Study on Contract Coordination of Exhibition Supply Chain

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Abstract. Based on the situation where exhibition organizers and functional service providers are not coordinated in behaviors, the study introduces the supply chain contracts and respectively builds a coordinative model for wholesale price contracts of exhibition supply chain and a contract coordinating model of revenue sharing. Through the analysis and comparison, the results show that the revenue sharing contract brings is more effective to the exhibition supply chain coordination. Based on the contract coordination of revenue sharing, a relationship between information sharing and fixed cooperation is established between the organizers and functional service providers, to improve the overall performance level of the exhibition supply chain.

Introduction

The competition among modern companies is actually the one that between supply chains and supply chains¹. With the development of supply chain management theory and its application to the exhibition industry, the exhibition supply chain has been basically formed. Shen Qiang (2014) defined the exhibition supply chain as: A functional network chain structure that centered on the organizers and served exhibitors and professional visitors and other downstream customers, through application of modern information technology and combining such functional service providers among the upstream customers as venues, exhibition producers, transportation agencies and travel service providers, in order to realize user value and service appreciation². The general operation mode of the exhibition supply chain is listed as follows: Firstly, the sponsor of an exhibition determines the exhibition type and theme, and assigns the specific implementation task to a professional exhibition company, namely, an exhibition organizer. Secondly, the organizer invites the related units and professional visitors to the exhibition, selects partners and integrates certain functional services of such partners, who then will be the functional service providers, including the exhibition venue, transportation agency, exhibition constructor and travel service provider. In the end, the organizer carries out an

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optimal configuration against such service resources, and makes them available to exhibitors and visitors to participate in such exhibition. In this process, it is services and information that the organizer offers to the exhibitors and visitors, who are required to be charged for them. According to the definition and operation mode of the exhibition supply chain, the following structure model of exhibition supply chain (Table 1) can be concluded.

As the exhibition supply chain becomes basically formed, its purpose to maintain sustainable competitive advantage tends to be closely related to the supply chain coordination\[3\]. The supply chain coordination refers to a circumstance where all supply chain members in the supply chain system reach a coordinating contractual relationship to make the entire chain optimal. Although the rudiment of the exhibition supply chain operation has appeared, the participants of the chain are not coordinated in behaviors, so that its overall advantage fails to work. This problem is specifically embodied in the uncoordinated behaviors between the exhibition organizers and functional service providers that the organizers often have no partners and select single service providers with the lowest cost or even entrust certain functional service provider to integrate different services, to decrease their service costs. This not only increases the speculation possibility of functional service providers, but also reduces the driving force of the service providers to improve their service level, not to mention failing to satisfy the personalized service requirements of the exhibitors and visitors of different types, quality and with different exhibition goals. Therefore, to strengthen the overall system of supply chain and ensure company members of various joints to realize a win-win situation, it is required to implement an effective coordination and management against the behaviors of all companies of the supply chain using scientific methods. The supply chain contract makes an effective method realizing the supply chain coordination. With the supply chain contract introduced, the coordination level among all joints companies and the operation and service levels of the exhibition supply chain can be enhanced through rendering a coordination to the behaviors of independent participants with economic benefit appeals.

<table>
<thead>
<tr>
<th>A: Sponsor</th>
<th>B: Exhibition organizer</th>
<th>C1: Exhibition</th>
<th>C2: Professional visitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: Exhibition venue</td>
<td>S2: Exhibition constructor</td>
<td>S3: Transportation agency</td>
<td>S4: Travel service provider</td>
</tr>
</tbody>
</table>

**Table 1. The Structure Model of Exhibition Supply Chain.**
Contract Coordination of Supply Chain

The supply chain contract refers to the relevant documents and conditions to guarantee the coordinated benefits between both sides of a cooperation, to optimize the performance of product sales channels and to explicit rights and responsibilities of both sides, through offering appropriate information and incentive mechanism[4]. The supply chain contract is the mutual bond and link among all members of the supply chain, which can be used to make various joint companies encouraged, share information, strengthen cooperation, make the optimal decisions and ultimately realize the optimal profit in such companies and the entire supply chain, combining the designed reasonable contract parameters. At present, there are the following common types of supply chain contract: Wholesale price contract, revenue sharing contract, buy-back contract and option contract, etc., which are extensively applied in the supply chain management by the industry and play certain coordinating role.

