Abstract: The profit issue of inter-organizational information systems has been a focus in research at present. This paper, based on the perspective of transaction costs and structure costs, carries on the optimal control theory and method to present the optimal profit model on the dynamic pricing, dynamic cost and dynamic subsidy of IOS’ user under different operating modes. As a result, this paper gives innovatively selection strategies about operating modes to IOS’ user according to analyzing the optimal evolutionary tracks of the variables of the pricing, the number of users, profit, and so on.

Keywords: Inter-organizational information systems, User, Operation mode, Dynamic profit model, Revenue management, Optimum control

JEL Classifications: M21, C73, M42, O33

1. Introduction

There have been more impressive facts of dynamic gains from Inter-organizational information systems (IOS) taken step to dynamic pricing, such as Facebook’ FBX, Amzon’s RTB, Google’s Enhanced Campaigns, Alibaba’s AliExpress, etc. As a example of Taobao’ Express System, it is a new search auction mode been provided for bidding the specific search services or results of a product. Taobao will charge for the Taobao seller when consumers enter the seller’ shop by clicking through the Express System, and the charge depends on the bid from the latter retrieval shop in each clicking from consumers. According to incomplete statistics, the advertising revenue of Taobao was over 1.5 billion in 2009, mainly from the Express System, accounting for 80%, and there were 100,000 sellers paying for it. Another success case of inter-organizational information systems: American Partners Healthcare System (PHS) (Richard Kesner, 2010) brought more than 7 billion U.S. dollars for its revenue in 2008.

These enterprises apply revenue management theory to operate their information platforms so as to gain huge profit, but nowadays still are many shortcomings in theory developing, of which including the same standards of dynamic pricing for each user, subsidy mechanism for user is incomplete, mode of operation is not suitable, and so on. It was confirmed by Google that asked for the AdWords System would subsidy for users of mobile advertising to raise revenues in February 2013. The rapid development of IOS in practice needed the theory of IOS to support, but the theory is not enough to address the following issues: (1) the subsidy policies of system user for supporting those who use the user’s service; (2) the selection strategies of operating mode to system user; and (3) why does the system user seek a favorable structural position on IOS?

The research orientation of revenue management applying to information systems can be divided into IS service provider and users, taking into account network characteristics, transaction characteristics, market structure, provider & user’s behaviors, service resource constraints and other
characteristics. Siguaw, et al.(2003) propose the adoption of B2B sales force revenue management as a solution for firms desiring improved sales efficiency metrics and increased sales revenues, and a framework is developed for the implementation of sales force revenue management that can be readily used by practicing sales managers. Etzion et al.(2006) present the expected profit from seller on B2C mode applying online auctions and fixed price channels. From B2B to network service providers, Fulp & Reeves (2004) research the network service providers purchase large end-to-end connections from network owners, then offer individual users network access at a price, being described a scalable connection management strategy for QoS enabled networks. such research area on ISP and users' selection policies carried on a multi-level services model based on the perspective of users are similarly presented by Liu, et al. (2002) and Kalyanasundaram, et al. (2005). Similarly, profit issues about pricing model based on the view of customer mainly reveal from Anderson & Wilson(2003), Elmaghraby et al.(2008), Su (2007), and Shen & Su (2007).

IS’ dynamic pricing considering these factors, network characteristics, transaction characteristics, and so on, have been proposed in literatures and contributed to this paper around IOS’ operation mode. Caillaud & Jullien(2003) indicates that bilateral platform enterprises should first be free or subsidize to the other side user in order to attract users, through a divide-conquer pricing strategy to compensate for the loss of free or subsidized services provided for the other side of the user. Effect factors of IOS’ operating include as follows: (1)price elasticity of demand. It is similar in raising service price to the monopoly platform and competitive platform apart, but differs to marginal cost of raising service price (Rochet Jean-Charles, Jean Tjrole, 2004); (2)network externalities(Armstrong Mark, 2004; Anderson S.P. & S.Coate, 2005); (3)diversity preference to users (Hagin A., 2005); (4)services differentiation, which is widely studied(Armstrong, 2004; Anderson S.P. & Coate, 2005; Viecens M.F., 2004); (5)price undertakings (Hagin A, 2005).

