

Summary of Research on Contract Design and Decision Optimization of Live Streaming Selling Channels

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Abstract

In the context of live sales, brands can not only observe the results of the actions of the online Red anchor, but also observe the specific behavior of the online Red anchor. This is the principal-agent relationship under complete information. In this case, the brand can design the sales contract to ensure that the online popular anchor pays the effort level expected by the brand, so as to maximize the revenue of the brand. This paper will introduce the concepts and theories related to live broadcast sales: online popular live broadcast sales, principal-agent theory and Stackelberg game. At the same time, it summarizes the relevant literature from the two aspects of the research status of sales contract design and channel optimization.

Keywords

Online Celebrity; Live Broadcast Sales; Analysis on the Characteristics.

1. Introduction

In recent years, webcast sales have become one of the preferred channels for a large number of brands to sell products and clean up inventory. The scale of online live broadcast sales market continues to expand. According to iResearch's Research Report on China's live broadcast e-commerce industry in 2021, the scale of China's live broadcast e-commerce market will exceed 1.2 trillion yuan in 2020, with an annual growth rate of 197.0%, and it is expected to exceed 4.9 trillion yuan in 2023 [3]. By paying attention to the high loyalty and accuracy fans of specific categories of online Red anchor, and then accurately selling according to the relevant attributes of the product, the brand has not only brought users a good experience, but also formed excellent sales opportunities.

2. Related Theories and Concepts

2.1. Webcast Sales

Online live broadcast sales refers to an emerging e-commerce model. With the support of platform technology, online celebrity anchors rely on their various talents, such as singing, dancing, make-up and talk shows, and get the attention of a large number of fans. Brands sign sales contracts for various products based on the loyal fans of specific categories of anchors. Thanks to the live broadcast, the anchor not only fully displays the product information, but also interacts with consumers in real time through the bullet screen news.

As a social e-commerce model, online live broadcast sales have the following advantages: first, the audience can clearly obtain the professional description of the product through the anchor in the live broadcast room, and feel the real experience and evaluation of the anchor [1]. Secondly, the audience can also conduct real-time communication with the anchor through the bullet screen, and put forward their own needs for products. In this process, the audience can get great respect and satisfaction [2]. Third, the price is relatively low. In order to expand the market, the sales price during the live broadcast is often lower than the official or guidance

price of the product. In addition, some manufacturers are pursuing the purpose of clearing the inventory backlog.

2.2. Principal Agent Theory

Principal-agent theory originated from enterprise theory. Adam Smith first put forward in his wealth of Nations: "in dealing with the problem of money, the directors of joint-stock companies are doing their best for the shareholders, and the members of private partnership companies are entirely for their own interests. Therefore, compared with the members of partnership companies, the directors of joint-stock companies are difficult to strictly monitor the use of the company's property, and negligence and waste are inevitable important problems in the business operation of joint-stock companies." In 1933, the famous American economists Polly and MINNES found in modern company and private property that 44% of the total number of companies had been "separated from ownership and control", that is, the ownership and management right of the enterprise were separated (the management right of the enterprise was transferred to the actual "control group" composed of professional managers for management, and the shareholders assumed the obligation of capital contribution and had the right to dividends). The origin of principal-agent theory is the practical problem of the separation of enterprise ownership and management right, which is also the core problem that corporate governance needs to face and solve.

With the deepening of the research on the principal-agent theory, people gradually realize that the principal-agent relationship, that is, the relationship between the responsibilities, rights and interests formed by the principal handing over his own affairs to his agent, not only exists in the level of corporate governance, but also widely exists in political and economic problems, which has affected people's vital interests. The essence of principal-agent theory is the conflict of interest and information asymmetry between principal and agent. If there is information asymmetry or conflict of interest in a trading activity, there must be a principal-agent relationship. The party with the advantage of information resources is often called the agent, while the party with the disadvantage of information is the principal. The principal can not directly observe the behavior of the agent, but can only judge according to the results of his actions. The basic structure of the principal-agent relationship is shown in the following figure:

