Studies on Online Course Resources Construction Based on the Perspective of Supply Chain

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Abstract

The construction of teaching online course resources is being developed more quickly with the continuous development of internet technology, which provides extremely favorable conditions for sharing teaching resources and optimizing the allocation of teaching resources. However, the construction of online course resources can't be conducted without the links of research and development, sales and purchase; the link of supply chain stays at a disadvantage at present, it is difficult to effectively coordinate the common interest of all the parties concerned. In view of such situation, this thesis firstly summarizes the development prospect of online course resources and the necessity of the construction under the current perspective of supply chain; and then utilizes the coordination contract model and discusses the coordination relationship between developers, sellers and terminal consumers of online course resources. Through simulation experiments, the results show that the efficient development of online course resources can be achieved and the coordinated development of all the parties concerned can be promotes only after realizing the benefit coordination of the subjects in supply chain during the construction of online courses resources.

Keywords: Supply Chain, Online Courses, Teaching Resources, Construction, Coordination Contract.

1. INTRODUCTION

1.1 Literature review

At present, the continuous updates of internet technology maximize the development of internet resources. However, it is difficult for the traditional teaching resources to catch up with the development of the era, which is not good for the progress of the teaching and curriculum reform. Therefore, promoting the teaching and curriculum reform through combining traditional teaching resources with online courses becomes the important foundation for the development of the online courses currently (Jia and Huang, 2016). Furthermore, under the perspective of supply chain, promoting the combination of online course resources and other teaching resources and improving the integration of the teaching resources of overall supply chain become the priority among priorities in the studies of academic circles (Zhu, 2017). At the present stage, the Ministry of Education and the Ministry of Finance have started and implemented “Undergraduate Teaching Quality and Teaching Reform Project in Institutions of Higher Education”, in order to promote the construction of the resource sharing platform for higher education curriculums.

On the platform, it is available to display the “resources sharing classes of Chinese universities” in a concentrated way, and operate, update, maintain and manage the course resources, which makes the development of overall supply chain more coordinative (Hong and Lian, 2011). In addition to the webpage courses, many the portal websites, such as NetEase, Sina and others, have launched the mobile terminal teaching curriculums in their programs of public classes currently (Stino, 2013). The users can log in mobile devices, for example, the client-side APPs in mobile phone and IPAD, and listen to an excellent course lectured by famous teachers in any place and at any time, which is the best benefit brought to the people who love studying in Internet era.

In the field of supply chain, it needs to adjust the relationship between production and sales of online courses. In this chain, the customer demand is taken as the primary driving force of production and sales of products and the corresponding manufactures will produce according to sales orders (Limongelli et al., 2015). Through the analysis on the resource construction of online courses and its specific function in supply chain, it can be observed that there exist a large number of supply chains in regards of knowledge dissemination, feedback and sharing. The course teaching team is the supplier of the products, they are the designers, suppliers and administrators of the teaching resources, and also set up products in an all-around way; and meanwhile, the sales terminal is each
network platform, and the objects of marketing are the consumers of the platforms, and have a larger demand for online courses. Therefore, the studies on the construction of the resources of online courses under the perspective of supply chain have significant effect.

1.2 Objectives of studies

In order to promote the construction and benign development of the resources of online courses and realize the benefit coordination in supply chain, the thesis adopts the coordination contract model to analyze the benefit coordination mechanism of subjects in the supply chain. The thesis firstly summarizes the development prospect of resource construction of online courses under the current perspective of supply chain. The online course resources can be developed rapidly along with the development of information technology, VR technology and other kinds of emerging technology. The necessity of the construction of the course resources is also discussed, in order to provide more convenient conditions for the scholars at remote regions, which has significant theoretical and practical meaning. It is observed from the analysis on model results that, in the supply chain of the development, sales and purchase of the resources of online courses, only after realizing the benefit coordination of all the parties concerned, the resources of online courses can be developed better. Therefore, it requires all the parties concerned in the supply chain to positively participate in the construction and maintenance of the resources of online courses, in order to promote the stable and health development of teaching resources.

2. THEORETICAL BASIS OF THE CONSTRUCTION OF THE ONLINE COURSE RESOURCES UNDER THE PERSPECTIVE OF SUPPLY CHAIN

2.1 Development prospect of the online course resources under the perspective of supply chain

In recent years, as the country attaches great importance to the vocational education, various schools have made better achievements in the design and development of the resources of online courses, which has important theoretical value and realistic significance (Lee et al., 2010). In the Work Focus of Vocational Education in Shanghai Municipality in 2015, it was clearly proposed to promote the construction and development of the online courses of the Secondary Vocational Education, set pilots to open the newly developed 6 online courses through students course selection, online learning, course guidance and credits identification. And meanwhile, during the overall construction process of the online course resources, based on the asynchronous learning and the construction concept of centering on independent study, it needs to realize the all-round development of the online course resources through teaching design and course framework analysis, interaction and presentation mode for the purpose of educational reform (Herrador et al., 2012). During the process of constructing the online course resources, the spreading and sales of the online course resources have become an industry chain. Under the perspective of supply chain, the sales, purchase and learning of online courses have also become the most important chain at present. In the Internet era that develops rapidly, the resources of the online courses will be developed towards the tendency of diversification, and can provide the learning channels for more learners.

