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Do LTE Service Customers Have Different Customer Loyalty Determinants?

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Abstract

This study explores the determinants of customer loyalty in the Korean mobile telecommunications market with the emphasis on customer satisfaction and switching costs as major predictors of customer loyalty. South Korea has now become one of the world's most leading mobile service markets with the launch of its advanced LTE services; the LTE service subscription rate in Korea has exceeded 50% as of November 2013. This raises a question as to whether LTE service subscribers are different from 3G service subscribers. In this rapidly changing environment of mobile service markets, this study examines the validity of the traditional determinants of customer satisfaction in data-service oriented mobile markets, analyzes the effect of customer satisfaction and switching costs on customer loyalty, and assesses the difference between 3G and LTE subscribers with respect to their determinants of customer loyalty. The results showed that there are significant differences between 3G and LTE subscribers while traditional factors such as call quality, data quality, customer support, and price perception are still significant determinants of customer satisfaction.

Keywords: LTE; 3G; Customer Satisfaction; Switching Cost; Loyalty; Smartphone

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1. Introduction

The Korean mobile telecommunication market has shown the fastest growth rate in the world for the past few years and has entered a saturated stage with penetration rate reaching over 100 percent as of 2010.¹ Market saturation in the Korean mobile telecommunications market has intensified competitions between Korean mobile network operators (MNOs) and induced them to switch their marketing strategies from attracting new customers to retaining existing customers and stealing customers from the competitors.

Moreover, as the market has reached its saturation point, attracting and securing new customers is not only becoming difficult but also becoming costly in terms of marketing. Hence, it has become an industry-wide belief that one of the most efficient marketing strategies is to retain the existing customers by strengthening customer loyalty (Kim, Park, & Jeong, 2004). It is a widely held in marketing research that the cost of acquiring a new customer far exceeds the cost of retaining an existing one (Siber, 1997), and the cost of making sale to a new customers is five times higher than the cost of making sale to an existing customers (Verbeke, 2012). In addition, the mobile number portability (MNP) policy in the Korean mobile telecommunication market further intensified the competition by lowering switching costs for customers (Shin & Kim, 2007).² As the switching costs are reduced, the less loyal consumers become more likely to switch their MNOs, thereby making customer retention one of the major challenges. Previous researches on customer retention suggest customer loyalty as its key antecedent (Gerpott, Rams, & Schindler, 2001), stressing the importance of securing customer loyalty in retaining existing customers. Studies also suggest that developing customer loyalty provides companies with foundation of competitive edge and helps them winning market shares in highly competitive markets (Deng, Lu, Wei, & Zhang, 2010; Lee & Cunningham, 2001; Reichheld, 1996). Furthermore, loyal customers are much more influenced than non-loyal customers by negative information about the product/service (Donio, Massari, & Passiante, 2006). Following the results of the studies, MNOs nowadays put strong effort in developing customer loyalty in order to survive under the pressure of ever increasing competitions.

Customer satisfaction has long been known to be the major factor that influences customer loyalty. There have been numerous studies on customer satisfaction, customer

¹ 2010 KCC Communications Service Statistics Report.

² The MNP, implemented in Korea in January 1st, 2004, refers to a service that allows customers to move to other MNOs while keeping their mobile phone numbers (Kwon & Kwon, 2014).

loyalty and their relationship. However, not many studies have been conducted with respect to the mobile telecommunication market especially in recent years during which rapid adoption of smartphones took place. This may be due to the relatively short history of smartphone usage; it was only in the late 2000s when the global smartphone penetration exploded. The global smartphone penetration rate began to increase rapidly since 2009 from 5% to 22% in 2013. In addition, the increase in the smartphone usage has resulted in sharp increase in the data service traffic; the mobile data traffic increased more than 15 times from 2009 to 2013 (Kwon & Kim, 2012). Such increase in data traffic implies that the mobile service trend is now rapidly shifting from call-based services to data-based services. For instance, mobile companies around the world are now offering rate plans that provide unlimited call hours but that charges fee based on the level of data usage. Such changes in the market paradigm give rise to questions as to whether the traditional customer loyalty determinants are still valid and whether the data service has any significant effect.

This paper analyzes the effects of customer satisfaction and switching costs on customer loyalty in the Korean mobile telecommunications market, the world's most advanced LTE market, with the emphasis on 3G, and LTE (Long Term Evolution) subscribers. Specifically, this study has three major objectives: first, to examine the effects of the major and traditional constructs on customer satisfaction in the Korean mobile telecommunications market and to examine their validity in the current age of data communication; second, to analyze the effect of customer satisfaction and switching costs on customer loyalty; and third, to determine whether there exist differences between factors affecting customer loyalty of 3G, and LTE users.

The remaining structure of this paper is as follows. Section 2 overviews the recent developments in the Korean mobile telecommunications market in order to help understand the unique characteristics of Korean mobile telecommunications market. Section 3 develops research hypotheses based on previous research and introduces the model used in this paper. Section 4 introduces data and method of analyses. Section 5 reports analytical results. Section 6 concludes the paper with conclusions on the major findings and their implications.

