Implications of New Technological Adaptions on Switching Barriers: An Empirical Study of Mobile Telecommunication Subscribers in Sri Lanka

Karunaratne, E.A.C.P.

School of Management, Huazhong University of Science and Technology, Wuhan, China

Department of Industrial Management, Wayamba University of Sri Lanka, Sri Lanka

Corresponding Author

Zhang Jing

School of Management, Huazhong University of Science and Technology, Wuhan, China

Abstract

With the technological advancements in the past few years in the mobile telecommunication industry, customer requirements and their behavioral patterns changed a lot. Implications of two of most popular such technological approaches which are independent from the service provider were discussed in this paper. Usually, firms have identified the value of maintaining a higher level of switching barriers since it is one kind of successful strategic aspects in mobile telecommunication. But, the importance of these strategies was challenged with the adoptions of new technologies. Therefore, to study its' implication, data set was obtained by conducting a survey from randomly select mobile subscribers in Sri Lanka. Descriptive statistics, correlation analysis, t-test and factorial ANOVA test were used for the data analysis purpose. According to the analysis, it is revealed that these two technological advancements are weakened the level of switching barriers significantly. It may allow subscribers to switch service providers easily. On the other hand, subscribers with higher relationship age are having the highest switching barrier level even though they are users of those new technologies. But a significant difference among users and non-users has been identified through the study. Thus, policy makers are required to come up with new strategies to retain those subscribers within the network.

Key words: *Switching barrier, technological advancements, Mobile voice over internet protocol, switching cost, relationship age*

JEL classification: *M30, M31, O33, L96*

Introduction

Drastically changing mobile telecommunication sector is facing increasing number of challenges in today's market. Technology attached with mobile telecommunications plays the main role for such changes. On the other hand, these technological advancements in both subscriber's end and service provider's end have become major implication for the industry growth in the recent years. Also, new technological innovations for the continuous developments in service providing platforms and extraordinary enhancements of mobile devices have paved the path for such development. With the advancement of telecommunication technologies, mobile services have become more accessible to a broad range of users. Also, mobile devices are particularly designed and intended for individuals, satisfying their diverse needs and expectations (Boakye, 2015). Due these technological developments in the mobile telecommunication, new technological adoptions are used by many service providers as a key factor to differentiate their products and services in the market place.

From market perspective, mobile telecommunication is one of the highly penetrated markets in which, it is hard to find a person who is not using a mobile phone. Due to its' perceived usefulness and perceived ease of use, mobile telecommunication and mobile devices have become a part and parcel of everyone's day to day life. Although it is a good sign to all individual service offering firms, lack of new potential customers' arrivals to the market has become an issue for them since the firm's customer base is one of the key indicators of their market strength. On the other hand, since everyone has already attached with a particular mobile network, only possible way of getting new customers is grabbing ones from other's network. Grabbing new customers from others' network has also become a tough task since all individual service offering firms have already set up many locked-in strategies to tighten their subscribers within their own networks. Thus, due to all of these reasons, mobile telecommunication industry has become one of rigorously competing markets.

In today's mobile industry, subscribers are not using mobile telecommunication services just to calling and messaging purposes. With the technological advancements in the past few years, customer requirements and their behavioral patterns changed a lot. With having broadband connectivity to mobile devices, video streaming, Internet of things (IoT), and mobile payments have become more popular among mobile subscribers than ever before. Those changes have brought positives as well as negatives to the industry. Popularity of communication tools which run through the Internet is one of the key challenges that mobile telecommunication operates are facing in today's digital era. Due to the popularity of these Internet based applications, company profits which was made through voice calls and short messaging services (SMS) has significantly declined in the past few years. Further, with these advancements, mobile operators in the market of today have become a platform supplier for data channels rather telecommunication service provider.

