International Journal of u- and e- Service, Science and Technology
Vol.9, No. 12 (2016), pp.19-38
http://dx.doi.org/10.14257/ijunesst.2016.9.12.03

Research on IT Capacity Matching between Enterprises Based on Vertical Value Chain

Zhang Tao[1] and Yang Libo[2*]

[1]*School of Economics and Business Administration,Chongqing University, Chongqing, 400030, China*
[2]*School of Management, Southwest political and Law science University, Chongqing, 401120, China*
No.301, at BaoSheng Road, Yubei Zone, Chongqing City, 401120, China; Tel: 18908370107;
[2]*cquyanglb@sina.com*

Abstract

The IT capacity based on the resource-based view could not bring sustainable competitive advantages to the enterprise.IT capacity is composed of the critical IT capacity and standard IT capacity; whether the enterprise could obtain the sustainable competitive advantage depends on the IT capacity matching of the enterprise. From the perspective of vertical market, with the help of Stackelberg model, the paper studies the influence of the network externality of standard IT capacity in components market on the competitive advantage of the total product enterprise. When the intensity of network externality of standard IT capacity in components increases, the change in the price of the inplace total product is uncertain; however, it always has positive feedback on the market demand of inplace total product, which makes the earnings from inplace total product increase continuously, resulting in the whole market in imbalance.

Keywords: *Critical IT capacity, Standard IT capacity, Matching, Network externality*

1. Introduction

In terms of IT capacity, Bharadwaj (2000) held the opinion that IT capacity is the ability of an enterprise to call and deploy IT resources, which should be combined with other resources of the enterprise.Wade (2004) proposed that IT capacity is a kind of complementary relation formed on the basis of IT and the enterprise's other resources, with the purpose to obtain sustainable competitive advantages. While the definition of Bharadwaj is the most authoritative.

Wang Dongqing *et. al.,* (2009) divided IT capacity into IT basic capacity, IT application capacity and IT development capacity: IT basic capacity is the ability of the enterprise to provide a basic platform to carry out basic IT application activities based on the internal and external business processes; IT application capacity is the ability of the enterprise to improve various business activities dynamically; IT development capacity is the ability to held the enterprise to adapt the environment and to fulfill a task. Zhang Heda *et. al.,* (2008) divided IT capacity into IT operation capacity and IT dynamic capacity: IT operation capacity is composed of IT manpower capacity, IT management capacity, IT cultural capacity and other static capacities; IT dynamic capacity is composed of IT planning capacity, IT identification capacity and IT implementation capacity.

For the relationship between IT capacity and enterprise competitive advantage, the basic idea of resource-based view is when the enterprise resources integrates with IT

*Corresponding Author

ISSN: 2005-4246 IJUNESST

resource to form into valuable, scarce inimitable and substitutable (VRIN) IT capacity, it will obtain long-term competitive advantage, to achieve economies of scale for the supplier and to help the enterprise to obtain the Ricardian rents.(Barney, 1991; Bharadwaj, 2000; Bingham & Eisenhardt, 2008). However, the basic idea of resource-based view is not accurate, as the market environment itself also has dynamic nature, and the change of the IT application environment is especially prominent. IT application environmet will change with the overflow of IT knowledge; although the channels of communication twist and turn, with the popularization of Internet, IT knowledge is more likely to overflow.

When the IT capacity can be coded overflows constantly, IT standard born accordingly, which could constantly generate network externality. The network externality of IT capacity could attract and target a larger consumer group, achieve the economies of scale of the demander, so as to avoid the balance of competition. For example, when selecting e-commerce platform, the consumer is more likely to select Taobao, Dangdang and other platform with high popularity, rather than those with smaller scale.

However, the enterprise is not exist in the market as an individual, no matter for industrial chain or industrial cluster, there is inevitable close contact relating to IT capacity among longitudinal enterprises, and this contact is known as IT capacity matching. The problem for longitudinal enterprises is how to perform IT capacity matching to guarantee that both sides will be in the equilibrium state.

In conclusion, the paper used two-stage game and Stackelberg price competition methods to perform quantitative research on the influence of the standard IT capacity's intensity of network externality in components market on the source of competitive advantage and strategic benefit of total product enterprises, and also discussed the positive influence as well as negative influence of modular enterprise cooperation.

2. Research Framework and Model Assumption

In this paper, IT capacity can be divided into standard IT capacity and critical IT capacity. The standard IT capacity is the ability mastered by an enterprise to use IT handle the structured businesses inside and outside the enterprise, including the application of IT in enterprise procurement, production, marketing and management and the communication and exchange among departments, which belongs to dominant layer and can be coded. While critical IT capacity is the ability of an enterprise to handle the unstructured businesses inside and outside the enterprise, including IT strategic planning, environmental adaptation, enterprise learning and innovation, which belongs to core layer and expanded layer and is hard to transfer.

IT capacity matching contains two levels of meaning, in one hand, it represents the internal relationship between standard IT capacity and critical IT capacity inside the enterprise, that is, standard IT capacity supplements and supports the critical IT capacity; on the other hand, the external relationship between different classes of IT capacity factors among vertical enterprises: the difference of critical IT capacity among enterprises; the consistency and similarity of the standard IT capacity among enterprises.

Critical IT capacity is the combination of IT resources and the enterprise's "special" resource, it belongs to the enterprise's tacit knowledge, which could improve IT strategy, improve the enterprise's ability to learn and innovate and provide the consumers with vertical differentiation service; however, it cannot be expanded through coding, so the critical IT capacity is unable to be imitated and replicated. The critical IT capacity shown by all enterprises has heterogeneity and equivalence, which refers to the difference in combination between the IT resource and the enterprise's "special" resource. The higher degree of combination the critical IT capacity is, the larger the larger influence on the consumer utility is and the more obvious the vertical difference is, so as to target the consumer to mitigate the price competition. However, the enterprises belonging to the same industry is locked in the same technological paradigm; although the critical IT capacity could not be imitated, the enterprise can obtain it along the evolution of IT capacity.

From the perspective of horizontal market, when the intensity of network externality of the standard IT capacity between enterprises rises gradually, the IT application environment of the market will change accordingly, and the consumers will more dependent on IT application. Relying on the vertical differentiation of critical IT capacity, the inplace enterprise could obtain the control power over the network, so as to attract more consumers; as a result, the market demand rises and the economies of scale forms, which subsequently reduces the equilibrium price of product. On the contrary, from the perspective of vertical market, whether the changes in the intensity of network externality of the standard IT capacity in components market will generate positive feedback on the competitive advantages of total product enterprises and whether it meets the Pareto improvement are the research emphases of this paper.

The paper puts forward the following assumptions:

Assumption 1: Market 1 is a components market, and there are two enterprises A and A': Enterprise A is a inplace enterprise while Enterprise A' is a competitive enterprise, and both enterprises cover the whole market 1. Enterprise A' implements one-way compatibility to the standard IT capacity of Enterprises A, and they share the same IT network.

Assumption 2: Market 1 is a total product market, and there are two enterprises B and B': Enterprise B is a inplace enterprise while Enterprise B' is a competitive enterprise, and both enterprises cover the whole market 2.Enterprise B' implements one-way compatibility to the standard IT capacity of Enterprises B, and they share the same IT network. Enterprise A combines with Enterprise B and Enterprise A' combines with Enterprise B', forming their respective vertical value chain.

Assumption 3: In market 1, there is no difference on the product of Enterprise A and A'; so does the product of Enterprise B and B'.The production cost for the products without difference is consistent; however, the difference on critical IT capacity results in the IT operating difference of the products without difference.

