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## Conference Paper

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# **The 19th ITS Biennial Conference 2012**

## **“Moving Forward with Future Technologies: Opening a Platform for All”**

18 - 21 November 2012, Thailand

### **Exploring mobile pricing strategies and innovations in the Thai mobile communications market**

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## **Exploring mobile pricing strategies and innovations in the Thai mobile communications market**

### **Abstract**

**Purpose-** This paper aims to explore the price plans offered by Thai mobile operators and analyse the role of demand characteristics in the development of new price plans. The paper also shows how demand affects a firm's degree of innovativeness in terms of the number of new price plans.

**Design/methodology/approach-** The empirical qualitative analysis is based on an original data set from several secondary data sources and includes all the price plans offered in the history of the Thai mobile communications market between 2002 and 2010.

**Finding-** The results show that mobile operators have introduced several innovative price plans to attract and retain their consumers. Although a greater number of price plans can increase competition among operators, some have complex combinations that may lead to confusion for consumers. A price comparison programme should therefore be implemented by the telecom regulator to ensure that consumers receive correct and complete information about the price plans.

**Original/value-** Most studies, by far, have not extensively discussed this mobile communications market in detail and the effect of innovation on competition between firms in the mobile communications industry, in particular the development of innovation in developing countries.

**Keywords-**pricing strategies, mobile communications market, innovation, Thailand

**Paper Type-**Research paper

## 1. Introduction

The number of cellular telephone subscribers reached 1.2 billion globally in 2002, exceeding the number of fixed line subscribers (1.1 billion) (ITU, 2010). This extraordinary growth in mobile telephony has been due to several factors. The emergence of several pricing structures has been one factor driving the diffusion of mobile telephones (Dholakia and Kshetri, 2002, 2003), as well as technological progress and regulations (Gruber, 2005; Koski and Kretschmer, 2005). Price plan innovations include, for example, prepaid, free minutes, frequent user benefits and other bonuses, family plans and location discounts. These represent what were initially considered trivial features and have become drivers, if not part of the adoption, of mobile use in many parts of the world. Thus, mobile communication has ascended to become the dominant form of communication since 2002.

The impact of the price plan on competition has been addressed by some well-known literature (i.e. Gans and King, 2001; Kim and Kwan, 2003; Fu, 2004; Birke and Swann, 2006; Corrocher and Zirulia, 2009). These studies note that during the last decade, mobile service providers have introduced termination-based price discrimination<sup>1</sup>. Termination-based price discrimination induces network effects because it is convenient for users to adopt the operator with the largest customer base, as Laffont, Rey and Tirole (1998) define as tariff-mediated network effects. These studies focus on the role of the price plan in the behaviour of consumers, switching cost rather than competition, and innovation between mobile service providers.

In fact, mobile operators use the '*innovative price plan*' to deal with uncertainty (or the demand for heterogeneity) and competition. The process of developing new and innovative price plans shares most of its basic elements with conventional innovation processes, i.e. novelty, uncertainty and success in application. Uncertainty, for example, is strictly related to the characteristics of demand, in particular in the mobile communications market where consumer demand is very heterogeneous (Corrocher and Zirulia, 2010). Few studies attempt to examine the firm's pricing mechanism for consumer heterogeneity and show that consumers behave rationally when choosing a price plan (e.g. Miravete, 2003, 2007; Miravete and Röller, 2004). At the same time, this heterogeneity is a source of opportunity and becomes an incentive for the firm to broaden the demand environment and increase competition (Adner and Levinthal, 2001; Adner, 2002).

Although the development of a new price plan is costly for mobile operators (Miravete, 2007) and an innovative price plan can easily be imitated from rivals, operators still produce new price plans to

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<sup>1</sup> Termination-based price discrimination means that an operator charges different prices for calls placed with different operators, on its own network and rival networks. An operator usually charges a higher price for calls placed on other operators' networks (off-net calls) and a lower price for calls placed on its own network (on-net calls).

respond to the demand for heterogeneity, switching costs and competition in each period (Techatassanasoontorn and Suo, 2011); otherwise, they may not sustain or increase their market power.

The concept of an innovation-based approach can therefore be seen as complementary to examining many of the dynamics that offer a link between consumers and firms. It also helps in understanding the contribution of demand-side factors to the emergence of new price plans and the evolution of competition within the industry structure. The mobile communications market has evolved and reached a stage close to maturity. Some empirical studies conducted at immature stages may be too early to draw reliable conclusions and also focus mostly on developed countries. Hence, mature cases in developing countries are worth re-examining to search for new findings beyond previous empirical results.

This study aims to investigate the number and characteristics of new price plans in the Thai mobile market with an innovation-based perspective as a basis of interpretation. Two main research questions, which have been proposed by Corrocher and Zirulia (2010), are applied: (1) How does demand affect a firm's degree of innovativeness in terms of the number of new price plans? and (2) How does demand affect the characteristics of new price plans in terms of the relative importance of incremental/ recombinative/ improvement innovations and specific characteristics of the price plans?