On the other hand, internet based communication adoptions present a great opportunity for both service providers and users. In today's market, the extent of subscriber's usage is dependent on the technology advancement, which is supporting the broad use of mobile devices (NetLab, 2012). Mobile broadband is one of these opportunities which created a favorable environment for them. It opened a new market opportunities as well as helped to connect more and more people from other internet based networks. Also, according to the GSM Association (2016), it is predicted that the mobile based Internet market will make profits for service providers in coming years drastically as they are the ones who are able to offer this facilities to the subscribers. But, even in such markets, customer base will become the key to win the market. As a result, service providers' focus on retaining subscribers has got higher interest than ever. Therefore, service providing firms have identified the value of maintaining a higher level of switching barriers in such scenario since it is one kind of successful strategic aspects which is used by many continuous industries like mobile telecommunication. Strategies focused on switching barriers enable firms to retain their subscribers within the network since subscribers feel costly to move to another provider. Most of the time, such barriers are insisted with the benefits that service provider's offer to their network members.

But, while all firms focus on instituting switching barriers in the mobile industry, due to the same technological advancements which assisted to open this new market, subscribers have received higher number of

opportunities to get link with another service provider easily. In other words, these technological advancements are assisted to reduce the level of switching barriers in the market place. Mobile voice over internet protocol (mVoIP) application usage and multiple mobile vendors accessing facility are two of most popular technological advancements which show such market behaviors. Therefore, this paper targets to understand the implications of above selected technological developments for the changes of the level of switching barriers in today's mobile industry. Understanding the way subscribers see it in the mobile telecommunication industry would be an interesting investigation both from a theoretical and a managerial perspective.

Switching barrier in the mobile telecommunication industry

The switching barrier refers to the difficulty of switching to another provider that is encountered by a customer who is dissatisfied with the existing service, or to the financial, social and psychological burden felt by a customer when switching to a new carrier (Fornell, 1992). It implies that, the more a customer is forced to remain with their existing service provider, when the switching barrier is higher (Kim et al., 2004). As a result, mobile telecommunication vendors are keen to set switching barriers in the market that they operate. On the other hand, if the future profit market leads to Internet based mobile market, number of subscribers within their network will be a crucial factor to win the market. Since switching barriers are assisting vendors to hold their customers together, concept of switching barriers has become a comprehensively discussing topic among industry top level policy makers. Furthermore, the presence of higher level of switching barrier has brought many benefits to the highly penetrated mobile telecommunication industry where there is a very limited options to differentiate.

As a result, many vendors were used different strategies to increase firm level switching barriers which ultimately help to locked-in their subscribers within the network. Through customer locked-in effect, firms prevent customers switching from one provider to another (Chang & Chen, 2007). Similarly, with the advancement of technology, many service providers focused on technology and successfully used it to set up switching barriers. Most of the time these switching barriers were used to locked-in their subscribers within the network. These market locked-in environments brought many benefits to the service providers. Subscribers retention possibility within the network even there are attractive alternative service providers was become a key benefit for vendors. On the other hand, these locked-in platforms are also brought benefits to the subscribers over the time. Actually for such environment, both parties must be benefited from the subscriber - service provider relationship (Chang & Chen, 2007; Marzo-Navarro et al., 2004).

After get connect with particular network, subscribers are tend to initiate and continue interpersonal relationship with the service provider over the time. And being connected with them from a period of time, subscribers are probably able to enjoy superfluous benefits beyond the basic company offerings. In such scenario, relationship between these two parties is also benefited to create a switching barrier among the subscribers. As per Jones et al. (2000), loss of such personal relationship established with service providers is another form of switching barrier. The benefits which gain through such relationship make it more difficult or costly for customers to alter providers. According to Gwinner et al. (1998) these benefits are namely as confidence, social, and special treatment benefits. These benefits plays the role of switching barrier since subscribers consider these when they want to change their service provider.

Past studies on switching barriers have revealed several compositions of it. According to Jones et al. (2000), interpersonal relationships, perceived switching costs, and the attractiveness of competing alternative service providers are the main underline reasoning for the switching barriers. Also, Chang and Chen (2007), Balabanis et al. (2006), Aydin and Özer (2005), Patterson and Smith (2003), Ping (1999), Gwinner et al. (1998), Fornell (1992) and Johnson (1982), have studied on switching barriers and have come up with different set of affecting factors based on the environment they studied.