The research method of IOS’ operating applied by revenue management mainly adopt optimal control theory, probability theory, utility theory, calculus model, etc to build a price model or a cost model. Wang & Schulzrinne (2001, 2006) propose a dynamic pricing mechanism of DiffServ (Differentiated Services framework), and then design a dynamic pricing algorithm of DiffServ according to the cost based on different levels of service and the average resource requirements for users, which realizes the optimization of dual pricing going to the maximum profit for both service provider and service users. Yang & Huang (2004) follow the advanced traveler information systems(ATIS) to maximize the profit of car user by a model of optimal service pricing over with time. Patel & Khan (2007) carry out a differentiate pricing to internet information searching services for Adaptive Distributed Search and Advertising(ADSA). Kumar & Sethi (2009) use optimal control theory to solve the control problem of internet content subscription fees and advertising occupies web content with change of the time. Liu, et al.(2010) construct a multinomial logit model to do a research of profit issue of on-demand IT services. Hajji, et al.(2012) investigate the benefit of a dynamic pricing strategy for ERP systems vendors in a business network governed by a quantitative diffusion model, being integrated into a simulation-based optimization approach to tackle the problem by a real scenario in the automotive industry.

All in all, there are insufficient researches in this area identified by literatures: (1)the dynamic cost of Hajji et al. (2012) is incomplete and not enough detailed. The cost will be further divided into production costs, transaction costs and structure costs in this paper, and the pricing and profit of user will be changed by different structure cost, being as a advantage or disadvantage structure position; (2)the starting time and extent of subsidy to IOS’ users from provider do not discuss in depth; (3)the profit of IOS should be analyzed the mode of IOS’ operating firstly because the different mode of IOS’ operating has different impacts to profit of IOS. Hence, the dynamic profit model of IOS’ users built in this paper will entirely consider the mode of operation, and carry out an optimal profit problem under an appropriate mode of operating.
2. Theoretical Model

2.1. Operating Mode of IOS

The operating mode of IOS can be classified as resource pooling IOS mode, complementary cooperation IOS mode, operational cooperation IOS mode, and operational coordination IOS mode, consisting of two dimensions—role linkage and system support level from Ilyoo B. Hong (2002), as shown in Fig. 1.

<table>
<thead>
<tr>
<th>Role Linkage</th>
<th>System Support Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>Operational Support</td>
</tr>
<tr>
<td>Vertical</td>
<td>Strategic Support</td>
</tr>
<tr>
<td>Role Linkage</td>
<td>System Support Level</td>
</tr>
<tr>
<td>Operational Cooperation IOS mode</td>
<td>Operational Support</td>
</tr>
<tr>
<td>--Joint DB (information sharing)</td>
<td>Strategic Support</td>
</tr>
<tr>
<td>--Improved customer service</td>
<td></td>
</tr>
<tr>
<td>Operational Coordination IOS mode</td>
<td>Operational Support</td>
</tr>
<tr>
<td>--Value/supply chain support (buyer-seller relationship)</td>
<td>Strategic Support</td>
</tr>
<tr>
<td>Resource Pooling IOS mode</td>
<td>Strategic Support</td>
</tr>
<tr>
<td>--Joint IT construction (cost/risk sharing)</td>
<td></td>
</tr>
<tr>
<td>--Market coalition</td>
<td></td>
</tr>
</tbody>
</table>

![Figure 1. A classification for operating mode of IOS](image)

It is significant difference of profit under these four modes of IOS’ operating depending on different services (data, information) based on different dimension, particularly adding these characteristics of market structure, network characteristics, supply chain structure, the size of IOS, behavior of IOS’ provider and user, subsidy policy can be further differentiated.

2.2. Dynamic Profit of IOS’ User

In the software industry, it is different economic laws to other industries, and results in the pricing strategy more complicated (Lehmann & Buxmann, 2009). Software provider may gain a growth potential earnings according to dynamic pricing by adjusting to customer needs and market environment (Elmaghraby & Keskinocak, 2003); changing operating rules timely to attract more high-level service users who will bring more revenue makes both IOS’ users and provider benefiting more than usual (Claussen et al., 2013). This paper adequately considers the impact of various factors on the dynamic profit to IOS’ user, and then develops a concept model of dynamic profit of IOS according to different pricing strategies matching each service need of IOS users, as shown in Figure 2 below.