The rest of this paper is organized as follows. The next section reviews the innovation-based concept and empirical examples. An overview of the Thai mobile communications market is then presented, followed by results and discussions. Conclusions are finally drawn in the summary section, along with recommendations for future research.

## **2. Pricing strategies, innovations and competition in the mobile communications market: an innovation-based approach**

### *2.1 Pricing strategies and competition*

In many countries including Thailand, mobile subscribers are usually charged a two-part retail price: access, and airtime or usage. Access refers to the subscription charge for post-paid mobile subscribers. This is a charge for the ability to make and receive calls from the consumer's point of view. For pre-paid customers, even though there is no explicit subscription fee, minimum usage requirements apply and these may perhaps be seen as an implicit subscription fee. The usage charge is usually based on a per-minute charge. The usage charges are now applied with several kinds of price discrimination. For example, calling charges are differentiated by the time of day (peak vs off-peak) and by destination (on-net vs off-net) (Gruber, 2005).

Recent literature on competition in mobile communications pays particular attention to the impacts of termination-based price discrimination. Findings of previous studies indicate that the large networks will secure a much larger share of new subscribers compared with smaller rivals when the mobile operators apply termination-based price discrimination (Kim and Kwon, 2003; Fu, 2004). Existing mobile customers of large operators are more likely to stay, even though the smaller operators apply similar termination-based price plans (Srinuan et al., 2012). Higher off-net prices will also lead to a lower number of off-net calls, and mobile subscribers may be reluctant to make calls to other networks due to the high off-net call prices (Birke and Swann, 2006; Grajek, 2010). Mobile subscribers may therefore make a choice to select the operator with the large subscriber base rather than smaller providers in order to minimize their phone bills. However, the price plans discussed in these studies are too simplified with no details on price plan characteristics. Moreover, all of these studies focus on the role of price plans in the behaviour of consumers, switching costs rather than competition and mobile service provider innovation.

Most economists consider product and service prices as supply-side variables. The issue is elasticity: if prices are lowered demand will go up. For mobile service providers, pricing often reflects demand rather than driving it. If demand is considered broad, the price is set low to reflect and capture this reality. If it is top-heavy (i.e., much more robust at the high-income consumer level), the price is kept relatively high and if it is bifurcated (with distinct high- and low-end segments) two or more products with different prices are introduced (Kalba, 2008). The installed base and existing demand by consumers vary across mobile operators. By introducing a new price plan, mobile providers can extract surplus from consumers and reduce the uncertainty of their profits.

Several empirical studies show that demand is as important as technological knowledge in determining the pattern of innovation. Firms attempt to interact with customers as a way to reduce uncertainty. Customers are considered the most important sources of information for both innovation ideas and completion (Fontana and Guerzoni, 2008; Cantner and Guerzoni 2009; Guerzoni 2010; Fabrizio and Thomas, 2012). In particular, recent studies in the telecommunications market confirm that demand heterogeneity evolves and acts as an important factor for new products, services and technological development. If the mobile service provider continuously increases demand-side competence, this influences its ability not only to economize on its own demand-side investments but also to increase its output (e.g., average revenue per user, profit) (Hüsig, Hipp and Dowling, 2005; Manral, 2010; Fabrizi, 2011; Whang and Hobday, 2011).

## *2.2 Innovative price plans and examples*

A price plan can be conceived as the mapping between the pattern of service use and the total price paid by the consumer, and its characteristics are given by all the elements that affect such a mapping. A new price plan can be seen as an innovation according to Corrocher and Zirulia (2010). Moreover,

they identified eleven characteristics of a price plan. However, a convergence of video, voice and data can lead to more price plans offered in the mobile market. More precisely, three more characteristics of price plans are identified to those mentioned by Corrocher and Zirulia (2010):

1. Pre-paid card subscriptions: indicate whether the price plan is designed for pre-paid or other subscriptions.
2. Subscription fee: indicates whether the price plan includes a subscription fee.
3. Price per unit/price per minute: indicates whether the price of the call is calculated on the basis of units (e.g. one unit = 30s) or on the basis of actual minutes/seconds of the call length.
4. Call connection fee: indicates whether the price plan includes a call connection fee.
5. Time-based charges: indicates whether the price plan discriminates between the prices according to time (e.g. morning hours or evening hours).
6. Day-based charges: indicates whether the price plan discriminates between the prices according to the day of the week (e.g. weekday, weekend or holiday).
7. Location-based charges: indicates whether the price plan discriminates between the prices according to the geographical location of the caller/receiver.
8. On-net vs off-net charges: indicates whether the price plan discriminates between the prices of on-net and off-net calls.
9. Rebate mechanism: indicates whether the price plan includes a rebate mechanism.
10. Free minutes/price related to total expenditure: indicates whether the price plan provides discounts on the basis of total monthly expenditure (e.g. 40% off on national calls if the consumer spends more than 120 euros per two months).
11. Variable prices: indicates whether the price plan provides variable prices during the time span of the call (e.g. 30 cents for the first 3 min, 15 cents afterwards).
12. Single price: indicates whether the price plan charges a single fixed fee for a service regardless of the calling time, location and network.
13. Bundling: indicates whether the price plan bundles voice services together with either communication services or other services at a discounted price.
14. Calling club: indicates whether the price plan discriminates between the prices according to pre-defined receiver(s).