Wholesale Price Contract

The wholesale price contract makes the firstly studied and the most common contract type. The wholesale price contract means that a retailer determines the order quantity according to the market demand and the wholesale price, the supplier organizes production according to the service order quantity of the retailer and the retailer is responsible for handling with the remaining products. Therefore, in such contract, the supplier enjoys a determined profit while the retailer fully undertakes all market risks. Lariviere et al. once made a relatively detailed discussion on the coordination of the wholesale price contract. the Boyaci and Gallegro believe that the wholesale price contract will be able to make the supply chain coordinated only when the supplier obtains zero profit or negative one. In the actual cases, however, it is impossible for the supplier not to obtain any profits, therefore, the wholesale price contract won't help the supply chain to be coordinated. Even so, the wholesale price contract has still been widely used in practice because of its simplicity and low cost of implementation[5]. Currently, the exhibition organizers and functional service providers in the exhibition supply chain are exactly adopting the wholesale price contract. In general, a functional service provider prices its services and offers them to an organizer, who then sells them to the exhibitors and professional visitors at an increased price. Either the organizers or the functional service providers are taking their own costs and profits as the measurement criteria and pursuing the maximum of their own profits. The wholesale price contract is often a one-time cooperation relationship. No fixed partnership is established between the exhibition organizers and functional service providers. Such one-time cooperation between participants contributes to the serious immoral conducts of participants with independent revenue demand, and impacts the operation level and overall earnings of the supply chain.

Revenue Sharing Contract

The revenue sharing contract is an agreement stipulating that a supplier offers a lower wholesale price to a retailer and obtains a part of sales revenue that the retailer obtains. Under the revenue sharing contract, the supplier offers a lower wholesale price to the retailer in the early stage when the retailer orders services from the supplier, to encourage the retailer or a distributor to purchase services and enhance the price competitiveness in the market. By the end of the sales period, the retailer will then return the sales profit to the supplier at certain parameter proportion as previously agreed by them. The common management
mode of special permission is a typical case of such contract. Mortimer J.H. made an empirical analysis on the utilization of the revenue sharing contract of the supply chain by the videotape leasing industry for a coordination, and discovered that such contract contributed to an extra increased 7% of the overall profit of the supply chain. Currently, most of the relevant studies showed that the revenue sharing contract can optimize the supply chain, and bring the win-win situation to all members of the chain. Compared to the simple wholesale price contract, this contract is able to increase the supply chain performance while enhancing the profits of suppliers and retailers

**Contract Coordination Model of Exhibition Supply Chain**

The basic model studying the exhibition supply chain contract is a two-level supply chain composed of single suppliers and single retailers. Therefore, the study assumes a contract coordination of supply chain formed by one exhibition organizer and one functional service provider. The following basic assumptions are also met: First, the organizer faces a random market demand; Second, the relationship between the exhibition organizer and the functional service provider is actually that between a leader (the functional service provider) and a follower (the organizer). The "leader" offers a set of contract parameters and the "follower" determines its optimal product order quantity based on such parameters; Third, both parties above are rational decision-makers. All information related to products and the market is symmetric. At the same time, assumes the purchased quantity of the exhibition organizer as q, the sales price as p, the sales income of the organizer as R, the production cost of the exhibitor as Cr, the profit of the organizer as πr, the production cost of the functional service provider as Cs, the profit of the functional service provider as πs, the product wholesale price that the functional service provider offers to the organizer as w, and the profit of the entire supply chain as π.

On the basis of the assumptions above and the specific definitions represented by the variable symbols, the profit functions of the exhibition organizer and the functional service provider in the supply chain and the entire supply chain are respectively as follows:

\[
\pi_r = R(q) - (w + cr)q; \quad (1)
\]

\[
\pi_s = (w - cs)q; \quad (2)
\]

\[
\pi = \pi_r + \pi_s = R(q) - (w + cr)q + (w - cs)q = R - (cr + cs)q. \quad (3)
\]

It can be found through the profit function of the entire supply chain that the condition of \( R' = cr + cs \) must be met to realize the optimal output \( q^* \) of the entire chain.

**Contract Coordination Model of Exhibition Supply Chain under Wholesale Price Contract**

Under the wholesale price contract, the organizer and the functional service provider are respectively a follower and a leader. The decision of the follower should be made based on that of the leader to guarantee the profit. When the exhibition organizer makes its own profit function and the wholesale price w is given to it, to make its own profit at the maximum, the optimal quantity \( q_0 \) decided by the organizer should meet the following condition:

\[
\pi'_r = R' - (w + c_r) = 0; \quad (4)
\]
\[ R' = c_r + c_s. \quad (5) \]

According to the analysis above on the overall profit of the exhibition supply chain, the condition for the optimal output is \( R' = cr + cs \) and that for the organizers to realize the maximum profit is \( R' = (w + cr) \). For the coordination of the entire supply chain, the organizers and the functional service providers and the entire exhibition service supply chain will all need to realize the maximum profits, therefore, the condition of \( w = cs \) must be satisfied. In this condition, the functional service provider makes its wholesale price \( w \) its production cost \( cs \). In this case, however, it obviously cannot obtain any profits, which is contradictory to the common sense; therefore, the wholesale price contract fails to achieve coordination of the supply chain.