Assumption 4: The total demand of Enterprise B or B' is composed of the deprived demand of Enterprise A or A' and the original demand of Enterprise B or B'; while the total demand of Enterprise A and A' is composed of the separate buying demand and the total demand of downstream inplace product. The demand of Enterprise A or A' is equals to the output of Enterprise A or A'.

According to the “New Wooden Barrel Theory”, the enterprises only needs to retain its critical capacity and looks for the rest of the resources from the market, to allow all enterprise to use their own critical capacity as the basis for cooperation. If the IT capacity among enterprises is similar to the “New Wooden Barrel Theory”, whether the vertical enterprises could obtain competitive advantages?

2.1. Establishment of the Mathematical Model of Enterprise A and A'

Firstly, in market 1, the consumer utility of the IT capacity of Enterprise A and A' is composed of the critical IT capacity which represents the vertical differentiation and standard IT capacity which represents horizontal differentiation. As the standard IT capacity of Enterprise A can be coded and has network externality, the more number of consumers selects the IT application of Enterprise A or the compatible IT application, the higher the intensity of network externality of the standard IT capacity of Enterprise A, so does the utility obtained by the individual consumer. For the critical IT capacity of Enterprise A, the utility on its critical IT capacity perceived by different consumers is different. Therefore, the utility function of the consumer on the IT capacity of Enterprise A can be deduced:

$$U_{cl} = \theta F_{cl} - p_{cl} + \tau_c q_{cl} + \tau_c \gamma_c q_{cf} \tag{1}$$

In Equation (1), the market demand of Enterprise A is q_{cl} and that of Enterprise A' is q_{cf} , and as the two enterprises covered market 1 jointly, so there is $q_{cl} + q_{cf} = 1$; the random variable $\theta \in [\theta_1, \theta_2]$, which represents the sensitivity coefficient of the consumers on the standard IT capacity of market 1 is subject to uniform distribution. When the sensitivity coefficient is θ_2, all consumers will select Enterprise A; when the sensitivity coefficient is θ_1, all consumers will select Enterprise A'; while when the sensitivity coefficient is within $[\theta_1, \theta_2]$, the two types of consumers will coexist. The level of the critical IT capacity formed by Enterprise A is F_{cl}, θF_{cl} is the willingness to pay of the consumers for obtaining the critical IT capacity of Enterprise A, that is the utility obtained by the consumer from the critical IT capacity; p_{cl} is the product price of Enterprise A; $\tau_c > 0$ is the intensity of network externality of the standard IT capacity in market A, which represents the dependency level of the consumer on the IT application of Enterprise A; $\gamma_c > 0$ represents the degree of similarity and generality of Enterprise A and A' on the standard IT capacity, and it also represents the control degree of Enterprise A on the codified IT technical standard, that is taking open strategy or ownership strategy.

In terms of network externality, $\tau_c q_{cl}$ represents the network externality generated by the standard IT capacity of Enterprise A; $\tau_c \gamma_c q_{cf}$ represents the compatible network externality generated by the compatible standard IT capacity of Enterprise A' for the consumers of Enterprise A. Similarly, the consumer utility function of Enterprise A' can be deduced:

$$U_{cf} = \theta F_{cf} - p_{cf} + \tau_c q_{cf} + \tau_c \gamma_c q_{cl} - \delta_c (1 - \gamma_c) \tag{2}$$

In Equation (2), ΔF represents the level of the critical IT capacity owned by Enterprise A'; θF_{cf} represents the willingness to pay of the consumers for obtaining the critical IT capacity of Enterprise A'.As Enterprise A is first-mover enterprise, having the initial endowment of the resources with competitive advantages, while Enterprise A' is a second-mover enterprise, its IT application started late, so the difference between the critical IT capacities of the two enterprises can be assumed as $\Delta F = F_{cl} - F_{cf} > 0$. ΔF not refers to the difference of both enterprises on the content of standard IT capacity, instead, it is the difference on the combination degree between IT resource and other resources of the enterprise; if $\Delta F = 0$, it means that Enterprise A and A' are equivalent. p_{cf} is the price of Product A'. $\tau_c q_{cf}$ represents the network externality generated by the standard IT capacity of Enterprise A'; $\tau_c \gamma_c q_{cl}$ represents the compatible network externality generated by the standard IT capacity of Enterprise A.

When there is no difference on the influence between the critical IT capacity of Enterprise A and that of Enterprise A' on the consumer, that is $U_{cl} = U_{cf}$, the critical sensitivity coefficient of the consumer θ^* can be deduced:

$$\theta^* = \frac{p_{cl} - p_{cf} - \tau_c(q_{cl} - q_{cf}) + \tau_c\gamma_c(q_{cl} - q_{cf}) - \delta_c(1-\gamma_c)}{\Delta F} \tag{3}$$

When $\theta > \theta^*$, the utility of the consumer on the critical IT capacity of Enterprise A' is lower than that of Enterprise A, that is $U_{cl} > U_{cf}$, which means that the consumer is more sensitive to the critical IT capacity of Enterprise A, and the consumer will select Enterprise A for its critical IT capacity is more superior. Therefore, the market demand function of Enterprise A can be deduced:

$$q_{cl} = (\theta_2 - \theta^*)/\Delta\theta, \quad \Delta\theta = \theta_2 - \theta_1 \tag{4}$$

When $\theta < \theta^*$, the utility of the consumer on the critical IT capacity of Enterprise A' is higher than that of Enterprise A, that is $U_{cl} < U_{cf}$, which means that when the consumer is not sensitive to critical IT capacity, it will select Enterprise A' with the lower price and compatible standard IT capacity. Therefore, the market demand function of Enterprise A' can be deduced:

$$q_{cf} = (\theta^* - \theta_1)/\Delta\theta, \quad \Delta\theta = \theta_2 - \theta_1 \tag{5}$$

Substitute Equation (3) into Equation (1) and (2) and can get the respective market demand of Enterprise A and A':

$$q_{cl}(p_{cl}, p_{cf}) = \frac{\theta_2\Delta F - p_{cl} + p_{cf} + (\delta_c - \tau_c)(1-\gamma_c)}{\Delta\theta\Delta F - 2\tau_c(1-\gamma_c)} \tag{6}$$

$$q_{cf}(p_{cl}, p_{cf}) = \frac{-\theta_1\Delta F + p_{cl} - p_{cf} - (\delta_c + \tau_c)(1-\gamma_c)}{\Delta F\Delta\theta - 2\tau_c(1-\gamma_c)} \tag{7}$$

From Equation (6) and (7), it can be deduced that $q_{cl}(p_{cl}, p_{cf}) + q_{cf}(p_{cl}, p_{cf}) = 1$.

In market 1, we set aside the influence of other factors of the enterprise on the competitive advantages temporarily, and focus the research emphasis on IT capacity. In fact, the two enterprise are participating in a two-stage game:

In Stage I, the two enterprises determine their respective optimal compatible degree of the balanced standard IT capacity and the difference of critical IT capacity jointly, so as to jointly determine several kinds of stable IT capacity matching;

In Stage II, when there are several kinds of stable IT capacity matching between the two enterprises, the two enterprises will participate in Stackelberg price competition next. Price is the most fundamental and important factor for product; as the products of the two enterprise are undifferentiated and homogeneous essentially, the price of the two products actually represents the IT capacity of its own enterprise.