The price plans outlined here reveal different categories of users' socio-economic characteristics (Von Hippel, 1982, 1986; Morrison et al. 2000; Haddon, 2002). These also represent different types of innovations and can be considered an extension of the static mode, explaining market power and switching costs (e.g., Klemperer, 1995; Farrell and Klemperer, 2002). On the demand side, new price plans in each period enable providers to acquire and retain consumers and influence consumers' willingness to purchase the range of services offered. The choice and degree of demand-side innovations vary across firms within an industry and even within firms over time.

Gallouj and Weinstein (1997) highlight six types of innovations in the service industry: radical innovation, incremental innovation, improvement innovation, ad hoc innovation, recombinative innovation and formalization innovation. Radical innovation obviously occurred in mobile communications markets such as SMS and MMS during the last decade, while ad hoc innovation and formalization innovation rarely occur in this market. Hence, the innovations of the price plan in this study only refer to three types of innovation: incremental innovation, improvement innovation and recombinative innovation.

Corrocher and Zirulia (2010) also identified the degree of price plan innovativeness as corresponding to a decreasing degree of uncertainty. Incremental innovation involves more uncertainty than combining characteristics (recombinative innovation) due to the mobile service provider introducing new characteristics into a price plan. The lowest degree of uncertainty is presumably associated with price plans that differ from existing price plans by improving a specific characteristic or improvement innovation.

For reasons of simplicity, consider a situation in which price plan A has already been introduced into the market. Later, four other price plans are introduced in sequence (price plan B, price plan C, price plan D and price plan E). The characteristics of these price plans are also summarized in Table 1.

**-Table 1** Innovative and non-innovative price plans: an example-

- Price plan B constitutes an incremental innovation with respect to price plan A since it introduces a characteristic for the first time to discriminate on the basis of on-net vs off-net calls.
- A price plan that improves certain characteristics without any change to the structure of the system can be called an improvement innovation. This refer to price plan C. Price plan C has the same characteristics as price plan A but considers three time zones instead of two.
- When a price plan requires the combination of different final and technical characteristics or derives from two or more existing price plans, it can be called a recombinative innovation. Price D is an example of this type of innovation since it combines characteristics of price plans B and C
- Finally, price plan E is not an innovation. Price plan E is identical to price plan A, the only difference being that the prices are lower. Following the pre-defined definition, price plan E resembles pre-existing plans. It could therefore be considered either ‘renaming’, if it is introduced by the same firm that introduced price plan A, or an ‘imitation’ if it is introduced by another firm.



The theoretical and empirical literature on demand and innovation (Von Hippel, 1982, 1986; Metcalfe and Miles, 2000; Miravete, 2003, 2007; Miravete and Röller, 2004; Kelpper and Malerba, 2010) notes that most studies, by far, have not extensively discussed this mobile communications market in detail and the effect of innovation on competition between firms in the mobile communications industry, in particular the development of innovation in developing countries. This study therefore aims to explore and analyse how demand affects a firm's innovative strategies and the characteristics of a new price plan in the Thai mobile communications sector. The secondary data are taken from three main sources: Srinuan (2005) for data during 2002-2004, printed media for data during 2005-2007 and NBTC for data during 2008-2010<sup>2</sup>.

### **3. Overview of the Thai mobile communications market**

The first mobile communications services in Thailand were introduced commercially in 1986 by the state-owned companies: Telephone Organization of Thailand (now TOT Plc.) and Communications Authority of Thailand (now CAT Telecom). They provided mobile services based on analogue technologies. Two private companies, Advance Info Service (AIS) and Total Access Communication (TAC<sup>3</sup>), were granted concession agreements in 1990 and 1991 respectively to provide analogue mobile services. This was a result of higher demand for mobile services and a lower degree of flexibility in expanding the mobile networks of state-owned companies.

Several limitations of analogue systems required AIS and TAC to upgrade their mobile services. They then asked CAT and TOT for permission to introduce a digital mobile system from 1994. CAT also granted other concessions to Truemove (formerly WCS and TA Orange) and the Digital Phone Company (DPC<sup>4</sup>) to operate mobile communications services in 1996 and 1997 respectively. However, Truemove did not operate commercially until March 2002.

In the following year, Hutch CAT wireless Multimedia (Hutch), which is a joint venture between the Hong Kong-based Hutchison and CAT, entered the market by introducing CDMA technology (Bangkok Post, 2002). Hutch serves mainly 25 central provinces, including Bangkok. It has acquired all the shares in Real Future Co., a True subsidiary, since January 2011 (Bangkok Post, 2011). The last mobile network operator is Thai mobile. It was a joint venture company between TOT and CAT and came to participate in the market in 2004. TOT and CAT agreed to terminate the joint venture agreement on the mobile phone services project from September 30, 2008. All assets, rights and

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<sup>2</sup> The first digital mobile system was introduced in 1994 by AIS and TAC. Shortly after this, two licences were granted to Truemove and DPC, although Truemove did not operate until March 2002. The data of tariff plan from 1994-2002 is unavailable publicly, however. This is clearly the limitation of this study.