For this study, Kim et al. (2004) study in the mobile telecommunication industry was mainly referred which was based on the three factors identified by Jones et al. (2000). This examines the presence of personal bonds between a service provider and a customer. Furthermore, this model concerns on factors which cause to strengthen customer – service provider relationship, costs associate with switching supplier and

related implications due to attractiveness of the available alternative suppliers. According to the model, these three factors of switching barriers were named as switching cost, the attractiveness of alternatives, and interpersonal relationships. To measure these three different variables, further literature was refereed mainly focusing past studies conducted in the mobile telecommunication industry.

Simply, the switching means a moving from one brand and buying a competing brand. Hence the cost involve with this process should base from the process of customers' purchase decision making and their implementation of the decision. Follow through of this process have identified operational measures of switching costs. According to Jones et al. (2000), perceived switching costs are consumer perceptions of time, money, and effort associated with changing service providers. These values may differ from one customer to another as these costs are fully depending on their perceptions. Monetary cost involve with switching is the only measurable item in the switching cost. All the other operational measures are non-quantifiable financial values may result from searching and leaning of alternatives (Aydin & Özer, 2005; Klemperer, 1987). Customer locked-in markets which are common in the mobile industry are generally characterized with switching costs (Aydin & Özer, 2005).

Other component of the switching barrier, attractiveness of alternative service provider is closely related to service differentiation. Customers tend to remain with the existing service provider, if the service provider offers differentiated services that are difficult for a competitor to match or to provide with equivalents, or if few alternative competitors exist in the market (Bendapudi & Berry, 1997). The reputation, image and service quality of the replacing service provider are considered under this category with compared to the attached service provider (Kim et al., 2004). When subscribers see a higher level of attractiveness from other service providers, they may attempt to switch if they value it than their current relationship with the service provider (Ping, 1993). Also, it may dilute the relationship and they might frequently come up with service issues (Park et al., 2010). But, on the other hand, if subscribers see insufficient attractiveness compared to current service provider, it may also assist them to retain their customers further within the network (Nguyen et al., 2011).

On the other hand, repeated interactions may strength the relationship between two parties and can finally leads to a long-term relationship which brings many benefits to the both parties in long run. These, relationship-specific investment helps increase customers' dependence, and thus magnifies the switching barrier (Jones et al., 2000). This is known as interpersonal relationship which can be caused to have repeated interactions between a service provider and a customer. As per Storbacka et al. (1994) definition, these relationships act as type of restriction in which customers were subordinate to the service provider for political, economical, social, and cultural reasons. From the customers' perspective, they are also willing to establish, develop and continue relationships that provide value and convenience to them (Gwiner et al., 1998). Most importantly, if a customer is having a strong relationship with the service provider, customers might continue their relationship even though they are not fully satisfied with the service (Gronhaug & Gilly, 1991).

Technological advancements in mobile telecommunication: Mobile voice over Internet protocol (mVoIP) and multiple vendors accessing facility

Telecommunication industry is one of main industries which having rapid advancements day by day in both service provider's as well as consumer's aspect. These technological advancements in the Sri Lankan mobile telecommunication industry are comparable with that of any advanced country. These advancements in mobile technologies and related services have generated a wide area of business opportunities. As a result, the paradigm of the mobile telecommunication services has been shifting from voice-centered communication to a combination of high-speed data communication and multimedia (Kim et al., 2004). The main strength of mobile devices are mobile applications, which deliver various mobile services to their users, enhancing their flexibility, mobility and efficiency within business and everyday life domains (Ovcjak et al., 2015). New technological innovations such as smart phone and tablets are become key to rapid development of mobile data services in the mobile telecommunication industry (Boakye, 2015;

NetLab, 2012). As a result of these advancements, customer's enormous preference towards these devices is clear in today's market place. The change it brings has enabled to persuade businesses and governments to prepare for transition from electronic to mobile services (Shaikh & Karjaluo, 2015).

Worst scenario for the service providers is mVoIP applications which directly impact on their traditional calling profits. Because these applications are offering voice calling facilities with their calling parties in attractive way using mobile data. These applications are known as over-the-top (OTT) contents and Skype, Viber, WhatsApp, Wechat, QQ are some OTT contents popular around the world. According to the Mobitel (Private) Limited CEO, Sri Lanka, generating meaningful revenues from OTT services will remain a challenge as these data services offer little value to the service provider (SLT Annual Report, 2014). On the other hand, this technological development helped to consumers to easily switch for another service provider if their expecting service is data. Further, these services are independent from their mobile number or the mobile communication service provider which means registered user profiles in these applications are not affected by the service provider. Thus, the availability of such technology definitely change customer's preference towards mobile telecommunication supplier helped to consumers to easily switch for another service provider if their expecting service is data.

