

AN ANALYSIS OF CONSUMER PREFERENCES FOR MOBILE VOICE CALLING IN DIFFERENT CONTEXTUAL USAGES: A CASE OF THAILAND

Monarat Jirakasem

Graduate School of Asia-Pacific Studies, Waseda University, Japan

ABSTRACT

This paper aims to investigate consumer preferences for voice calling using two methods via mobile phone—Over-the-top (OTT) voice calling services using the Internet and mobile telephony using cellular networks in different situations—for both formal and casual occasions. In brief, it explores how users prioritize these attributes; service quality, price, and Internet connection requirements. A discrete choice experiment was conducted in Thailand in 2019 with 444 observations. The results reveal that respondents valued service quality most in both occasions, followed by price, and lastly Internet connection requirements. However, in regards to situations of formal usage, consumers valued service quality to a significantly higher degree than prices when compared with casual use situations. Hence, users rely on better quality services over low cost services. It can be implied that users are more likely to employ mobile telephony, the service quality of which is considered to be better, than they are to use OTT in casual situations compared to formal occasions. Implications of these results are also discussed in this paper.

KEYWORDS

Mobile Telephony, Over-the-top (OTT) Communication Services, Consumer Preferences, Thailand

1. INTRODUCTION

Mobile telephony has been widely used as an essential means of communication. In the last decade, mobile telephony has replaced fixed-line telephony due to its flexible attributes and affordable prices for services and devices. However, the recent emergence of Over-the-top (OTT) communication services has proven to be an exciting entry into the field of telecommunications, as it challenges traditional telecommunications services, including mobile telephony. OTTs refer to “online services that can be regarded as potentially substituting for traditional telecommunications and audiovisual services, such as voice telephony, SMS, video on demand, and television” (ITU, 2017, p.4). The Body of European Regulators for Electronic Communications (BEREC) divided OTT into three groups, based on the level of risk to Electronic Communication Services (ECS): OTT-0, OTT-1 and OTT-2. OTT-0 is an OTT service that can connect to Publicly Available Telephone Service (PATS), and is considered to be an ECS. OTT-1 is an OTT service that cannot connect to PATS, but provides voice calling and instant messaging, which can potentially compete with ECS. The last group, OTT-2 is an OTT service that does not provide services relating to ECS, such as video streaming (BEREC, 2016). This study focuses on OTT-1 group. Thus, adopting the definitions from ITU and BEREC, OTT services in this study is defined as OTT communications that generally provide voice calls and instant messaging at no additional cost via the Internet, including services such as Line, Facebook Messenger, Whatsapp, WeChat, and Skype (basic services without connecting to PSTN).

By utilizing a free service strategy, OTT services can compete to a significant degree with traditional telecommunications services, especially traditional mobile telephony that utilize cellular networks. The emergence of OTTs provides alternative voice calling services for consumers, particularly for consumers using smartphones. Subsequently, consumers nowadays basically have two choices for voice calling - mobile telephony using cellular networks, and OTT services using an Internet connection.

Although free services are fascinating, there are tradeoffs to using them. From the users' perspective, apart from privacy concerns, the tradeoffs are associated with service usage - users need to consider each service attribute, such as price, quality, and Internet connectivity requirements. With respect to the case of voice calling on OTTs and mobile telephony, users must consider that although calling on OTTs is free, the quality fluctuates, and it requires an Internet connection. Mobile telephony generally provides a higher quality connection, is more reliable, and is independent of an Internet connection, but it is usually not free. This paper aims to tackle this issue by investigating consumer preferences for each attribute of both methods of voice calling on mobile phones. Moreover, both formal and casual contextual usages are considered, which are divided according to the purpose of the call. Furthermore, this paper estimates users' willingness to pay (WTP) to obtain a higher quality of services against the Internet connection available in each situation.

Since the trend of OTT services is now considered a threat to mobile network operators, this research intends to examine that assumption in terms of voice calling services. It is expected that users primarily value low cost when making a voice call. If that is true, then it can be assumed OTT services will replace traditional mobile telephony. Moreover, this paper aims to examine on which occasions users are more likely to choose OTT services by dividing those occasions into formal and casual designations of use, each of which require a different degree of service quality. The results are intended to help policymakers understand the usage patterns of Thai consumers. Moreover, they can help mobile network operators tailor proper strategies suitable to consumer behavior in Thailand.