2. Recent developments in the Korean mobile telecommunications market

2.1. Evolution of market structure

The mobile services in Korean are currently served by three major MNOs (Mobile Network Operator), namely SKT (SK Telecom), KT (Korea Telecom), and LG Uplus with

their market share being 50.42%, 29.86%, and 19.72% respectively as of March 2014. South Korea launched its first mobile telecommunication services in 1984 through a government-owned company named KMT (Korea Mobile Telecom). Later, in 1994, SK Group acquired KMT and changed their name into SK Telecom. With only one MNO serving the market, the Korean mobile telecommunications market operated under a monopolistic structure. The monopolistic structure continued for more than 10 years from 1984 until 1996 when new players joined the market. The entrance of Shinsegi Telecom in April 1996 put an end to the long-lasting monopoly structure in the Korean mobile telecommunications market.

Following the entry of Shinsegi Telecom, other competitors, namely, KT, Hansol, and LG Telecom, joined the market, making the market increasingly competitive. The fierce competitions among MNOs brought down subscription prices, brought about significant increase in the number of mobile service subscribers, and ultimately led to dramatic growth in the market. However, the competition and the presence of latecomer disadvantages led to market restructurings which reduced the number of market players from five to three; Hansol merged with KT in 2000, and SKT acquired Shinsegi in 2002.³ Among the remaining three MNOs in the market, SKT has been the dominant player with a market share slightly above 50%. As shown in Table 1, the market shares of the three MNOs remained relatively steady over the past years. The Korean mobile telecommunications industry has shown the fastest growth rate in the world in the past and has entered a maturity stage with the penetration rate exceeding 100% as of 2010.

Table 1 Changes in market shares in the Korean mobile telecommunications market

Year	2007	2008	2009	2010	2011	2012	2013	Mar. 2014
SKT (%)	50.5	50.5	50.6	50.6	50.6	50.3	50.0	50.4
KT (%)	31.6	31.5	31.1	31.6	31.5	30.8	30.1	29.9
LG U+ (%)	17.9	18	18.3	17.8	17.9	18.9	19.9	19.7
Total Subs.	43196	45607	47846	50621	52507	53624	54681	55162

Source: Reconstructed information from the Ministry of Science, ICT, and Future Planning, Korea (<http://www.msip.go.kr>)

* Total subscribers (total subs.) are denoted in thousands.

2.2. Market developments

Mobile telecommunications services in South Korea have been evolving from CDMA (Code Division Multiple Access), commonly known as 2G services, to WCDMA (Wideband Code Division Multiple Access), commonly known as 3G services, and to LTE (Long Term

³ At the end of 2009, LG Telecom, LG Dacom, and LG Powercom merged into LGU+.

Evolution) services. Unlike 2G service which only offers voice oriented services, 3G and LTE services offer both voice and data oriented services. The 3G service was first launched in Korea during the early 2007. In 2009, within less than two years of its launch, the 3G service overtook 2G service in terms of the number of subscribers. In 2009, as shown in Fig. 1, 3G services became the most dominant service in the Korean mobile telecommunications market; however, it was only until 2013 when 3G services were overtaken by LTE services. In 2011, SKT and LG U+ first launched LTE services in Korea, and KT followed them shortly after in 2012.

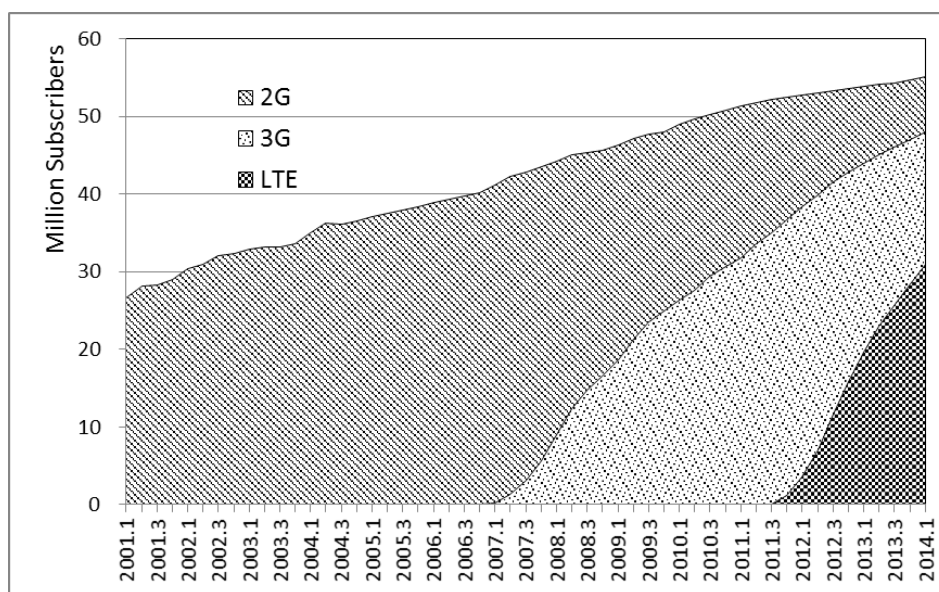


Fig. 1 Evolution of mobile services in South Korea

Korea has reached smartphone penetration rate of 78% as of March 2014 among which 56% are LTE service subscribers.⁴ Such rapid growth of the smartphone users along with the launch of LTE services has rapidly transformed the Korean mobile telecommunications industry from call service-oriented to data service-oriented service market. Since the commercialization of LTE services in 2011, there has been a significant rise in the number of LTE service subscribers in the market. As shown in Figure 1, the number of LTE service subscribers increased from 1.1 million in 2011 to 30.9 million in March 2014, indicating that more than 50% of Korean mobile subscribers have switched their services to LTE within the past three years. The growth rate of LTE service in South Korea is significant in that, although South Korea launched the LTE service after United States (Verizon) and Japan

⁴ Mobile service report by the Ministry of Science, ICT, and Future Planning (March, 2014).

