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## The Hard Decision of Mobile Operators: A Dumb Pipe or a Value-Added Service Provider

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# **The Hard Decision of Mobile Operators: A Dumb Pipe or a Value-Added Service Provider**

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## **Abstract**

With progress of communication technologies, it enables rapid development of all kinds of services over the Internet, and we call these services with a name as over the top (OTT). The penetration rate of 4G has increased rapidly and also increased mobile operator's revenue. With the increase of digital convergence demand and other video platforms appear, it can be predicted the level of complex and competition will rise in whole market. The business expansion from scale of economies and the popularity of flat rates all have provided some convenience for people to surf and enjoy OTT services with no worry. However, the mobile Internet service providers (ISPs) have increase the number of market penetration rate quickly and have to deal with huge mobile traffic generated from OTT services. Video streaming accounts for 58 percentages in all mobile data traffic from a recent survey and it indicates that OTT videos streaming services convert mobile operators to be dumb pipes. If mobile operators have to maintain quality of service, they need to invest more money to upgrade their communication infrastructure.

Although voice of IP (VoIP) services provided by Facebook, line and Skype do not consume huge amount of mobile bandwidth, it decreases mobile operator's' voice revenues and average revenue per user (APRU) significantly. Moreover, the revenue of SMS from mobile operators decline dramatically, too. Therefore, the paper addresses whether mobile operators are capable facing the impact of OTT videos and VOIP, to cope with emerging challenges from OTT services.

In Taiwan, all mobile operators have developed their OTT platforms, and some mobile operators bundle their OTT services and mobile Internet service together to

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make more attractive for reducing churn rates and increase ARPU. In addition, cooperation with content providers and mobile operators are necessities and large scale of merger and acquisition (M&A) between AT&T and Time Warner to enrich their OTT capacities also emerged.

This paper discusses different options of mobile operators to cope with OTT challenges. 1. Mobile operators choose to be dumb pipes and upgrade their infrastructures aggressively, and adopt strategic alliance with OTT service providers. 2. Mobile operators aggregate contents to develop OTT platforms by themselves to compete with other OTT services providers.

In addition, the paper also how do asymmetric regulations between BISPs and OTT service operators affect the competition between mobile operators and OTT service providers. One is network neutrality and the other is data protection of personal privacy. Network neutrality has been discussed and debated for many years with different kinds of interpretation, but restrictions of selling personal data for mobile operators can produce more notable effect. OTT service provides can sell customer data to make profits whether mobile operators can sell customer data with precise location data.

In order to study the competition between mobile operators and OTT service providers clearly, we propose, basing on mobile operator's perspective, six options from pure wholesale dumb pipe to fully bundle service provider.

1. Wholesale only. It means mobile operators won't contact consumers directly, and provides their spectrum and infrastructure to mobile virtual network operators(MVNO).

2. Retail only. It means mobile operators focus on their mobile business (e.g. voice business and mobile data business) and don't get involving in developing their OTT services.

3. Wholesale and retail together. But mobile operators do provide OTT services.

4. Wholesale, retail and strategic alliance with OTT service providers. Mobile operator do develop their own OTT services but take strategic alliance with other OTT service providers and bundle those services together.

5. Wholesale, retail, and develop their owned OTT platforms. Mobile operators can produce contents by themselves or purchase copyright from channel operators and

other content providers.

6. The last option is to combine all of above five options.

This study adopts cost-benefit analysis to compare total cost and benefit and assess profitability of each option, because cost-benefit analysis can provide quantitative number to aid for analyzing each option and obtaining a clear picture for input and output.

The research outcome not only can depict the competition between mobile operators and OTT service providers clearly but also offers a valuable reference for NRAs, mobile operators and OTT service providers about how to regulate and how to compete with difference scenarios and options.

**Keywords:** OTT, mobile operators, competition, asymmetric regulations, business strategy, options.

## **1. Introduction**

With progress of information and communication technologies (ICT), it enables rapid development transition of all kinds of services from analog to digital over the Internet, and these services have a set name as over the top (OTT). The penetration rate of the fourth generation (4G) has increased quickly and also enhanced mobile operator revenues. With the development of digital convergence from streaming music and video, on-line games, social network, and sharing economic model from AirBNB and Uber, the impacts of OTT has been unleashed and the trend would change the old business model and force broad Internet service providers (BISPs) make some hard decisions. The business expansion from scale of economies and the popularity of flat rates all have provided some convenience for people to surf and enjoy OTT services with no worry of unaffordable bill of mobile data charges. However, the mobile Internet service providers (MISPs) have increased market penetration rates quickly and need to deal with huge mobile traffic generated from OTT services. Video streaming accounts for 58 percentages in all mobile data traffic from a recent survey and it indicates that OTT videos streaming services convert mobile operators to be dumb pipes. If mobile operators have to maintain quality of service, they need to invest more money to upgrade their communication infrastructure.

