A Comparative Study of Customer Preferences for Telecommunication Technologies in Pakistan

Muhammad Saadi[1], Rabeel Manzoor[2], Waqas Tariq Toor[3], Sanika. K. Wijayasekara[4], Farhat Masood[5], and Lunchakorn Wuttisittikulkij[6,*]

1 Department of Electrical Engineering, University of Central Punjab, Lahore, Pakistan
2 Lahore Electric Supply Company (LESCO), Lahore, Pakistan
3 Department of Electrical Engineering, Khwaja Fareed University of Engineering and Information Technology (KFUEIT), Rahim Yar Khan, Pakistan
4 Department of Electrical Electronic & Telecommunication Engineering, General Sir John Kotelawala Defence University, Ratmalana, Sri Lanka
5 Department of Electrical Engineering, Capital University of Science and Technology, Islamabad, Pakistan
6 Department of Electrical Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand

*E-mail: wlunchak@chula.ac.th (Corresponding author)

Abstract. The telecommunication industry is a huge and ever-growing industry and it is contributing dominantly to the economy in terms of revenue generation and being one of the biggest taxpayers to the government. Telecommunication is now considered to be a basic necessity. In this paper, a study has been conducted to know the customer preferences of telecommunication technologies in Lahore, Pakistan, and also to compare different customer preferences for telecommunication technologies. From the results of our study, we have concluded that there is a great variation among people in terms of their usage of mobile phones and internet services. Furthermore, results regarding the relationship between the socio-demographic characteristics and the preference towards specific telephony and internet service providers have also been analyzed. This work is unique when the scenario of Pakistan is considered. No such study has been conducted in Pakistan to know the customer preferences in Pakistan. Some recommendations for the telecommunication operators have also been discussed which can help to know their customer needs in a better fashion.

Keywords: Telecommunication, customer preference, socio-demographics characteristics.

1. Introduction

Telecommunication is now a part of human necessity like water, air, electricity, health, and education. It's hard to imagine life without telecommunication systems. Telecommunication customers are from very poor class to rich class choosing a different type of telecommunication technologies to keep in touch with their beloved ones according to their budget and requirements [1]. The telecommunication industry is a complex and rapidly changing economy sector due to the high vulnerability of new technologies, however, the telecommunication industry is huge and it is contributing dominantly in terms of revenue generation and being one of the biggest taxpayers to the government [2]. According to the Government of Pakistan statistics, this sector contributes 3% of the Gross Domestic Product GDP. The telecommunication industry is also a major shareholder bringing Foreign Direct Investment (FDI) in the country [3].

In this paper, a comprehensive analysis is conducted on the choice of telecommunication technologies (like fixed landline phone, mobile phones, internet technology) from the residents of Lahore, Pakistan. The objective of this research is to study the customer preferences of telecommunication technologies in Lahore, Pakistan. Furthermore, this study also intends to assess the influence of socio-demographic characteristics on consumer preference towards telecommunication technologies. We believe that the relationship between socio-demographic characteristics and customer preferences of telecommunication technology is important to understand as it is linked to a multi-billion dollar industry which is also contributing significantly in the country's GDP concerning customer preferences.

Customer satisfaction builds a strong relationship and bonding between the customer and the telecommunication service provider. In literature, it has been found that the satisfaction of the customers can help the brands to build long and profitable relationships with their customers [4, 5]. Service quality is generally finding of services given to consumers. It depends on customer judgment. The core objective of this research is to evaluate the relationship between quality of service on customer satisfaction. The rest of the paper is organized in the following way. Section 2 talks about the telecommunication industry of Pakistan. Section 3 discusses the research design and Section 4 highlights the results and their interpretation. In Section 5, the limitations of this research are discussed followed by the conclusion in Section 6.