Provider and users of IOS can be classified as suppliers, manufacturers and retailers according to the role and structure position of enterprises present in IOS. Considering the impact of supply chain structure for profit model is for the user, denotes $g_{ab}$ as the $b^{th}$ ($b=1,2,3$) sort of enterprises to the $a^{th}$ ($a=1,2,3,...$) supply chain, as shown in Figure 3 below.
3. Dynamic Profit Model

3.1. The Model

This paper builds a new participant growth model based on Subodha Kumar et al. (2009) and Hai Yang & Hai-Jun Huang (2004), that is.

\[ n(t) = \eta + \xi \cdot u(t) - \zeta \cdot v(t) \]  \hspace{1cm} (1)

where

\[ \eta \sim f(n(t)), \quad u(t) \sim f(n(t), \rho, p), \quad v(t) \sim f(n(t), \rho) \]

Equation (1) describes the variation of participant number depending on natural growth rate of number(\( \eta \)), attraction mechanism(\( u(t) \)) and competition mechanism(\( v(t) \)). And \( \rho \) and \( p \) respectively stand for the service pricing of IOS’ user(also a participant to IOS) to users who using his services, and the service pricing for IOS’ provider who constructs the IOS.

Further, the dynamic profit model of IOS’ user consists of revenue and cost consulted by Narahari et al. (2005), KARIYA et al. (2014), and Liu & Zhuang (2013). It can be listed as equations (2) and (3) below.

\[ \pi_{\text{user}}^{\text{total}} = R_{\text{user}}^{\text{total}} - C_{\text{user}}^{\text{total}} = R_{\text{user}}^{\text{op}} - C_{\text{user}}^{\text{op}} + R_{\text{user}}^{\text{ret}} - C_{\text{user}}^{\text{ret}} - C_{\text{user}}^{\text{reg}} - C_{\text{user}}^{\text{str}} - C_{\text{user}}^{\text{fee}} \]  \hspace{1cm} (2)

Figure 3. The structure character to IOS in supply chain

Figure 2. Frame structure of dynamic profit model
Expanded as,

\[
\pi_{\text{user}}(n(t), g) = \left\{ \begin{array}{ll}
\sum_{j=1}^{m_1} \sum_{j=1}^{m_j} p_j^j (e_j, g | n(t)) + W_j(n(t), g) - p_{\text{REGI}} (e, g) - SC(n(t), g) \\
-G(e, g) - \sum_{j=1}^{m_1} p_j^j (e_j, g | n(t)) + \sum_{j=1}^{m_j} \theta_j^i (e_j, g | n(t)) - \sum_{j=1}^{m_j} \vartheta_j^i (e_j, g | n(t))
\end{array} \right.
\]  

(3)

\(w_i(n(t), g)\) describes the potential value to IOS’ user takes part in this IOS; \(p_{\text{REGI}} (e, g)\) is the price of registering for the IOS; \(SC(n(t), g)\) describes the structure cost (Zhuang & Liu, 2013) to IOS’ user locating in a structure position of IOS; \(G(e, g)\) describes the transaction cost (Zhuang & Liu, 2013); \(\theta\) and \(\vartheta\) describe respectively the subsidy to IOS’ user providing from IOS’ provider and the subsidy to IOS users providing from IOS’ user, hence, it is negative to IOS’ user for providing subsidy to IOS users who adopt the IOS service from him.

3.2. Resource Pooling IOS Mode

Resource pooling IOS’ user encompasses a supply chain to express its structure position as the relationships with supplier, manufacturer and retailer in a supply chain.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOS based on supplier</td>
<td>IOS based on manufacturer</td>
<td>IOS based on retailer</td>
</tr>
<tr>
<td>(g_{11})</td>
<td>(g_{12})</td>
<td>(g_{13})</td>
</tr>
</tbody>
</table>

**Figure 4.** The structure character to resource pooling IOS mode in supply chain

Solves the optimal control problem to get optimal path to control variables, state variables and performance indicators, and the optimal evolutionary path can be seen as Fig. 5 to Fig. 8. Further analysis as follows:

Firstly, IOS’ user sets a dynamic price to users who use the service that IOS’ user offers over the time. The optimal pricing presents a smooth declining status, namely smooth dynamic pricing, so as to bring real-time optimal profitability for IOS’ user over the real-time decline in service pricing with the change of users number.

Secondly, the number of users using IOS services appear to increase rapidly at the initial stage, and follow by slow growth on the stable phase over the time. It is shown that the number of IOS users will be a stable state in the end because of limited services provided by IOS’ user.

Thirdly, at the early evolution of users number, the optimal profit increases rapidly, but it goes to a gradual declining state with a stable state in the number of users. It indicates that profit will be restricted by the limited number of IOS users to resource pooling IOS mode, hence, it should take measures to strengthen its ability to attract users at the next stage, such as increasing subsidy.