The remainder of this paper is organized as follows. Section 2 introduces an overview of the voice communication market in Thailand. Section 3 provides literature review. Section 4 presents the objective and research question in this study. Section 5 proposes the methodology employed in this study, including the discrete choice experiment method, how the questionnaire was formulated, and how the data was collected. Section 6 presents the main results and also willingness to pay (WTP). Section 7 discusses the results and implications. Section 8 remarks on the contributions and limitations and also provides recommendations for future study.

2. OVERVIEW OF THE VOICE COMMUNICATION MARKET IN THAILAND

The telecommunications market in Thailand is growing fast. Currently, there are three mobile network operators that dominate the market: AIS, TrueMove H, and dtac (NBTC, 2019). They hold 44%, 31.8%, and 21.6% of the market share, respectively. The other two mobile network operators, CAT and TOT, handle just 2.4% and 0.18%. The traditional telecommunications services in Thailand, particularly voice services, are seen as declining for two reasons. Firstly, while the overall revenue of each mobile network operator is increasing, the revenue from the voice calling segment has been declining, from an average of 5.379 million US dollars in 2009 to 3.867 million US dollars in 2017. Secondly, the minutes used per connection has been declining as well. Voice minutes used per customer reached its peak in 2010, with 507 minutes per connection. Since then, it has been decreasing, up to 316 minutes in 2011 and 117 minutes as of late 2019, as shown in Figure 1.

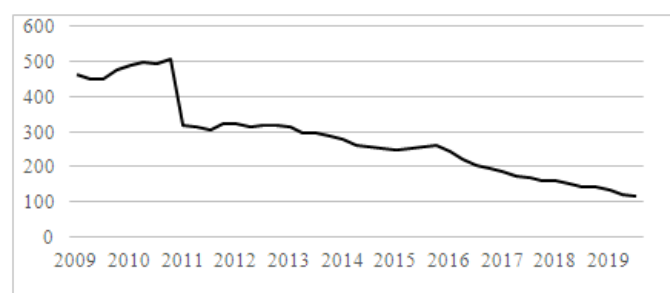


Figure 1. Minutes of use per connection 2009-2019 (GSMA, 2019)

At the same time, OTT services, as part of Internet services, are increasing and are considered to be the cause of the decline in the traditional telecommunications services market (Chuah et al., 2015). This reasoning is built on three factors. First, OTT services are increasing in terms of revenue and

subscription. For example, the LINE application is favored by users in Thailand, with 44 million active accounts as of 2019 (Wearesocial, 2019), while the number of mobile Internet subscribers in Thailand is only slightly higher, at 46 million, meaning nearly everyone with an Internet-enabled mobile device also has a Line account. Second, mobile network operators' revenue from non-voice segment, which includes the usage of data, is increasing, from 66 million U.S. dollars in 2009 up to 5,124 million U.S. dollars in 2017. On the other hand, data traffic per connected user is increasing. Telecommunications operator AIS reports an increase from 240 MB per connection in 2013 to 12 GB per connection in 2019, implying that the usage of OTTs makes for the majority of this increase. Third, the adoption rate of smartphones reached 68 million users in 2019, while the population of Thailand is 69.7 million. With smartphones, users can easily access to OTTs.

This study does not intend to measure the substitution effect between the two services. Rather, it intends to investigate consumer behavior in selecting the choice of voice calling services when there are two available alternatives.