2. A Brief Background of Pakistan Telecommunication Industry

In the last decade, Pakistan like the rest of the world has seen tremendous growth in the telecommunication sector. In the past, there was only a single company, Pakistan Telecommunication Corporation Limited (PTCL), which was providing telecommunication services in Pakistan [6]. But with the enormous growth in these sectors, many players entered in this game. Presently there are five major mobile operators in Pakistan namely Mobilink, Warid, CMPak, Telenor, and Ufone which are providing mobile voice and data services across Pakistan [7]. Although Mobilink and Warid are now merged when this study was planned and conducted, they were different. So in all our analyses, we will treat Mobilink and Warid as different companies. For fixed telecommunication services, PTCL is still the major key player whereas National Telecommunication Corporation (NTC), Brain Limited, and World Call also have a nominal market share for fixed local line services.

Exponential growth in the telecommunication sector has attracted researchers to determine the relationship between their preferences for technology. Many studies are done in developed countries regarding the internet use via mobile phone (for the residents of Japan) [8], comparison of the internet of mobile phone usage (for the residents of United States) [9], social influences and adoption of wireless Internet services via mobile technology [10], the relationship among service quality, customer satisfaction, and post-purchase intention. There are also many recent studies that have been conducted that how the telecommunication industry is playing its role in strengthening the economy of Srilanka [11-13], India [14-16], and Bangladesh [17]. However, such studies are not conducted for the residents of Pakistan.

2.1. Tele Density Growth

The telecommunication sector in Pakistan has been growing at a rapid pace in the last decade or so [18]. Total Tele-density which includes fixed telecommunication services, wireless local loop, and the mobile sector was 6.25% in the year 2003-2004 and within six years, the teledensity increased to approximately 62%. As per the recent data obtained from the Pakistan Telecommunication Authority (PTA), the teledensity has increased slightly more than 75% in early 2019 [19]. If we compare the total teledensity growth with mobile teledensity, then we will come to know that mobile communication was the driving force for rapid telecommunication penetration [20]. Figure 1 shows the total teledensity, mobile teledensity as well as mobile teledensity growth over the last 10 years. We can see that the trend is emerging from fixed-line telecommunication services to mobile telecommunication services. A significant decline has been observed in the year 2015 for the number of subscribers which is because of the reason that the Government of Pakistan asked all the subscribers to get their subscriber identity module (SIM)/devices verified through the biometric system within a deadline. Those subscribers who failed to do so resulted in the blockage of the SIM/device [21]. However, this step also helps the government in creating various secure and digitized systems. [22].
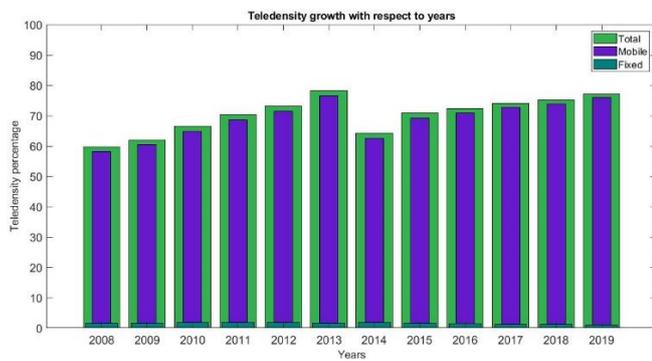
Fig. 1. Teledensity growth in Pakistan over the last decade.

2.2. Mobile Subscriber Growth

There are five companies which are providing cellular services to the people of Pakistan. The number of mobile subscribers is growing at an exponential rate and there are more than 161 million subscribers. Mobilink is the leading cellular service provider company. Figure 2 shows the annual cellular subscribers' growth.
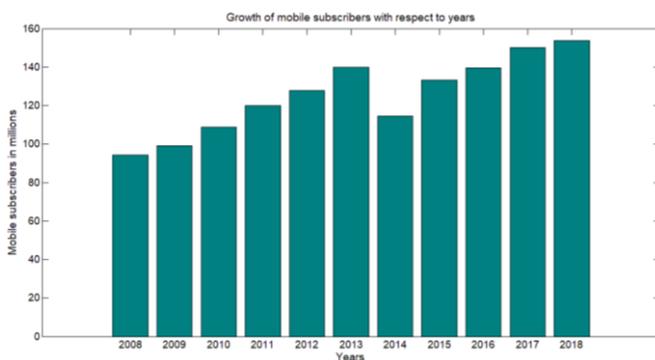

Fig. 2. Mobile subscribers growth in Pakistan over the last decade.