<sup>3</sup> It has now been renamed DTAC.

<sup>4</sup> In February 2000, DPC merged with the Shinnawatra Group. It was a fighting band for AIS for a few years. This company does not exist in the Thai mobile communications market now.

duties of the Thai Mobile Joint Venture were transferred to TOT as of September 29, 2008 (Srinuan, Srinuan & Bohlin, 2011). It is now solely owned by TOT and has been renamed TOT3G.

Mobile subscribers have gradually increased year on year, and by the end of 2010 the mobile penetration rate had reached 100% (see Figure 1). However, more than 98% of mobile subscribers are served by three major operators: AIS, DTAC and Truemove. These operators provide similar services to their customers and operate nationwide (see Table 2). Nevertheless, AIS has relatively better network coverage. Its network covers 97% of populated areas while Truemove never reports its network coverage to the public, but it is widely known among mobile consumers that its coverage is worse than that of its rivals.

During the periods of entry, new entrants launched different kinds of price plans to acquire customers. For example, Truemove used handset subsidies and calling club price plans as its entry strategies. Hutch implemented similar strategies to Truemove by offering buy one get one free handsets, termination-based price discrimination and market segmentation for students (Srinuan, 2005). This led to Truemove acquiring a million customers within one year of entry.

**-Figure 1** Mobile subscribers and penetration-

**-Table 2** Comparison of major mobile operators-

The National Telecommunications Commission (NTC) was established late in 2004 to take over regulatory roles from TOT and CAT. The NTC set up the necessary regulations, such as a licensing regime, interconnection regulation, market definition, the Significant Market Power (SMP) regulation and so on (Srinuan, Annafari & Bohlin, 2011). It set mobile number portability (MNP) as a first priority and wanted to implement it within one year of establishing NTC (2006), however, the implementation of MNP was delayed and introduced in December 2010. The MNP clearing house has a capacity of 400 mobile numbers per operator per day with a three-day porting duration (Asia News Monitor, 2012).

The NTC has prepared for a new chapter in the Thai telecom industry. The awarding of new 3G licences has been prepared for, for the past couple of years, but the political situation together with legal difficulties has led it to fail. The Supreme Administrative Court has decreed that the NTC does not have the authority to issue the 3G licence. The National Broadcasting and Telecommunications Commission (NBTC) or a new regulatory body needs to be formed to oversee the matter, due to the 2007 Constitution (Srinuan et al., 2011). However, major mobile operators managed to launch 3G services in 2011. For instance, AIS launched 3G-900 MHz and signed an agreement with TOT to use 3G-2.1 GHz for data services. Real Move, a subsidiary of True Corp, jointly provides 3G services with CAT at a spectrum of 800 MHz for 14.5 years. DTAC has also managed to launch 3G services

on the 850 MHz band in spite of protests from CAT (The Nation, 2011; BMI, 2012). Mobile operators will compete fiercely on both voice and data packages in the near future.

Various pricing schemes are offered by mobile operators. The offered price plans in the Thai mobile market also illustrate the existence of a process of price plan innovation. In order to attract new customers and retain existing ones, mobile service providers have either innovated or imitated existing price plans in response to competitors' strategies. Table 3 reports examples of the new price plans that firms introduced to the market between 2002 and 2010 with short descriptions. For instance, Truemove introduced a close friends price plan in February 2002 that allowed its customers to make calls to six selected telephone numbers at a discounted price. This price plan was imitated by AIS in November 2002. AIS partly changed the details of its price plan to one selected number at a discount price. Another selected example is that DTAC and Truemove implemented new price plans for new customers, Suriyan/Chandra SIM and Day/Night Buffet, at almost the same time (in February 2008). Time-based charges were used in these price plans. AIS introduced a similar price plan one month later (see Table 3).

**-Table 3** Innovation and imitation in the Thai mobile communications market-

#### **4. Research propositions**

A guide for exploring the empirical evidence has been developed based on the concept of demand as a source of information and incentive to innovate new price plans. Four propositions will be employed that have mainly been discussed in Corrocher and Zirulia (2010). These propositions aim to frame the main research questions rather than the hypotheses to be tested.

*Proposition 1: Mobile service providers with a large installed customer base are more innovative than mobile service providers with a small installed customer base.*

Demand can be conceived as a flow of information from consumers to producers. Firms obtain knowledge and learn from the socio-economic characteristics of consumers and their behaviours (Von Hippel, 1982, 1986; Morrison et al. 2000; Haddon, 2002). A number of empirical studies show that the size of the market is a proxy for the presence of demand. Firms attempt to interact with customers to learn what consumers need and about their willingness to pay in order to reduce their uncertainty (Fontana and Guerzoni, 2008; Cantner and Guerzoni 2009; Guerzoni 2010; Fabrizio and Thomas 2012). It can be hypothesized that mobile service providers with broad-based relationships with customers would be more innovative than firms with a small installed customer base.