According to backward induction, in Stage I, the two enterprise will participate in Stackelberg price competition. Enterprise A determines its market price p_{cl} first, while Enterprise A' will determine its own price p_{cf}^* based on p_{cl}.While Enterprise A observed the pricing behavior of its competitor, it then adjusts its price to p_{cl}^*.Therefore, the earnings response function of Enterprise A' can be deduced firstly:

$$\pi_{cf} = q_{cf}\left(p_{cf} - c_{cf}\right) \tag{8}$$

Where, $c_{cf} > 0$ is the marginal cost of Enterprise A', which represents the degree of influence of the IT application of Enterprise A' on the marginal cost of its product and embodies the operating cost of IT application. Substitute Equation (7) into Equation (8) and get

$$\pi_{cf}\left(p_{cf}\right) = \left[\frac{-\theta_1 \Delta F + p_{cl} - p_{cf} - \left(\delta_c + \tau_c\right)\left(1-\gamma_c\right)}{\Delta F \Delta\theta - 2\tau_c\left(1-\gamma_c\right)}\right]\left(p_{cf} - c_{cf}\right) \tag{9}$$

Then calculate the first-order partial derivative and second-order partial derivative of the earnings response function ($\pi_{cl}(p_{cl})$) of Enterprise A':

$$\frac{\partial \pi_{cf}}{\partial p_{cf}} = \frac{-\Delta F\theta_1 + p_{cl} - 2p_{cf} - \left(\delta_c + \tau_c\right)\left(1-\gamma_c\right) + c_{cf}}{\Delta F\Delta\theta - 2\tau_c(1-\gamma_c)}$$

$$\frac{\partial^2 \pi_{cf}}{\partial p_{cf}^2} = -\frac{2}{\Delta F\Delta\theta - 2\tau_c(1-\gamma_c)}$$

If the intensity of network externality of the standard IT capacity in market 1 meets $\tau_c < \frac{\Delta F\Delta\theta}{2\left(1-\gamma_c\right)}$, then there must be $\frac{\partial^2 \pi_{cf}}{\partial p_{cf}^2} < 0$, then the earnings response function ($\pi_{cl}(p_{cl})$) of Enterprise A' must be strictly concave function and there must be sole equilibrium price:

$$p_{cf}^* = \frac{-\Delta F\theta_1 + p_{cl} - \left(\delta_c + \tau_c\right)\left(1-\gamma_c\right) + c_{cf}}{2} \tag{10}$$

When Enterprise A' determined its own equilibrium price p_{cf}^*, Enterprise A will adjust its equilibrium price. The earning response function of Enterprise A can be assumed as:

$$\pi_{cl} = q_{cl}\left(p_{cl} - c_{cl}\right) \tag{11}$$

Where, $c_{cl} > 0$ is the marginal price of the product of Enterprise A, which also represents the influence of the IT capacity of Enterprise A on the marginal cost of the product. And as the IT capacity of Enterprise A is superior to that of Enterprise A', then there should be $c_{cl} < c_{cf}$.Substitute Equation (6) and (10) into Equation (11) and get:

$$\pi_{cl} = \left\{\frac{2\theta_2\Delta F - p_{cl} + \left(\delta_c - 3\tau_c\right)\left(1-\gamma_c\right) - \Delta F\theta_1 + c_{cf}}{2\left[\Delta\theta\Delta F - 2\tau_c\left(1-\gamma_c\right)\right]}\right\}\left(p_{cl} - c_{cl}\right) \tag{12}$$

Now calculate the first-order partial derivative and second-order partial derivative of the earnings response function ($\pi_{cl}(p_{cl})$) of Enterprise A:

$$\frac{\partial \pi_{cl}\left(p_{cl}\right)}{\partial p_{cl}} = \frac{2\Delta F\theta_2 - 2p_{cl} + \left(\delta_c - 3\tau_c\right)\left(1-\gamma_c\right) - \Delta F\theta_1 + c_{cf} + c_{cl}}{2\left[\Delta F\Delta\theta - 2\tau_c\left(1-\gamma_c\right)\right]}$$

$$\frac{\partial^2 \pi_{cl}}{\partial p_{cl}^2} = -\frac{1}{\Delta F\Delta\theta - 2\tau_c(1-\gamma_c)}$$

If the intensity of network externality of the standard IT capacity of Enterprise A meets $\tau_c < \frac{\Delta F \Delta \theta}{2(1-\gamma_c)}$, then there must be $\frac{\partial^2 \pi_{cl}}{\partial p_{cl}^2} > 0$, then the earnings response function ($\pi_{cf}(p_{cf})$) of Enterprise A must be strictly concave function and there must be sole equilibrium price:

$$p_{cl}^{**} = \frac{2\Delta F\theta_2 + (\delta_c - 3\tau_c)(1-\gamma_c) - \Delta F\theta_1 + c_{cf} + c_{cl}}{2} \tag{13}$$

Substitute Equation (13) into Equation (10) and can get the equilibrium price of the product of Enterprise A':

$$p_{cf}^{**} = \frac{-3\Delta F\theta_1 - (\delta_c + 5\tau_c)(1-\gamma_c) + 3c_{cf} + 2\Delta F\theta_2 + c_{cl}}{4} \tag{14}$$

From Equation (13) and (14), it can be deduced that $\frac{\partial p_{cl}^{**}}{\partial \tau_c} = \frac{-3(1-\gamma_c)}{2} < 0$, $\frac{\partial p_{cf}^{**}}{\partial \tau_c} = \frac{-5(1-\gamma_c)}{4} < 0$, which represents for either Enterprise A or Enterprise A', the compatible degree $\gamma_c \in [0,1]$; the equilibrium price of both enterprises will decrease with the increase of the intensity of network externality (τ_c) of the standard IT capacity in market 1.

Therefore, the two enterprises could determine their respective equilibrium market output simultaneously:

$$q_{cl}^{*} = \frac{2\Delta F\theta_2 + (\delta_c - 3\tau_c)(1-\gamma_c) + c_{cf} - c_{cl} - \Delta F\theta_1}{4[\Delta\theta\Delta F - 2\tau_c(1-\gamma_c)]} \tag{15}$$

$$q_{cf}^{*} = \frac{-3\Delta F\theta_1 - (\delta_c + 5\tau_c)(1-\gamma_c) + 2\Delta F\theta_2 - c_{cf} + c_{cl}}{4[\Delta\theta\Delta F - 2\tau_c(1-\gamma_c)]} \tag{16}$$

2.2. Establishment of the Mathematical Model of Enterprise B and B'

In market 2, the consumer utility of Enterprise B is:

$$U_b = \mu S_b - p_b + \tau q_b + \tau\gamma q_m + \tau_c q_{cl}^{*} \tag{17}$$

In addition to the vertical differentiation and price of total product, the consumer utility of Enterprise B is composed of two parts: firstly, the network externality of the standard IT capacity in market 2.The positive feedback network externality τq_b of the standard IT capacity of Enterprise B. At the same time, the consumer utility of Enterprise B' on Enterprise B will also generate the positive compatible network externality $\tau\gamma q_m$ .Secondly, the influence of the network externality $\tau_c q_{cl}^{*}$ of the standard It capacity of Enterprise A on Enterprise B.

Similarly, the consumer utility of Enterprise B' is also affected by both the product of Enterprise B' and Enterprise A'.Therefore, the consumer utility function of Enterprise B' is:

$$U_m = \mu S_m - p_m + \tau q_m + \tau\gamma q_b + \tau_c q_{cf}^{*} - \delta(1-\gamma) \tag{18}$$

τq_m represents the network externality generated by the standard IT capacity of Enterprise B ; $\tau\gamma q_b$ represents the network externality generated by compatible product B' in the same network. While $\tau_c q_{cf}^*$ is generated from the functional complementation of the standard IT capacity of Enterprise A' and that of Enterprise B' .

