

An Exploratory Study on Service Quality Measurement of the Fourth Generation Mobile Telecommunication: The Case of the Korean Market

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Abstract

Now, the Korean mobile communication market already reached full growth. In this situation, mobile communication companies are constantly trying to find ways to differentiate their services. But it was quite difficult. The only thing that differentiates their service is quality. This study aims to examine the impact of service quality and satisfaction on continuous use intention in the Korean mobile telecommunication context. More specifically, the objectives of the present study are to investigate how service quality and satisfaction influence directly continuous use intention of LTE, and what is the most significant constructing factor of service quality as antecedents of a subscriber's satisfaction and continuous use intention of LTE. Though studies measuring service quality mainly used SERVQUAL and SERVPERF, studies considering the uniqueness of mobile communication market were rare. There were few studies that measured the quality of Korean mobile communication service. But they didn't reflect the distinctiveness of the market. We were able to find critical common variables that can be applied to Korean mobile communication market from prior research. We suggested billing system, device, call quality, corporate image, speed, customer support and bonus system as core variables of service quality. Afterwards, we conducted a questionnaire survey of college students mainly in their twenties. As a result, customer support, corporate image, and speed among service quality factor presented in this paper significantly influenced customer satisfaction. Also, customer satisfaction has a strong relationship with continuous use intention.

Keywords: Korea, LTE, LTE-A, Service Quality, Telecommunication

1. Introduction

People today seem to experience so much information, such fast changes, and too large of a world. Consequently, this creates the aggravating situation of having difficulty making choices. As science advances and the speed of civilization development increases, their choices widen. Now, the Korean mobile communication market already has reached full growth^{1,2}. The number of new subscribers is expected to begin to stabilize, as happened in developed market such as in Japan and U.S.A, and acquiring new

subscribers will become sharply difficult and expensive. Hereupon, mobile communication companies are trying to maintain the retention of existing profitable customers and provide a desperate marketing effort and a high-quality service in order to prospect for new customers. Most people don't understand what is likely triggering their purchase behavior when making a purchase of goods and services. It is difficult and important for companies to identify a specific psychological process of purchase of goods and services. Only a company that understands and utilizes this process will be able to possess compe-

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tion superiority in an increasingly competitive mobile communication market place².

Traditionally, three firms (SK Telecom, LG Uplus, KT Corporation) have cornered the mobile communication market in Korea. But, MVNO (Mobile Virtual Network Operator) appeared on the market and the market experienced saturation after the Electric Communication Law was revised in 2010. There are 17 companies in MVNO market and the number of MVNO subscribers surpassed about 2.23 million in October 2013³. In this situation, mobile communication companies are constantly trying to find ways to differentiate their service. But it is quite difficult. The only thing that differentiates their service is quality. In 2011, LTE (Long Term Evolution) service, which is called the fourth generation mobile communication, was introduced and those who used the three generation mobile communication service are switching to LTE service. Therefore, they knew that they needed service quality to prevent their customers trying to upgrade to next generation mobile communication service from escaping them and encourage customers to use their next generation mobile communication service (i.e. LTE and LTE-Advanced). For this reason, they are trying to retain continuously their customers and are doing their utmost for customer satisfaction. This study aims to examine the impact of service quality and satisfaction on continuous use intention in the Korean mobile telecommunication context.

More specifically, the objectives of the present study are to investigate:

- how service quality and satisfaction influence directly continuous use intention of LTE, and
- what is the most significant sub-factor of service quality as antecedents a of subscriber's satisfaction and continuous use intention of LTE.

The remainder of the paper is organized as follows. The following section provides a brief introduction of the LTE

service and the theoretical background of service quality evaluation models and the concept of service quality, satisfaction, and continuous use intention. The next section develops related hypotheses and presents the integrated framework that shows the hypothesized relationships, which is followed by the methodology and measures of the survey in this study. Then the measurement model and the hypothesized relationships are empirically tested based on the evidence from Korean mobile telecommunication sector. Lastly, Results are reported and discussed, and limitations and directions for future research are indicated.