*Proposition 2: Mobile service providers with a large installed customer base introduce relatively more improvements and combinative innovations than incremental innovations compared with mobile service providers with a small installed customer base.*

On the other hand, mobile service providers with a large customer base may have more heterogeneous consumers. Some of them may have similar preferences (preference symmetry), while others may have overlapping (preference overlap) or different degrees of preferences (Adner, 2002). This indicates that a large mobile service provider needs to be concerned about market segmentation (Adner, 2002). An important consequence of this heterogeneity demand is that the degree of innovation that the mobile service provider introduces into the market may differ between large and small mobile service providers. When the installed base of consumers is relatively small, the firm tends to provide a small number of price plans in order to attract as many new customers as possible with simple, clear price plans, without worrying too much about market segmentation (Corrocher and Zirulia, 2010). It is therefore logical to infer that mobile service providers with a large installed customer base innovate more, relatively, in terms of improvements and combinative innovations than incremental innovations compared with mobile service providers with a smaller installed customer base.

*Proposition 3: Mobile service providers focus more on improvements and recombinative innovations than incremental innovation as the market becomes saturated.*

Consumer heterogeneity increases over time as the market grows and tends to saturate. Firms risk wasting time and resources on introducing innovation (Adner and Levinthal, 2001; Adner, 2002). Under the condition of market saturation, the number of potential new consumers decreases and the risk of consumer migration increases. The development of a new price plan is also costly for a firm. Firms should only offer a few price options if their commercialization and product development costs are non-negligible (Miravete, 2007). Alternatively, a new price plan should be developed to retain or lock in existing customer rather than attract new ones. Hence, the characteristics of the new price plan are more likely to be modifications or recombinations of some of the existing price plans, their own and those of rivals, rather than a new one being introduced. It can be hypothesized that mobile service providers focus more on improvement and recombinative innovations than incremental innovation as the market becomes saturated.

*Proposition 4: Mobile service providers are more likely to offer price plans that are characterized by rebate mechanisms, network-based discrimination and bundling as market saturation grows.*

More specifically, mobile service providers understand that consumers face switching costs when switching from one service provider to another (Klemperer, 1995; Farrell and Klemperer, 2002). They can use the benefit of their installed consumer base to influence all existing and potential consumers as the market grows. For example, they may introduce a price plan with a rebate mechanism or reward programmes to their consumers. Not all existing consumers influence a consumer adoption decision equally. Some key adopters in a consumer network may exert a stronger influence on an individual adoption decision through a local network, i.e. families and friends. If the mobile service provider

takes these factors into account for the new price plan with on-net vs off-net characteristics, it will easily lock in its consumers (Birke and Swann, 2006; Corrocher and Zirulia, 2009; Techatassanasoontorn and Suo, 2011). Mobile service providers compete by offering various types of bundling services as the market saturates. Various kinds of complementarity services, i.e. mobile phone service, fixed telephone and mobile Internet in one basket with some amount of discount, cannot only lock in consumers but also bring about monopoly profit to firms (Manral, 2010; Techatassanasoontorn and Suo, 2011). Hence, mobile service providers are more likely to offer price plans that are characterized by rebate mechanisms, network-based discrimination and bundling as market saturation grows.

## 5. Pricing innovation in the Thai mobile market: empirical evidence

During 2002-2010, 463 price plans were introduced by three major mobile operators: AIS, DTAC and Truemove. Each price plan is defined by the 14 characteristics mentioned in Section 3.2. Each price plan is then classified as to whether it is an innovation or not and if it is the type of innovation that will be identified according to the following criteria.

Overall, the number of new price plans has increased over time (see Figure 2), with a peak in 2008 coinciding with the introduction of Internet SIM cards from every mobile provider. *GSM Internet SIM 99* by AIS was the first mobile Internet price plan, at the beginning of January 2008. This price plan offer was also for on-net vs off-net calls. DTAC and Truemove introduced *Sabai Jai Chai Dai Khum* and *Cyber Sim*, which are similar mobile Internet price plans a few months later.

**-Figure 2.** Number of price plans introduced per year and firm-

According to our definition of innovation, 362 out of 463 price plans are new, as shown in Table 4. This means that mobile service providers do not imitate their competitors but adopt their own strategies of service differentiation. In absolute terms, Truemove and DTAC are leaders in service offerings, providing 185 and 152 price plans respectively over time in the market, while AIS has provided 126 price plans. Each firm has introduced 13-14 new price plans per year. On the contrary, AIS has been the most innovative firm over time in relative terms. Truemove's price plans are partly from re-branding price plans and imitation. In relative terms, AIS has the highest percentage of total innovations to total price plans, at 90%, while DTAC and Truemove have lower percentages of total innovations to total price plans at about 81% and 68% respectively. This evidence can be interpreted in light of *Proposition 1*. This study shows that mobile service providers with a high installed customer base generally introduce a higher number of innovative price plans than smaller ones. This implies that large mobile service providers attempt to use a flow of information from their consumers in order to reduce their uncertainty.