2.3. Broadband Subscribers by Technology

Broadband services are provided to the users in Pakistan in several ways. Some broadband services are provided through the wired channel (coaxial cable, optical fiber, hybrid fiber-coaxial network) and some are provided through the wireless channel (WiMAX, EvDO, Mobile broadband). The following are the broadband technologies that are used in Pakistan [13].

- Digital Subscriber Line (DSL)
- Hybrid fiber-coaxial (HFC)
- WiMAX (Worldwide Interoperability for Microwave Access)
- Fiber to the Home (FTTH)
- Evolution-Data Optimized (EvDO) CDMA based network
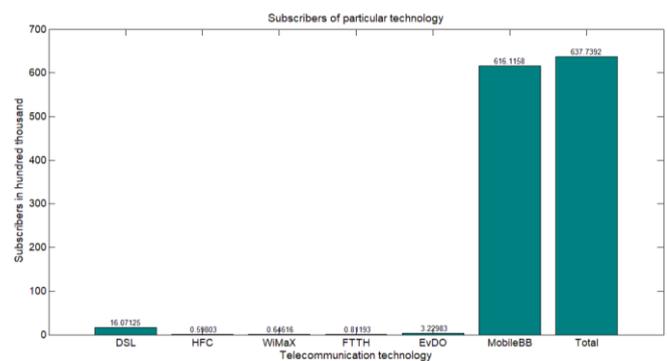- Mobile Broadband

Fig. 3. The number of subscribers of broadband technology.

Till the year 2013-14, DSL was the most popular method to have broadband access. But now the trend is moving towards mobile broadband. Presently there are more than 65 million broadband subscribers in Pakistan [13]. As per the end of the year 2018, 96.66% of the broadband subscribers are using mobile broadband services. The second most popular broadband technique which is subscribed by users is DSL services which a market share of 2.52% has followed by the Evolution-Data Optimized CDMA based network which has a market share of 0.5% only. Figure 3 shows the share of each technology.

3. Research Design

3.1. Research Process

The theoretical framework of this study is to identify and analyses the influence of socio-demographic characteristics in determining the choice of mobile phone services and internet services. Furthermore, this study also analyzes whether the respondents are satisfied with the customer services by the telecom operators or not? The null hypothesis for the present study is: There is no influence of socio-demographic characteristics in determining the choice of mobile phone and internet service providers among the residents of Lahore Pakistan. The alternate hypothesis is: there is a significant influence of socio-demographic characteristics in determining the choice of mobile phone and internet service providers among the residents of Lahore Pakistan.

Respondent's educational levels, monthly income, marital status, and living arrangements have no relationship with the choice for the selection of specific mobile phone and internet services providers in the operational hypotheses. The alternate operational hypotheses are respondent's educational levels, monthly income, marital status, and living arrangements have a strong relationship with the choice for the selection of specific mobile phone and internet services providers.

3.2. Research Design Tool

Data collection is done through a cross-sectional survey in which a questionnaire was developed. A quantitative cross-sectional survey methodology is adopted for this research. A cross-sectional survey is a type of observational study in which data is collected at a specific point in time and is analyzed subsequently. Since the aim is to assess consumer preferences at the given point in time, therefore the chosen method is best suited. Cross-sectional surveys are best suited for marketing research as it can gather data about the market's size and trends. While collecting the data online survey as well as face to face meetings are conducted to have sample collection from all walks of life. The following inclusion/exclusion criteria is applied.