(NTT Docomo) did, the conversion and adaptation of the services were considerably faster than those of the two countries.

3. Conceptual framework and research hypothesis

3.1. Customer loyalty

Customer loyalty, according to Oliver (1999), is defined as “a deeply held commitment to repurchase or re-patronize a preferred product/service consistently in the future, thereby causing repetitive same-brand or same brand-set purchasing, despite situational influences and marketing efforts having the potential to cause switching behavior.” Customer loyalty has been operationally defined from three general perspectives: the attitudinal perspective, the behavioral perspective, and the perspective that takes account of both attitude and behavior. According to the attitudinal perspective, loyalty is the state of mind that reflects the preference or commitment and is often measured by service recommendations to others (Reichheld, 2003; Kim et al., 2004; Collier & Bienstock, 2006), resistance to switching to superior products (Narayandas, 1996), and willingness to pay premium (Narayandas, 1996). From the behavioral perspective, on the other hand, loyalty is the behavioral reaction and is often measured by probability of repurchase and repeated consumption behavior (Anderson & Sullivan, 1993; Kim et al., 2004; Liu, Guo, & Lee, 2011). The other but more prevalent perspective, the integrated perspective, encompasses both attitudinal and behavioral perspective of loyalty. According to the integrated perspective, customer loyalty is realized in time through repeated consumption of good/service accompanied by favorable attitude toward the good/service or toward the provider (Wong & Zhou, 2006).

For the purpose of this study, the concept of integrated perspective of loyalty is adopted; customer loyalty is perceived as a combination of customers’ favorable attitude and their repurchase behavior. Therefore, customer loyalty is measured as customers’ behavioral intention to repurchase the good/service from their current providers, as well as their tendency to make recommendation of the providers to others.

3.2. Customer satisfaction

The concept of customer satisfaction has long been perceived as one of the most important theoretical as well as practical issues for the marketing researchers (Jamal, 2004). Though there is an inconsistency with respect to the definition of customer satisfaction

among the researchers, the most widely held definition is based on the fulfillment of customers' expectation; customer satisfaction is how a standard of the product/service offered fulfills customer expectation (Oliver, 1997; Vavra, 1997). Customer satisfaction is generally defined as customer reaction to the state of fulfillment and customer judgment of the fulfilled state (Oliver, 1997). Homburg & Bruhn (1998) define customer satisfaction as an experience-based assessment made by the customer on the degree to which his or her own expectations about the characteristics or the overall quality of the services provided from the provider have been fulfilled. Earlier research suggests that increasing customer satisfaction lowers price sensitivity of customers, promotes marketing efficiency, strengthens brand reputation, enhances customer loyalty and ultimately helps customer retention (Fornel, 1992).

The linkage between customer satisfaction and customer loyalty is one of the most central relationships in the field of marketing. The association between customer satisfaction and loyalty has long been studied and has been proven that they are strongly correlated; customer satisfaction is perceived as a major antecedent of customer loyalty. According to Dick and Basu (1994), customers experiencing a high level of satisfaction are more likely to remain with their current providers and maintain their contracts. Homburg & Bruhn (1998) also suggest distinguishing between the constructs of customer satisfaction and customer loyalty and suggest that the two constructs are linked by a causal chain; they suggest that customer satisfaction is a direct determining factor of customer loyalty. Based on the theoretical arguments, many empirical studies confirmed that the overall customer satisfaction has a significant influence on customer loyalty across variety of industry (e.g., Athanassopoulos, 2000; Gerpott et al., 2001; Kim et al., 2004; Aydin & Ozer, 2005; Deng et al., 2010; Song & Yang, 2013). Therefore, this paper makes the following hypothesis.

H₁: Higher levels of customer satisfaction lead to higher levels of customer loyalty.

3.3. Switching costs

Switching costs refer to the perceived magnitude of additional costs and efforts required for consumers to change suppliers (Ping, 1993). According to Jones (2000), switching costs are factors that make it more difficult or costly for consumers to change their service providers. Fornell (1992) stated that switching costs play a crucial role in determining the repurchase intention of consumers because consumers may still remain with the provider even when they are not satisfied due to the existence of potential financial or psychological burden when switching.

The effect of switching costs on customer loyalty has been widely studied in previous

research, and the findings confirm that the switching cost is an important predictor of customer loyalty (Colgate & Lang, 2001; Albert, 2002; Kim et al., 2004; Deng et al., 2010; Liu et al., 2011). According to Fornell (1992), switching costs, posing direct effects on customer loyalty, offer benefits for service providers such as lowering consumers' price elasticity of demand and sensitivity to satisfaction.

Switching costs include not only monetary costs but also perceived psychological costs and time effort required for switching service providers (Kim, Kliger, & Vale, 2003). Kim et al. (2014) have categorized switching costs into three subgroups: loss cost, adaptation cost, and move-in cost. Loss cost refers to loss of benefits when terminating the contract with the current service provider; adaptation cost the time and effort required for adaptation such as search cost and learning cost; move-in cost the economic cost incurred when switching to a new service provider. Kim et al. (2014) empirically confirmed that loss cost and move-in cost have a positive effect on customer loyalty in the Korean mobile telecommunications market. Therefore, based on the previous research, this paper sets up the following hypotheses.