**-Table 4** Innovation and imitations by firm-

In view of the innovation characteristics, the findings show that the large mobile providers introduce more incremental innovations than small mobile providers. For example, incremental innovations constitute 28.31% and 20.33% of AIS's and DTAC's total innovations respectively, while this percentage is lower in relative terms for Truemove (15.87%). Truemove has a higher number of recombinative (50.00%) and improvement (34.00%) innovation than AIS (31.85%, 39.82%) and DTAC (27.64%, 52.03%) however. These results are in contrast with *Proposition 2*: a large firm introduces more recombinative and improvement innovations in relative terms than smaller firms. However, these findings can be related to the Truemove business structure. Although Truemove has a smaller consumer base in the mobile market than AIS and DTAC, Truemove has related services in other communication markets, i.e. fixed-telephony, broadband and cable TV. This firm tends to provide a number of new price plans in order to attract new consumers and existing consumers from other segments using a convergence strategy.

In exploring mobile pricing innovation and competition, the period of the analysis is divided into three periods according to Fig. 1 in Section 2: the initial stage of competition (2002-2004) when all three major mobile operators are in the market, the growth stage (2005-2007) and the maturity stage (2008-2010). The number of innovative price plans was still increasing in the last period of observation (2008-2010). Incremental innovations increase significantly during this period since mobile operators start to create smart phone price plans that add mobile Internet services and Wi-Fi Internet connection to their packages. The handset subsidy is also being reintroduced for the iPhone and Blackberry price plans by all the mobile operators. However, mobile operators concentrate on implementing recombinative and improvement innovations rather than incremental innovation ( see Table 5). This provides evidence for confirming *Proposition 3*: operators tend to provide improved innovations as the market becomes mature.

**-Table 5.** Type of innovation over time-

The empirical evidence shows some interesting results. As the market grows, price plans are characterized by network-based price discrimination, rebate mechanisms and bundling increase (see Table 6). For instance, network-based price discrimination price plans were implemented at about 3% of the total price in the first period (2002-2004) and they increased to 20% in the last period (2008-2010). The rebate mechanism increased from 4% to 7%. Bundling plans also increased twice compared with the first and the last periods. This evidence confirms *Proposition 4*. The mobile operators offer network-based price discrimination, rebate mechanisms and single fee heavily in the market saturation period.

Considering each mobile operator in a different period, their main strategies vary over time. In the first period, AIS and Truemove implemented free minutes as their main price plans, while DTAC used a single fee strategy. AIS switched its major price plan to network-based price discrimination in the second period and changed its focus again to a single fee in the last period of the study. DTAC and Truemove have used variable cost and network-based price discrimination as the same major price plans in the last two periods. However, DTAC also focused on a single fee price plan in the last period.

**-Table 6** Types of price plans over time-

Other interesting observations have been found. Location-based charges were implemented by AIS and DTAC. However, AIS uses them more regularly. This may be due to AIS's customers being more spread out nationally. AIS also introduced every characteristic of the price plan except day-based charges, while others introduced fewer characteristics. This implies that the customers of AIS are more heterogeneous and AIS attempts to satisfy its customer demands. DTAC has its own price plan, which has not been introduced by others: day-based charges. It usually combines this with a rebate mechanism. For example, customers could pay less during weekends and national holidays. It often offers free calls on the customer's birthday. Truemove has started to combine its mobile price plans with cable TV, broadband Internet access and fixed telephony. For instance, pre-paid customers can receive free installation costs for cable TV and several TV channels free if they pay more than 300 Baht per month for their mobile telephony.

Price plan innovations not only reflect the consumers demand but also give evidence of how these innovation affect the level of competition in mobile communication industry. According to the finding, Truemove is the most innovative firm in absolute terms. This means that Truemove tends to provide more alternatives to attract new consumers and retain its existing consumers by using its resources in other communication markets. This contradicts what Corrocher and Zirulia (2010) have mentioned: small firms are more likely to offer a small number and simple and clear price plans. Moreover, it results in the market share of the larger firms, i.e. AIS, having decreased over time. At the end of 2002, AIS earned 59% of the total market share while DTAC and Truemove had about 31% and 7% respectively. Recently, Truemove had 23% of the market share of the mobile market, while AIS and DTAC gained 43% and 30% respectively. This implies that Truemove's innovative price plan has successfully covered the heterogeneous needs of existing and new mobile customers. The price plan innovations therefore also drive competition in this market.

## **6. Conclusion**

In traditional industrial economics, several studies have investigated the impacts of price discrimination, in particular termination-based price discrimination, and the analyses are usually

limited to a simple price plan and deal with consumers' behaviours and switching costs. However, in reality, mobile operators offer several different characteristics of price plans: time-based, location-based, network-based and so on. This study analyses the competition in the Thai mobile communications services market using the innovation-based approach and employing the secondary data of the price plan between 2002 and 2010.