In Equation (17) and (18), it represents the intensity of network externality of the standard IT capacity of Enterprise; it is the compatible degree of Enterprise on the standard IT capacity of Enterprise; random variable $\mu \in [\mu_1, \mu_2]$ represents that the sensitivity coefficient of the consumer on the critical IT capacity in market 2 is subject to uniform distribution. When the sensitivity coefficient of the consumer on the critical IT capacity of the enterprise in market 2 is μ_2, it represents that all consumers will select Enterprise B .When the sensitivity coefficient of the consumer on the critical IT capacity of the enterprise in market 2 is μ_1, it represents that all consumers will select Enterprise B', while it is between μ_1 and μ_2, it represents that the two types of consumers covered the whole product market jointly.

As Enterprise B and B' also adopt the method of "back-to-back" development, $S_b > 0$ represents the critical IT capacity of Enterprise B , μS_b represents the willingness to pay of the consumer for obtaining the critical IT capacity of Enterprise B ; $S_m > 0$ represents the critical IT capacity of Enterprise B' , μS_m represents the willingness to pay of the consumer for obtaining the critical IT capacity of Enterprise B' . However, the critical IT capacity of Enterprise B is superior to that of Enterprise B' , so the difference on the critical IT capacity between the two enterprises is $\Delta S = S_b - S_m > 0$. p_b represents the product price of Enterprise B , p_m represents the product price of Enterprise B' .Then the respective market demand function of each enterprise can be deduced:

$$q_b = \frac{\Delta S \mu_2 - p_b + p_m + \tau_c\left(q_{cl}^* - q_{cf}^*\right) + (\delta - \tau)(1-\gamma)}{\Delta S \Delta\mu - 2\tau(1-\gamma)} \tag{19}$$

$$q_m = \frac{p_b - p_m - \tau_c\left(q_{cl}^* - q_{cf}^*\right) - \Delta S \mu_1 - (\delta + \tau)(1-\gamma)}{\Delta S \Delta\mu - 2\tau(1-\gamma)} \tag{20}$$

Where, $\Delta\mu = \mu_2 - \mu_1$.

Similar to market 1, the two enterprises in market 2 also participate in a two-stage game; in Stage I, the two enterprises will jointly determine the stable IT capacity matching, including the optimal compatible degree of standard IT capacity and the optimal difference of critical IT capacity. In Stage II, the two enterprises will participate in Stackelberg price competition to determine their respective equilibrium price and equilibrium market output. According to backward induction, in Stage II, Enterprise B and B' will participate in Stackelberg price game.The earnings response function of Enterprise B' can be deduced

$$\pi_m(p_m) = q_m\left[p_m - c_m(\tau_c)\right] \tag{21}$$

Where, $c_m(\tau_c)$ is the marginal cost of the product of Enterprise B' , as Enterprise B' and Enterprise A' complement each other, as a result, the equilibrium price of Enterprise

A' is also the marginal cost of Enterprise B', that is $c_m(\tau_c) = p_{cf}^{**}$. Substitute Equation (20) into Equation (21) and get

$$\pi_m(p_m) = \left[\frac{p_b - p_m - \tau_c(q_{cl}^* - q_{cf}^*) - \Delta S\mu_1 - (\delta+\tau)(1-\gamma)}{\Delta S\Delta\mu - 2\tau(1-\gamma)}\right][p_m - c_m(\tau_c)] \tag{22}$$

According to Stackelberg competition, Enterprise B' will determine its equilibrium price p_m^* based on the product price p_b of Enterprise B .Now, calculate the first-order partial derivative and second-order partial derivative of the earnings response function $\pi_m(p_m)$ of Enterprise B':

$$\frac{\partial \pi_m}{\partial p_m} = \frac{p_b - 2p_m - \tau_c(q_{cl}^* - q_{cf}^*) - \Delta S\mu_1 + c_m(\tau_c) - (\delta+\tau)(1-\gamma)}{\Delta S\Delta\mu - 2\tau(1-\gamma)}$$

$$\frac{\partial^2 \pi_m}{\partial p_m^2} = \frac{-2}{\Delta S\Delta\mu - 2\tau(1-\gamma)}$$

When the intensity of network externality of the standard IT capacity in market 2 is $\tau < \frac{\Delta S\Delta\mu}{2(1-\gamma)}$, there must be $\frac{\partial^2 \pi_m}{\partial p_m^2} < 0$, so $\pi_m(p_m)$ is strictly concave function and there should be sole equilibrium price. Now, assuming $\frac{\partial \pi_m}{\partial p_m} = 0$, so the equilibrium price of the product of Enterprise B' is:

$$p_m^* = \frac{p_b - \tau_c(q_{cl}^* - q_{cf}^*) - \Delta S\mu_1 + c_m(\tau_c) - (\delta+\tau)(1-\gamma)}{2} \tag{23}$$

Similarly, the earnings response function of Enterprise B can be deduced

$$\pi_b(p_b) = q_b[p_b - c_b(\tau_c)] \tag{24}$$

Where, $c_b(\tau_c)$ is the marginal cost of the product of Enterprise B, similarly, the equilibrium price of the product of Enterprise is also the marginal cost of the product of Enterprise B, that is $c_b(\tau_c) = p_{cl}^{**}$ .As $p_{cl}^{**} \neq p_{cf}^{**}$, there must be $c_b(\tau_c) \neq c_m(\tau_c)$ .Substitute Equation (19) and (23) into Equation (24) and get:

$$\pi_b(p_b) = \left\{\frac{2\Delta S\mu_2 - p_b + \tau_c(q_{cl}^* - q_{cf}^*) - \Delta S\mu_1 + c_m(\tau_c) + (\delta - 3\tau)(1-\gamma)}{2[\Delta S\Delta\mu - 2\tau(1-\gamma)]}\right\}[p_b - c_b(\tau_c)] \tag{25}$$

Now, calculate the first-order partial derivative and second-order partial derivative of the earnings response function $\pi_b(p_b)$ of Enterprise B:

$$\frac{\partial \pi_b}{\partial p_b} = \frac{2\Delta S\delta_2 - 2p_b + \tau_c(q_{cl}^* - q_{cf}^*) - \Delta S\mu_1 + c_b(\tau_c) + c_m(\tau_c) + (\delta - 3\tau)(1-\gamma)}{2[\Delta S\Delta\mu - 2\tau(1-\gamma)]}$$

$$\frac{\partial^2 \pi_b}{\partial p_b^2} = \frac{-1}{\Delta S\Delta\mu - 2\tau(1-\gamma)}$$

When the intensity of network externality of the standard IT capacity in market 2 is $\tau < \Delta S\Delta\mu / 2(1-\gamma)$, there must be $\frac{\partial^2 \pi_b}{\partial p_b^2} < 0$, so the earnings function of Enterprise B must be strictly concave function. Now, assuming $\frac{\partial \pi_b}{\partial p_b} = 0$, it can deduce the sole equilibrium price of Enterprise B:

$$p_b^{**} = \frac{2\Delta S\mu_2 + \tau_c\left(q_{cl}^* - q_{cf}^*\right) + (\delta - 3\tau)(1-\gamma) - \Delta S\mu_1 + c_m(\tau_c) + c_b(\tau_c)}{2} \tag{26}$$