H₂: Higher levels of move-in cost lead to higher levels of customer loyalty.

H₃: Higher levels of loss cost lead to higher levels of customer loyalty.

3.4. Perceived service quality

The concept of perceived service quality, according to Parasuraman, Zeithaml, and Berry (1988), refers to the extent to which customers are satisfied and dissatisfied based on their experience of purchasing and using the service. Service quality is also defined as the difference between customers' expectation and perception of service quality (Zeithaml, Berry, & Parasuraman, 1996). Shin & Kim (2008) suggested that the service quality is a customers' overall impression of the efficiency of the service provider and argued that the service quality has significant effect on customer satisfaction.

Researchers have argued that service quality is a predictor of customer satisfaction and a number of empirical studies have confirmed that there is a strong causal relationship between service quality and customer satisfaction across a wide range of industry (Brady & Robertson, 2001; Kassim & Abdullah, 2008; Yang, Wu, & Wang, 2009; Kassim & Abdullah, 2010; Ganguli & Roy, 2011; Siddiqi, 2011). In earlier studies pertaining to the mobile telecommunications market, perceived service quality has been most commonly measured via call quality, price perception, customer support (Keaveney, 1995; Lee, Lee, & Freick, 2001; Gerpott et al., 2001; Kim et al., 2004; Kuo, Wu, & Deng, 2009; Liu et al., 2011; Liang, Ma, & Qi, 2012; Song & Yang, 2013). This study adopts the perspective that perceived service

quality is a strong antecedent of customer loyalty. Therefore, based on the previous studies, the following hypotheses are formulated.

H₄: Higher levels of perceived call quality lead to higher levels of customer satisfaction.

H₅: Higher levels of price perception lead to higher levels of customer satisfaction.

H₆: Higher levels of perceived customer support lead to higher levels of customer satisfaction.

Apart from the traditional factors studied in previous studies, this study considers data service as one of the core service functions of the mobile telecommunication services because after smartphones were introduced, data service became the key service in the mobile telecommunications industry. Thus, this paper creates a latent variable, the data quality, to test the effects of perceived data service quality on customer satisfaction. Song and Yang (2013) is a paper that included data service quality in the model as a latent variable. In this context, the following hypothesis is formulated.

H₇: Higher levels of perceived data quality lead to higher levels of customer satisfaction.

The proposed model and hypotheses are shown in Fig. 2.

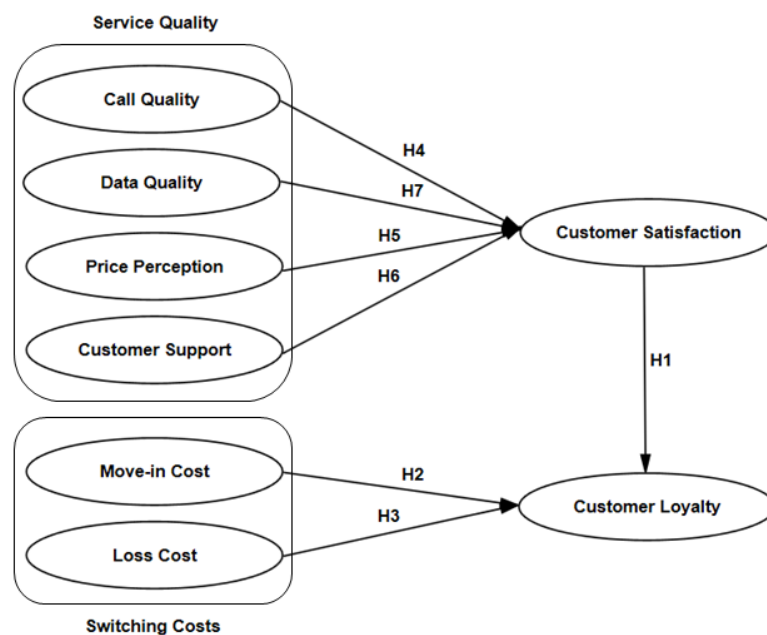


Fig. 2 The model of analyses

4. Data and research methodology

4.1. Operational definitions and measurements of variables

Table 2 summarizes the operational definitions and measurements of variables used in the study.

Table 2 Operational definitions and measurement of variables

Variable	Operational definition	Measurement Items
Call quality	Perceived quality of call(voice) services according to customers	<ul style="list-style-type: none"> - Call stability - Call clarity - Call coverage
Data quality	Perceived quality of data services according to customers	<ul style="list-style-type: none"> - Data transmission stability - Data transmission speed - Data coverage
Customer support	Perceived quality of customer support system	<ul style="list-style-type: none"> - Availability and variety of customer care services - Speed of complaint processing - Convenience in reporting complaint - Friendliness of customer service staffs
Price perception	Perceived perception of customer on prices	<ul style="list-style-type: none"> - Reasonability of price - Variety of rate schedules
Move-in cost	Perceived costs involved in switching to a new service provider	<ul style="list-style-type: none"> - Cost of new device - Registration cost - Cost of termination/penalty
Loss cost	Perceived loss of benefits when terminating contract with the current service provider	<ul style="list-style-type: none"> - Loss of mileage - Loss of membership benefits
Customer satisfaction	Customers' judgments of satisfaction level with the service provider	<ul style="list-style-type: none"> - Overall satisfaction with the service provider - Overall satisfaction with the service provided
Customer loyalty	Customer's favorable attitude toward the service providers and intention to re-purchase the service	<ul style="list-style-type: none"> - Customer's intention to continue using services from current provider - Customer's intention to recommend the service provider to others