Further, according to the Sri Lanka Telecom annual report of 2014, they are commonly accepted that broadband demand will fuel future revenue growth, even though voice services continue to drive industry revenue. However as per their understanding, the speed and cost of technological change will be a challenge for any operator, particularly in the broadband space. According to above illustration, there might have some sort of impact towards lock-in models created by mobile service providers. In other words, these technological advancements may influence on switching barrier in mobile telecommunication industry.

Other technological advancement which may cause to switching barrier is facility of accessing more than one service providers simultaneously using a same mobile device. In one aspect, it can be identified as way of breaking consumer locked-in model in mobile telecommunication industry. In other words, this may also have impact on switching barrier as it helps to release customers bonds with one service provider. The main advantage of customers get in here, they can use another one or more mobile connections without changing usual contact number. These mobile phones are known as "Multiple mobile smart card enabled phones" or simply "multi-SIM mobiles". According to the Sri Lanka Telecom, 2014 annual report, approximately a fifth of mobile subscribers are multi-SIM users. Indicate that the technology has opened another new large market for mobile operators.

Methodology

The methodology followed in this paper is based on a survey to find out the consumer perceptions of switching barriers in the mobile telecommunication industry. Constructs of switching barriers were identified refereeing many past literatures in mobile telecommunication and they were measured using a Five-Point Likert-type scale which ranged "strongly agree" to "strongly disagree". Since the study carried out in Sri Lanka, the originally developed questionnaire was translated to the local language (Sinhala). Then it translated back to English again. This process continued several times to ensure conceptual equivalence (Mullen, 1995).

To measure overall impact of switching barrier, model developed by Jones et al. (2000) was refereed. According to that model, three attributes namely switching cost, interpersonal relationship and attractiveness of alternatives were considered in the survey. Switching cost was measured using seven-item scale which is developed by Aydin & Özer (2005) in their study in mobile telecommunication sector. Interpersonal relationship of the service provider was measured by the four-item scale developed by Kim et al. (2004). And for the attractiveness of alternative service provider, three-item scale developed by Kim et al. (2004) was adopted.

Independent sample t test was mainly used since this study focus on examine consumer perception of switching barriers with regards to identified grouping variables. Further, Levene's F test results, clinical

significance values, observed power and Cohen's d values were examined for the results validation purposes.

Initially, implication of mVoIP application usage and multiple connection usage on switching barrier was examined. When there are significant differences among groups, further analysis was carried out based on period that subscriber connected with particular service provider. The period that subscriber connected with particular service provider, which is known as relationship age is one of key considerations in customer locked-in scenarios in mobile telecommunication. For this purpose factorial ANOVA statistical test was used. Finally based on the findings, recommendation and conclusions were made.

Data Collection and Analysis

The data set used in this paper is taken from a survey carried out in February and March 2016 that involved random sampling of customers in Sri Lanka. The survey was restricted to subscribers of mobile telecommunication and each respondent were asked to fill out a written questionnaire. A total of 800 questionnaires were distributed over a six-week period and 734 completed survey forms were returned. That indicates 91.75% response rate for the survey. Among those, excluding those with omitted answer and same answers for the continuous questions, 691 valid survey responses were considered for the data analysis.

As an initial step, to get a view on sample profile, simple descriptive statistic techniques were applied. According to the descriptive results, sample consists 60% of female and 40% of male mobile subscribers. Among the sample 73% subscribers use pre-paid connections which is almost equal to the population pre-paid connection penetration. In this sample, 24% subscribers having less than two years of relationship with mobile service provider. On the other hand, 31.4% subscribers are having more than six years of experience with their mobile service provider. From the education perspective 51% of the participants are involved with higher studies after schooling. In the context of age category, 11.1% of the sample represents the over 40 years old subscribers. Also, the sample consists 14.7% of subscribers who are less than 21 years. From the subscriber's mVoIP application usage perspective, 51% respondents have experience with such internet based mobile voice applications. Also, the sample consists 49% of multiple mobile connection users.