Fourthly, the development of subsidy shows a rapid decline at the initial stage, and then presents a slow decline state at a certain stage. Hence, we can make a Z-subsidy policy to users to the operating mode of resource pooling IOS.
Figure 5. Optimal service pricing path by user on resource pooling IOS mode

Figure 6. Optimal path of number of service users by user on resource pooling IOS mode

Figure 7. Optimal profit path by user on resource pooling IOS mode

Figure 8. Optimal subsidy to users who use the service by user on resource pooling IOS mode

3.3. Complementary Cooperation IOS Mode

Complementary cooperation IOS’ user spans several supply chain to express its structure position as the relationships with supplier, manufacturer and retailer in different supply chain. It is different characteristics between resource pooling IOS mode and complementary cooperation IOS mode, which users are across different supply chain, and then given the appropriate hypothesis 1.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOS based on supplier</td>
<td>IOS based on manufacturer</td>
<td>IOS based on retailer</td>
</tr>
</tbody>
</table>

\[ g_{a1} \quad g_{a2} \quad g_{a3} \]

Figure 9. The structure character to complementary cooperation IOS mode in supply chain

**Hypothesis 1:** The terminal number of users who using services provided by IOS’ user is free to complementary cooperation IOS mode, while the terminal number of users is limited to resource
pooling IOS mode.

Numerical analysis is given under above assumption, and the optimal evolutionary path can be seen as Figure 10.

We can see the optimal pricing to IOS’ user declines gradually and gently. It manifests that IOS’ user providing services can adopt a smooth dynamic pricing strategy when facing many upstream and downstream enterprises across several supply chain.

Figure 10. Optimal service pricing path by user on complementary cooperation IOS mode (on the right)

3.4. Operational Cooperation IOS Mode

Due to the difference of system support level to resource pooling IOS mode, complementary cooperation IOS mode, operational cooperation IOS mode, and operational coordination IOS mode, therefore, giving the appropriate assumption of service pricing, maintaining cost, structure cost, transaction cost, and charge of subsidy.

**Hypothesis 2:** The operational support of system support level is higher than the strategic support on service pricing, maintaining cost, structure cost and transaction cost.

**Hypothesis 3:** The operational support of system support level is lower than the strategic support on charge of subsidy.

<table>
<thead>
<tr>
<th>Table 1. Different costs to the difference of system support level</th>
</tr>
</thead>
<tbody>
<tr>
<td>system support level</td>
</tr>
<tr>
<td>strategic support</td>
</tr>
<tr>
<td>operational support</td>
</tr>
</tbody>
</table>

Note: "high" and "low" are relative to each other.

Figure 11. Optimal service pricing path by user on operational cooperation IOS mode

Figure 12. Optimal path of number of service users by user on operational cooperation IOS mode
Firstly, it is a smooth declining state to optimal service pricing for IOS’ user with the evolution of time. It shows that IOS’ user should adopt a smooth dynamic pricing strategy for users who using his services.

Secondly, the number of users presents a rapid growth at the initial stage with the evolution of time, and then turns to a steady slow growth. We can see the number of users using its services will eventually stabilize because of limited service contents which IOS’ user provides to other users.

Thirdly, at the early evolution of users number, the optimal profit increases rapidly, and keeps a stationary phase, but later it begins to decline steadily. It indicates that profit will be restricted by the limited number of IOS users to operational cooperation IOS mode, hence, it should take measures to strengthen its ability to attract users at the next stage or change another operating mode.

Fourthly, the optimal path of subsidy is same to the optimal path of pricing, which presents a smooth decline. We can see it should adopt a smooth dynamic subsidy strategy to users, also it is direct relationship between subsidy level and pricing level.

3.5. Operational Coordination IOS Mode

Hypothesis 4: The terminal number of users who using services provided by IOS’ user is free to operational coordination IOS mode, while the terminal number of users is limited to operational cooperation IOS mode.

It is a smooth declining state to optimal service pricing for IOS’ user with the evolution of time to operational coordination IOS mode. It also shows that IOS’ user should adopt a smooth dynamic pricing strategy for users who using his services.