4.2. Data collection and methods of analyses

Data were collected through survey, targeting customers of the Korean mobile communications market. Pilot surveys were conducted prior to the implementation of the actual survey in order to make sure that questions are easily understood by survey participants and to make necessary revision. Moreover, the survey was sent to an expert to further improve the clarity of the questionnaires. After the final revision, the survey was sent to be carried out by Micromil Embrain Co., Ltd., one of the largest market-research companies in South Korea. Total of 1124 survey samples were collected. SPSS 18 was used to analyze basic statistical analyses, factor analyses, and reliability tests and AMOS 20 was used for structural equation model (SEM) analyses.

4.3. Sample characteristics

In this study, stratified sampling was used in order to capture some of the key population characteristics; samples were obtained layered approximately proportional to the subscription

ratios in Korean mobile telecommunication market. The demographic characteristics of the survey show that the gender composition of male (49.4%) and female (50.6%) is roughly equal. Regarding the age groups, though the distribution of participation rates were relatively even between each age group, participants aged in their 10s (6.2%) show lowest participation while participants aged in their 30s (23.8%) and 20s (21.6%) showed highest participation.

Table 3 Sample characteristics

Demographic variables	Categories	Sample	Percentage (%)
Gender	Male	555	49.4
	Female	569	50.6
Age	<19	70	6.2
	20-29	243	21.6
	30-39	268	23.8
	40-49	183	16.3
	50-59	195	17.3
	≥60	165	14.7
	Young group (<40)	581	51.7
	Old group (≥40)	543	48.3
Carrier	KT	348	31.0
	SKT	596	53.0
	LGU+	180	16.0
Service type	3G	408	36.3
	LTE	716	63.7
Monthly data usage	<1 Gigabyte	312	27.8
	1-2 Gigabyte	275	24.5
	2-3 Gigabyte	172	15.3
	3-4 Gigabyte	157	14.0
	≥4 Gigabyte	208	18.5
	Below-average data users (<2 Gigabyte)	587	52.2
Above-average data users (≥2 Gigabyte)	537	47.8	

The sample characteristics pertaining to the usage of mobile telecommunication services show that SKT, KT, LG U+ subscribers constituted 53%, 31%, and 16% respectively, each of which closely represents the ratio of the current market shares. The 3G, and LTE user constituted 36.3%, and 63.7% respectively approximately equivalent to the actual market ratio. Among the participants using data service, 81.5% used less than 4GB per month while 18.5% used more than 4GB per month. The descriptive statistics of participants are summarized in Table 3.

5. Results of the analyses

This study draws on a two-stage approach to data analyses. The confirmatory factor analysis was carried out in order to assess the construct validity of the measurement model. After testing the construct validity, this paper uses the SEM to test the proposed model and

hypotheses. AMOS 20 is used for the analyses of SEM. Prior to the confirmatory factor analysis, exploratory factor analysis was conducted to test the reliability of the data.

5.1. Exploratory factor analysis

To test the reliability of the constructs, this paper carried out the exploratory factor analysis and the latent variables' reliability was evaluated with Cronbach's alpha coefficients. As shown in Table 4, all the factor loadings were greater than the recommended 0.5 thresholds suggested by Hair, Black, Babin, Anderson, and Tatham, (2006). Cronbach's alpha values are greater than 0.7, indicating a good reliability level (DeVellis, 2003).

Table 4 Composite reliability and AVE by constructs

Constructs	Item	Loadings	VE	AVE	CR	Cronbach's alpha
Customer support	CuS3	0.834	0.6381	0.5458	0.8269	0.872
	CuS2	0.797				
	CuS4	0.780				
	CuS1	0.694				
Customer loyalty	CL2	0.867	0.7721	0.6052	0.8208	0.908
	CL3	0.863				
	CL1	0.821				
Price perception	PP1	0.881	0.7045	0.5532	0.7853	0.868
	PP2	0.863				
	PP3	0.745				
Customer satisfaction	CS3	0.816	0.8412	0.7690	0.9094	0.943
	CS1	0.808				
	CS2	0.787				
Call quality	CQ2	0.827	0.6363	0.5221	0.7653	0.835
	CQ1	0.818				
	CQ3	0.810				
Data quality	DQ1	0.836	0.6305	0.4873	0.7397	0.830
	DQ2	0.823				
	DQ3	0.737				
Move-in cost	MIC1	0.850	0.5554	0.4190	0.6846	0.788
	MIC2	0.839				
	MIC3	0.812				
Loss cost	LC1	0.839	0.5951	0.4121	0.5831	0.744
	LC2	0.806				

5.2. Measurement model

Confirmatory factor analysis was carried out in order to test the validity of the measurement model. The analysis show that the ratio of χ^2/df is 3.103. Moreover, the Root Mean Square (RMR) is 0.062, Goodness-of-Fit Index (GFI) is 0.950, Adjusted Goodness-of-Fit Index (AGFI) is 0.933, Normed Fit Index (NFI) is 0.959, Incremental Fit Index (IFI) is

0.972, Comparative Fit Index (CFI) is 0.972, and Root Mean Square Error of Approximation (RMSEA) is 0.043. Therefore, all the fit indices were assessed to be within suitable ranges, indicating that the measurement model satisfies the acceptance level.