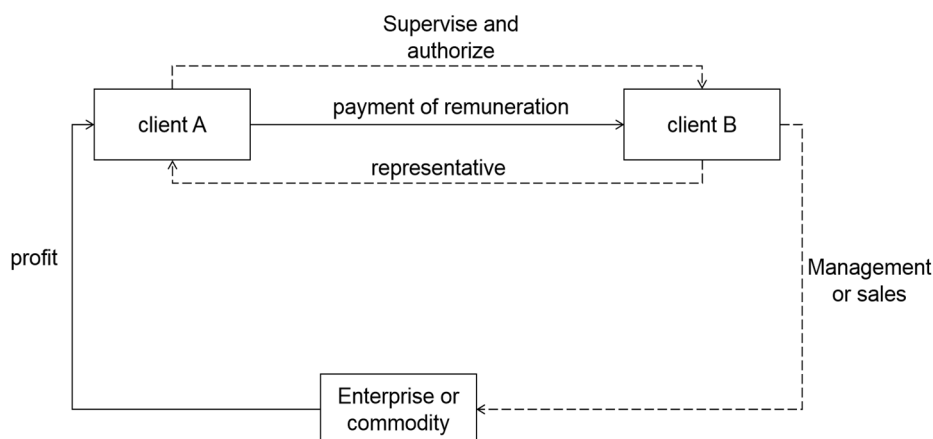


Figure 1. A figure of principal-agent relationship

When a entrusts B to handle certain affairs or participate in certain activities, the principal-agent relationship is established. In Figure 1, a is the principal and B is the agent. Principal a needs to pay for agent B's handling of affairs or participation in activities. Agent B needs to pay physical or mental labor to complete the tasks assigned by principal a according to the contents

of the contract or oral agreement. In this process, restricting the agent's behavior before, during and after the event belongs to the problem solved by the principal-agent theory.

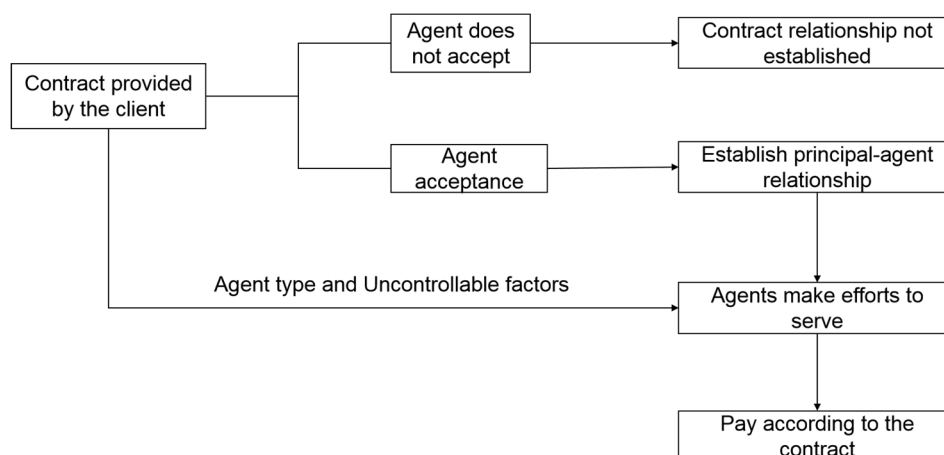


Figure 2. The basic path of principal-agent relationship

As shown in Figure 2, the path of principal-agent relationship is mostly the beginning of a set of contracts provided by the principal to the agent. The agent can choose to accept the contract or not. If you accept, you need to make efforts to complete the tasks assigned by the client. Finally, the client shall make corresponding payment according to the completion degree of the agent's task or the final result according to the contract.

2.3. Stackelberg Game

Stackelberg game is an output leadership model proposed by German economist Stackelberg in 1934. It is a two-stage complete information dynamic game. The model is widely used in Supply Chain Pricing and profit distribution.

The game problem belongs to master-slave game, that is, there are obvious status differences between subjects in the game process. The existing subjects are the leaders with higher dominant position and the followers with lower decision-making power. The main idea of the game is that the members participating in the game decide their own strategies according to the relevant strategies adopted by the other party, and their goal is to maximize their own profits under the other party's strategies, so as to realize the Nash equilibrium.

Under the background of the game, the players in the supply chain are widely used, resulting in the difference of the players in the supply chain. According to the main idea and goal of Stackelberg game, the brand and the online Red anchor do not make decisions at the same time, but the brand gives its own relevant decisions first, and the online Red anchor makes decisions to maximize its expected profit according to the brand's decisions, and finally reaches the Nash equilibrium state. It is worth noting that before making decisions, brands need to fully understand the actions of online Red anchor, that is, by predicting the response function of online Red anchor, they can understand how to maximize their own profits on the basis of online Red anchor response.