Although voice of IP (VoIP) services provided by Facebook, Line and Skype do not consume huge amount of mobile bandwidth, they have decreased mobile operator's voice revenues and average revenue per user (ARPU) significantly. Moreover, the revenue of SMS from mobile operators decline dramatically, too. Therefore, the paper addresses whether mobile operators are capable to confront the impacts of OTT videos and VOIP, to cope with emerging challenges from OTT services. In Taiwan, all mobile operators have developed their OTT platforms, and some mobile operators bundle their OTT services and mobile Internet service together to make more attractive for reducing churn rates and increase ARPU. In addition, cooperation with content providers and mobile operators are necessities and large scale of merger and acquisition (M&A) between AT&T and Time Warner to enrich their OTT capacities also emerged.

This paper discusses different options of mobile operators to deal with OTT challenges. 1. Mobile operators choose to be dumb pipes and upgrade their infrastructures aggressively, and adopt strategic alliance with OTT service providers. 2. Mobile operators aggregate contents to develop OTT platforms by themselves to compete with other OTT services providers. In addition, the paper also how do asymmetric regulations between BISPs and OTT service operators affect the competition between mobile operators and OTT service providers. One is network

neutrality and the other is data protection of personal privacy. Network neutrality has been discussed and debated for many years with different kinds of interpretation, but restrictions of selling personal data for mobile operators can produce more notable effect. OTT service providers can sell customer data to make profits whether mobile operators can sell customer data with precise location data.

## **2. Literature Review**

The first part of literature review discusses user behavior change, it causes mobile operators have to confront the challenge from OTT services. The second part is domestic and foreign mobile operators' strategies, we can analysis their strategies and think how to help mobile operators in this study. Besides, definition and implement scenarios of cost benefit analysis and sensitivity analysis are introduced in the last part referring to related precedent cases.

### **2.1 User Behavior Change**

According to the institute for information industry report, user's behavior of watching video has been changing. Most of users have used smart phones to watched OTT videos. With progress of high speed 4G technology, video's demand and dependence of users is getting higher. The institute for information industry issues questionnaires for using smart phones and 4G Internet users. There are more than 70% of the users have used mobile devices to watch online streaming videos, and compared with 2014, the proportion increased from 69.9% to 75.7%. We can see the ratio increased significantly.

### **2.2 Domestic and foreign mobile operators' strategies**

#### **● Blocking OTT**

When mobile operators confront the challenge from OTT operators, the first strategy is operators can adopt a short term strategy wherein they can decide to deny users the access to the OTT services. However, it is a short term strategy and has a high dependency on net neutrality policies in a given country; moreover it is detrimental to the business as it will limit the revenue-generation possibilities for the operator through increased data usage. It should be noted that the strategy only work if all the operators adopts same strategy simultaneously. Example:

A. In South Korea, after being pressurized by CSPs KT and SK Telecom, the national regulator sanctioned the blocking of Kakao Talk Service. Telecom companies

in many countries have either blocked Skype or slowed down the speed of Skype traffic however users can get access to the blocked content using VPNs. Finally, KT and SK Telecom charges Kakao to let users use this service but this strategy had aroused protest from Korea people, they think it has already violated the internet neutrality.

B. In UAE, Etisalat (mobile operator) has blocked the Skype and other VoIP services for using their network and decreasing their revenue, blocking OTT strategy has been possible only because of UAE is a highly regulated market and Etisalat has the support of telecom regulator.

#### ● **Bundling with OTT**

Bundling of services is another strategy which can be followed. Many operators are resorting to this strategy wherein they are bundling offers in such a way that the lure of financial saving by using OTT services becomes less enticing. For example in case of SMS services, they are trying to extract a base revenue from users in the form of a fixed free for the SMS package and then charging data based on actual usage. Thus by bundling data or voice package with SMS plan, at an affordable price operators can maximize their revenues and at the same time reduce the threat of OTT services. However, this would only help the operator retain some level of customer loyalty for a short time period. Content bundling is another innovative way of operator to bundle the data intensive OTTs like Video apps (Netflix) with their normal voice subscription plans to encourage the customer for using these apps thus driving the increased data usage or decreased churn rate. Example:

A. After a failed attempt to block Skype, European mobile operator TeliaSonera offers Skype with select data plans. Many Indian telcos such as Tata Docomo, RCom, Airtel among others have plans specifically for whatsapp, Facebook, saavn services.