3. LITERATURE REVIEW

Consumer preferences for mobile services have been an area of significant interest in telecommunications and marketing studies for decades, including mobile network quality, usage plans, Mobile Number Portability (MNP), and Digital Television Terrestrial Services, as well as other specific additional services (Shin et al., 2011; Satitsamitpong & Mitomo, 2013; Klein & Jakopin, 2014; Confraria et al., 2017; García-Mariñoso & Suárez, 2019). Cost and quality are important attributes in many studies. Although analysis of OTT voice calling is rare, there are many cases focusing on Voice over the Internet Protocol (VoIP) or IP telephony, which is similar to OTT voice calling. However, the results are mixed. Many studies found that quality is still the priority for users. A study using conjoint analysis found that call quality is an important attribute when making a voice call (Zubey et al., 2002). Similarly, a study in 2008 focusing on Japanese customers was conducted using conjoint analysis. The results indicated that users relied on more secure quality of services (QoS) telephony, particularly fixed-line telephony. As a result, they used IP telephony as complementary technology, since the substitution effect between IP telephony and fixed-line telephony had not occurred at that time (Ida et al., 2008). Another study focused on mobile services attributes on consumer purchasing by comparing decisions made by males and females. It found that service quality is a significant attribute for both male and female consumers (Zeeshan, 2013).

Alternatively, some literature has found that price is the priority for certain users. Jaiswal & Raghav (2004) found that users preferred lower cost over other attributes, such as quality, responsiveness, reliability, and value added service (VAS). Another study was conducted in Denmark to explore the economic factors affecting the diffusion of IP telephony, such as user perceptions and network effects (Constantiou & Kautz, 2008). The results indicated that users tended to recommend IP services to other users due to perceived low cost in installation, use, and the ability to make international calls. IP telephony is cheaper than fixed-line in international calls, resulting in increased perceived value for people who live abroad. Because users perceive low cost to be a priority, they tend to ignore the relatively low quality of service compared to fixed-line telephony. Similarly, other reports found that effective pricing of calls are essential factors affecting operator choice adoption (Czajkowski & Sobolewski, 2016).

When two services are available from which to choose, apart from the service's attributes, the situation of use seems to affect users' selections. Early studies were interested in the context of use in different locations. A study examined the usage patterns of mobile services in different contexts, finding that multimedia services were mostly used in "on the move" situations, as opposed to at home or in the office (Verkasalo, 2009). Similar studies found that usage context, or using services in a variety of locations, affected smartphone communications service usage patterns, indicating diverse usage among consumers (Soikkeli et al., 2011; Karikoski & Soikkeli, 2013). However, later studies focused more on the context of purpose of use and media selection. A study focusing on Blackberry

messaging services and traditional SMS revealed that the users selected those services based on social ties or social contacts (Reynolds et al., 2011). A study that conducted interviews with users in Germany found that users selected OTT messengers and SMS services depending on the situation and the person or people the message was being sent to. If the user and receiver had an established relationship, they were more likely to use traditional rather than OTT services (Arnold et al., 2016). Church & Oliveira (2013) also conducted interviews with users of mobile instant messaging services and traditional SMS. Apart from the cost, which was included in the study, community, sense of connection, reliability, and choice of technology affected users' selections. They found that users were not likely to use new services, such as WhatsApp, with their formal relationships, but instead chose traditional services.

Previous studies show that the ways in which consumers value service attributes differs depending on the services and countries involved. This study aims to investigate the issue in Thailand. Moreover, it also examines the value users place on specific attributes of services in different contexts. With respect to an academic contribution, this study is the first to examine the attributes in OTT voice calling in Thailand, across different contextual usages. The results are expected to enhance understanding of usage patterns in mobile voice calling in Thailand.

4. OBJECTIVE AND RESEARCH QUESTIONS

The objective of this study is to identify consumer preferences for voice calling using mobile phones via two methods—OTT and mobile telephony. Thus, the following research question is posited: What are the attributes that consumers prefer when making a voice call in different situations of use? The significance of this study is to extend knowledge about consumer preferences for telecommunications service usage. Furthermore, the work is expected to contribute to the field of telecommunications, as the results are expected to suggest guidelines for coping with this phenomenon, especially as they pertain to mobile network operators and policymakers in Thailand.