Substitute Equation (26) into Equation (23) and get the equilibrium price of the product of Enterprise B':

$$p_m^{**} = \frac{2\Delta S\mu_2 - \tau_c\left(q_{cl}^* - q_{cf}^*\right) - (\delta + 5\tau)(1-\gamma) - 3\Delta S\mu_1 + 3c_m(\tau_c) + c_b(\tau_c)}{4} \tag{27}$$

On the basis that Enterprise B and B' have determined their respective equilibrium price, the two enterprises will simultaneously determine their respective equilibrium market output. According to Equation (24) and (25), the respective equilibrium market output of either Enterprise B and Enterprise B' can be deduced:

$$q_b^* = \frac{2\Delta S\mu_2 + \tau_c\left(q_{cl}^* - q_{cf}^*\right) + (\delta - 3\tau)(1-\gamma) - \Delta S\mu_1 - c_b(\tau_c) + c_m(\tau_c)}{4[\Delta S\Delta\mu - 2\tau(1-\gamma)]} \tag{28}$$

$$q_m^* = \frac{2\Delta S\mu_2 - \tau_c\left(q_{cl}^* - q_{cf}^*\right) - (\delta + 5\tau)(1-\gamma) - 3\Delta S\mu_1 + c_b(\tau_c) - c_m(\tau_c)}{4[\Delta S\Delta\mu - 2\tau(1-\gamma)]} \tag{29}$$

Analyzing from market 2, only the condition of $\tau < \Delta S\Delta\mu/2(1-\gamma)$ meets, Enterprise B and B' can have the sole equilibrium price and equilibrium market output. $\tau < \Delta S\Delta\mu/2(1-\gamma)$ formula illustrates that in the horizontal competition of two enterprise, the difference on critical IT capacity is particularly important, and it can bring vertical differentiation for homogeneous product. While the compatibility of standard IT capacity can narrow the horizontal differentiation between two enterprises, only when the vertical differentiation effect is stronger than horizontal differentiation, the two enterprises will have the sole equilibrium price and equilibrium market output.

3. The Influence Of Network Externality τ_c On The Competitive Advantage Of Total Product Enterprise

The influence of the network externality τ_c of the standard IT capacity in components market on the total product enterprise mainly embodies in price, market demand and earnings, a total of three aspects. The product equilibrium price p_b^{**} and p_m^{**} of the total product enterprises B and B' are simultaneously affected by the intensity of network externality τ_c of the standard IT capacity in market 1 and the intensity of network externality τ of the standard IT capacity in market 2:

$$dp_b^{**} = \frac{\partial p_b^{**}}{\partial \tau_c} \times d\tau_c + \frac{\partial p_b^{**}}{\partial \tau} \times d\tau \tag{30}$$

$$dp_m^{**} = \frac{\partial p_m^{**}}{\partial \tau_c} \times d\tau_c + \frac{\partial p_m^{**}}{\partial \tau} \times d\tau \tag{31}$$

From Equation (30) and (31), it can be deduced that the product differential equilibrium prices dp_b^{**} and dp_m^{**} of Enterprise B and B' are calculated from the network effect part $\frac{\partial p_b^{**}}{\partial \tau} \times d\tau$, $\frac{\partial p_m^{**}}{\partial \tau} \times d\tau$ in market 2 and the network effect part $\frac{\partial p_b^{**}}{\partial \tau_c} \times d\tau_c$, $\frac{\partial p_m^{**}}{\partial \tau_c} \times d\tau_c$ of the standard IT capacity in market 1.It can be deduced that the change in the product equilibrium price of Enterprise B or B' may be affected by the intensity of network externality of the standard IT capacity in market 1 and market 2.

3.1. The Influence of Network Externality τ_c on the Equilibrium Price of Inplace Total Product

Different from the influence of the intensity of network externality τ on the product equilibrium price p_b^{**} of Enterprise B , the influence of the intensity of network externality τ_c on the product equilibrium price p_b^{**} of Enterprise B is more complicated. Now, calculate the first-order partial derivative of the product equilibrium price p_b^{**} of Enterprise B on τ_c :

$$\frac{\partial p_b^{**}}{\partial \tau_c} = \frac{\left[\tau_c\left(q_{cl}^* - q_{cf}^*\right)\right]' + \left[c_m(\tau_c) + c_b(\tau_c)\right]'}{2} \tag{32}$$

From Equation (32), it can be deduced that the influence ($\partial p_b^{**} / \partial \tau_c$) of the intensity of network externality τ_c of the standard IT capacity in market 1 on the product equilibrium price of Enterprise B is mainly composed of two parts: one is the marginal net network effect of the standard IT capacity of Enterprise A, $\left[\tau_c\left(q_{cl}^* - q_{cf}^*\right)\right]'$, if the Enterprise A has the sole equilibrium market output, so its marginal net network effect $\left[\tau_c\left(q_{cl}^* - q_{cf}^*\right)\right]' > 0$; the other is the marginal price competition effect of market 1, $\left[c_m(\tau_c) + c_b(\tau_c)\right]' < 0$, so market 1 is always in the status of price competition.

From the above analysis, the feedback effect $\partial p_b^{**} / \partial \tau_c$ of the intensity of network externality τ_c of the standard IT capacity in market 1 on the product equilibrium price of Enterprise B is subject to the combined action of the marginal net network externality of the standard IT capacity in market 1 and the marginal price competition effect in market 1.If the marginal network externality is greater than the absolute value of marginal price competition effect, then $\partial p_b^{**} / \partial \tau_c > 0$; otherwise, $\partial p_b^{**} / \partial \tau_c < 0$ .However, this explanation cannot directly judge the feedback effect of the intensity of network externality τ_c of the standard IT capacity in market 1 on the product equilibrium price of Enterprise B ; what it can be explained is the transmission mechanism of this kind of feedback effect. Next, we will continue to discuss the positive and negative situations of the feedback effect.

Now, directly calculate the first-order partial derivative of the product equilibrium price p_b^{**} of Enterprise B on τ_c :

$$\frac{\partial p_b^{**}}{\partial \tau_c} = \frac{2\Delta\theta\Delta F\left[(\delta_c + 2\tau_c)(1-\gamma_c) + c_{cf} - c_{cl} + \Delta F\theta_1\right] - 4\tau_c^2(1-\gamma_c)^2 - 11(1-\gamma_c)\left[\Delta\theta\Delta F - 2\tau_c(1-\gamma_c)\right]^2}{8\left[\Delta\theta\Delta F - 2\tau_c(1-\gamma_c)\right]^2}$$

Now, assuming: $g(\tau_c) = -(48-44\gamma_c)(1-\gamma_c)^2\tau_c^2 + \Delta\theta\Delta F(48-44\gamma_c)(1-\gamma_c)\tau_c + \Theta$

Its formula is: $\Delta_g = 2\delta_c(1-\gamma_c) + 2c_{cf} - 2c_{cl} + \Delta F\theta_2 + \Delta F\theta_1 > 0$

Where, $\Theta = \Delta\theta\Delta F\left[2\delta_c(1-\gamma_c) - 11\Delta\theta\Delta F(1-\gamma_c) + 2c_{cf} - 2c_{cl} + 2\Delta F\theta_1\right]$, and $\Theta \neq 0$ .Therefore, $g(\tau_c)$ has two different intensity of network externalities τ_c^* of the critical standard IT capacity:

$$\tau_c^* = \frac{-\Delta\theta\Delta F(48-44\gamma_c) \pm \sqrt{(\Delta\theta\Delta F)^2(48-44\gamma_c)^2 + 4\Theta(48-44\gamma_c)}}{-2(48-44\gamma_c)(1-\gamma_c)}$$