In order to assure construct validity, convergent and discriminant validity are assessed. Construct Reliability (CR) values (Hair et al., 2006) and Variance Extracted (VE) values (Anderson & Gerbing, 1988) are used to test the convergent validity, whereas Average Variance Extracted (AVE) values are used to test the discriminant validity (Fornell & Larcker, 1981). The calculated CR and AVE values for the respective factors are shown in Table 4. The results showed that all other variable except move-in cost and loss cost confirm their convergent validity; the CR values for move-in cost and loss cost did not satisfied the recommended criterion of having CR values greater than 0.7 to assure convergent validity (Hair et al., 2006). However, using Variance Extracted (VE), another recommended criterion for measuring convergent validity, the convergent validity of move-in cost and loss cost were assured with the respective VE values of 0.5554 and 0.5951.⁵ With regard to obtaining discriminant validity, the square roots of all AVE values were calculated to be greater than the correlation coefficients between the variables, indicating that the discriminant validity is assured (Fornell & Larcker, 1981). The comparisons of correlation coefficients and square roots of AVEs are shown in Table 5.

Table 5 Correlation, the square roots of AVE (diagonal), and discriminant validity

	CQ	DQ	PP	CuS	MIC	LC	CS	CL
CQ	0.723							
DQ	0.563	0.698						
PP	0.294	0.329	0.744					
CuS	0.421	0.461	0.492	0.739				
MIC	0.043	0.052	-0.202	-0.014	0.647			
LC	0.303	0.354	0.421	0.583	-0.112	0.642		
CS	0.470	0.562	0.454	0.587	-0.034	0.474	0.877	
CL	0.344	0.399	0.390	0.468	-0.019	0.439	0.628	0.778

5.3. Proposed model and hypothesis testing

The result of the SEM analyses of the proposed model and hypotheses tests are summarized in Table 6 and Fig. 3. As shown in Table 6, the results indicate that the proposed model is acceptable with all the model fit indices falling within the recommended range.

Table 6 Results of hypotheses tests

⁵ Convergent validity is satisfied when VE values are greater than 0.5 (Anderson & Gerbing, 1988).

Path	Estimates	C.R	p	Result
H ₁ Customer satisfaction → customer loyalty	0.618	18.144	0.000	Accept
H ₂ Move-in cost → customer loyalty	0.027	0.692	0.489	Reject
H ₃ Loss cost → customer loyalty	0.240	6.102	0.000	Accept
H ₄ Perceived call quality → customer satisfaction	0.152	3.654	0.000	Accept
H ₅ Price perception → customer satisfaction	0.216	5.665	0.000	Accept
H ₆ Perceived customer support → customer satisfaction	0.458	9.715	0.000	Accept
H ₇ Perceived data quality → customer satisfaction	0.324	8.210	0.000	Accept
Model fit	$\chi^2/df = 3.120$ NFI=0.957	RMR = 0.068 IFI=0.971	GFI=0.949 CFI=0.971	AFGI=0.933 RMSEA=0.043

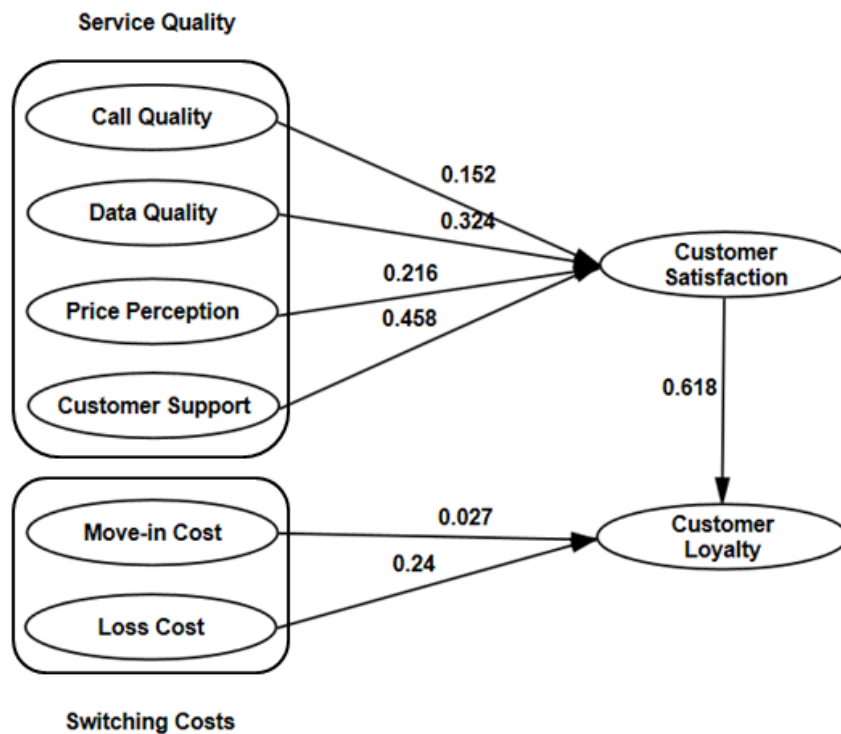


Fig. 3. Results of the basic model

The test result of the hypothesis 1 which proposed that the customer satisfaction affects customer loyalty revealed that customer satisfaction has strong positive effect on customer loyalty. For instance, the analysis showed that a one unit increase in customer satisfaction will lead to 0.618 unit increase in customer loyalty with high significance. This result is adequately in line with numerous studies conducted in the past about the positive causal link between the two constructs. Thus, this study once again confirms that the customer satisfaction and customer loyalty causal chain is valid among the 3G and LTE subscribers in the Korean mobile telecommunications market.