5. METHODOLOGY

5.1. Identification of Attributes

The attributes employed in the model are mainly adapted from previous studies explained in the literature review section. These attributes are the main characteristics of OTT services and mobile voice calling. OTT voice calling and mobile telephony can be regarded as providing similar functions but with different prices. However, compared with mobile telephony, OTT (which combines IP telephony as a main feature), is considered to be inferior in terms of quality. OTT requires an Internet connection as the service transmission mean. However, Internet connections in Thailand, a developing country, are not satisfactory, particularly with respect to mobile Internet services. Despite 3G/4G coverage being reported as provided for 98% of the population (GSMA, 2019), users often experience unstable and poor connections. Additionally, OTT's service quality depends on application development. It may sometimes crash or lag, thus reducing overall service quality; hence, service quality and price are the main attributes in this context. Moreover, Internet connection requirement is also included as one of the attributes as shown in table 1.

Table 1: Characteristics of OTT voice calling and mobile telephony

Characteristics (Attributes)	OTT voice calling	Mobile telephony
1. Service quality*	Unstable	Stable
2. Price	Free of charge*	Charged*
3. Internet connection requirement	Yes*	No

Note: * In general cases

Table 2: Definition and level of attributes

Attribute	Definition and level
1) Service quality	Overall quality experienced by users
	◆ Satisfactory/more stable quality
	◆ Less satisfactory/ fluctuating quality
2) Price	Price per minute
	◆ Free or 0
	◆ 1.5 Baht (\$0.05)
	◆ 3 Baht (\$0.1)
3) Internet	Internet connection requirement
	◆ Yes
	◆ No

Service quality is the first attribute examined. Quality is one of the priorities that users are concerned with when choosing services. In this paper, there are two levels in this regard: satisfactory/more stable quality and less satisfactory/fluctuating quality (Dagli & Jenkins, 2016).

Price, the second attribute, refers to price per minute. Free or 0 price is one of the levels representing the characteristic of OTT. The next level is 1.5 baht per minute, a value derived from the effective price per minute for mobile telephony in Thailand (GSMA, 2019), and the last level is defined as 3 baht per minute to make the gap between each price equal.

Internet connection requirement is typically necessary when calling or using OTT services. Compared with traditional mobile telephony, OTT is considered to be a more complex process because it requires an Internet or mobile Internet connection, resulting in a more complicated user process that also involves higher time and cost outlays. This attribute may be slightly subjective, yet it demonstrates meaningful insight regarding the use of voice calling services in Thailand.

In this paper, two use situations are analyzed: formal and casual. The selection of a particular service may depend on the occasion of use. The occasion of use is separated on the grounds of the quality-secured situation—formal and casual. A formal occasion is defined as official, in an emergency or calling someone with whom the caller has an established relationship. On the other hand, casual occasions are unofficial, not an emergency, or contacting someone with whom the caller wishes to have a leisure conversation. Formal occasions require more stable, higher quality connections and should be less complicated to use. In contrast, casual ones do not. In this scheme, it is expected that users are more likely to employ mobile telephony for formal conversations, and hence users would select higher priced mobile telephony because the quality is relatively secure. The same set of attributes is provided on both occasions, but they were randomly arranged in the questionnaire. By understanding consumer choices of particular services and how those attributes are selected, it is possible to anticipate which services users tend to choose between OTT and mobile telephony in different use situations.

5.2. Questionnaire Formulation

Regarding the discrete choice experiment, a full factorial design is preferable, but it is not appropriate for this paper. Since there are two schemes required in this research, such a design would be a burden for respondents, negatively affecting survey quality. Instead, an orthogonal main-effect plan (OMEP) is employed using the R statistical analysis program.

Q: Which service is more preferable when making an emergency or official voice call?

	A	B
Service quality	Satisfactory/more stable	Unsatisfactory/fluctuates
Internet connection	Not required	Required
Price	3 Baht/minute	Free
Your choice	<input type="checkbox"/>	<input type="checkbox"/>

Figure 2: Sample question

There are three attributes—two of them comprise two levels and one consists of three levels, and hence there will be 12 questions. After fractional factorial design is conducted, respondents are required to answer six questions per scheme, totalling 12 questions that are used in the questionnaire.