2. Theoretical Background

2.1 LTE (Long Term Evolution) Service

Korea is not only one of the world's most wired nations, but also boasts the world's fastest Internet access. Korean mobile phone subscribers are not satisfied with the current state of wireless service and want to be provided with mobile communication service similar to quality of wired communication at an affordable price⁴. Also, recently one of the problems the mobile communication market is facing is that the deficient traffic is beyond their practice because available frequency resource is limited. Compared to 2009, mobile traffic in 2020 is expected to increase as much as more than 13 times⁵. The advancement towards a 4G mobile communication system is inevitable because 3G service is too limited to address the problem of mobile traffic and fulfill changing consumer needs. In September 2011, 4G LTE service started⁶. In the strict sense, LTE is 3.9 generation service. Genuine fourth generation mobile communication service is LTE-A (Advanced). LTE service guarantees a transmission of 100Mbps for downlink and 50Mbps for uplink in 20MHz. Also, LTE-A guarantees data transmission speeds of 1Gbps for downlink and 500Mbps for uplink in 100MHz band. Like so, LTE

Table 1. The expectation of the number of domestic and foreign lte service subscriber⁸

Year	2011	2012	2013	2014	2015
World (unit: million people)	5.6	16.3	33.6	56.2	82.1
Domestic (unit: thousand people)	14.2	72.5	189.9	393.5	708.2

and LTE-A is global convergence wireless communication technology with very fast data rates⁷. LTE and LTE-A are receiving huge attention these days because they are being regarded as core communication technologies that can solve the problem 3G service is facing. The number of 4G service subscribers increased sharply within a short period and passed 23 million².

The study dealing with LTE and LTE-A service has been biased commonly towards technical aspects such as communication frequency and bandwidth⁹⁻¹¹. Occasionally, though there was the study dealing with social psychological aspects of LTE service subscribers^{12,13}, most of the study used TAM (Technology Acceptance Model)¹⁴ and UTAUT (Unified Theory of Acceptance and Use of Technology)¹⁵. Besides, an attempt to unravel its causal connection with service quality, customer satisfaction, and continuous use intention of LTE service in Korean context was very unusual.

2.2 Service Quality

Concept of service quality was initiated in the 1980s when marketers and scholars recognized that good quality products were guaranteed to maintain competitive advantage¹⁶. Thus, the study of service quality had always received large attention by researchers and practitioners due to its strong impact on business performance, customer satisfaction, profitability, and eventually survival of businesses. There were great efforts trying to measure service quality in many countries such as Nigeria¹⁷, Bangladesh¹⁸, Turkey¹⁹, and so on. Then, what is service quality? Parasuraman et al. defined service quality as the overall evaluation of a specific service firm that results from comparing that firm's performance with the customers' general expectations of how firms in that industry should perform²⁰. Also Van der Wal et al. stated that service quality is the difference between what a customer expects and what is provided¹⁶.

Services are characterized as being intangible, perishable, produced and consumed simultaneously, and heterogeneous. Thus, service quality is difficult for customers to assess²¹. Amongst measure methods of service quality, the most commonly used method is SERVQUAL model^{20,22}. Parasuraman et al. presented 10 variables (Tangibles, Reliability, Responsiveness, Credibility, Security, Competence, Courtesy, Understanding/ Knowing the customer, Access, and Communication) as structuring factor of service quality²² and Parasuraman

et al. integrated these 10 variables into 5 variables (Tangibles, Reliability, Responsiveness, Assurance, and Empathy) through factor and reliability analysis²⁰. But the SERVQUAL model was highly criticized because the model measures service quality by calculating difference between service expectation and actual experienced service and failed to load 5 factors properly. Cronin and Taylor developed SERVPERF which measures service quality by using service performance and improves the problem of reliability²³. Since then, though studies measuring service quality mainly used SERVQUAL and SERVPERF, studies considering the uniqueness of mobile communication market were rare. There were few studies that measured the quality of Korean mobile communication service. But they didn't reflect the distinctiveness of the market. For example, it is not appropriate to apply Tangibles factor for the measurement of service quality because it is not easy to confirm physical facility, equipment, and appearance of the employee for those who use mobile communication service such as 3G, LTE, and LTE-A.