Pearson r correlation analysis was followed to identify possible correlation among three components of switching barriers. The analysis revealed moderate positive correlation among all three components of switching barriers. Switching cost and interpersonal relationship, $r = 0.559$, switching cost and alternative attractiveness, $r = 0.556$ and alternative attractiveness and interpersonal relationships, $r = 0.509$ are correlation values in output.

Testing of Hypothesis

As an initial step, implications of subscribers' usage of mVoIP applications and multiple service provider accessing facilities were examined on switching barriers. For this purpose, null hypothesis and alternative hypothesis were designed and tested.

H1: Users and non-users of mVoIP applications have equal perceptions of switching barriers in the mobile telecommunication

Above hypothesis was developed to test the mobile subscriber's perception of switching barriers with regards to their usage of mVoIP application. The mVoIP non-user group ($N=339$) was associated with a perception of overall switching barrier $M=3.46$ ($SD=1.80$). By comparison, the mVoIP user group ($N=351$) was associated with a numerically smaller perception of overall switching barrier $M=3.19$ ($SD=1.72$). To test the above hypothesis, independent sample t-test was performed. According to the results, mVoIP users and non-users distributions were sufficiently normal for the purpose of conducting t-test (i.e., skew $| < 2.0 |$ and kurtosis $| < 9.0 |$; Schmider et al., 2010). Additionally, the assumption of homogeneity of variances was tested and satisfied via Levene's F test, $F(688) = 1.51$, $p = 0.219$. This indicates that the variances of two populations are assumed to be approximately equal. Thus the standard t test results were used. The independent sample t-test was associated with a statistically significant effect, $t(688) = -1.98$, $p = 0.048$.

Thus, the non-users of mVoIP applications were associated with a statistically significant larger mean perception of overall switching barrier than mVoIP users. Cohen's d was estimated at -0.151, which is a smaller effect based on Cohen's (1992) guidelines.

H2: Multiple connection users and non-users have equal perceptions of switching barriers in the mobile telecommunication

Multiple connection usage also got its popularity in last few years among mobile subscribers. Therefore above hypothesis was developed to understand the implications of multiple connection usage on market switching barriers status. The multiple connection non-user group (N=352) was associated with a perception of overall switching barrier $M=3.61$ ($SD=1.75$). By comparison, the multiple connection user group (N=338) was associated with a numerically smaller perception of overall switching barrier $M=3.19$ ($SD=3.03$). To test the above hypothesis, independent sample t-test was performed. According to the results, multiple connection users and non-users distributions were sufficiently normal for the purpose of conducting t-test (i.e., skew < 2.0 and kurtosis < 9.0 ; Schmider et al., 2010). Additionally, the assumption of homogeneity of variances was tested and satisfied via Levene's F test, $F(688) = 0.463$, $p = 0.496$. This indicates that the variances of two populations are assumed to be approximately equal. Thus the standard t test results were used. The independent sample t-test was associated with a statistically significant effect, $t(688) = -4.36$, $p = 0.000$. Thus, the multiple connection non-users were associated with a significant larger mean perception of overall switching barriers than users. Cohen's d was estimated at -0.332, which is a medium effect based on Cohen's (1992) guidelines.

Here onwards subscriber's relationship age was taken into consideration for the analysis. Therefore, Factorial ANOVA analysis technique was applied to identify behavioral changes of subscribers in mobile telecommunication. Identification of changes in switching barriers due to these two technological advancements would be an interesting investigation. For this purpose, null hypothesis and alternative hypothesis were designed and tested as given below.