5.3. Data collection

To collect the data, the survey was conducted in Thailand. A pilot study was performed initially on 30 respondents, primarily to determine appropriate survey language and correct understanding. After the pilot study, an online survey and face-to-face interviews were conducted in Thailand from June 18 to July 18, 2019, by a professional marketing agency called IT Survive. The data collection was conducted using a random sampling method at the city center and public transportation stations in the Bangkok metropolitan area in order to control differences in the development gap between regions affecting bias in overall answers. The characteristics of respondents are determined to be diverse in terms of age, gender, and background. However, all respondents were age 16 or older. The trained collector briefly explained the general concept of the research project and presented questionnaires to respondents. The respondents were asked to choose an alternative that potentially satisfied them the most.

6. RESULTS

All 502 responses were checked to remove incomplete and unrealistic responses; respondents who did not complete all the questions or who carelessly selected only straight A or B choices in every question were eliminated. A total of 444 respondent surveys were used for the analysis. The age of the respondents ranged from 16-70 years old with more female respondents than male, which reflects the gender proportion difference in Thailand (NSO, 2019). Descriptive data are presented in Table 3. Results analyzed using conditional logit analysis (CL) are presented in Table 4.

Table 3: Socio-demographic characteristics of respondents

	Obs	Mean	Std. Dev.	Min	Max
Gender					
Male	198	.446	.498	0	1
Female	246	.554	.498	0	1
Age					
	444	36.685	11.245	16	70
Marital status					
Married	249	.559	.497	0	1
Not married	195	.441	.497	0	1
Education					
> Secondary school	4	.009	.095	0	1
High school	148	.336	.473	0	1
Undergraduate	245	.552	.498	0	1
Graduate	46	.104	.305	0	1
Income					
	444	29,070.9	25,432.34	0	250,000*
Employment status					
Employed	289	.599	.491	0	1
Self-employed	117	.313	.462	0	1
Student	24	.054	.226	0	1
Retired	4	.009	.095	0	1
Unemployed	10	.025	.156	0	1

* Note: Thai Baht (THB)

Table 4: Results: CL

Attributes	Formal Occasion		Casual Occasion	
	Coef.	Std. Err.	Coef.	Std. Err.
<i>Service quality</i>	3.918 ***	.173	1.998 ***	.088
<i>Internet requirement</i>	.817 ***	.089	.212 ***	.067
<i>Price</i>	-.985 ***	.056	-1.406 ***	.046

Note: * p < 0.1, ** p < 0.05, *** p < 0.01

All attributes were found to be statistically significant for both occasions of use, with pseudo R² 0.68 in the formal occasion, and 0.51 in the casual occasion. For formal occasions, service quality and Internet requirement were positive attributes to users. Hence, users prefer higher service quality and also require Internet connections. When comparing service quality to Internet requirement, service quality was a much higher priority than Internet connection. Regarding price, as expected, the coefficient had a negative sign, indicating that users prefer a lower price for voice calling. Among these three attributes, service quality was the attribute that respondents value the most, price the second, and Internet requirement third.

With respect to casual occasions of use, similar results were found when compared to formal occasions. The service quality was still the priority for users, followed by price and then Internet connection. However, regardless of positive and negative signs, the quality and price coefficient were quite similar. Compared to formal occasions, the coefficient of service quality and price are clearly different. This observation may imply that users prioritize service quality over price in both schemes, but they tend to value service quality more compared to casual occasions. This result is consistent with the expectation that in the higher quality-required situation, people are more likely to value service quality over price.

6.1. Willingness to Pay

Table 5: Willingness to pay (WTP)

Attributes	WTP	
	Formal occasion	Casual occasion
<i>Service quality</i>	4 Baht (\$0.13)	1.4 Baht (\$0.046)
<i>Internet connection requirement</i>	0.8 Baht (\$0.026)	0.15 Baht (\$0.0049)

The results of WTP indicate that, in a formal situation, respondents were willing to pay 4 Baht per minute to make a voice call with higher, more stable quality. Moreover, they were willing to pay 0.8 Baht to obtain an Internet connection. On the other hand, the willingness to pay for voice calling in casual situations was only 1.4 Baht per minute. Furthermore, they were only willing to pay 0.15 Baht for their Internet connection, which is a particularly small amount.