2.2 Necessity of the construction of the online course resources

At present, the construction of online teaching resource library can be taken as the tool of extending classroom teaching, effectively relieve the pressure of insufficient depth of teaching caused by limited classroom time (Lu et al., 2014). And meanwhile, through the construction of the online course resources, the projector equipment can be sufficiently used to project basic knowledge in classroom, and then the student’s capability can be improved by different levels through the supplement of teaching resource library after class (Yang et al., 2014). A high-quality teaching resource library of online courses can avoid the waste of teaching resources largely and break through the restriction of time and place, and effectively solve the problems that metropolises run short of and are unable to share the teaching resources, which also provides effective solutions for the issues that the advanced teaching online course resources cannot be applied at remote mountain areas and relatively less developed areas.

3. ANALYSIS ON THE COLLABORATION OF THE RESOURCE CONSTRUCTION OF ONLINE COURSES ON THE BASIS OF COORDINATION CONTRACT MODEL

At present, the design, sales and purchase of online course resources have formed the supply chain that both supply and requisitioning parties need, and the tendency of specialization of work, market competition and industry integration causes larger conflict in the construction, sales and purchase and other links of the online course resources (Baker et al., 2015). Furthermore, along with the demand tendency of the study-type market for
the integration of services of online courses, it is difficult for the single operation mode of online course resources to meet the service needs of the individualized and specialized learning of customers, which requires the entire form of organization of the construction and sales of online course resources deeply cooperating with each other, in order to provide comprehensive service for the party demanding for learning service. In order to coordinate the stable development of the supply chain of the online course resources, this thesis adopts the coordination contract model to analyze the coordination of the construction, sales and purchase and other links in the whole supply chain of online course resources. The research personnel of online courses (D), the sales personnel of courses (R) and the users of online courses (C) are taken as the subjects of the study, the interaction (D and C), service experience (C), system management (D) and resource sales (R) are treated as the objects of study, in order to build the coordinative relationship between both parties.

3.1 Variable declaration and model assumption

3.1.1. Variable declaration

Based on the above purpose of studies, the thesis makes a variable declaration for the models, in order to serve for the following models better, the specific variables are as shown in Table 1:

| Variables | Declaration | | Variables | Declaration |
|-----------|-------------| | | |
| $D \geq 0$ | Supply quantity demand in face of suppliers | $Q$ | Purchase quantity |
| $F(x)$ | Distribution function of random demand of the demander | $h(c_2)$ | Risk ratio of random variables |
| $f(x)$ | Density function of random demand of the demander | $g(c_2)$ | Density function of random variables |
| $w$ | Wholesale price of retailers | $G(c_2)$ | Distribution function of random variables |
| $s_1$ | Ability deficiency cost of suppliers | $s_2$ | Ability deficiency cost of sellers |

3.1.2. Model assumption

(1) It is assumed there is a singly periodic two levels system, including the supplier of the online course resources and an integrator which orders online courses and meets the demand of final users whom study the courses. Both of them are of bounded rationality and risk neutral.

(2) The actual demand that the research personnel of online courses are faced with is $D \geq 0$, its average value $\mu = E(x) = \int_0^{\infty} xf(x)dx$, the distribution function and density function are respectively $F(x)$, $f(x)$. At this moment, $F(x)$ is continuously differentiable and reversible increasing function, $F(\theta)=0$. It is assumed that, the demander of the online course resources need a certain capability for the course resources to meet their demand, and then the quantity of sale required by sellers needs meeting through the designer of online courses.

(3) The sellers propose the purchase quantity $Q$ to the suppliers at the wholesale price $w$. It is assumed that the initial number of the courses of suppliers is 0, the sellers still make investment according to suppliers’ capacity of development, if the development capacity of suppliers is inadequate, the unit losses of capacity that the suppliers and sellers bear are respectively $s_1$, $s_2$ (both of which are greater than 0).

(4) Set the risk ratio of random variable is $h(c_2) = \frac{g(c_2)}{1-G(c_2)}$, and $z(c_2) = \frac{g(c_2)}{\gamma(c_2)}$ which represents incomplete information commission, and then $z(c_2) \geq 0$.

3.2 Construction and calculation of basic models

Under the centralized decision-making supply chain model, the decision makers confirm the order quantity of the suppliers and investment amount of sellers and corresponding price strategy according to the principle of the expected profit maximization of supply chain. Obviously, on the premise of profit maximization of the supply chain during the construction process of the online course resources, the cooperation relationship between
suppliers and sellers shall be confirmed according to the market demand information and coordinated with the maximization of the overall expected profit. Based on such principle, the basic model (1) is built:

$$\Pi_{sc}(K) = (p - c_2) - c_1 K - (s_1 + s_2)L(K)$$  \hspace{1cm} (1)$$

It can be learnt from Leibniz's rule that $\Pi_{sc}$ is concave function in regard to $K$; according to newsboy model, the formula of the optimal investment amount (2) under the decision-making model can be obtained as follows:

$$K^c = F^{-1}(\frac{p+e_2-e_1+s_1+s_2}{p-c})$$  \hspace{1cm} (2)$$

In a similar way, the formula of the supply quantity of sellers (3) can be obtained:

$$Q^*_i = F^{-1} \ast (p - w + s_1)/(p + s_1)$$  \hspace{1cm} (3)$$

At this moment, the expected profit of sellers is formula (4):

$$\Pi^s_i(Q^*_i) = (w + s_1 - c_1 - c_2)Q^*_i + \int_0^{Q^*_i} xf(x)dx$$  \hspace{1cm} (4)$$