The findings show that mobile operators use price plans as their competition tools. Large mobile operators introduced more innovative price plans in relative term (*Proposition 1*). The smallest mobile operator has the highest number of price plans in absolute term however. This finding is not the same as the hypothesis in *Proposition 2*. This may be due to the smallest mobile operator having economies of scope in the telecom market and then being more likely to use its products through the offered price plans compared with large mobile operators. When the market becomes saturated, operators introduce recombinative and improvement innovations (*Proposition 3*). Moreover, as the market grows, specific price plans, i.e. network-based price discrimination, rebate mechanisms and bundling, increase (*Proposition 4*).

Although a high number of price plans can increase competition between operators, several price plans offer complex combinations that may lead to confusion for consumers. Consumers may not be able to choose the plan according to their real needs to minimize their monthly costs. This issue is worth investigating further to ensure the consumer benefits. Therefore, the roles of the telecom regulator also need to be considered. A price comparison programme needs to be implemented to allow mobile subscribers to select the price plan that suit their needs properly and increase competition in the market.

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**Table 1.** Innovative and non-innovative price plans: an example

	Price Plan A	Price Plan B	Price Plan C	Price Plan D	Price Plan E
Pre-paid/ subscription	Subscription	Subscription	Subscription	Subscription	Subscription
Subscription fee:	159 Baht	119 Baht	199 Baht	139 Baht	99 Baht
Price per unit/price per minute:	Price per minute: 0 from 05:00 to 16:59 hrs, 1.5 from 17:00 to 04:59 hrs	Price per minute: 0 from 05:00 to 16:59 hrs, 1.5 from 17:00 to 04:59 hrs	Price per minute: 0 from 05:00 to 09:59 hrs, 0.5 from 10:00 to 16:59 hrs, 1.5 from 17:00 to 04:59 hrs	Price per minute: 0 from 05:00 to 09:59 hrs, 0.5 from 10:00 to 16:59 hrs, 1.5 from 17:00 to 04:59 hrs	Price per minute: 0.5 from 05:00 to 16:59 hrs, 2 from 17:00 to 04:59 hrs
Call connection fee	No	No	No	No	No
Time-based charges	Yes	Yes	Yes	Yes	Yes
Day-based charges	No	No	No	No	No
Location-based charges	No	No	No	No	No
On-net vs off-net charges	No	Yes	No	Yes	No
Rebate mechanism	No	No	No	No	No
Free minutes/price related to total expenditure	No	No	No	No	No
Variable prices	No	No	No	No	No
Bundling	No	No	No	No	No
Single rate	No	No	No	No	No
Calling club	No	No	No	No	No
INNOVATION		Yes	Yes	Yes	No

**Table 2** Comparison of major mobile operators

Characteristics	AIS	DTAC	Truemove
Mobile subscribers	30,425,700	20,935,813	16,537,382
Market share in 2010 (by subscriber)	43.68	30.34	24.02
Year of entry	1990	1991	2002
Concession end	2016	2018	2018
Current technology	GSM 900 MHz (1994)	GSM 1800 MHz (1994)	GSM 1800 MHz (2002)
Number of base stations	15,400	10,082	N/A
Populated coverage (%)	97	N/A	N/A
Introduced mobile Internet	2000	2001	2002
Introduced Internet SIM	2008	2008	2008
3G launched	900 MHz and 2.1 GHz (2011)	850 MHz (2011)	800 MHz (2011)

Note: N/A refers to not available

Source: Partly adopted from Srinuan et al. (2011)

**Table 3** Innovation and imitation in the Thai mobile communications market

Characteristics	2002-2004			2005-2007			2008-2010		
	AIS	DTAC	Truemove	AIS	DTAC	Truemove	AIS	DTAC	Truemove
1. Price plan (date introduced)		MY (Feb 2003)	Close friends (Feb 2002)			One Baht per call (Aug 2006)		Suriyan/Chandra SIM (Feb 2008)	Day/Night Buffet (Feb 2008)
1.1 Price plan innovation	No	Yes	Yes	No	No	Yes	No	Yes	Yes
1.2 Imitation	One Love One Number (Nov 2002)			Oaw Pai Leay (Sep 2006)	Happy Tee Neung (Sep 2006)		Day / Night SIM (Mar 2008)		
1.3 Imitation from	Truemove			Truemove	Truemove		DTAC		
2. Characteristics	One selected number at a discounted rate	Sets the number of minutes and the deal date by customers	Free minutes and discounted charges for six selected numbers	1 Baht per call during 00:00-14:00 hrs, 1 Baht per minute during 14:00-23:59 hrs	1 Baht per call during 00:00-15:00 hr, 0.50 Baht per minute during 15:01-23:59 hrs	1 Baht per call for on-net during 05:00-17:00 hrs, 3 Baht per call for off-net during 17:00-23:59 hrs	Day SIM: discounted price for all calls during 06:00-17:59 hrs, Night SIM: discounted price for all calls during 22:00-09:59 hrs	Suriyan SIM: discounted price for all calls during 06:00-17:59 hrs, Chandra SIM: discounted price for all calls during 22:00-09:59 hrs	Day Buffet: Monthly 129 Baht for unlimited calls during 05:00-16:59 hrs, Night Buffet: Monthly 129 Baht for unlimited calls during 17:00-22:59 hrs