WTP for better quality service is greater than the effective price per minute in Thailand. This reflects the fact that users value quality of service and are willing to pay more for it if they are assured of that quality when making voice calls. With respect to WTP for Internet connections, the amount of money users were willing to pay was less than that of service quality. However, it was still positive. This result was surprising, because it was expected that people would choose services that require fewer steps to use. This issue will be discussed in the next session.

7. DISCUSSION & CONCLUSION

This study found that users clearly value service quality most, price second, and Internet requirement least. However, the occasions for use play an important role in choosing a voice calling service within the two alternatives provided. In summary, users were likely to choose their service each time based on the situation of the call they wished to make. OTT and traditional mobile telephony were found to differ in terms of service quality, Internet requirement, and price. Regarding this study’s results, it can be assumed that users chose the services differently depending on the situation. Thus, when those two services are considered as being different, users select each service accordingly. In Thailand, traditional mobile telephony is perceived as being of higher quality and having a more stable service. People are more likely to choose this form of telephony when they are making a voice call in formal situations, or when higher quality is required. On the other hand, when they are making a voice call in a casual situation, they do not wish to pay a similar amount of money as for a formal situation. It is therefore more likely that users will choose the no cost OTT in this situation when compared to a formal occasion.

Concerning the Internet requirement attribute, it was expected to have a negative coefficient, but surprisingly demonstrated the opposite result. There are three possibilities regarding this issue. First, participants may not consider that an Internet requirement is burdensome. Also, access to the Internet or mobile Internet for Thais is convenient, which is a good indication—the Internet is generally considered to provide a highly accessible form of infrastructure and lead to a reduced digital divide. Second, respondents were familiar with calling on OTT, and they may perceive that calling over the

Internet is associated with lower additional cost. According to participants' characteristic information, the majority use smartphones and subscribe to mobile Internet services. Third—and relating to the second possibility—respondents may perceive that an Internet connection is associated with a surplus benefits because they can utilize the Internet for features in addition to making a voice call. Thus, they also value the Internet requirement attribute as being positive and significant, even though the effect is not large compared to other attributes.

As pertains to the willingness to pay for better quality of service, this factor can be used to explain the case of the freemium service type. Freemium is a business model utilized to a significant extent by OTT players today. This model typically offers basic services for free, but charges users for better quality or various options and premium services. If OTT communications can guarantee satisfactory quality of services, and charge consumers, users would most likely be willing to pay higher than the current zero cost models.

The findings in this paper indicate that service quality is the priority of users, with OTT communications and mobile telephony in Thailand being utilized as complementary functions while still considered to be inferior products. The results are consistent with a previous study indicating that users are more likely to adopt new services if they are complementary. In other words, they still rely on higher quality service (Ida et al, 2008). Nevertheless, when technology improves in the near future to the point that the quality of services between traditional and Internet-dependent services does not significantly differ, the relationship between OTT and mobile telephony will likely change. When the quality between the two is equal, users are then expected to consider price to be the most important attribute. Consequently, substitution may occur in near future.

The results in this study confirm that the success of OTT is not based solely on the zero cost business model, because users do not currently value price above all else. Consequently, there are two possibilities for OTT success. First, it is possible that current OTT services have improved their quality to an acceptable level, even though it remains inferior to mobile telephony. Moreover, OTT offers richer features than traditional telephony services. OTT applications offer a variety of high-end services and features that are not available to traditional telecommunications users, such as group calling, sticker emojis, and photo sharing. Thus, offering the same services to end-users as traditional telecommunications providers is not the key to success for OTT.

As for mobile network operators (MNOs), it seems that the threat of OTT voice services to surpass traditional mobile telephony is not as severe as expected by some analysts. The results in this study can be useful for MNOs. Apart from challenging traditional mobile telephony, MNOs should focus on the other side of OTTs, such as data consumption. MNOs in Thailand are not only providing traditional telecommunications services, but also mobile Internet. As the results in this study indicate, users are willing to pay for Internet connectivity. MNOs should see this as an opportunity. Although revenue for traditional telecommunications services is declining, revenue for data can be used to boost income. Moreover, MNOs can use OTTs to attract new users. In other words, partnering with OTTs may also be a good strategy, as recommended by a previous study (Stork et al., 2017).