B. Taiwan mobile operator T-star offers a new tariff which bundle with OTT operator i-QIY. It can be subscribed with lower price. T-star offers this strategy planning to decrease churn rate and increase new subscribers.

#### ● **Partnering with OTT**

Partnering with the opponent can be a good strategy when it is difficult to beat them at their game. Many Mobile operators are already adopting this strategy wherein they are partnering with the OTT players and benefit from their traffic. The strategy has enabled the operators to keep the traffic and gain a share of the revenues. Mobile operators also cooperate in their consumer information, money and technology. However, the operator has limited or almost no control on the direction as well as quality of the services offered through these partnership deals. This may adversely affect their relationship with their customers. Examples:

A. DiGi telecommunications, a Malaysian mobile service provider, has partnered with WhatsApp provider as a result of which the DiGi customers can get unlimited access to WhatsApp service for a fixed fee. Same strategy has also been adopted by 3 Hong Kong, a mobile network operator and broadband service provider in Hong Kong and by reliance Communications in India.

B. Aircel partnered with Nimbuzz and promoted their partnership, in the state of Jammu and Kashmir wherein the Aircel via SMS informed and encouraged its subscribers to download Nimbuzz application whereby 40 MB of data usage would be transferred for free to those subscribers who would download and activate the application within a time span of 24 hours.

#### ● **Developing their Own Services**

Another long term strategy which can be adopted by mobile operators would be to introduce its own OTT service. This will enable them to have full control over the service and interact with more consumers. However, the investment required for such an approach is quite high and the approach is risky for mobile operators as they do not have the necessary skills to launch such services. Example:

A. T-Mobile USA has launched Bobsled, Telefonica Digital has introduced Tu Me service both of which offer free voice and texts. Orange have also launched their own branded OTT communication services namely Libon. Similarly, Comcast has started providing web access to its films and TV shows in order to compete with Netflix.

B. AT&T mergers with Time Warner, this acquisition makes both of them more influential. AT&T wants to make use of Time Warner's content to expand their OTT video platform, like CNN and HBO.

### **2.3 Cost-Benefit Analysis**

Cost-benefit analysis is a technique that provides a systematic and consistent procedure for evaluating the best approach for the adoption and practice in terms of benefits in labour, time and cost savings. CBA is also defined as a systematic process for evaluating and comparing costs and benefits from different decision, policies and projects. Processes of cost benefit analysis are standardized by Weimer and Vining in 2015. First, define more specific impact categories in terms of goal and decide which costs and benefits should be counted. Items of cost and revenue are delineated in details in this step. Next, quantify or monetize these items. Treatment of non-monetized cost and benefits, for example devoted opportunity cost or users' willingness to pay, is to



describe reasons of non-monetized, impacts and limitation. As to treatment of uncertainty and risk, sensitivity analysis and Monte Carlo analysis are applied to observe relationship of manipulated parameters and results (Campbell & Brown, 2003). The last step is applying economic benefit assessment index such as Net Profit Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio to calculate present value and select the best option.

In 1970, the concept and quantification theory of CBA was introduced in Taiwan. With maturity of concepts and techniques, CBA was implemented in the decision making process of several fields including agriculture industry, environment protecting and transportation and etc. And since democratization, economy liberalization and economic growth in Taiwan in 1990s, the government began to emphasize on how to utilize limited resources on account of maximization (Kuo, 2007). CBA is now valued in both public departments and private enterprises for evaluation of strategy decision and assessment of finance allocation.

Nowadays CBA is widely used to appraise investment plans. There are two cases applying in media industry. New Zealand government commissioned independent spectrum strategy consultant institute 'Free to Air ' in 2005 to proceed in DTT development research implementing cost benefit analysis (Lin, 2008). 'High quality television development plan', which was executed by Bureau of Audiovisual and Music Industry Development (MOC), estimated budget distribution and expected benefit including domestic broadcasting benefit and oversea sale benefit to discuss whether proposed plan generate economic profit.

### **Net Present Value**

Net Present Value (NPV) is a measure applied in capital budget to evaluate a project's potential return on investment. Time value of money is considered in NPV using discount rate to estimate cash inflow and outflow for each period. The function is as follows:

$$\sum_{t=0}^n \frac{R_t - C_t}{(1 + i)^n} - C_0$$

'R<sub>t</sub>' means revenue generated before year 't', 'C<sub>t</sub>' represents investment in year 't', 'i' is discount rate, C<sub>0</sub> is initial capital invested in the project.