H3a: There will be no significant interaction among some unique combinations of mVoIP applications usage status and mobile service usage period on their perceptions of switching barriers in the mobile telecommunication

Above hypothesis was designed to identify changes of subscriber's perception of switching barrier with regards to their mVoIP application usage and the relationship age. The result yielded a statistically significant effect, $F(1,686) = 10.10$, $p = 0.002$, $\eta^2 = 0.015$. Thus, the null hypothesis of no differences on between means was rejected as the significant level is less than 0.05 ($p = 0.002$). It indicates that customer's perception of switching barrier is significantly different based on the combination of their mVoIP application usage and mobile service usage period. In other words, mobile users in Sri Lanka rate their perceptions of switching barrier depending on those two categories. On the other hand, the assumption of homogeneity of variance was tested and satisfied based on Levene's F test, $F(3,686) = 0.15$, $p = 0.929$. This indicates switching barrier is having equal variance across the selected combinations of groups. Further, analysis results indicate weaker clinical significance ($\eta^2 = 0.015$) and observed power 0.888 indicates strong level of accuracy and adequate power in the analysis. A descriptive result of above analysis has given below in Table 1.

Table 1: Descriptive Statistics of mVoIP applications usage status and mobile service usage period on customers' perception of switching barrier

MVoIP Usage	Mobile Usage	Mean	Std. Deviation	N
mVoIP User	Low	2.8901	1.68350	166
	High	3.4712	1.70819	185
mVoIP Nonuser	Low	2.7166	1.67254	158
	High	4.1128	1.65645	181

H3b: There will be no significant interaction among some unique combinations of multiple mobile connection usage status and mobile service usage period on their perceptions of switching barriers in the mobile telecommunication

Similar to previous hypothesis, this was designed to identify perceptual changes of switching barrier with regards to subscriber's multiple connection usage acceptance and relationship age. The result yielded a statistically significant effect, $F(1,686) = 14.50$, $p = 0.000$, $\eta^2 = 0.021$. Thus, the null hypothesis of no differences on between means was rejected as the significant level is less than 0.05 ($p = 0.000$). It indicates that customer's perception of switching barrier is significantly different based on the combination of multiple mobile connection usage and mobile service usage period. In other words, mobile users in Sri Lanka rate their perceptions of switching barrier depending on those two categories. On the other hand, the assumption of homogeneity of variance was tested and satisfied based on Levene's F test, $F(3,686) = 0.53$, $p = 0.662$. This indicates switching barrier is having equal variance across the selected combinations of groups. Further, analysis results indicate weaker clinical significance ($\eta^2 = 0.021$) and observed power 0.967 indicates strong level of accuracy and adequate power in the analysis. A descriptive result of above analysis has given below in Table 2.

Table 2: Descriptive Statistics of multiple connection usage status and mobile service usage period on customers' perceptions of switching barrier

Multiple SIM Usage	Mobile Usage	Mean	Std. Deviation	N
User	Low	2.8084	1.74937	172
	High	3.2629	1.68744	166
Non-user	Low	2.8021	1.59875	152
	High	4.2248	1.60823	200

Results and Discussion

Initial analysis were carried out to determine whether there is a difference in the mean customer perceptions' of switching barrier relates to user groups based on their usage of mVoIP applications and multiple connections. The analysis results were mainly used to test the designed hypotheses.

According to the test results of mVoIP application usage, a statistically significant difference between means was identified among users and non-users on their perceptions of switching barriers. Thus, the null hypothesis was rejected. Further it shows that non-users are having higher level of switching barriers than mVoIP application users. It indicates that the implication of mVoIP applications usage to weaken the level of switching barriers which mobile telecommunication firms had before these technological advancements.

From the multiple connection usage perspective, a statistically significant difference between means was also identified among multiple mobile connections users and non-users. Thus, the null hypothesis was rejected. The analysis results indicate that non-users are having higher level of switching barrier perception than the customers who have already connected with several service providers. It implies that the multiple connection accessibility through one mobile device has weakened switching barrier status in the market place.

According to the further study based on relationship age indicates that customer's perception of switching barriers is significantly different based on the combination of their mVoIP application usage and mobile service usage period. Interestingly, non-users of mVoIP applications who are using particular mobile connection for longer period of time have shown the highest switching barriers. Even the older subscribers who are using mVoIP applications have shown higher level of switching barriers with compared to recently joined subscribers. Most importantly, notable drop due to mVoIP technological adoption among subscribers with higher relationship age has provided evidences for the impact of technology usage on industry level switching barrier.