OTT is challenging the traditional telecommunications services. However, the quality of mobile telephony is still higher at this point than OTT services, meaning that users continue to make use of mobile telephony. Currently, service quality is what users value most, so competition is mainly based on quality more than the price, though this may change in the near future as Internet connectivity improves, especially if telecommunications regulators support quality of service upgrades while monitoring the effects these enhancements bring. Moreover, encouraging competition on the grounds of service quality would be an appropriate policy towards voice calling services in Thailand. Companies and users alike can share the benefits of competition. Services offered to users should be guaranteed. However, regulation regarding the quality of OTT services may affect prices charged to end-users. This development should be considered by both regulators and OTT services providers.

8. CONTRIBUTIONS & LIMITATIONS OF THIS STUDY

There are contributions in this study, which is the first paper empirically focusing on usage patterns of Thai consumers in using voice calling services on mobile phones, which includes zero cost OTT services. Moreover, it explicitly demonstrates the demand for voice calling in different contextual usages, both formal and casual. This factor has been qualitatively investigated in previous studies, but this paper examined it empirically. However, this study has some limitations, which are expected to improve in future studies. Firstly, the data collection was conducted in the Bangkok metropolitan area, so the results cannot imply the developmental gap between regions in Thailand, which may affect the outcome. Secondly, consumers' motives for selecting particular services should be additionally investigated using the qualitative method, including in-depth interviews as conducted in previous research (e.g. Church & Oliveira, 2013; Arnold et al., 2016). Limitations in the questionnaire include psychological factors that could not be properly investigated. Future studies are expected to address these constraints.

REFERENCE

- [1] Aizaki, H., & Nishimura, K. (2008). Design and analysis of choice experiments using R: a brief introduction. *Agricultural Information Research*, 17(2), 86-94.
- [2] Arnold, R., Schneider, A., & Hildebrandt, C. (2016). All Communications Services Are Not Created Equal– Substitution of OTT Communications Services for ECS from a Consumer Perspective. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2756395
- [3] BEREC (2016). BEREC Report on OTT services. Retrieved from <http://berec.europa.eu>
- [4] Chima RMS & Javier P. (2017, May 22). Internet vs. telecommunication services: differences that matter for users' rights. Retrieved from <https://www.accessnow.org/ott-vs-telecom-services/>
- [5] Chuah, H. W., Marimuthu, M., & Ramayah, T. (2015). Wireless telecommunications industry in Malaysia: Trends, challenges, and opportunities. In *Consumption in Malaysia: Meeting of New Changes*. Universiti Sains Malaysia Publisher, Penang.
- [6] Church, K., & De Oliveira, R. (2013). What's up with WhatsApp? Comparing mobile instant messaging behaviors with traditional SMS. In *Proceedings of the 15th international conference on Human-computer interaction with mobile devices and services*, 352-361.
- [7] Confraria, J., Ribeiro, T., & Vasconcelos, H. (2017). Analysis of consumer preferences for mobile telecom plans using a discrete choice experiment. *Telecommunications Policy*, 41(3), 157-169.
- [8] Constantiou, I. D., & Kautz, K. (2008). Economic factors and diffusion of IP telephony: Empirical evidence from an advanced market. *Telecommunications Policy*, 32(3-4), 197-211.
- [9] Corrocher, N. (2003). The diffusion of Internet telephony among consumers and firms: current issues and future prospects. *Technological Forecasting and Social Change*, 70(6), 525-544.
- [10] Czajkowski, M., & Sobolewski, M. (2016). How much do switching costs and local network effects contribute to consumer lock-in in mobile telephony? *Telecommunications Policy*, 40(9), 855-869.
- [11] Dagi, O., & Jenkins, G. P. (2016). Consumer preferences for improvements in mobile telecommunication services. *Telematics and Informatics*, 33(1), 205-216.
- [12] García-Mariñoso, B., & Suárez, D. (2019). Switching mobile operators: Evidence about consumers' behavior from a longitudinal survey. *Telecommunications Policy*, 43(5), 426-433.
- [13] Greene, W.H. (2012). *Econometrics Analysis* (7th ed.). Harlow: Pearson Education