With regard to the effects of switching cost on customer loyalty (H₂ and H₃), the test

results indicate that, although move-in cost does not have significant influence, loss cost has significant positive effects on customer loyalty. The analysis show that a unit increase in loss cost will result in 0.240 unit increase in customer loyalty with high significance. Even though the move-in cost was considered in previous research as a subset of switching cost that influences customer loyalty in the Korean mobile telecommunications market, the results of this study showed that the move-in cost is no longer a determinant of customer loyalty. The difference in the results may be attributed to the rapid change in the market paradigm of the Korean mobile telecommunications industry in recent years. Unlike in the past where majority of Korean mobile subscribers were 2G service subscribers, the majority of mobile subscribers nowadays are data service oriented 3G and LTE service subscribers. Therefore, it is plausible to presume that what current mobile consumers consider as switching cost has changed as the market environment changed and as the major service area was shifted to data-oriented service from call-oriented service.

The hypothesis tests show that there is a positive causal relationship between service quality and customer satisfaction (H_4 , H_5 , H_6 , and H_7); the qualities of the proposed services—call quality, price perception, customer support, and data service—all have positive effects on customer satisfaction with varying degrees of influence. In line with the results of previous research, perceived quality of customer support appeared to have relatively high influence on customer satisfaction; however, the relative influence of perceived quality of call service was found to have decreased. The quality of data service, on the other hand, emerged as a new variable with significant influence on customer satisfaction. The test results suggest that a one unit increase in call quality, price perception, customer support, and data service quality will result in 0.152, 0.216, 0.458, and 0.324 unit increase in customer satisfaction respectively.

5.4. Moderating effects: multi-group analysis

Multi-group analyses were conducted in order to test the moderating effects of group characteristics. To analyze the moderating effects, an overall Chi-square difference test was conducted for each group characteristics. To test whether each group characteristics influence the model, a model with equality constraints on all seven paths was compared with the non-restricted model. After identifying the effects of moderating variables in the general model, each path was analyzed using Chi-square difference tests to statistically confirm the effect of moderator on the path. The group characteristics tested as moderators are service type, level of monthly data usage, gender, and age. The summary of results of the Chi-square difference

tests for the group variables are shown in Table 7.

Table 7 Path coefficients and Chi-square differences tests

Overall $\Delta\chi^2(df=6)$: 30.724**	Service Type		χ^2	$\Delta\chi^2$ (df = 1)
	3G	LTE		
Perceived call quality → customer satisfaction	0.257**	0.054	1034.076	4.648*
Perceived data quality → customer satisfaction	0.192*	0.425**	1034.999	5.571*
Price perception → customer satisfaction	0.088	0.256**	1033.787	4.359*
Perceived customer support → customer satisfaction	0.707**	0.334**	1042.208	12.780**
Customer satisfaction → customer loyalty	0.490**	0.707**	1038.516	9.088**
Move-in cost → customer loyalty	0.072	0.008	1030.055	0.627
Loss cost → customer loyalty	0.272**	0.225**	1029.750	0.322
Overall $\Delta\chi^2(df=6)$: 21.325**	Monthly data usage		χ^2	$\Delta\chi^2$ (df = 1)
	≤ 2GB	≥ 2GB		
Perceived call quality → customer satisfaction	0.203**	0.113	1015.429	1.155
Perceived data quality → customer satisfaction	0.245**	0.393**	1017.672	3.398
Price perception → customer satisfaction	0.187**	0.222**	1014.473	0.199
Perceived customer support → customer satisfaction	0.458**	0.448**	1014.286	0.012
Customer satisfaction → customer loyalty	0.503**	0.745**	1026.361	12.087**
Move-in cost → customer loyalty	0.047	0.007	1014.547	0.273
Loss cost → customer loyalty	0.362**	0.074	1027.311	13.037**
Overall $\Delta\chi^2(df=6)$: 19.187**	Gender		χ^2	$\Delta\chi^2$ (df = 1)
	Male	Female		
Perceived call quality → customer satisfaction	0.215**	0.099	1059.476	1.883
Perceived data quality → customer satisfaction	0.411**	0.252**	1061.590	3.997*
Price perception → customer satisfaction	0.246**	0.192**	1058.098	0.505
Perceived customer support → customer satisfaction	0.387**	0.534**	1059.963	2.370
Customer satisfaction → customer loyalty	0.695**	0.541**	1062.430	4.837*
Move-in cost → customer loyalty	0.040	0.005	1057.794	0.201
Loss cost → customer loyalty	0.223**	0.254**	1057.738	0.145
Overall $\Delta\chi^2(df=6)$: 11.225	Age		χ^2	$\Delta\chi^2$ (df = 1)
	Young	Old		
Perceived call quality → customer satisfaction	0.122*	0.192**	998.034	0.735
Perceived data quality → customer satisfaction	0.387**	0.246**	1000.541	3.242
Price perception → customer satisfaction	0.242**	0.173**	998.124	0.825
Perceived customer support → customer satisfaction	0.413**	0.515**	998.416	1.117
Customer satisfaction → customer loyalty	0.564*	0.692**	1000.731	3.432
Move-in cost → customer loyalty	-0.039	0.080	999.673	2.374
Loss cost → customer loyalty	0.297*	0.181**	999.519	2.220