From which it observed that the intensity of network externality τ_c of the standard IT capacity in market 1 has uncertainty on the feedback effect of the equilibrium price of the product of Enterprise B.And this kind of uncertainty is also related to the compatible degree γ_c of the standard IT capacity of Enterprise A and A'.To make $\partial p_b^{**}/\partial\tau_c < 0$, now, the following two situations are discussed:

①When $\Theta > 0$:

1) If $\Delta F > \frac{2\delta_c}{11\Delta\theta}$, the range of the compatible degree γ_c of the standard IT capacity of Enterprise A' is:

$$\gamma_c > \frac{11\Delta\theta\Delta F - 2\delta_c - 2c_{cf} + 2c_{cl} - 2\Delta F\theta_1}{11\Delta\theta\Delta F - 2\delta_c} \tag{33}$$

2) If $\Delta F < \frac{2\delta_c}{11\Delta\theta}$, the range of the compatible degree γ_c of the standard IT capacity of Enterprise A' is:

$$\gamma_c < \frac{11\Delta\theta\Delta F - 2\delta_c - 2c_{cf} + 2c_{cl} - 2\Delta F\theta_1}{11\Delta\theta\Delta F - 2\delta_c} \Rightarrow \gamma_c < 1 \tag{34}$$

If it requires $\partial p_b^{**}/\partial\tau_c < 0$, then there msut be $g(\tau_c) < 0$; then the range of the intensity of network externality of the standard IT capacity in market 1 is:

$$\tau_c > \frac{-\Delta\theta\Delta F(48-44\gamma_c) - \sqrt{(\Delta\theta\Delta F)^2(48-44\gamma_c)^2 + 4\Theta(48-44\gamma_c)}}{-2(48-44\gamma_c)(1-\gamma_c)} \tag{35}$$

However, as there is the sole equilibrium price for Enterprise A, so the intensity of network externality of the standard IT capacity in market 1 must be $0 < \tau_c < \frac{\Delta\theta\Delta F}{2(1-\gamma_c)}$.

Obviously, $\tau_c^* = \frac{-\Delta\theta\Delta F(48-44\gamma_c) - \sqrt{(\Delta\theta\Delta F)^2(48-44\gamma_c)^2 + 4\Theta(48-44\gamma_c)}}{-2(48-44\gamma_c)(1-\gamma_c)} > \frac{\Delta\theta\Delta F}{2(1-\gamma_c)}$, therefore, only when the the intensity of network externality τ_c of the standard IT capacity in market 1 is:

$$\tau_c \in \left(0, \frac{\Delta\theta\Delta F}{2(1-\gamma_c)}\right) \tag{36}$$

When the intensity of network externality τ_c of the standard IT capacity in market 1 increases, the equilibrium price of Enterprise B will inevitably rise, that is $\partial p_b^{**} / \partial \tau_c > 0$.

②When $\Theta < 0$:

1) If $\Delta F > \frac{2\delta_c}{11\Delta\theta}$, the compatible degree of the standard IT capacity of Enterprise A' is:

$$\gamma_c > \frac{11\Delta\theta\Delta F - 2\delta_c - 2c_{cf} + 2c_{cl} - 2\Delta F\theta_1}{11\Delta\theta\Delta F - 2\delta_c} \tag{37}$$

2) If $\Delta F < \frac{2\delta_c}{11\Delta\theta}$, the compatible degree of the standard IT capacity of Enterprise A' is:

$$\gamma_c > \frac{11\Delta\theta\Delta F - 2\delta_c - c_{cf} + c_{cl} - \Delta F\theta_1}{11\Delta\theta\Delta F - 2\delta_c} \tag{38}$$

As $\Delta F < \frac{2\delta_c}{11\Delta\theta}$, it can be judged that $\gamma_c > 1$, which is inconsistent with the domain range of γ_c; therefore, the IT capacity matching between module Enterprise A and A' is actually false.

When the intensity of network externality τ_c of the standard IT capacity in market 1 is :

$$0 < \tau_c < \frac{-\Delta\theta\Delta F(48-44\gamma_c) + \sqrt{(\Delta\theta\Delta F)^2(48-44\gamma_c)^2 + 4A(48-44\gamma_c)}}{-2(48-44\gamma_c)(1-\gamma_c)} \tag{39}$$

There must be $g(\tau_c) < 0$, so there must be $\partial p_b^{**} / \partial \tau_c < 0$.

As the range of the network externality τ_c of the standard IT capacity in market 1 is:

$$\tau_c^* = \frac{-\Delta\theta\Delta F(48-44\gamma_c) + \sqrt{(\Delta\theta\Delta F)^2(48-44\gamma_c)^2 + 4\Theta(48-44\gamma_c)}}{-2(48-44\gamma_c)(1-\gamma_c)} < \frac{\Delta\theta\Delta F}{2(1-\gamma_c)}$$

Therefore, when the range of the intensity of network externality τ_c of the standard IT capacity in market 1 is:

$$\tau_c \in \left(0, \frac{-\Delta\theta\Delta F(48-44\gamma_c) + \sqrt{(\Delta\theta\Delta F)^2(48-44\gamma_c)^2 + 4\Theta(48-44\gamma_c)}}{-2(48-44\gamma_c)(1-\gamma_c)}\right) \tag{40}$$

Then there must be $\partial p_b^{**} / \partial \tau_c < 0$.

The above discussion shows, as described in Equation (36), when the two enterprises in market 1 have respective equilibrium price and equilibrium market demand, if the IT capacity matching $(\gamma_c, \Delta F)$ of Enterprise A and A' meets the above conditions, the difference on the standard IT capacity of Enterprise A and A' is larger and the vertical differentiation between Enterprise A and A' is larger, and the competitive advantage of Enterprise A is superior. Enterprise A adopts open strategy, and Enterprise A' keeps high compatible degree with Enterprise A on the standard IT capacity, and they are also closer functionally; therefore, as the increase of the intensity of network externality τ_c of the standard IT capacity in market 1, the consumer group obtained by Enterprise A expands accordingly, which helps Enterprise A to achieve economies of scale, and the economies of scale will cause the equilibrium price of Enterprise A to fall.

However, the fall of the equilibrium price of Enterprise A' is not caused by the economies of scale; as the increase of the intensity of network externality τ_c of the standard IT capacity in market 1, the consumer demand of Enterprise A' narrows; obviously, the purpose for Enterprise A' to fall the price is to carry out price competition with Enterprise A.Which will inevitably cause that the marginal net network externality of Enterprise A is greater than its marginal price competition effect.

The IT capacity matching of Enterprise A shows if the difference on the critical IT capacity of two enterprises is relatively large, the degree of the vertical differentiation between two products is prominent, meanwhile, the network externality of the standard IT capacity of Enterprise A is also prominent; to maintain its competitive advantages, it will inevitably select the strategy of strictly controlling the IT technical standard, to prevent the competitor eroding its value network, so as to further expand the degree of differentiation between two products. On this occasion, Enterprise A is also willing to raise the equilibrium price of the product to widen the price dispersion, and to sent the signal that the comprehensive quality of the product A is superior to the competitive products.

When the intensity of network externality of the standard IT capacity in market 1 is:

$$\tau_c \in \left(\frac{-\Delta\theta\Delta F(48-44\gamma_c)+\sqrt{(\Delta\theta\Delta F)^2(48-44\gamma_c)^2+4\Theta(48-44\gamma_c)}}{-2(48-44\gamma_c)(1-\gamma_c)}, \frac{\Delta\theta\Delta F}{2(1-\gamma_c)} \right) \tag{41}$$

There must be $\partial p_b^{**} / \partial \tau_c > 0$.