4. Discussions

4.1. Variation of Profit with the Change of Pricing

Further test given by different terminal number of users, and service level divided into high level and low level($\varepsilon_1 = \varepsilon_1, \varepsilon_2 = 0$; $\varepsilon_1$ stands for low level, $\varepsilon_2$ stands for high level).
Table 2. The profit range with the change of pricing where $n(t_f = 1) = 10$

<table>
<thead>
<tr>
<th>$p_{eg}^R$</th>
<th>alteration situation</th>
<th>$\pi_{avg}$ range</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\theta^1(e_1, g_{12}) = 0.085 \cdot \theta^2(e_2, g_{12}) = 0.095$</td>
<td>$\rho^1(e_1, g_{12}</td>
<td>n(t)) = 0.9 \cdot \rho^2(e_1, g_{12}</td>
</tr>
<tr>
<td>$\theta^1(e_1, g_{12}) = 0.100 \cdot \theta^2(e_2, g_{12}) = 0.070$, $\theta^1(e_1, g_{12}) = 0.105 \cdot \theta^2(e_2, g_{12}) = 0.085$</td>
<td>$\rho^1(e_1, g_{12}</td>
<td>n(t)) = 0.7 \cdot \rho^2(e_1, g_{12}</td>
</tr>
<tr>
<td>$\theta^2(e_1, g_{12}) = 0.055 \cdot \theta^2(e_2, g_{12}) = 0.065$, $\theta^2(e_1, g_{12}) = 0.100 \cdot \theta^2(e_2, g_{12}) = 0.085$</td>
<td>$\rho^1(e_1, g_{12}</td>
<td>n(t)) = 0.5 \cdot \rho^2(e_1, g_{12}</td>
</tr>
<tr>
<td>$\theta^2(e_1, g_{12}) = 0.055 \cdot \theta^2(e_2, g_{12}) = 0.065$, $\theta^2(e_1, g_{12}) = 0.100 \cdot \theta^2(e_2, g_{12}) = 0.085$</td>
<td>$\rho^1(e_1, g_{12}</td>
<td>n(t)) = 0.3 \cdot \rho^2(e_1, g_{12}</td>
</tr>
</tbody>
</table>

Table 3. The profit range with the change of pricing where $n(t_f = 2) = 20$

<table>
<thead>
<tr>
<th>$p_{eg}^R$</th>
<th>alteration situation</th>
<th>$\pi_{avg}$ range</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\theta^1(e_1, g_{12}) = 0.080 \cdot \theta^2(e_2, g_{12}) = 0.090$</td>
<td>$\rho^1(e_1, g_{12}</td>
<td>n(t)) = 0.9 \cdot \rho^2(e_1, g_{12}</td>
</tr>
<tr>
<td>$\theta^1(e_1, g_{12}) = 0.095 \cdot \theta^2(e_2, g_{12}) = 0.100$, $\theta^1(e_1, g_{12}) = 0.055 \cdot \theta^2(e_2, g_{12}) = 0.015$, $\theta^1(e_1, g_{12}) = 0.020 \cdot \theta^2(e_2, g_{12}) = 0.035$</td>
<td>$\rho^1(e_1, g_{12}</td>
<td>n(t)) = 0.7 \cdot \rho^2(e_1, g_{12}</td>
</tr>
<tr>
<td>$\theta^2(e_1, g_{12}) = 0.055 \cdot \theta^2(e_2, g_{12}) = 0.065$, $\theta^2(e_1, g_{12}) = 0.100 \cdot \theta^2(e_2, g_{12}) = 0.085$</td>
<td>$\rho^1(e_1, g_{12}</td>
<td>n(t)) = 0.5 \cdot \rho^2(e_1, g_{12}</td>
</tr>
<tr>
<td>$\theta^2(e_1, g_{12}) = 0.055 \cdot \theta^2(e_2, g_{12}) = 0.065$, $\theta^2(e_1, g_{12}) = 0.100 \cdot \theta^2(e_2, g_{12}) = 0.085$</td>
<td>$\rho^1(e_1, g_{12}</td>
<td>n(t)) = 0.3 \cdot \rho^2(e_1, g_{12}</td>
</tr>
</tbody>
</table>

Figure 15. The contrast of evolution of profit range over time to IOS’ user
According to recursive test to service pricing, we can see that it brings a larger profit margin to IOS’ user adopting dynamic pricing with the greater number of users using services provided by IOS’ user, while the profit space will be very limited with the number of users tends to be smooth. It can be seen in Fig. 15 that the difference of maximal value of profit comparing to minimal value of profit where $n(t_f = 2) = 20$ is greater than the difference of maximal value of profit comparing to minimal value of profit where $n(t_f = 1) = 10$. We can reach the conclusion that the more classification to dynamic pricing and the more number of users adopted its services, the greater optimal return to IOS’ user.