*Significant at 0.05 level ($p<0.05$)

**Significant at 0.01 level ($p<0.01$)

5.4.1. Service type as a moderator: the comparison of 3G and LTE subscribers

As shown in Table 7, the results of chi-square difference test for service type show that there is a significant difference ($p<0.01$) between the restricted model and non-restricted model, indicating that 3G and LTE subscribers differ in terms of factors determining their satisfaction and customer loyalty. The individual path coefficients suggest that the perceived call quality, while being a significant factor that leads to satisfaction of 3G subscribers, does not determine the satisfaction of LTE subscribers. On the other hand, the price perception,

while making significant contribution to satisfaction of LTE subscribers, was not a significant factor for satisfaction of 3G subscribers. The results also imply that the perceived quality of customer support has stronger influence on customer satisfaction for 3G subscribers than for LTE subscribers. As expected, the relationship of perceived data service quality and customer satisfaction is significantly stronger for LTE subscribers than for 3G subscribers, indicating that the LTE users put greater importance on the quality of data service. Although there is no significant difference between 3G and LTE subscribers with regards to the effect of loss cost on customer loyalty, the customer satisfaction and customer loyalty linkage is found to be significantly stronger for LTE subscribers.

5.4.2. Data usage level as a moderator

For the purpose of comparison, respondents are categorized into two groups based on their data usage level. Based on the monthly average data usage of Korean mobile subscribers (MSIP 2014)⁶, subscribers using more less than 2GB of data per month are grouped as ‘below-average data users’ and those using more than 2GB per month are grouped as ‘above-average data users’. The Chi-square difference test for the monthly data usage level showed that there is a significant difference ($p < 0.01$) between the two groups, indicating the moderation effect of data usage level. The individual path coefficients reveal that the two groups significantly differ in the extent to which customer satisfaction affects customer loyalty; the linkage of customer satisfaction and loyalty is significantly stronger for the above-average data users than for the below-average data users. Furthermore, it is shown that the loss cost, while having significant influence on customer loyalty for the below-average data users, had no effect on customer loyalty for above-average data users.

5.4.3. Gender and age as moderators

As shown in Table 7, the Chi-square difference test for gender show that there is a significant difference ($p < 0.01$) between male and female. The relationship of perceived data quality and customer satisfaction is found to be stronger for males than for females. Moreover, customer satisfaction and loyalty linkage was also determined to be stronger for males. However, different age groups showed no moderating effect.

6. Conclusion and implications

The primary objective of this study is to analyze the determinants of customer loyalty of 3G and LTE subscribers in the Korean mobile telecommunications market. Focusing on the

⁶ Mobile data traffic report (the Ministry of Science, ICT, and Future Planning, March 2014).

major determinants of customer loyalty, this study draws on customer satisfaction as a mediating variable. As the determinants of customer satisfaction, some of the traditional market-specific determinants were empirically tested. In addition to testing the traditional determinants, this study introduces data service quality as a new predictor of customer satisfaction in an advanced mobile telecommunications environment.

In line with numerous studies conducted in the past, the results of this study indicate that there exists a strong causal relationship between customer satisfaction and customer loyalty. Therefore, maximizing customer satisfaction should be the priority of MNOs in enhancing customer loyalty which will ultimately result in superior customer retention. With respect to increasing customer satisfaction in the Korean mobile telecommunications market, this study suggest focusing on improving service quality, namely call quality, data service quality, quality of customer support, and price perception of customers.

Loss cost, a part of the proposed switching costs along with move-in cost, is also turned out to be a significant predictor of customer loyalty. Loss cost refers to the loss of benefits perceived by customers when moving to other MNOs such as accumulated mileage, partnership discounts, discounts for bundled consumption, and other potential membership benefits. Therefore, the MNOs should take the effect of loss costs into account and should focus on implementing strategies that offer superior membership benefits to increase switching costs. Move-in costs, on the other hand, are found to be insignificant in affecting customer loyalty. This may be due to the generous subsidies being provided to customers in the Korean mobile telecommunications market; new subscribers are provided with large subsidies in forms of substantial handset price discounts, free registration fees, full support for cancellation fees charged by competitors, and so forth. Therefore, the move-in costs perceived by customers may have been mitigated by the subsidies they receive when changing their current service providers.

As discussed earlier, this study suggests that 3G and LTE subscribers differ in terms of factors leading to their satisfaction. For instance, while call quality and quality of customer support are found to be the strong factors that lead to satisfaction for 3G subscribers, data quality and price perception are found to be significant factors that affect satisfaction for LTE subscribers. Apart from the differences between 3G and LTE subscribers, this study also confirmed the difference between below-average data users and above-average data users. Therefore, MNOs should consider these differences carefully in formulating their marketing strategies to maximize the loyalty of different customer groups with different characteristics.

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