**Table 4** Innovation and imitations by firm

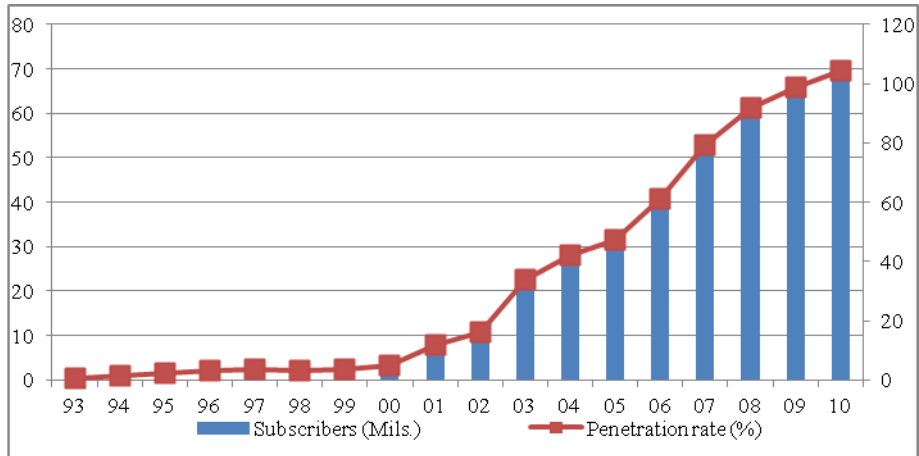
Firm/Price plan	Incremental	Recombinative	Improvement	Total Innovations	Imitation	Renaming	Total price plans
AIS	32	36	45	113	5	8	126
DTAC	25	34	64	123	15	14	152
Truemove	20	43	63	126	15	44	185
Total	77	113	172	362	35	66	463

**Table 5** Type of innovation over time

Year	Incremental	Recombinative	Improvement
2002	7	1	3
2003	3	3	7
2004	4	4	5
2005	7	10	10
2006	7	7	9
2007	9	8	23
2008	18	27	51
2009	11	40	32
2010	11	13	32
Total	77	113	172

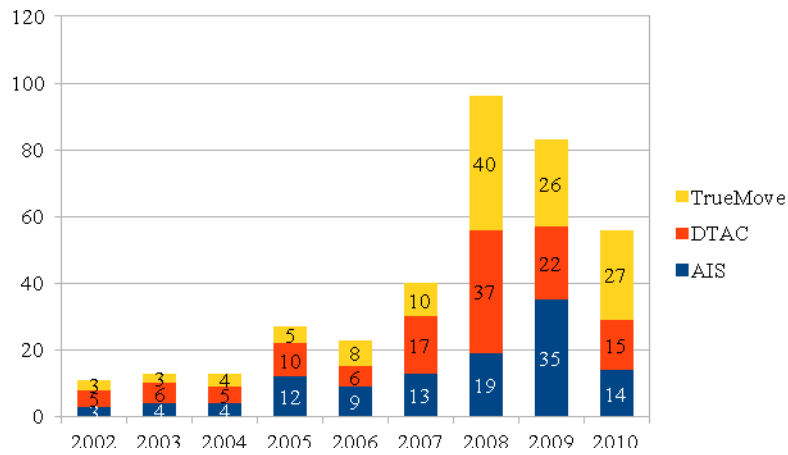
**Table 6** Types of price plans over time

Industry evolution	Characteristics										Total
	Time-based	Location-based	Day-based	On-net vs off-net	Rebate mechanism	Free minutes and price related to total expenditure	Variable	Bundling	Single fee	Calling club	
<b>All firms</b>											
2002-2004	5%	0%	3%	3%	26%	21%	10%	4%	14%	15%	100%
2005-2007	16%	2%	1%	23%	4%	10%	30%	3%	11%	2%	100%
2008-2010	14%	0%	0%	20%	17%	8%	7%	8%	18%	6%	100%
<b>AIS</b>											
2002-2004	9%	0%	0%	5%	18%	27%	18%	0%	14%	9%	100%
2005-2007	12%	4%	0%	25%	4%	8%	24%	2%	22%	0%	100%
2008-2010	12%	2%	0%	17%	13%	11%	9%	6%	25%	4%	100%
<b>DTAC</b>											
2002-2004	0%	0%	7%	0%	41%	10%	10%	7%	17%	7%	100%
2005-2007	19%	1%	1%	17%	3%	11%	33%	0%	8%	6%	100%
2008-2010	16%	0%	0%	20%	17%	6%	5%	12%	20%	4%	100%
<b>TRUE</b>											
2002-2004	9%	0%	0%	5%	14%	27%	0%	5%	9%	32%	100%
2005-2007	15%	0%	0%	26%	4%	11%	32%	6%	6%	0%	100%
2008-2010	14%	0%	0%	22%	18%	7%	7%	8%	16%	7%	100%



**Figure. 1** Mobile subscribers and penetration

Source: ITU (2010) and NBTC (2011)



**Figure 2** Number of price plans introduced per year and firm