From multiple connection users' points of view, perceptions of switching barriers are also significantly different based on the combination of multiple connection usage and relationship age. Subscribers who are

having higher relationship age have shown clear perceptual differences towards switching barriers. It has provided clear evidences for the weakening situation of switching barriers due to having access to multiple mobile services. Furthermore, results show a relatively same level of switching barriers among recently joined subscribers regardless whether their usage of multiple connections. However, higher level of switching barriers has shown by subscribers with the higher relationship age.

Conclusion

The primary purpose of this study was to investigate the implication of two technological advancements in the Sri Lankan mobile telecommunication services. Due to rapid changes in the mobile telecommunication industry, it is not possible to make profits in the way they used to do it in the past. It is clear that the future mobile markets are to make profits via mobile based internet and to enjoy benefits in such market, service providers need to have healthy customer base. So that, it required for service providers to retain their currently attached customers with in the firm. In past, mobile service provider used different locked-in strategies based on switching barriers to retain their customers with them. But, the importance and validity of these strategies were challenged with the adoptions of new technologies which are independent from the service provider. Most commonly seen such approaches are mVoIP applications and multiple connections accessing facility.

According to the analysis, it is revealed that these two technological advancements are weakened the level of switching barriers in the industry. Weaken the switching barriers allows subscribers to switch their service provider easily. Further, analysis indicate that subscribers with higher relationship age are having the highest switching barrier level even though they are users of mVoIP applications or multiple connections. In other words, it implies the presence of locked-in scenarios even these technological advancements fragile the bond between customer and vendor. But, technological users having lower perceptions towards switching barrier level in the industry compared to the non-users. That indicates major sinking of switching barrier environment due to having access to these new technologies.

As an conclusion, the analysis indicates that longer the period they attached with particular service provider increases user attachments which caused to higher level of switching barrier with regards to switching cost, alternative's attractiveness and interpersonal relationship with the service provider. But new technological adoptions key to significant decline the switching barrier level in the market place. This implies that longer the period customers attached with particular service provider get locked-in with that firm. On the other hand it implies non-usability of past strategies to keep them all within the industry. Thus, it is obvious that, to grab future market opportunities, retention of their subscribers within the network for longer period of time will be a key. Therefore, while utilizing past locked-in strategies, policy makers have to come up with new set of strategies targeting subscribers who adopting latest technologies.

Acknowledgement

The authors of this study are grateful to the National Natural Science Foundation of China for sponsoring to carry out this research study under the grant 71272125 and 71672068.

References

- Aydin, S., & Ozer, G. (2005). The analysis of antecedents of customer loyalty in the Turkish mobile telecommunication market, *European Journal of Marketing*, 39(7/8), 910 – 925. doi: 10.1108/03090560510601833
- Balabanis, G., Reynolds, N., & Simintiras, A. (2006). Bases of e-store loyalty: perceived switching barriers and satisfaction. *Journal of Business Research*, 59, 214–224. doi: 10.1016/j.jbusres.2005.06.001
- Bendapudi, N., & Berry, L. L. (1997). Customers' motivations for maintaining relationships with service providers, *Journal of Retailing*, 73 (1), 15–37. doi: 10.1016/S0022-4359(97)90013-0
- Boakye, K. G. (2015). Factors influencing mobile data service (MDS) continuance intention: An empirical study, *Computers in Human Behavior*, 50, 125–131. doi: 10.1016/j.chb.2015.04.008