- [14] Ida, T., Kinoshita, S., & Sato, M. (2008). Conjoint analysis of demand for IP telephony: The case of Japan. *Applied Economics*, 40(10), 1279-1287.
- [15] International Telecommunication Union (2017). Economic impact of OTTs - Technical Report 2017. Retrieved from https://www.itu.int/dms_pub/itu-t/opb/tut/T-TUT-ECOPO-2017-PDF-E.pdf
- [16] Jaiswal, M. P., & Raghav, B. (2004). Cost-quality based consumer perception analysis of voice over Internet protocol (VoIP) in India. *Internet Research: Electronic Networking Applications and Policy*, 14(1), 95-102.
- [17] Karikoski, J., & Soikkeli, T. (2013). Contextual usage patterns in smartphone communication services. *Personal and ubiquitous computing*, 17(3), 491-502.
- [18] Klein, A., & Jakopin, N. (2014). Consumers' willingness-to-pay for mobile telecommunication service bundles. *Telematics and Informatics*, 31(3), 410-421.
- [19] Kraemer, J., & Wohlfarth, M. (2015). Regulating over-the-top service providers in two-sided content markets: Insights from the Economic Literature. *Communications & Strategies, Communications & Strategies*. 99. 71-90.
- [20] NSO (2019). Sathiti prachākōnsāt prachākōn læ khēha [Statistics of demography, population and housing] Retrieved from <http://statbbi.nso.go.th/staticreport/page/sector/th/01.aspx>
- [21] NBTC (2019). Thai telecom industry database. Retrieved from http://ttid.nbtc.go.th/mobile_db.html
- [22] Reynolds, L., Gillette, S., Marder, J., Miles, Z., Vodenski, P., Weintraub, Birnholtz, J. & Hancock, J. (2011, March). Contact stratification and deception: blackberry messenger versus SMS use among students. In *Proceedings of the ACM 2011 conference on Computer supported cooperative work*. 221-224.
- [23] Satitsamitpong, M., & Mitomo, H. (2013). An analysis of factors affecting the adoption of digital terrestrial television services in Thailand. *International Journal of Managing Public Sector Information and Communication Technologies*, 4(2), 9.
- [24] Shin, H. K., Kim, A., & Lee, C. W. (2011). Relationship between consumer's preference and service attributes in mobile telecommunication service. *Expert Systems with Applications*, 38(4), 3522-3527.
- [25] Soikkeli, T., Karikoski, J., & Hämmäinen, H. (2011, September). Diversity and end user context in smartphone usage sessions. In *2011 Fifth International Conference on Next Generation Mobile Applications, Services and Technologies*, 7-12.
- [26] Stork, C., Esselaar, S., & Chair, C. (2017). OTT-Threat or opportunity for African Telcos?. *Telecommunications Policy*, 41(7-8), 600-616.
- [27] Train, K. E. (2009). *Discrete choice methods with simulation*. Cambridge university press.
- [28] Verkasalo, H. (2009). Contextual patterns in mobile service usage. *Personal and Ubiquitous Computing*, 13(5), 331-342.
- [29] Zeeshan, Z. (2013). The impact of mobile service attributes on males' and females' purchase decision. *Management & Marketing*, 8(4). 669-682.
- [30] Zubey, M., Wagner, W. and Otto, J. (2002), A conjoint analysis of voice over IP attributes, *Internet Research*, 12 (1), 7-15.

AUTHOR

Monarat Jirakasem is a doctoral student at the Graduate School of Asia-Pacific Studies (GSAPS), Waseda University. She received a Bachelor of Political Science from Thammasat University and a Master of Arts in International Relations from Graduate School of Asia-Pacific Studies, Waseda University. Her research interests are Over-the-top (OTT) services and regulatory framework in developing countries.