It can be learnt from the above formula that, under new option mechanism, the suppliers offer the ordering opportunities within the fixed cycle, therefore, the market demand is reevaluated and adjusted according to the risks brought by such kind of uncertainty. The game between both parties during the decision-making process makes these subjects reach the optimal level. Therefore, the game models between suppliers and sellers are as follows:

$$\max_{w_0, q_0} \Pi^s_i$$  \hspace{1cm} (5)$$

s.t. \max_{K} \Pi^s_i$$  \hspace{1cm} (6)$$

s.t. K \geq Q_0 \geq 0$$  \hspace{1cm} (7)$$

Hereby, the basic relationship among parameters can be obtained:

(1) $p > w_0 + w_1 > c_1 + c_2$: guarantee both suppliers and sellers to be profitable;

(2) $w_0 \leq w, w_e \leq w$: guarantee the reasonable execution of the option contracts of the three parties;

(3) $c_1 > w_0$: avoid the unlimited investment of sellers that causes the market saturation of user demand.

3.3 Simulating calculation

Through numerical simulation, the coordination mechanism of option contracts among suppliers, sellers and users and the effectiveness in face of uncertain demand are further verified in the following. It is assumed that the demand of suppliers of online courses observe the uniform distribution $[0, 500]$, other parameters are respectively set up as follows:

$$p = 85, w = 50, c_1 = 20, c_2 = 40, s_1 = s_2 = 35$$  \hspace{1cm} (8)$$

It can be observed through data calculation that, during the construction and sales process of online course resources, when the three parties are dispersed and lack of coordination, the order quantity of suppliers of the course resources is $Q^*_i = 158.25$, and the expected profit is $\Pi^s_i(Q^*_i) = 1855.21$; when the three parties coordinate with each other, the optimal investment amount of the system is $K^c = 265$, and the corresponding expected profit of the system is $\Pi^s_{sc} = 1485.65$. Obviously, the expected profit gap of the system under such two conditions is $\Pi = \Pi^s_{sc} - \Pi^s(Q^*_i) - \Pi^s(Q^*_i) = 792.54$. 
3.4 Result analysis and discussion

It is observed from the coordination contract model that, during the process of construction, research and development and sales of online courses, it requires to continuously coordinating the benefits of all the parties concerned. Along with the continuous change and development of the connotation of courses, the teaching resources of online courses also involve learning environment and learning process, and the terminal learners need more effective support services when they learn through utilizing the resources of online courses, which requires the coordinative development of the suppliers and wholesalers of online courses, in order to provide more support services for terminal consumers jointly, and then guide learners to continuously learn the resources of online courses and practice and apply in the basis of such kind of learning. Only in this way, the coordinative development among suppliers and wholesalers of online courses and the terminal learners can be achieved. And meanwhile, during the process of construction and sales of online course resources, when these three parties are dispersed and lack of coordination, the expected profit of the suppliers of online course resource is \( \Pi^S(Q^S) = 1855.21 \); when three parties coordinate with each other, the expected profit of corresponding system is \( \Pi^S = 1485.68 \). Obviously, the expected profit gap of the system under such two conditions is \( \Pi = \Pi^S - \Pi^C(Q^S) - \Pi^P(Q^P) = 792.54 \), which indicates that only through coordinating the interest relationship among these three parties and connect the online course resources and terminal consumers well, it can be guaranteed that the profit of the suppliers and sellers of online courses will be maximized.

4. CONCLUSION

In conclusion, the rapid development of Internet of Things and the enhancement of the resources sharing promote the study-type sharing mechanism gradually emerge, and make online teaching resources gradually develop towards the direction of openness. However, the problems of the unbalanced distribution of traditional teaching resources and unreasonable structure of majors in colleges and universities become prominent at present, which attract more and more people to pay attention to the strength of resource construction of online courses. As the essence of the open-type teaching resources lies in opening up and sharing resources of good quality, during the construction process of increasing the resources of online courses, it requires more subjects participating in the expansion of the course resources, in order to continuously optimize the channels of the resources of online courses and increase the intensity of sharing. Therefore, in the overall supply chain, the links of development and construction, spreading, sales, purchase and study of the online course resources need to be optimized further. The coordination contract model adopted in this thesis is mainly used for optimizing the benefit coordination of the subjects in supply chain during the construction process of the resources of online courses, and thus realizes the more reasonable distribution of teaching resources. It is found through empirical analysis that, the construction and sharing of the resources of online courses can be achieved and the common progress of society can be promoted only after the benefit coordination of the subjects in supply chain.

REFERENCES