**Contract Coordination Model of Exhibition Supply Chain under Revenue Sharing Contract**

First of all, the exhibition organizer and the functional service provider pre-determines the revenue sharing ratio \( k \). After the functional service provider gives the wholesale price \( w \), the organizer decides the optimal order quantity according to the market demand and its own situation. At the end of the same period, the organizer transfers a part of the revenue to the functional service provider at the ratio \( k \). At this point, the profit functions of the exhibition organizer and the functional service provider are respectively as follows:

\[
\pi_r = (1-k)R(q) - (w + c_r)q; \quad (6)
\]

\[
\pi_s = (w - c_s)q + kR(q). \quad (7)
\]

To realize the maximum profit of the organizer, the optimal order quantity \( q_0 \) should satisfy the condition of \( R' = (w - cr)/1-k \), and for the maximum profit of the overall profit of the exhibition supply chain, the optimal output \( q^* \) should satisfy the condition of \( R' = cr + cs \). Namely, make \( q_0 = q^* \), equal to \( (w - cr)/1-k = cr + cs \). In this condition, the functional service provider will need to set the wholesale price \( w = 2cr - KCr + (1 - k) cs = v + (1 - k) cs \), which shows that \( w > cs \), and that the functional service provider can obtain profit and realize the maximum profit if its wholesale price is greater than its cost of production, thus, the revenue sharing contract is able to realize the coordination of the exhibition supply chain.

**Coordination Strategy with Revenue Sharing Contract of Exhibition Supply Chain**

According to the analysis on the contract model of the exhibition supply chain, the revenue sharing contract is more advantageous to coordination realization of the exhibition supply chain. Under the coordination by the revenue sharing contract, the exhibition organizers and the functional service providers may adopt the strategies below:

**Utilize Information Technology to Realize Information Sharing**

The coordination relying on the revenue sharing contract can be only realized based on the information sharing between the organizers and the functional service providers. The information sharing must be realized, from the type, quantity and quality of exhibitors and exhibit information, to quantity, quality and participation purpose of participating visitors, and to the service level and service content of the functional service providers. On the one hand, through the information sharing, the exhibition organization ability of the organizers can be increased, on the other hand, the pertinency and
service level of services by the functional service providers will be improved.

**Develop Fixed Partners to Optimize Organizational Structure**

To realize the coordination by the revenue sharing contract, the exhibition organizers and the functional service providers should enter into a partnership to optimize the organization structure. Firstly, the organizers must prudently select the functional service providers. They should select the functional service providers with high service level, abundant service content and good reputation as their fixed partners. Secondly, as for the quantity of partners, they should enlarge the quantity of the functional service providers of the same kind, which can decrease the operation risk of the supply chain while forming a competitive and incentive status among such functional service providers; In the end, they should select the service providers of different levels and hierarchies, to shape a horizontal echelon of the functional service providers of the same kind, to meet diversified service needs of the suppliers and exhibitors.

**Determine Contract Parameters to Realize the Overall Coordination**

Under the coordination of the revenue sharing contract, both parties of the exhibition organizers and the functional service providers should determine the contract parameters, namely, the profit distribution parameters, so as to realize the coordination of the entire supply chain. The profit distribution parameters often depends on the prediction for the future market demand by, production costs and game abilities of companies of both sides. The rationality of the contract parameters can encourage the exhibition organizers to enhance their needs of services, thus increasing earnings of both companies, enhancing profits and making risks shared.

**Conclusion**

Referring to the research method and thinking of the supply chain of manufacturing industry, this paper applies the supply chain contract theories to establish a coordination model, with a view to solving the practical problems existing in the exhibition supply chain. It mainly studies the partnership between the exhibition organizers and the functional service providers, in order to improve the performance level of the exhibition supply chain. According to the established wholesale price contract model and revenue sharing contract model, it discovers by an analysis that the revenue sharing contract plays a coordinative role in such supply chain, and it also proposes specific coordination strategies based on such revenue sharing contract. There are, however, less studies related to the exhibition supply chain applying the supply chain contract theories. It contains many inevitable deficiencies and defects that this paper attempts to adopt the method of product supply chain to solve the problem existing in such chain. First, the models constructed herein require lots of premises and assumptions, however, these assumptions are not entirely consistent with the reality. Secondly, after the models are constructed, this paper does not make a calculation example simulation due to lack of data. Finally, this paper only studies the coordination mechanism between one exhibition organizer and one functional service provider, without fully considering the cooperation between other members of the entire exhibition supply chain. Therefore, in the future, the contract coordination between other members of the exhibition supply chain will require further research content.
References