3.2. The Influence of the Network Externality τ_c on the Equilibrium Market Output of Inplace Total Product

The network externality of the standard IT capacity of Enterprise A and that of Enterprise B will also generate feedback effect on the equilibrium market output of Enterprise B.Now, calculate the total deriative of the equilibrium market output of Enterprise B:

$$dq_b^* = \frac{\partial q_b^*}{\partial \tau_c} \times d\tau_c + \frac{\partial q_b^*}{\partial \tau} \times d\tau \tag{42}$$

When the intensity of network externality τ_c of the standard IT capacity of Enterprise A generates positive feedback effect on the equilibrium market output of Enterprise B and the intensity of network externality τ of the standard IT capacity of Enterprise B also generates positive feedback effect on its own equilibrium market output, then the total differential of the equilibrium market output of Enterprise B meets $dq_b^* > 0$.Which shows that the increase of the network externality of the standard IT capacity of Enterprise A and Enterprise B could expand the equilibrium market output of Enterprise B.

In Equation (42), $\frac{\partial q_b^*(\tau_c)}{\partial \tau_c} = \frac{[\tau_c(q_{cl}^* - q_{cf}^*)]' + [c_m(\tau_c) - c_b(\tau_c)]'}{4[\Delta S \Delta \mu - \tau(1-\gamma)]}$ represents the feedback effect of the intensity of network externality of the standard IT capacity of Enterprise A on the deprived demand of Enterprise B.

Similar to the above, $[\tau_c(q_{cl}^* - q_{cf}^*)]'$ represents the marginal network externality advantage of Enterprise A and represents the difference between the network externality of the standard IT capacity of Enterprise A and that of compatible Enterprise A' when the intensity of network externality τ_c of the standard IT capacity of Enterprise A increases. When $\tau_c < \Delta F \Delta \theta / (1-\gamma_c)$, there nust be $[\tau_c(q_{cl}^* - q_{cf}^*)]' > 0$.Meanwhile, as the condition for Enterprise A having a sole equilibrium market output is $\tau_c < \Delta F \Delta \theta / 2(1-\gamma_c)$, it can be deduced that $\Delta F \Delta \theta / (1-\gamma_c) > \Delta F \Delta \theta / 2(1-\gamma_c)$; therefore, when Enterprise A has a sole equilibrium market output, there must be a marginal network externality advantage $[\tau_c(q_{cl}^* - q_{cf}^*)]' > 0$.

$[p_{cf}^* - p_{cl}^*]' = (1-\gamma_c)/4 > 0$ represents the marginal price advantage effect of Enterprise A, when the intensity of network externality of the standard IT capacity of Enterprise A increases, the falling speed of the equilibrium price of Enterprise A is faster than that of the competitive critical components; as the demand increases, Enterprise A is more likely to achieve the scale of the producer and the progressive increase of returns to scale.

Obviously, as Enterprise A has the sole equilibrium market output, relying on its marginal network effect and marginal price advantage effect, the intensity of network intensity of the standard IT capacity of Enterprise A will always generate positive feedback effect on the deprived demand of Enterprise B, that is $\partial q_b^*(\tau_c)/\partial \tau_c > 0$.

3.3. The Influence of Network Externality τ_c on the Equilibrium Earnings of Total Product Enterprise

The intensity of network externality τ_c of the standard IT capacity in market 1 not only affects the equilibrium price of Enterprise B or B', it also affects the equilibrium market output of Enterprise B or B'.As the equilibrium price and equilibrium market output of Enterprise B or B' change simultaneously, it is necessary to further discuss the influence of the intensity of network externality τ_c of the standard IT capacity in market 1 on the equilibrium earnings of Enterprise B or B'.

①The influence of network externality τ_c on the equilibrium earnings of Enterprise B'.

Now, calculate the first-order partial derivative of the equilibrium earnings function of Enterprise B' on τ_c:

$$\frac{\partial \pi_m^*}{\partial \tau_c} = \frac{\partial (p_m^{**} - c_m)}{\partial \tau_c} q_m^* + \frac{\partial q_m^*}{\partial \tau_c}(p_m^{**} - c_m) \tag{43}$$

In Equation (43), the influence of the intensity of network externality τ_c on the equilibrium earnings of Enterprise B' is composed of two parts: price effect $\frac{\partial\left(p_m^{**}-c_m\right)}{\partial\tau_c}q_m^*$ and output effect $\frac{\partial q_m^*}{\partial\tau_c}\left(p_m^{**}-c_m\right)$.According to the above discussion and analysis, the price effect of Enterprise B' is negative inevitably, that is $\frac{\partial\left(p_m^{**}-c_m\right)}{\partial\tau_c}q_m^*<0$; meanwhile, as $\frac{\partial q_b^*(\tau_c)}{\partial\tau_c}>0$, then the output effect of Enterprise B' is also negative, that is $\frac{\partial q_m^*}{\partial\tau_c}\left(p_m^{**}-c_m\right)<0$. Combining the two parts, it is obvious that the intensity of network externality τ_c has negative feedback effect on the equilibrium earnings of Enterprise B', that is $\frac{\partial\pi_m^*}{\partial\tau_c}<0$.

②The influence of the intensity of network externality τ_c on the equilibrium earnings of Enterprise B

When the intensity of network externality τ_c acts on the product equilibrium price and equilibrium market output of Enterprise B simultaneously, the influence of τ_c on the product equilibrium price of Enterprise B is uncertain, which is conditional. As the two factors shift, the influence of τ_c on the product equilibrium earnings of Enterprise B is uncertain. To research the feedback effect of the intensity of network externality τ_c on the equilibrium earnings of Enterprise B, calculate the first-order partial derivative of the equilibrium earnings of Enterprise B, π_b^*:

$$d\pi_b^*(\tau_c,\tau)=\frac{\partial\pi_b^*}{\partial\tau_c}d\tau_c+\frac{\partial\pi_b^*}{\partial\tau}d\tau$$

$$\frac{\partial\pi_b^*}{\partial\tau_c}=\frac{\partial\left(p_b^{**}-c_b\right)}{\partial\tau_c}q_b^*+\frac{\partial q_b^*}{\partial\tau_c}\left(p_b^{**}-c_b\right) \tag{44}$$

From Equation (44), it can be deduced the influence of the intensity of network externality τ_c on the equilibrium earnings of Enterprise B is composed of two parts of price effect $\frac{\partial\left(p_b^{**}-c_b\right)}{\partial\tau_c}q_b^*$ and output effect $\frac{\partial q_b^*}{\partial\tau_c}\left(p_b^{**}-c_b\right)$, which is the same as Enterprise B'.Then, we will discuss their relationship, and its output efffect is:

$$\frac{\partial q_b^*}{\partial\tau_c}\left(p_b^{**}-p_{cl}^{**}\right)=\frac{\left[h(\tau_c)-c_b(\tau_c)'+c_m(\tau_c)'\right]\left[\Psi-c_b(\tau_c)+c_m(\tau_c)\right]}{8\left[\Delta S\Delta\mu-\tau(1-\gamma)\right]} \tag{45}$$

Its price effect is:

$$\frac{\partial\left(p_b^{**}-p_{cl}^{**}\right)}{\partial\tau_c}q_b^*(\tau_c)=\frac{\left[h(\tau_c)-c_b(\tau_c)'+c_m(\tau_c)'\right]\left[\Psi-c_b(\tau_c)+c_m(\tau_c)\right]}{8\left[\Delta S\Delta\mu-\tau(1-\gamma)\right]} \tag{46}$$

Where,assuming $h(\tau_c)=\left[\tau_c\left(q_{cl}^*-q_{cf}^*\right)\right]'$, $\Psi=2\Delta S\mu_2+\tau_c\left(q_{cl}^*-q_{cf}^*\right)-\tau(1-\gamma)-\Delta S\mu_1$.