Therefore, studies considering the distinctiveness of a mobile communication market are being carried out^{1, 24, 26}. Gerpott et al. studied the relationship among Customer Retention (CR), Customer Loyalty (CL), and Customer Satisfaction (CS). They presented personal benefits, assessment of prices, assessment of network quality, and assessment of customer care as factors that determine customer satisfaction²⁴. Lim et al. suggested using pricing plan, network quality, data services, billing system, and customer service quality as influencing factor on perceived quality of mobile service²⁶. In the study comparing Vietnamese with Korean mobile market, Lien et al. stated that call, charge, cell phone, added services, corporate image, and employee's attitude and behavior are antecedents of service satisfaction²⁷. Kim et al. argued that call quality, pricing structure, mobile device, value-added services, convenience in procedure and customer support constitute service quality¹. Especially, call quality, value-added services, and customer support positively influenced customer satisfaction. We are able to find critical common variables that can be applied to Korean mobile communication market from prior research above. Of these common variables, value-added service is substituted with a bonus system in consideration of distinctiveness of LTE service because value-added service in their research means services such as ringtone, real-time provision of stock quotations, weather, and so on.

Table 2. Measurement instrument

Construct	Item	Wording	Reference
Billing System (BST)	BST1	LTE service rate is inexpensive.	[1,24,25]
	BST2	LTE service rate system has many pricing options.	
	BST3	Subscription costs of LTE service are affordable.	
	BST4	There are many LTE service discounts available.	
Bonus System (BNS)	BNS1	A bonus system of LTE service has various uses.	[1]
	BNS2	A bonus system of LTE is usable in book stores, restaurants, and convenience stores, etc.	
	BNS3	Those who signed up for a mileage bonus system are provided with special discount.	
Corporate Image (CIM)	CIM1	Social contribution (e.g. social service activity, donation) of mobile communication company operating LTE service is high.	[19]
	CIM2	Mobile communication company operating LTE service tries to listen to requirements of customer.	
	CIM3	Mobile communication company operating LTE service is trustworthy.	
Customer Support (CSP)	CSP1	Call center employee of mobile communication company operating LTE service is polite.	[1,24,25]
	CSP2	Work handling mobile communication company operating LTE service is quick.	
	CSP3	Work handling mobile communication company operating LTE service is accurate.	
Device (DVC)	DVC1	The kind of LTE Smartphone is various.	[1]
	DVC2	The design and color of LTE Smartphone is excellent.	
	DVC3	Performance and specification of LTE Smartphone is high.	
Call Quality (CQT)	CQT1	Crosstalk and noise of LTE service does not occur.	[1,24,25]
	CQT2	Dropped call of LTE service does not occur.	
	CTQ3	Never before have I had to cope with poor reception on my phone while I have used LTE service.	
Continuous Use Intention (CUI)	CUI1	I will continue to use LTE service.	[39]
	CUI2	I will recommend LTE service to those around me.	
	CUI3	In the future, I will use LTE service more frequently.	
Satisfaction (STF)	STF1	I am provided with satisfactory LTE service.	[1,26]
	STF2	I think that it is good to use LTE for me.	
	STF3	Overall, I am satisfied with LTE service.	
Speed (SPD)	SPD1	I think that access to the information is fast when I use LTE service.	[1,24,25]
	SPD2	Data transfer rates of LTE are fast.	
	SPD3	Telephone call connection of LTE is fast.	

2.3 Measurement Instrument

Many of the instruments used to measure the constructs involved in this study are adapted from existing literature and others are developed based on the extant conceptual studies.