3. Journals Reviewed

Online live broadcast sales has become one of the preferred channels for a large number of brands to sell products and clean up inventory. This new business model improves the sales conversion rate of products and creates greater profit opportunities for the traditional e-commerce industry. However, with the development of live broadcast sales industry, brands, online celebrities and live broadcast platforms are facing more complex cooperative relations.

Based on this, it is very necessary to study the contract design and channel optimization of online live broadcast sales channel. Therefore, this paper will review the research status of online live broadcast sales, contract design and decision optimization at home and abroad, and point out the differences between this study and previous studies.

3.1. Research Status of Online Live Broadcast Sales

Online Red live broadcast sales refers to that brands sign sales contracts for various products based on the specific categories of loyal fans owned by online Red anchors, and then with the technical support of the live broadcast platform, online Red anchors not only fully display product information, but also interact with consumers in real time through bullet screen messages. At present, the research perspective of online live broadcasting sales can be divided into four categories: the current situation of online live broadcasting industry, live broadcasting sales model, merchants, consumers and supply chain.

(1) From the perspective of the current situation of the industry. Cai Xiaolu [3] and others summarized the types, profit models and industrial chain of online red, and put forward suggestions on the reflection and further development of online Red economy. Chen Chunzhu [4] and others analyzed the regulatory difficulties faced by the network anchor industry and put forward the regulatory system of the network anchor industry, including the employment qualification certificate, tax supervision, labor relations protection, privacy confirmation and other systems of the network anchor industry. Zhu Tong [5] found its characteristics and existing problems through the analysis of "online marketing" means, which provided reference for enterprises to adopt "online marketing" means. Xing Yanhui [6] studied the development process of online popularity from the perspective of the Internet and found the internal logic of the paradigm transformation of online popularity. Based on the perspective of celebrity theory, Sun Jing [7] and others evaluated and analyzed the relevant research of online popularity and online popularity economy, deeply analyzed the phenomenon of online popularity economy, and studied the factors of the emergence and development of online popularity and its economic and sociological essence. Wang Biao [8] and others found the deep motivation and essence of its rapid rise and various risks affected by various factors through in-depth research on webcast delivery, and put forward suggestions for the sound development and operation of the webcast delivery industry. Wang Jiahang [9] and others analyzed the application of scenarios in live sales from different angles and proposed that live sales in the era of scenarios reconstructed the connection relationship between goods, users and information. Yao Qinglin [10] and others summarized and sorted out the advantages of live broadcasting with goods and the chaos behind fraud, inefficiency and irrationality. Jia Weiwei [11] summarized the concept and application fields of influencer marketing, and put forward the theoretical interpretation model and research framework of the marketing mechanism.

(2) From the perspective of live broadcast sales mode. Shu Shibin [12] and others analyzed the current situation of webcast in the publishing industry and found that the industry has problems such as conservative concept and lack of talents. They put forward methods to solve the current problems from the aspects of establishing internet thinking. Jia Jingjie [13] studied the definition and development status of webcast delivery, and put forward the optimization strategy in the context of webcast delivery from four aspects: the establishment of mutual review and evaluation system, the optimization of platform content screening and push mechanism. Liufengjun [14] et al. Found through qualitative and quantitative research methods that the information source characteristics of online Red play a role in the purchase intention through the two shopping values of consumer practicality and hedonism. At the same time, the consistency of online red and product image plays a regulatory role between consumers' perceived practicality. Liu Zhongyu [15] and others constructed the formation mechanism of purchase intention in the three main categories of consumer cognition, consumer emotion and

consumer intention through grounded theory. Finally, they put forward suggestions and opinions to online celebrity anchor, consumers, brands and regulatory authorities. Geng [16] et al. Evaluated the economic value of online celebrity endorsement through cross-sectional regression method, and used panel vector regression model to test the relationship between online celebrity content marketing behavior and sales performance. The results show that the content generation efforts of marketers and the interactive behavior between marketers and consumers will significantly affect e-commerce sales. Wong [17] et al. Found that symbolic value has a direct and indirect impact on customer participation through the seller's trust, while utilitarianism and hedonism have an indirect impact on customer participation through the customer's trust in products and sellers. Shen Zhanbo [18] and others, from the perspective of brand value co creation, believe that the online live broadcasting and delivery mode is multi brand value co creation with the participation of consumers. Online Red plays an effective link role for all parties, and logistics and information flow play a supporting role. Consumer preference determines the path of value co creation, and puts forward the core that consumers should pay attention to online Red personal brand, commissioned product brand and delivery platform. Guo [19] and other researchers believe that trust in anchors can lead to a positive impact on trust in products and community members.