The study adopts NPC as economic revenue evaluation index. Generally, the decision maker chooses the strategy with positive NPV. In this study, we select the best strategy with highest NPV value. As to evaluation of uncertain factors, the study adopt

sensitivity analysis to figure out which variable parameters lead to more significant influence on cost and benefit items.

### 3. Research Method

#### Strategy Analysis of Mobile Operators

In order to study the competition between mobile operators and OTT service providers clearly, we propose, basing on mobile operator’s perspective, six options from pure wholesale dumb pipe to fully bundle service provider.

1. Wholesale only. It means mobile operators won’t contact consumers directly, and provides their spectrum and infrastructure to mobile virtual network operators (MVNO).
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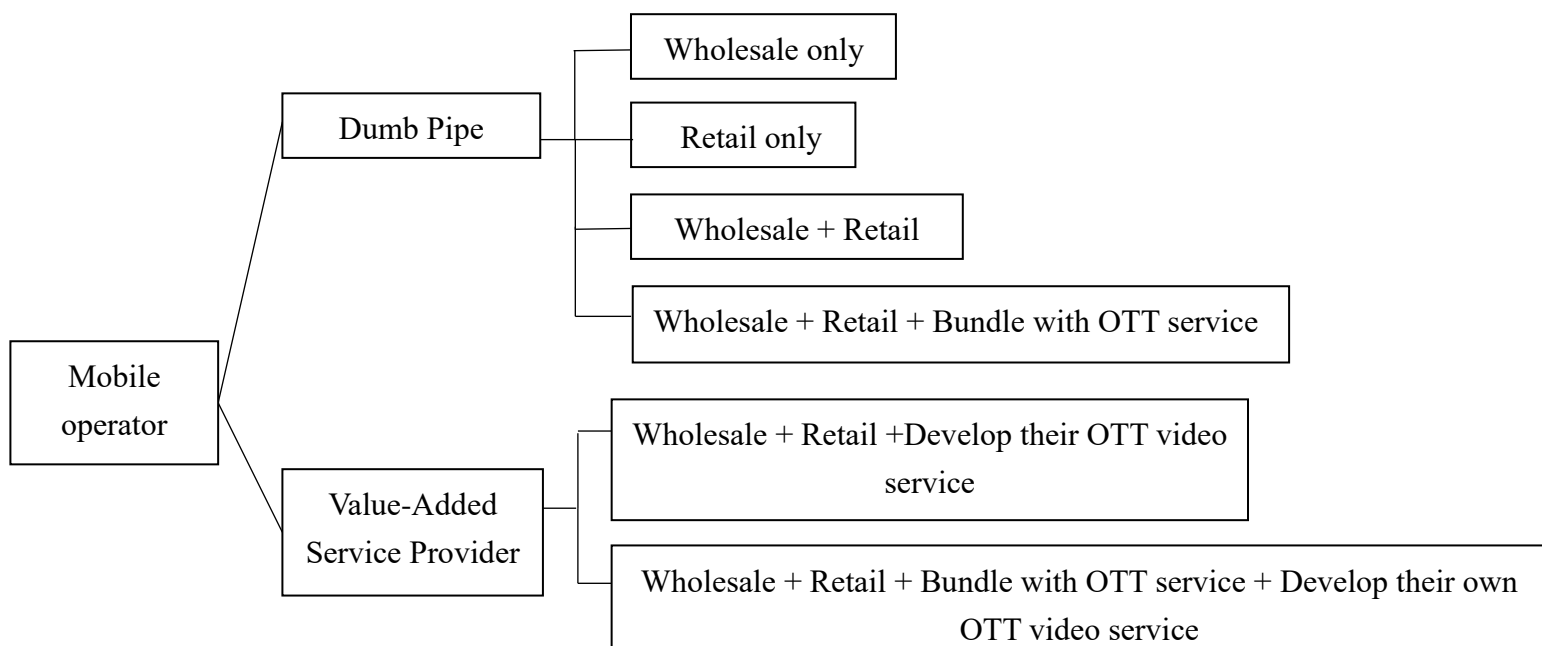


Figure1. The figure of strategy

This study adopts cost-benefit analysis to compare total cost and benefit and assess profitability of each option, because cost-benefit analysis can provide quantitative number to aid for analyzing each option and obtaining a clear picture for input and output.