3. The Hypothesis and Research Model

Already, the relationship between service quality and customer satisfaction was verified^{23,28,30}. This research is an exploratory study to find factors constructing service quality in consideration of distinctiveness of LTE service. We suggest billing system, device, call quality, corporate image, speed, customer support, and bonus system as core variables of service quality. Therefore, we hypothesized as follows:

H1: Call quality will positively influence on satisfaction.

H2: Billing system will positively influence on satisfaction.

H3: Bonus system will positively influence on satisfaction.

H4: Customer support will positively influence on satisfaction.

H5: Corporate image will positively influence on satisfaction.

H6: Device will positively influence on satisfaction.

H7: Speed will positively influence on satisfaction.

Additionally, since speed and device are regarded as critical elements facilitating subscription of LTE service, it can be hypothesized as below.

H8: Device will positively influence on continuous use intention.

H9: Speed will positively influence on continuous use intention.

Cronin and Taylor suggested that customer satisfaction had a significant effect on purchase intention²³. Kuo et al. argued that consumers satisfied with service quality and service value have post purchase intention³¹. Likewise, subscribers satisfied with service quality of LTE and LTE-A will continuously use the service the mobile communication company offers.

H10: Satisfaction will positively influence on continuous use intention.

4. Research Methodology

The present study verified the model using Smart PLS 2.0³². The PLS method has been gaining interest and used in recent years because of its ability to model latent constructs under conditions of non-normality and small to medium sample sizes, which is preferable to techniques such as regression assuming error free measurement. Also, it is apt for exploratory study.

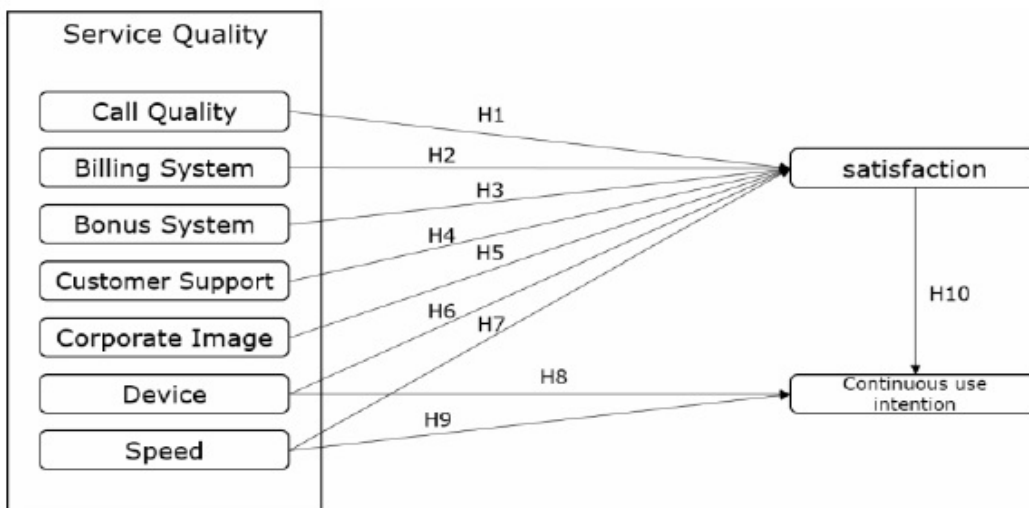


Figure 1. The Proposed Model.

4.1 Data Collection

A survey was administered from March 9-13, 2015. The survey respondents were at least aware of Smartphone and interested in the latest IT technology. Of 210 people who responded to the survey, all respondents completed the survey, which showed a very high response rate. Excluding one insincere copy, 209 copies were analyzed. Early adopter of state-of-the-art IT technology such as the Smartphone and the tablet PC are mostly young people ranging from 20s to 30s. Also they are major population¹². Also, they adapt to new technology easily, as well as researchers can access the sample relatively readily³³. So, we conducted a questionnaire survey of college students mainly in their twenties.

4.2 Demographic Characteristics

Regarding the demographics of respondents, males and females were 73.7% and 26.3%, respectively. 68.4% and 31.6% of respondents were in their 20s and 30s, respectively. The most of respondents (99.0%) were student, followed by worker (13.6%).

