta1=8$, $\eta2=3$, $k=0.6$, consumers have a certain understanding of the product information before purchasing the product, so $\beta\in(0.1, 0.8)$, that is, ignore the impact of the boundary error.

### 4.2 The Combined Effect of Product Experience Coefficient and Free Rider Coefficient

The following analyzes the influence of product experience coefficient and product experience service free ride coefficient on the service level decision result. Let $\eta1=8$, $\eta2=3$, $k\in(0, 1)$, because consumers have a certain understanding of the product information before purchasing the product, $\beta\in(0.15, 1)$, that is, ignore the influence of boundary error, can be obtained in the centralized decision-making mode and decentralized decision-making mode of dual-channel decision changes.

Both the service hitchhiking coefficient and the product experience coefficient will affect the level of online service. Especially when the product experience coefficient is small, the service free ride coefficient has a greater impact on the level of online service. The service level of online sales channel is a concave function of consumer free rider coefficient k. This indicates that with the change of consumers' free-riding coefficient k, consumers will experience products from offline sales channels through free-riding behavior. With the increase of free-rider coefficient k of consumers, the number of consumers transferred from offline entities to online sales channels gradually increases. As these consumers have experienced products through offline sales channels, they have a more comprehensive understanding of the real attributes of products, and their demands are more certain, the service level provided by online sales channels will gradually decrease. When the free-rider coefficient k of consumers reaches a certain minimum value, consumers also begin to pay attention to the service level of online sales channels, so as to determine the channels for their purchase of products. Therefore, online sales channels need to improve the service level of their own channels, so as to stimulate consumers transferred from offline sales channels to buy products through online sales channels. It can be seen that the service level of online sales channels decreases with the increase of product experience coefficient β, and first decreases and then increases with the increase of consumer hitchhiking coefficient k.

The product experience service level of offline sales channels decreases with the increase of product experience coefficient β, and increases with the increase of consumer free ride coefficient k. This indicates that with the increase of product experience coefficient β, consumers' degree of product experience gradually decreases, and consumers will be more inclined to buy products with a higher degree of product experience, so that consumers get a higher degree of product experience, offline sales channels will pay more services and provide a higher level of service to meet the needs of consumers. With the increase of consumers' free-rider coefficient k, the service level of offline sales channels will also gradually rise, mainly because consumers have free-rider behavior, that is, consumers will have new requirements on the service level of offline sales channels by consulting product information through online sales channels, and will require offline sales channels to provide more products and services. For example, when consumers buy products in physical stores, they will consult online sales channels and have a partial understanding of product prices and functions. Offline sales channels can no longer only provide product information services to meet the actual needs of consumers, and offline sales channels will provide a higher level of service to meet the shopping needs of consumers. Therefore, the product experience service level of offline sales channels is negatively correlated with the product experience coefficient β, and positively correlated with the product experience service hitchhiking coefficient k.

The service level of online and offline dual channels does not have continuous monotonicity with the increase of consumer hitchhiking coefficient k. When 0<k<0.45, the product experience service level of online sales channels and offline sales channels increases with the increase of product experience coefficient β, and decreases with the increase of consumer free ride coefficient k. When 0.55<k<1, the product experience service level of online sales channels and offline sales channels decreases with the increase of product experience

coefficient β, and the product experience service level of online sales channels and offline sales channels is a concave function of consumer free-rider coefficient k.

This result shows that when consumers' free-riding behavior is at a low level, with the increase of product experience coefficient β, consumers' product experience degree will gradually decrease, and the service level of online sales channels will gradually improve. When the product experience is certain, consumers will go to the physical store to experience the product before making a purchase decision, and the degree of experience of the product is high, and offline sales channels bear most of the pre-sale service. When consumers purchase products through online sales channels, online sales channels bear less pre-sale service, so with the increase of consumers' free-rider coefficient k, the product experience service level of online sales channels will be reduced.