The research outcome not only can depict the competition between mobile operators and OTT service providers clearly but also offers a valuable reference for NRAs, mobile operators and OTT service providers about how to regulate and how to compete with difference scenarios and options.

| Item                                       | Strategy1 | Strategy2 | Strategy3 | Strategy4 | Strategy5 | Strategy6 |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| Wholesale Benefit                          | ✓         |           | ✓         | ✓         | ✓         | ✓         |
| Retail Benefit                             |           | ✓         | ✓         | ✓         | ✓         | ✓         |
| Bundle OTT Service Benefit                 |           |           |           | ✓         |           | ✓         |
| OTT Video Platform's Advertisement Benefit |           |           |           |           | ✓         | ✓         |
| Subscription Benefit                       |           |           |           |           | ✓         | ✓         |
| Bundle OTT Service Cost                    |           |           |           | ✓         |           | ✓         |
| <b>Develop OTT Platform Cost</b>           |           |           |           |           |           |           |
| Content Coding Cost                        |           |           |           |           | ✓         | ✓         |
| Rent Cost for Cloud and Bandwidth          |           |           |           |           | ✓         | ✓         |
| <b>OTT Platform Content Cost</b>           |           |           |           |           |           |           |
| Content Purchase Cost                      |           |           |           |           | ✓         | ✓         |
| <b>Spectrum Cost</b>                       |           |           |           |           |           |           |
| Spectrum Bidding Cost                      | ✓         | ✓         | ✓         | ✓         | ✓         | ✓         |
| Spectrum Using Cost                        | ✓         | ✓         | ✓         | ✓         | ✓         | ✓         |

Table1. The item of cost benefit analysis

| Parameter                                      | Parameter Abbreviation   |
|--|--------------------------|
| Original Churn Rate                            | OCR                      |
| New Churn Rate                                 | NCR                      |
| Total Customers                                | TC                       |
| Number of Viewing per Month                    | N_VM                     |
| Number of Own OTT Platform Subscribers         | NS_OTT                   |
| Price Difference in Bundling OTT service       | PD_BOS                   |
| Number of Choosing Bundling OTT Service Tariff | N_CBOST                  |
| Number of Buying Movie of Each Set             | NOMES <sub>x</sub> , x≥0 |

Table2. Variable parameter table

#### 4. Model Analysis

Before going to analyzing the results, we separate strategies in two parts by strategy characteristic. Strategy 1, 2 and 3 cover a large range of business, including voice and data revenue. With bundling OTT service and developing their OTT video platforms is only a part of the overall business. Compared to the wholesale and retail business, it covers a small range of business and the user it impacts is less. Therefore, we compare strategy1, 2 and 3 together, and strategy 4, 5 and 6 together.

##### Strategy 1: Wholesale only

In calculating the net present value of the wholesale only,  $n$  is the forecast for the next 10 years,  $R_t$  has Wholesale Benefit,  $C_t$  has Spectrum Using Cost,  $C_0$  is the Spectrum Bidding Cost in the beginning and  $i$  is discounting rate 3.83%.

##### Strategy 2: Retail only

In calculating the net present value of the retail only,  $n$  is the forecast for the next 10 years,  $R_t$  has retail benefit,  $C_t$  has Spectrum Using Cost,  $C_0$  is the Spectrum Bidding Cost in the beginning and  $i$  is discounting rate 3.83%.

##### Strategy 3: Wholesale + Retail

In calculating the net present value of the wholesale and retail, we assume that each business account for 50%.  $n$  is the forecast for the next 10 years,  $R_t$  has 50% retail benefit and 50% wholesale benefit,  $C_t$  has spectrum using cost,  $C_0$  is the spectrum bidding cost in the beginning and  $i$  is discounting rate 3.83%.

Table3. The result of estimation in strategy 1, 2 and 3

| Year | Strategy1            | Strategy2            | Strategy3            |
|------|----------------------|----------------------|----------------------|
| 2017 | 4,724,845.517        | 9,860,912.843        | 7,292,879.178        |
| 2018 | 4,351,877.497        | 9,298,489.576        | 6,825,183.537        |
| 2019 | 3,993,324.691        | 8,757,470.005        | 6,375,397.348        |
| 2020 | 3,665,164.01         | 8,253,573.249        | 5,959,368.630        |
| 2021 | 3,349,108.263        | 7,768,263.844        | 5,558,686.054        |
| 2022 | 3,044,710.934        | 7,300,856.153        | 5,172,783.544        |
| 2023 | 2,751,541.997        | 6,850,689.833        | 4,801,115.905        |
| 2024 | 2,469,187.207        | 6,417,128.897        | 4,443,158.052        |
| 2025 | 2,197,247.719        | 5,999,560.817        | 4,098,404.268        |
| 2026 | 1,935,339.323        | 5,597,395.663        | 3,766,367.493        |
| NPV  | <b>32,482,347.16</b> | <b>69,534,340.88</b> | <b>54,293,344.01</b> |