4.3 Reliability and Validity

The PLS analysis requires testing internal consistency, convergent validity, and discriminant validity of question items and constructs. To test the internal consistency, bill-

ing system, device, call quality, corporate image, speed, customer support, and bonus system, satisfaction and continuous use intention were analyzed in terms of Fornell and Larcker³⁴'s composite reliability and internal consistency. Table 4 shows the analysis results. The composite reliability proved to be higher than 0.7, the reference standard suggested by Nunnally³⁵ and Barclay et al³⁶. The Cronbach's α , widely in use for testing the reliability, proved to be 0.7 and higher, indicating the internal consistency was good. The convergent validity was tested with AVE and factor loadings of constructs. The AVE proved to be higher than 0.5, the reference standard suggested by Fornell and Larcker³⁴ and Chin³⁷. All factor loadings of constructs proved to be significant, the reference standard suggested by Fornell and Larcker³⁴.

As in Table 5, the discriminant validity was tested based on whether the square root of every AVE marked on the diagonal axis of correlation coefficients was bigger than the coefficients of the other constructs. As a result, the smallest square root of AVE (0.757) was bigger than the largest coefficient (0.619), indicating the discriminant validity was good.

The present study performed the confirmatory factor analysis as in Table 6. In the confirmatory factor analysis, the factor loading of a construct should be higher than those of the other constructs. As a result, every question item met the requirement.

Table 3. Descriptive statistics of respondents

		Frequency (unit: people)	Distribution (%)
Gender	Male	154	73.7
	Female	55	26.3
Age	20s	143	68.4
	30s	66	31.6
Job	Student	207	99.0
	Worker	2	1.0
Monthly Income (KRW)	Less than 500,000 won	180	86.1
	500,000 – 1,000,000 won	24	11.5
	1,000,000 – 2,000,000 won	4	1.9
	More than 2,000,000 won	1	0.5

Table 4. Testing of internal consistency and convergent validity

Construct	Composite reliability	Cronbach's α	AVE	Item	Factor loading	t-value
BST	0.842	0.764	0.573	BST1	0.694	9.498
				BST2	0.822	18.499
				BST3	0.739	10.932
				BST4	0.767	9.596
CQT	0.862	0.767	0.676	CQT1	0.859	20.600
				CQT2	0.808	13.188
				CQT3	0.799	15.856
CUI	0.899	0.831	0.748	CUI1	0.835	28.907
				CUI2	0.859	32.761
				CUI3	0.900	71.834
CIM	0.845	0.732	0.648	CIM1	0.697	9.372
				CIM2	0.847	25.090
				CIM3	0.860	28.769
SPD	0.882	0.798	0.714	SPD1	0.830	22.060
				SPD2	0.902	54.419
				SPD3	0.799	15.968
DVC	0.852	0.744	0.658	DVC1	0.716	10.709
				DVC2	0.871	21.298
				DVC3	0.839	25.040
CSP	0.897	0.828	0.744	CSP1	0.834	23.859
				CSP2	0.887	36.532
				CSP3	0.866	27.715
BNS	0.912	0.857	0.775	BNS1	0.840	19.500
				BNS2	0.915	13.750
				BNS3	0.885	17.625
STF	0.897	0.828	0.745	STF1	0.891	56.520
				STF2	0.873	34.649
				STF3	0.824	24.026

Table 5. Correlation between latent variables (testing of discriminant validity)

Construct	BST	BNS	CQT	CUI	CIM	CSP	DVC	STF	SPD
BST	(0.757)								
BNS	0.489	(0.880)							
CQT	0.200	0.192	(0.822)						
CUI	0.214	0.201	0.268	(0.865)					
CIM	0.503	0.369	0.272	0.273	(0.805)				
CSP	0.100	0.104	0.340	0.265	0.262	(0.863)			
DVC	0.284	0.262	0.373	0.399	0.249	0.342	(0.811)		
STF	0.304	0.246	0.341	0.619	0.389	0.394	0.347	(0.863)	
SPD	0.184	0.146	0.302	0.455	0.208	0.286	0.391	0.392	(0.845)

As abovementioned, the constructs and question items used here were found to be fit for the structural model analysis as their internal consistency, convergent validity and discriminant validity met the reference requirements.