- Chang, Y. H., & Chen, F.Y. (2007). Relational benefits, switching barriers and loyalty: A study of airline customers in Taiwan, *Journal of Air Transport Management*, 13, 104-109. doi: 10.1016/j.jairtraman.2006.10.001
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155-159. doi: 10.1037/0033-2909.112.1.-155
- Fornell, C. (1992). A national customer satisfaction barometer: The Swedish experience. *Journal of Marketing*, 56, 6–21. doi: 10.2307/1252129
- Gronhaug, K., & Gilly, M. (1991). A Transaction Cost Approach to Consumer Dissatisfaction and Complaint Actions, *Journal of Economic Psychology*, 12(1), 165-183. doi: 10.1016/0167-4870(91)90048-X
- GSM Association (2016). The Mobile Economy 2016, retrieved online from <http://www.gsmamobileeconomy.com/>
- Gwinner, K.P., Gremler, D.D., & Bitner, M.J. (1998). Relational benefits in services industries: the customer's perspective. *Journal of the Academy of Marketing Science*, 26(2), 101–114. doi: 10.1177/0092070398262002
- Jones, M.A., Mothersbaugh, D.L., & Beatty, S.E. (2000). Switching barriers and repurchase intentions in services. *Journal of Retailing*, 76(2), 259–274. doi: 10.1016/S0022-4359(00)00024-5
- Johnson, M. P. (1982). Social and Cognitive Features of the Dissolution of Commitment to Relationships. In S. Duck (Ed.), *Personal Relationships: Dissolving Personal Relationships* (51-74). London: Academic Press.
- Klemperer, P. D. (1987). Markets with Consumer Switching Costs. *Quarterly Journal of Economics*, 102(2), 375-394. doi: 10.2307/1885068
- Kim, M., Park, M., & Jeong, D. (2004). The effects of customer satisfaction and switching barrier on customer loyalty in Korean mobile telecommunication services, *Telecommunications Policy*, 28, 145–159. doi: 10.1016/j.telpol.2003.12.003
- Marzo-Navarro, M., Pedraja-Iglesias, M., & Rivera-Torres, M.P. (2004). The benefits of relationship marketing for the consumer and for the fashion retailers. *Journal of Fashion Marketing and Management*, 8, 425–436. doi: 10.1108/13612020410560018
- Mullen, M.R. (1995). Diagnosing measurement equivalence in cross-national research, *Journal of International Business Studies*, 26(3), 573–596. doi: 10.1057/palgrave.jibs.8490187
- NetLab (2012). Understanding, managing and trouble-shooting the evolving cellular data networks. retrieved online from <http://networking.cs.umn.edu/site/understanding-cellular-data-networks>.
- Nguyen, N.T., Trawiński, B., & Jung, J.J. (2011). New Challenges for Intelligent Information and Database Systems, *Studies in Computational Intelligence* 351, Springer-Verlag Berlin Heidelberg, 349–362.
- Ovcjak, B., Hericko, M., & Polancic, G. (2015). Factors impacting the acceptance of mobile data services – A systematic literature review, *Computers in Human Behavior*, 53, 24–47. doi: 10.1016/j.chb.2015.06.013
- Park, J., Kim, J., & Koh, J. (2010). Determinants of Continuous Usage Intention in Web Analytics Services, *Electronic Commerce Research and Applications*, 9(1), 61–72. doi: 10.1016/j.eierap.2009.08.007
- Patterson, P. G., & Smith, T. (2003). Switching Barriers and Behavioral Intentions towards Service Provider: A Cross Cultural Study. *Journal of Retailing*, 79(2), 107-120. doi: 10.1016/S0022-4359(03)00009-5
- Ping, R. (1993). The Effects of Satisfaction and Structural Constraints of Retailer Exiting, Voice, Loyalty, Opportunism, and Neglect. *Journal of Retailing*, 69(3), 320–352. doi: 10.1016/0022-4359(93)90010-G

- Ping, R. (1999). Unexplored antecedents of Exiting in a Marketing Channel, *Journal of Retailing*, 75(2), 218-241. doi: 10.1016/S0022-4359(99)00005-6
- Schmider, E., Ziegler, M., Danay, E., Beyer, L., & Buhner, M. (2010). Is it really robust? Reinvestigating the robustness of ANOVA against violations of the normal distribution assumption. *Methodology: European Journal of Research Methods for the Behavioral and Social Sciences*, 6, 147-151. doi: 10.1027/1614-2241/a000016
- Shaikh, A., & Karjaluoto, H. (2015). Mobile banking adoption: A literature review. *Telematics and Informatics*, 32 (1). doi:10.1016/j.tele.2014.05.003
- SLT (Sri Lanka Telecom): Annual Report (2014). retrieved online from <http://www.slt.lk/en/about-us/investors/financial-reports/annual>
- Storbacka, K. Strandvik, T. & Grönroos, C. (1994). Managing Customer Relationships for Profit: The Dynamics of Relationship Quality, *International Journal of Service Industry Management*, 5(5), 21-38. doi: 10.1108/09564239410074358