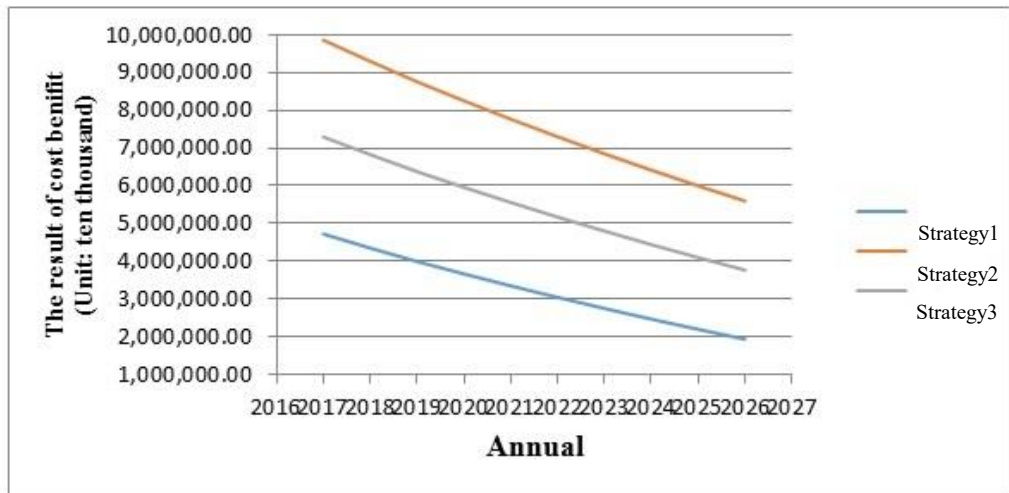


Figure2. The result of estimation in strategy 1, 2 and 3

#### Strategy 4: Wholesale + Retail + Bundle with OTT service

In calculating the net present value of wholesale, retail and bundle with OTT service, we have to add the cost and benefit of bundle OTT service.  $n$  is the forecast for the next 10 years,  $R_t$  has wholesale benefit, retail benefit and bundle OTT service benefit,  $C_t$  has spectrum using cost and bundle OTT service cost,  $C_0$  is the spectrum bidding cost in the beginning and  $i$  is discounting rate 3.83%. The equation is below:

$$\text{Bundle OTT Profit}(\text{year}) = (\text{OCR} - \text{NCR}) \times \text{TC} \times \text{AP}_T$$

$$\text{Operation Fee}(\text{year}) = (\text{PD}_{\text{BOS}} \times \text{N}_{\text{CBOST}}) \times 12(\text{month})$$

#### Strategy 5: Wholesale + Retail + Develop their OTT video service

In calculating the net present value of wholesale, retail and develop their OTT video service, we have to add the cost and benefit of develop OTT video service.  $n$  is the forecast for the next 10 years,  $R_t$  has wholesale benefit, retail benefit, OTT video platform's advertisement benefit and subscription benefit,  $C_t$  has spectrum using cost, content coding cost, rent cost for cloud and bandwidth and content purchase cost,  $C_0$  is the spectrum bidding cost and content purchase cost in the beginning.  $i$  is discounting rate 3.83%.

#### Strategy 6: Wholesale + Retail + Bundle with OTT service + Develop their own OTT video service

In calculating the net present value of wholesale, retail, bundle with OTT service and develop their OTT video service, we have to add the cost and benefit of bundle with OTT service and develop OTT video service.  $n$  is the forecast for the next 10 years,  $R_t$  has all the benefit items,  $C_t$  has all the cost items,  $C_0$  is the spectrum bidding cost and content purchase cost in the beginning.  $i$  is discounting rate 3.83%.