4.4 Structural Model Analysis

Figure 2 shows the results of the PLS analysis. In the PLS analysis, the explanatory power of the path model is

expressed as the explained variance, R^{237} . The PLS analysis of R^2 showed the sub-factors of service quality explained 33.6% of the satisfaction, whilst device, speed, and satisfaction explained 45.5% of continuous use intention, which exceeded Falk and Miller³⁸'s power (10%).

With the PLS analysis, path coefficients and their significance were tested. For this, the full sample was used to find out the path coefficients of the structural model. The

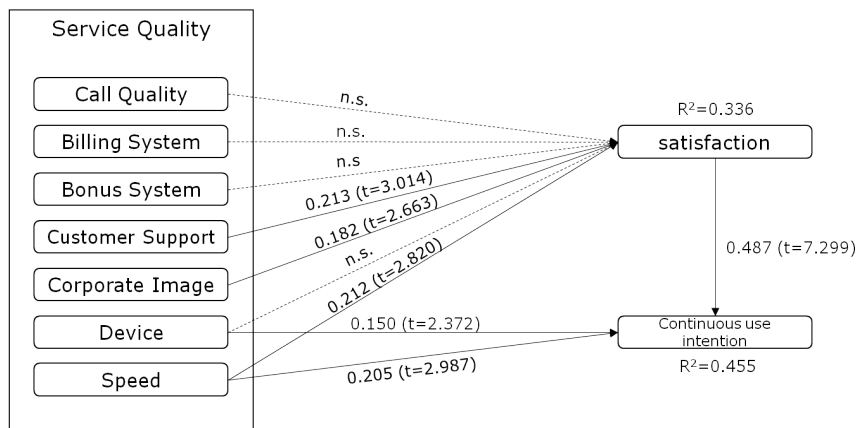


Figure 2. The Analysis of path Coefficient.

Table 6. Confirmatory factor analysis

Construct	BST	BNS	CQT	CUI	CIM	CSP	DVC	STF	SPD
BST1	0.694	0.246	0.038	0.024	0.296	-0.039	0.022	0.145	0.046
BST2	0.822	0.369	0.189	0.204	0.394	0.089	0.355	0.320	0.192
BST3	0.739	0.384	0.152	0.166	0.320	0.104	0.124	0.188	0.116
BST4	0.767	0.474	0.180	0.202	0.503	0.116	0.231	0.203	0.155
BNS1	0.419	0.840	0.122	0.147	0.351	0.107	0.152	0.175	0.047
BNS2	0.455	0.915	0.187	0.189	0.354	0.060	0.273	0.259	0.187
BNS3	0.417	0.885	0.191	0.191	0.269	0.121	0.248	0.202	0.128
CQT1	0.180	0.190	0.859	0.296	0.208	0.286	0.381	0.345	0.275
CQT2	0.149	0.164	0.808	0.178	0.248	0.247	0.198	0.224	0.199
CQT3	0.158	0.111	0.799	0.155	0.228	0.304	0.308	0.247	0.261
CUI1	0.178	0.138	0.217	0.835	0.201	0.260	0.375	0.484	0.432
CUI2	0.223	0.150	0.228	0.859	0.279	0.182	0.300	0.550	0.362
CUI3	0.156	0.230	0.248	0.900	0.230	0.246	0.361	0.571	0.388
CIM1	0.419	0.370	0.232	0.232	0.697	0.222	0.279	0.216	0.216
CIM2	0.439	0.285	0.187	0.225	0.847	0.247	0.211	0.322	0.154
CIM3	0.383	0.275	0.248	0.217	0.860	0.181	0.154	0.373	0.157
CSP1	0.009	0.081	0.298	0.231	0.185	0.834	0.332	0.328	0.306
CSP2	0.101	0.060	0.274	0.262	0.257	0.887	0.317	0.363	0.251
CSP3	0.148	0.133	0.310	0.190	0.233	0.866	0.234	0.326	0.184
DVC1	0.293	0.225	0.228	0.228	0.172	0.221	0.716	0.188	0.213
DVC2	0.276	0.256	0.304	0.371	0.263	0.267	0.871	0.330	0.319
DVC3	0.149	0.165	0.362	0.346	0.164	0.335	0.839	0.301	0.394
STF1	0.300	0.246	0.318	0.543	0.390	0.348	0.272	0.891	0.340
STF2	0.256	0.195	0.307	0.556	0.325	0.372	0.320	0.873	0.358
STF3	0.228	0.196	0.254	0.503	0.288	0.296	0.309	0.824	0.315
SPD1	0.052	0.132	0.210	0.422	0.098	0.290	0.293	0.317	0.830
SPD2	0.207	0.116	0.263	0.395	0.160	0.239	0.372	0.339	0.902
SPD3	0.215	0.124	0.298	0.330	0.281	0.191	0.326	0.340	0.799