4.2. The Character of Pricing to the Four Operating Modes

Further summarizes the characteristic of four operating modes of IOS’ user (Table 4, Fig. 16): the service pricing to operational cooperation IOS mode and operational coordination IOS mode are generally greater than resource pooling IOS mode and complementary cooperation IOS mode; the maximal service pricing to operational cooperation IOS mode is slightly greater than resource pooling IOS mode and complementary cooperation IOS mode, while the minimal service pricing to operational cooperation IOS mode is far greater than resource pooling IOS mode and complementary cooperation IOS mode; the maximal service pricing to operational coordination IOS mode is greater than operational cooperation IOS mode, while the minimal service pricing to operational coordination IOS mode is less than operational cooperation IOS mode. It shows that there is a larger pricing space for user adopting operational coordination IOS mode than operational cooperation IOS mode, which reflects stronger market competitiveness.

<table>
<thead>
<tr>
<th>time</th>
<th>optimal service pricing by IOS’ user</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>resource pooling IOS mode</td>
</tr>
<tr>
<td>t=0</td>
<td>1.301</td>
</tr>
<tr>
<td>t=1</td>
<td>0.985</td>
</tr>
<tr>
<td>t=2</td>
<td>0.758</td>
</tr>
<tr>
<td>t=3</td>
<td>0.596</td>
</tr>
<tr>
<td>t=4</td>
<td>0.480</td>
</tr>
<tr>
<td>t=5</td>
<td>0.396</td>
</tr>
<tr>
<td>t=6</td>
<td>0.337</td>
</tr>
<tr>
<td>t=7</td>
<td>0.294</td>
</tr>
<tr>
<td>t=8</td>
<td>0.263</td>
</tr>
<tr>
<td>t=9</td>
<td>0.241</td>
</tr>
<tr>
<td>t=10</td>
<td>0.226</td>
</tr>
</tbody>
</table>

4.3. Selecting Strategy to IOS’ User

A list of selecting strategies to service pricing and subsidy under different operating modes are shown in Table 5 below.
Pricing comparison of four operating modes to IOS’ user

Table 5. Selecting strategies on service pricing and subsidy to IOS’ user

<table>
<thead>
<tr>
<th>object</th>
<th>resource pooling IOS mode</th>
<th>complementary cooperation IOS mode</th>
<th>operational cooperation IOS mode</th>
<th>operational coordination IOS mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>pricing</td>
<td>smooth dynamic pricing strategy</td>
<td>smooth dynamic pricing strategy</td>
<td>smooth dynamic pricing strategy</td>
<td>smooth dynamic pricing strategy</td>
</tr>
<tr>
<td>subsidy</td>
<td>smooth Z-shape dynamic subsidy policy</td>
<td>smooth dynamic subsidy policy</td>
<td>smooth dynamic subsidy policy</td>
<td>smooth dynamic subsidy policy</td>
</tr>
</tbody>
</table>

Note: Smooth dynamic pricing strategy and smooth dynamic subsidy policy describe as a smooth curve that shows continued to steady, decreasing & increasing evolving over time (number of users).

5. Conclusion and Further Research

This paper mainly focuses on the problem of dynamic profit to IOS’ user under the four operating modes and then summarizes several innovative conclusions as follows:

(1) It indicates that profit will be restricted by the limited number of IOS users both to resource pooling IOS mode and operational cooperation IOS mode, hence, it should take measures to strengthen its ability to attract users at the next stage or change another operating mode.

(2) It is utterly different complementary cooperation IOS mode to operational cooperation IOS mode in role linkage and system support level, but it is similar to each other in pricing strategy, which IOS’ user should adopt a smooth dynamic pricing strategy to users who use his services. Hence, it is not sensitive difference of pricing to complementary cooperation IOS mode and operational cooperation IOS mode.

(3) Given the differences of role linkage and system support level to the four operating modes, as the result of research, operational coordination IOS’ user brings a larger pricing space to operational cooperation IOS mode, showing a stronger market competitiveness; the service pricing...
from operational coordination IOS’ user and operational cooperation IOS mode are both higher than resource pooling IOS mode and complementary cooperation IOS mode, therefore, it is suitable for IOS’ user or users who prefer to higher service pricing to tend to the operational support of IOS.

Lastly, this paper puts forward prospect for further study.

(1) The results of study should be testified a specific enterprise to further improve the model.

(2) Other factors should be expanded on the IOS profit issue, such as the risk preference to IOS’ user.

(3) According to the research needs, we can design some constraints added to the dynamic profit model to analyze the influence of constraints playing to these variables.

(4) Respectively, the dynamic profit issue to the four operating modes should be implemented under the cooperation of IOS’ provider and IOS’ user.

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References