Table4. The result of estimation in strategy 4, 5 and 6

| Year       | Strategy4            | Strategy5            | Strategy6            |
|------------|----------------------|----------------------|----------------------|
| 2017       | 7,293,534.136        | 7,257,852.258        | 7,258,507.216        |
| 2018       | 6,825,694.486        | 6,777,519.125        | 6,778,030.075        |
| 2019       | 6,375,774.024        | 6,327,234.589        | 6,327,611.265        |
| 2020       | 5,959,675.826        | 5,909,468.985        | 5,909,776.181        |
| 2021       | 5,558,874.850        | 5,506,773.090        | 5,506,961.886        |
| 2022       | 5,172,862.257        | 5,118,832.904        | 5,118,911.617        |
| 2023       | 4,801,142.056        | 4,745,180.608        | 4,745,206.759        |
| 2024       | 4,443,135.413        | 4,385,304.801        | 4,385,282.162        |
| 2025       | 4,098,382.464        | 4,038,701.907        | 4,038,679.268        |
| 2026       | 3,766,257.768        | 3,704,883.885        | 3,704,774.160        |
| <b>NPV</b> | <b>54,295,333.28</b> | <b>53,771,752.15</b> | <b>53,773,740.59</b> |

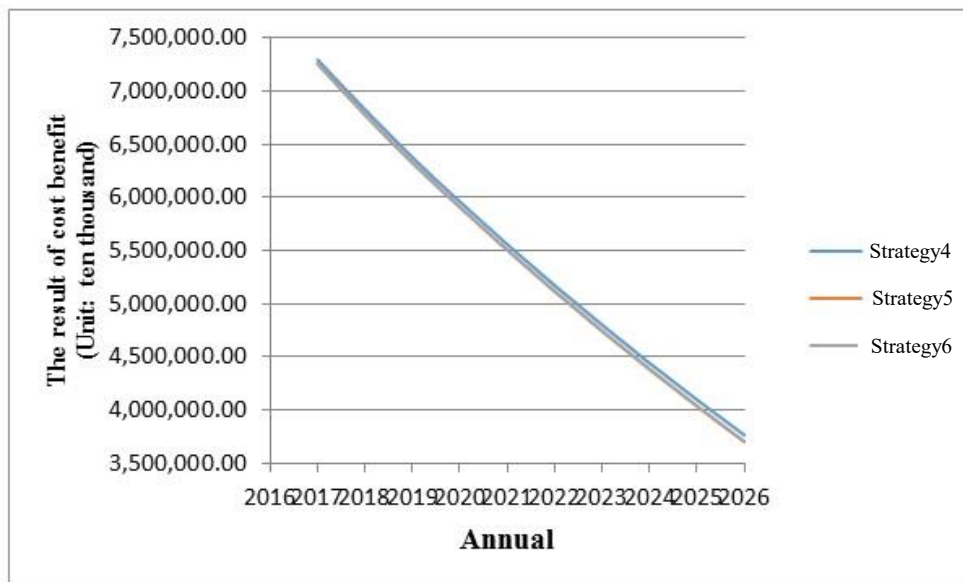


Figure3. The result of estimation in strategy 4, 5 and 6

## **5. Conclusion and suggestion**

The main purpose of this research is to find the best strategy and provide useful suggestions for mobile operators. The result of this research is described in section 5.1, and research suggestions in section 5.2. Then the limitations of the research are mentioned in last section.

### **5.1 Summary of the Results**

This study aims to analyze the Taiwan telecom operators adopted strategies when facing the challenges of the OTT industry. The Analyzing outcome indicates telecom operators should maintain their dumb pipe service as the cash cow and develop as many as OTT value added services as they could. To build their owned OTT video platform is one of the options. With the different strategies, there are also different revenue generation avenues. (e.g., advertisement, subscription fees and the benefit of bundle OTT video). At the same time, it should summarize the cost items needed to invest in different strategies and also builds a cost-benefit model. After estimating the each strategies of a cost-benefit analysis, it can provide the appropriate strategy for the telecoms operators. The results of estimating are as followed:

Strategy 1: Mobile operators choose to continue be a dumb pipe and wholesale only will have the least benefit. The advantage is that do not have to contact with customers directly and responsible for the customers services, and the challenge form OTT service providers will be confronted by MVNOs. Mobile operators adopt this strategy have less risk. However, there has no chance to create new revenue except the revenue from rental infrastructure and spectrum.

Strategy 2: Mobile operators choose to continue be a dumb pipe and retail only will have the most benefit. They have to provide service to consumers directly, but they can provide innovative services for customers. However, they have to take the risk when providing innovative service. Moreover, they can't solve the challenges from OTT operators effectively.