When consumers' free-riding behavior is at a high level, with the increase of product experience coefficient β, consumers' product experience degree gradually decreases, and the service level of online sales channels also gradually decreases. When the product experience is certain, consumers will go to the physical store to experience the product before making a purchase decision, and the degree of experience of the product is high, and offline sales channels bear most of the pre-sale service. When consumers buy products through online sales channels, online sales channels bear less pre-sale services. Therefore, with the increase of consumer hitchhiking coefficient k, the product experience service level of online sales channels will be reduced. However, when the consumer hitchhiking coefficient k reaches a certain minimum value, the product experience service level of online sales channels will be reduced. Consumers who move from offline sales channels to online sales channels will put forward new requirements on the service level of online sales channels. Therefore, the product experience service level of online sales channels first decreases with the increase of consumer free ride coefficient k, and then increases with the increase of consumer free ride coefficient k.

When the manufacturer opens up the online and offline dual-channel sales model at the same time, as a retailer, it is necessary to coordinate the product service issues between the two channels. Due to the lack of product experience of consumers when buying products, free-riding behavior will occur. When consumers buy products through the platform, free-riding behavior will be more prominent. Therefore, manufacturers should provide consumers with targeted product pricing and service strategies based on the differences in product experience coefficient and consumer free-riding coefficient, and adopt corresponding decision-making modes according to them.

## 5. Conclusions

Aiming at product experience and consumers' free-riding behavior, this paper analyzes manufacturers' experience service coordination strategies under different decision models by constructing a supply chain consisting of manufacturers with online and offline sales channels. Through the research, the following management enlightenment is obtained:

1) When consumers have high requirements for product experience, such as the sale of

cosmetics, perfume and other products, considering that online sales channels cannot meet consumers' demand for product experience, consumers will tend to purchase products or experience products through offline sales channels. Consumers will also collect product information through online sales channels for price comparison, information consultation and other activities, thus giving rise to free-rider behavior. At this time, manufacturers should promote cooperation between online sales channels and offline sales channels when opening online and offline dual channels. The product information consultation and other services of online sales channels are integrated with the product experience, return and exchange services of offline sales channels, so that the two channels become a unified whole and adopt a centralized decision-making mode, so as to maximize the total revenue of the two channels.

2) When the product experience coefficient is small, that is, consumers have low requirements for the degree of product experience, such as the sale of toys, books and other products. With the development of e-commerce, consumers are more inclined to purchase through online sales channels, and they will pay more attention to the convenience of purchasing products and the logistics service level of products. In order to meet the needs of consumers, manufacturers can adopt a decentralized decision-making mode when implementing the dual-channel strategy, so that online sales channels and offline sales channels can give full play to their channel advantages, provide targeted service levels according to the characteristics of their own channels, and set corresponding product pricing and service levels for products with low experience.

3) When manufacturers adopt online and offline dual-channel sales, they should also coordinate the dual-channel service strategy by combining the free-riding behavior of consumers. Consumers have different demands for product experience, which leads to free riding between online sales channels and offline sales channels. It is more convenient to collect product categories and product information through online sales channels. When consumers purchase products, they will collect product price, after-sales service and other information through online sales channels to compare with offline sales channels, which will virtually increase the service cost of each channel and have an impact on the revenue of each channel and the total revenue of both channels. It is necessary for manufacturers to classify products according to the difference of product experience, and adjust the service level of their respective channels according to the change of consumers' free ride coefficient, so as to provide personalized services for consumers when purchasing products in their respective channels.

The supply chain model constructed in this paper only considers manufacturers that develop online and offline channels. In the hypothesis part, the free-rider behavior of consumers is described in proportional form, which is relatively simple. Future research can expand on the above aspects. In addition, the manufacturer's decision can be introduced into the online and offline dual-channel service coordination decision, and the influence of the manufacturer's decision-making behavior on the manufacturer's dual-channel service decision can be considered. At the same time, the influence of the manufacturer's effort level on the online and offline dual-channel service level can be considered under the condition that the manufacturer provides financial subsidies.

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