Table 7. Hypothesis testing

Hypothesis		Path coefficient	t-value	Result
H1	CQT→STF	0.102	1.554	Not supported
H2	BST→STF	0.090	1.010	Not supported
H3	BNS→STF	0.043	0.597	Not supported
H4	CSP→STF	0.213	3.014	Supported
H5	CIM→STF	0.182	2.663	Supported
H6	DVC→STF	0.071	1.164	Not supported
H7	SPD→STF	0.212	2.820	Supported
H8	DVC→CUI	0.150	2.372	Supported
H9	SPD→CUI	0.205	2.987	Supported
H10	STF→CUI	0.487	7.299	Supported

bootstrapping provided in PLS was used to calculate the t-value for the path coefficient. Table 7 summarizes the analysis results. The results of the analysis are as follows in the order of hypotheses. In brief, 6 out of 10 hypotheses set up in the present study except the 4 hypotheses were found significant and adopted.

5. Results

Customer support, corporate image, and speed among service quality factor presented in this paper significantly influenced customer satisfaction. Also, customer satisfaction has a strong relationship with continuous use intention. Thus, it is possible to infer that customer support, corporate image, and speed positively influence satisfaction, which in turn influences continuous use intention of LTE service. Meanwhile, it turned out that service quality factor directly influences continuous use intention of LTE service is device and speed. According to Seo et al. study⁶, 37.4% of new subscriber of LTE selected the service due to the fast speed of LTE and 31.3% did so

for the purpose of purchase of latest-model smartphone. Our research is surprisingly consistent with their survey.

6. Discussion and Conclusion

Our investigation provides practical and academic implications. First, in practical aspects this study offers significant insights into what investments marketers should make in an increasingly competitive market. It is already a well-known fact that quality of communication service is mightily important in the telecommunication market. The result of this study shows mobile communication carriers would be better to focus on courtesy of call center, customer support service, faithful after service, and improvement of corporate image, provision of various and the newest device (Smartphone), and fast speed. However, the result of our study doesn't mean that call quality, billing system, and bonus systems are not important. Their level should be maintained. Next, in academic aspects, our research contributed to find what constitutes service quality in Korean mobile communication market. Traditionally, though SERVQUAL and SERVPERF

are used widely for measurement of service quality, we still mentioned the fact that indeed to use those models is not proper in the telecommunication context. Then, in the further study, researchers and practitioners trying to measure quality of mobile communication service could utilize and apply service quality dimensions which appeared significant in our study. Of course, because this study dealt only with LTE service, the result of this study cannot be applied and generalized to all wireless services (e.g. Wi-Fi and Bluetooth). Also, the fact that for convenience' sake we carried out survey on people in their 20s who are mainly buyers of up-to-date IT device can be pointed out. In the future study, we strongly suggest investigating switching cost other than service quality as determinant of customer satisfaction. This work will understanding as to which service elements they do satisfy.

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