Strategy 3: Mobile operators choose to continue be a dumb pipe and adopt retail and wholesale will be the third best in all strategies. The advantage is they can not only benefit from rental spectrum to the MVNOs, but also operate their own mobile business. Compared with strategy two, this strategy can release data usage and spectrum pressure from OTT operators. If mobile operators' mobile business has been impact seriously, they can adjust the rental spectrum costs as a balance. This strategy will be more flexible.

Strategy 4: When mobile operators choose to provide bundling OTT service, it will

be the second best in all strategies. It can bring positive profit, but it will start reduce after strategy begin eight years. The reason is that the reduction in customer churn rate has limited effect as time goes on. When the churn rate is no longer significant, the cost of the Bundle OTT service will surpass the benefits. This study will show that Bundling OTT service has been effective in previous years, but when the reduction of customer churn rate is no longer significant, it will lead to lost in in business.

Strategy 5: When mobile operators choose to develop their OTT video service, it will be the fifth best in all strategies. Most of Taiwan's mobile operators operate their OTT video platform is showing a loss. OTT video platform decisive key lies in the platform content. There has too many competitors, and most users tend to subscribe to the platform which has popular content. Content in Taiwan mobile operators' OTT platform can't compete with the OTT operators like LiTV, Netflix and i-QIY. Therefore, if mobile operators can't invest more money in purchase content, they won't have ability to compete with extensive OTT operators.

Strategy 6: When mobile operators choose to provide bundling OTT service and develop their OTT video service, it will be the fourth best in all strategies. We can know that the profit in strategy 4 can't balance the deficit in strategy 5. Therefore, it also presents a lower efficiency than the business of wholesale and retail.

## **5.2 Suggestions of the research**

There are three suggestions for mobile operators in our research. The first one is mobile operators have to pay attention how to deal with churn rate. It's very important whether the degree of decline in churn rate can balance the cost in bundling OTT service or not. The subscribers of bundling with OTT service will not only be the customers who choose to stay for this strategy, but also the customers who choose to stay in the beginning. Therefore, mobile operators have to pay attention when the strategy goes on.

The second suggestion is mobile operators have to provide not only the OTT video platform, but also the platforms integrate other value-added services like shopping, music, mobile payment and games. When mobile operators develop their OTT platform, they have to confront many foreign OTT video service providers, for example, Netflix, i-QIY and Dailymotion. The content costs of these foreign OTT service providers are lower than Taiwan mobile operators. To compete with these OTT service providers, the main goal is to provide consumers attractive and famous video content. However, the content copyright costs and investment risks have to evaluate seriously.



The third suggestion is mobile operators have to generate extra income resources. When mobile operators confront the challenge from OTT service providers, the extra income resources could be make good use of user's personal information. Based on user privacy regulations in Taiwan, mobile operators can't sell and use the user information legally. However, the US Senate rejected the privacy rules established by the Federal Communications Commission (FCC) by 50 to 48 on March 24, 2017. They intended to allow mobile operators to sell user's personal information without having to get their consent. Although the rules are still need to verify by the relevant agencies, it can indicate that mobile operators pay attention for these income resources. Consumers can choose the mobile operators they preferred easily when mobile operators adopted the two methods of protecting privacy or not. We considered the best strategy for mobile operators is price discrimination with providing several of choose (e.g., mobile operators will provide higher cost when users choose not to provide their information, and vice versa). On the contrary, the level of extra cost depend on the market equilibrium of supply and demand (i.e., consumers can accept the range and management level of privacy strategy of mobile operators).

### **5.3 Limitations of the research**

The cost-benefit analysis relies on accurate information. In this study, the initial parameter values are limited by the latest data and commercial confidential. Therefore, there are several assumptions of parameters are made by ourselves without historical data or can't obtain. The research limitations of this study were listed as followed:

1. We can't obtain the key data in the strategies which select wholesale. Therefore, it can only calculate in traffic and voice. If the relevant information is available in the future, we can estimate the result more accurately.
2. Churn rate can't obtain because Taiwan's mobile operators choose to bundle with OTT service recently. The decline in churn rate will affect the calculation results. Moreover, the subscribers of bundling with OTT service don't have the exact number and growth rate. It will be able to obtain accurate information to calculate after the strategy operating for longer.
3. In the calculation of the mobile operator's OTT video platform subscribers, we use Chunghwa Telecom's OTT video platform subscribers growth rate to estimate. Due to

OTT video industry changes rapidly, there are too many competitors. Therefore, it is difficult to predict whether mobile operators will reinforce for the lack of their OTT platform or not. It will also affect the growth rate of subscribers in the future.

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