(3) From the perspective of merchants and consumers. Zhou [20] and others explored the popularity of online celebrities by studying the social distance perceived by users from the intention of online celebrity live broadcast on the live broadcast platform. The research found that the social distance between users and online celebrities was positively correlated with the intention of live broadcast, and challenging stressors and obstructive stressors played different mediating effects. Zhou [21] and others studied the role of the audience's social interaction on the live broadcast platform in paying gifts, and found that the interaction between the audience can affect the audience's awakening level through the stimuli in the barrage, so as to promote the gift of paid gifts. Wong [22] et al. Analyzed the Facebook data of live sellers and determined four sales methods and twelve strategies used in acquiring and retaining customers. Meng Lu [23] and others found that social presence increases the sense of identity, which improves the psychological mechanism of purchase intention. At the same time, the information source characteristics of online red are summarized into five dimensions: credibility and professionalism. Through the econometric model, the impact of the information source characteristics of different types of online red on consumers' purchase decision is refined. Based on a combination of qualitative and quantitative research methods, Chen Haiquan [24] and others found that the more obvious the personal characteristics of online celebrity are, the more conducive it is to enhance the purchase intention of fans. At the same time, the perceived value of fans plays an intermediary role between the characteristics of online celebrity and the purchase intention of fans. Luo [25] and others divided the anchor's language persuasion style into five types based on five theoretical foundations, such as huffland's persuasion model and Aristotle's rhetorical skills. At the same time, they established a regression model in combination with the product sales, and obtained the impact of the anchor's language persuasion style on the sales of live broadcast products. Tiktok, Li [26], and other users, through tiktok, have found that product discount has no direct or indirect impact on users' purchase intention. Guo [27] and others found that beauty, professionalism, humor and enthusiasm are positively correlated with the pleasure value of Betta, while warmth and professionalism are positively correlated with utilitarian value. At the same time, it is found that professional knowledge is more important than beauty, and the popularity of online popularity has no effect on consumers' purchase intention.

From the perspective of supply chain. Wang [28] and others studied the interaction between trade unions and online celebrity anchors based on the salary mechanism. The results show that whether the webmaster joins the trade union depends on the salary mechanism of the

trade union and its individual ability, and the mechanism will be affected by the sharing rate of the platform between the trade union and the webmaster. Liu [29] and others found that if the platform sets a higher revenue sharing rate, its efforts to recommend online celebrities will be reduced, which may reduce the revenue of the platform and online celebrities. On this basis, a subsidy mechanism is proposed to encourage nethong to increase the investment in platform recommendation, and make the platform and nethong win-win by setting a reasonable income sharing rate. Xing Peng [30] et al. Obtained the optimal quality effort strategy and profit in the two cases by constructing the profit function of supply chain members under the two cases of anchor signing and non signing, and numerically simulated the changes of anchor service quality effort and platform service quality effort with the proportion of anchor Commission and the proportion of platform pumping. Xu [31] and others studied the factors affecting consumers' purchase behavior in live shopping of tourism products based on the presence theory, and found that physical factors effectively alleviate the unsalable situation, while social existence itself can not fully stimulate the significant improvement of sales results. Jiang [32] et al. Analyzed the impact of consumers' impulsive purchase on manufacturers, retailers and supply chain. The results show that the impact of impulsive expenditure on the main body of the supply chain is not monotonous. Reasonable pricing decision and ensuring high-value products are the key to profitability and coping with impulsive consumption.

3.2. Research Status of Contract Design

In reality, in the market model in which brands hire webmasters to sell products or services, it is a common phenomenon for brands to determine the commodity price and give webmasters a commission through a certain proportion of sales or sales. If the webmaster accepts the contract provided by the brand, he will be responsible for putting the products on the shelves in his live broadcasting room and introducing the product information. The sales capacity of webmasters may be different, so the impact on market demand may be different under the same sales efforts. Based on such sales situations and contract models, scholars have conducted many in-depth studies.

Tian Houping [33] and others studied the incentive mechanism model under the asymmetry of sales ability and effort. The results show that the model can achieve the purpose of information screening and sales efforts at the same time. The above scholars only consider the influence of the sales ability of salespeople and their sales efforts on market demand.