It can be deduced easily from Equation (45) and (46) that the price effect of Enterprise B , $\frac{\partial\left(p_b^{**}-p_{cl}^{**}\right)}{\partial\tau_c}q_b^*(\tau_c)$ is equal to the output effect $\frac{\partial q_b^*}{\partial\tau_c}\left(p_b^{**}-p_{cl}^{**}\right)$, and the positive and negative conditions are consistent.As $\frac{\partial\left(p_b^{**}-p_{cl}^{**}\right)}{\partial\tau_c}q_b^*(\tau_c)=\frac{\partial q_b^*}{\partial\tau_c}\left(p_b^{**}-p_{cl}^{**}\right)$, Equation (44) can be rewritten as:

$$\frac{\partial\pi_b^*}{\partial\tau_c}=2\frac{\partial q_b^*}{\partial\tau_c}\left(p_b^{**}-c_b\right) \tag{47}$$

In other words, the influence of the intensity of network externality τ_c on the equilibrium earnings of Enterprise B depends on the influence of the intensity of network externality τ_c on the equilibrium market output of Enterprise B .As there always be $\frac{\partial q_b^*}{\partial\tau_c}>0$, so there always be $\frac{\partial\pi_b^*}{\partial\tau_c}>0$.

In fact, price effect $\frac{\partial\left(p_b^{**}-p_{cl}^{**}\right)}{\partial\tau_c}q_b^*(\tau_c)$ can be deemed as the marginal profit margin of Enterprise B , although the increase of the intensity of network externality τ_c of the standard IT capacity in market 1 can urge the product equilibrium price p_b^{**} of Enterprise B to rise or fall, τ_c will certainly cause the product equilibrium price p_{cl}^{**} of Enterprise A to fall, and the falling range is larger than that of p_b^{**} , resulting in $\frac{\partial\left(p_b^{**}-p_{cl}^{**}\right)}{\partial\tau_c}q_b^*(\tau_c)>0$.

In conclusion, as long as the inplace total product Enterprise B cooperates with the inplace component Enterprise A, both sides will form into functional complementation relationship; with the constantly increase of the compatible degree of the standard IT capacity of Enterprise A, the deprived demand of Enterprise B will expand accordingly, and the demand curve will move right, and Enterprise B will expand the equilibrium market output to balance the consumer demand. Therefore, the product supply curve of Enterprise B will also move right, so that the demand is equal to market output, to balance the rise of equilibrium price caused by complementary products.

4. Conclusion

This paper mainly researched on the influence of the intensity of network externality of the standard IT capacity in component market on the competitive advantages of the total product enterprise, including equilibrium price, equilibrium market output and equilibrium earnings. When the intensity of network externality of the standard IT capacity in component market strengthens, its influence on the price of inplace total product is uncertain. However, its influence on the market demand of inplace total product is always negative, which directly results in the sustainable growth of the equilibrium earnings of the inplace total product enterprise, while the equilibrium earnings of competitive total product enterprise falls continuously, which causes the imbalance of the total product market.

The research of this paper also explains the IT productivity paradox from another perspective; IT application itself is featured with network externality, the more the consumer is, the higher the value of IT application is. IT capacity is dynamic. In vertical market, the enterprise with the advantage of the standard IT capacity network externality is possible to obtain competitive advantages, while other enterprises will be caught in " IT productivity paradox".

It is noteworthy that under this status, the competition within the industry is extremely unstable. The competitive enterprise will take the measures which have the foreseeable changes, and it will improve the compatible degree of standard IT capacity, so that the intra-industry competition could be equilibrium. Therefore, the research on the influence of the compatible degree of the standard IT capacity on the enterprise competitive advantage is an important research direction, which is conducive to improve the disequilibrium of intra-industry competition.

Acknowledgments

The writers wish to acknowledge the financial support provided by the Chongqing University.

References

[1] J. B. Barney, "Firm recourses and sustainable competitive advantage", Journal of Management., vol. 17, no. 1, **(1991)**, pp. 99-120.

[2] A. Bharadwaj, "A resource-based perspective on information technology capability and firm performance: An empirical investigation", MIS Quarterly., vol. 24, no. 1, **(2000)**, pp. 69–196.

[3] C. B. Bingham and K. M. Eisenhardt, "Position, leverage and opportunity: a typology of strategic logics linking resources with competitive advantage", Managerial and Decision Economics., vol. 29, **(2008)**, pp. 241-256.

[4] B. Bingham and K. M. Eisenhardt, "What makes a process a capability? heuristics,strategy, and effective capture of opportunities", Strategic Entrepreneurship Journal., vol. 1, **(2007)**, pp. 27-47.

[5] M. Wade and J. Hulland, "Review: the Resources-based View and Information Systems Research Review, Extension and Suggestions for Future Research", MIS Quarterly, vol. 28, no. 1, **(2004)**, pp. 107-142.

[6] Z. Heda and B. Xinhua, "Research on Enterprise's IT Capacity Structure", Intelligence Method., vol. 6, **(2008)**, pp. 3-5.

[7] W. Xiaobo and N. Pin, "A Review on the Technology System Evolution Theories and the Relevant Knowledge Evolution Theorie ", Science Research Management., vol. 29, no. 2, **(2008)**, pp. 103-114.

[8] J. C. Henderson and N. Venkatraman, "Strategic alignment: Leveraging information technology for transforming organizations ", IBM Systems Journal., vol. 32, no. 1, **(1993)**, pp. 4-16.

[9] J. N. Luftman, P. R. Lewis and S. H. Oldach, "Transforming the Enterprise: The alignment of business and information technology strategies", IBM Systems Journal., vol. 32, no. 1, **(1993)**, pp. 198-221.

[10] N. Venkatraman, "The concept of fit in strategy research", Academic Management Review, vol. 14, no. 1, **(1998)**, pp. 423-444.

[11] R. D. Sidhartha, A. Z. Shaker and E. M. Warkentin Merrill, "Integrating the content and process of strategic MIS planning with competitive Strategy ", Decision Sciences., vol. 22, **(1991)**, pp. 953-983.

[12] Y. Libo, S. Youhe, X. X. Huangwei, "Enterprises's IT Strategy Alignment Based on Supply Chains ", System Engineering Theory and Practice., vol. 30, no. 1, **(2010)**, pp. 38-47.

[13] P. Baake and A. Boom. "Vertical product differentiation, network externalities, and compatibility decisions ", International Journal of Industrial Organization., vol. 19, **(2001)**, pp. 267-284.

[14] S. Xun and C. Hongmin. "Selection of Network Externality, Transfer Cost and Enterprise Compatibility ", System Engineering Theory and Practice., vol. 9, **(2003)**, pp. 71-79.

Authors

Zhang Tao, 1971-10, Chongqing, China. Current position: he is a doctoral candidate in the school of economics and business. Author affiliation: school of Economics and business administration of Chongqing University. Scientific interest: network economics

Yang Libo, 1980-03, chongqing, China. Current position: lecturer, doctor**.** Author affiliation: Southwest University of political science and law**.** Scientific interest: network economics.