AI [34] et al. Studied a competitive supply chain composed of a manufacturer and a retailer selling two alternative products, how manufacturers choose wholesale price contracts and revenue sharing contracts under the condition of supply chain competition and uncertain demand, and under what circumstances. Kostamis [35] et al. Studied that a manufacturer sells the same products to two retailers with incomplete competition. The study found that manufacturers had better sell more products through high-cost retailers. Zhang [36] and others studied the relationship between the contract selection of the platform and the manufacturer's quality decision by building two contracts provided by the e-commerce platform to the manufacturer. The results show that when the product quality is exogenous, the platform will always choose the revenue sharing contract, and when the manufacturer decides the product quality, the contract selection of the platform may change. Zhen [37] et al. Established a model for retailers to sell products through offline channels, online channels and third-party channels that provide two kinds of agency contracts. They studied the optimal pricing decision of retailers and the contract preference of retailers and third-party platforms. The results showed that retailers prefer revenue sharing contracts rather than fixed fee contracts. When the degree of channel competition is very low, third-party platforms are unwilling to provide revenue sharing contracts. The above scholars only consider the linear correlation between market price and market demand.

Ding Chuan [38] and others studied the principal-agent model under the condition that marketing channel members have complete rationality and fair preference, and found that the principal-agent model under fair preference can realize the Pareto improvement of the income of manufacturers and retailers. Chen chouyong [39] and others studied the relationship between the optimal effort level paid by retailers with or without fair preference and the contract incentive coefficient and product wholesale price, as well as the relationship between the optimal incentive coefficient and the product wholesale price and the marginal profit of retailers. At the same time, they found that the efficiency of e-commerce helps to promote the channel income of manufacturers and the whole supply chain. The above scholars also consider the impact of retailers' sales efforts and product market price on market demand, and assume that market price is an exogenous variable.

Gao Jie [40] and others studied pharmaceutical marketing service outsourcing based on personal performance contract and relative performance contract, and analyzed the CSO marketing efforts and expected profits obtained by the two contracts under the condition of symmetrical and asymmetric marketing difficulty information. The above scholars consider the impact of retailers' sales efforts and product market prices on market prices. At the same time, the product prices decided by manufacturers are made at the same time as the marketing efforts paid by nethong.

3.3. Research Status of Decision Optimization

Online live broadcast sales is a new sales model. Based on the sales situation, scholars have conducted many in-depth research on decision optimization.

Wang Wenlong [41] and others constructed the optimal decision-making of manufacturers and retailers considering low-carbon efforts under two types of contracts, namely wholesale price and revenue sharing contract, and discussed the impact of demand transfer, relative bargaining power and consumers' awareness of environmental protection on members' profits. Cao Xiaoning [42] and others took the supplier led dual channel supply chain of fresh agricultural products as their research object and designed three kinds of contracts, namely, two-part pricing contract, cost sharing and compensation contract and wholesale price coordination contract. It is found that these three contracts can achieve supply chain coordination and improve the profits of suppliers and retailers. Zou Xiao [43] and others considered the impact of value-added service elasticity and freshness elasticity demand on the decisions of suppliers and sellers, compared the optimal decisions under decentralized and centralized supply chain systems, and designed "two-way revenue sharing cost sharing contract" to realize the coordination of supply chain. Zhou Yongsheng [44] and others considered the integration of different types of consumer demand between channels, and discussed the optimal decision-making between retailers and suppliers.

The above studies did not take into account the impact of the difference in brand pricing decisions between online Red sales channels between Daren live studio and store live studio and the difference in sharing mode set by the third-party platform on the profits of both parties.

4. Summary

Firstly, this chapter briefly introduces the relevant theories and concepts involved in this paper, such as the concept of online live broadcast sales, principal-agent theory and Stackelberg game. Secondly, it summarizes the relevant literature from three aspects: the research status of online live broadcast sales, the status of contract design and channel optimization. From the existing research, most studies mainly focus on the current situation of online live broadcast sales industry, sales model and the businesses and consumers involved, while less literature focuses on the research of online live broadcast sales supply chain. In the research on the online Red

sales supply chain, only the contract design between the online Red anchor and the live broadcast platform or the labor union organization is studied. Even if it involves the brand, the online Red anchor and the live broadcast platform, the contract design is not considered, but the decision of focusing on the sales quality effort.

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