3.3. Participants and Sample Design

The age of participants should be more than 18 years old and they will participate in the study is taken in prior. Another necessary parameter for choosing the participant for data collection is that the individuals must be active users of mobile phones and using some sort of internet services (either fixed or mobile internet). The individual must have a good understanding of English (as the questionnaire will only be developed in English). People with mental illness or not a resident of Lahore city (tourist, recreational, study trip individuals) were not be included in the study. The city of Lahore is chosen because it is the second-largest city of Pakistan and Lahore is home to people from a variety of social backgrounds. Although the results of convenient sampling are often not generalizable to the whole population it is a quick method of sampling especially when the sampling frame is not available. The unit of analysis in this research is individuals from which data is collected. The sampling frame consists of all residents of Lahore city meeting the inclusion/exclusion criteria. The sample size for this study is 377 calculated using an online sample size calculator, however, due to lack of resources, only 270 participants were tested.

3.4. Questionnaire Development

The questionnaire consists of three sections. In section one, participants' demographic data is obtained. In section two, there preferences and satisfaction with the mobile phone service provider is assessed. In the third and final section, there preferences and satisfaction with the internet service provider is assessed. There are be 7, 6, and 6 questions in sections I, II, and III respectively. The questionnaire is pilot tested on 10 members of the general public to ensure the face validity of the questionnaire. These 10 questionnaires are not included in the final analysis. In our case, there was no need to change the questions in the questionnaire.

3.5. Tools and Tests Used

Data is coded and entered into SPSS (Statistical Package for Social Sciences) version 22. Mean and standard deviation are calculated for contentious variables. The demographic of the participant is presented as frequencies and percentages. Chi-square test was used to assess the association between customer preference towards the mobile service provider and their social-demographic characteristics. Reliability analysis using Cronbach's alpha is also performed to test the reliability of the questionnaire.

4. Data Analysis and Results Interpretation

4.1. Demographic Characteristics of Participants

390 participants were approached, of which 270 agreed to participate. The demographic characteristics of the participants are detailed in Table 1. Most (174; 64.4%) of the participants were aged between 18 and 30 years. More than half (55.6%) participants were females and had a bachelor degree (59.3%). The complete demographic characteristics of the participants are given in Table 1.

Table 1. Demographic characteristics of participants.

Characteristics	Percentage
Age	
18-30	174 (64.4%)
31-40	74 (27.4%)
41-50	14 (5.2%)
>50	8 (2.96%)
Gender	
Male	120 (44.4%)
Female	150 (55.6%)
Highest Education Level	
Grade 10	3 (1.1%)
Grade 12	46 (17.0%)
Bachelor degree	160 (59.3%)
Master degree or above	61 (22.6%)
Marital Status	
Single/Separated/Divorced	157 (58.2%)
Married	113 (41.8%)
Income Status (PKR)	
No income/student	21 (7.8%)
Less than 30,000	21 (7.8%)
30000 – 50,000	105 (38.9%)
50,000 – 1,00,000	98 (36.3%)
>1,00,000	25 (9.3%)
Vehicle ownership by Family	
Yes	238 (88.1%)
No	32 (11.9%)
Living Arrangement	
Rented house	210 (77.8%)
Own a house/by parents	60 (22.2%)

4.2. Reliability Analysis

The reliability of the questionnaire was assessed using Cronbach's alpha. Cronbach's alpha value for the overall questionnaire was 0.72 (Acceptable). The Cronbach's alpha values for sections II and III were 0.73 and 0.71. The Cronbach's alpha value was not calculated for sociodemographic characteristics. The complete results of Cronbach's alpha are given in Table 2.

Table 2. Cronbach's alpha results.

Section	Cronbach's Alpha (CA)	CA based on standardized items	No. of items
Overall questionnaire	0.72132	0.7123	13
Section I	0.7325	0.7258	7
Section II	0.7112	0.7015	6

4.3. Preference and Satisfaction with Mobile Telephony

Mobilink (31.3%) was the most popular telephone network provider among the respondents followed by Ufone (23.3%), Warid (19.3), CMPak (14.4%), and Telenor (11.9) respectively. More than one-third of the participants (38.9%) had an outgoing call time between 31 and 60 minutes. Only 28 (10.4%) participants had an outgoing time for more than 60 minutes. The satisfaction with the quality of voice over telephone stratified by network provider is shown in Fig. 4. More than half of the participants were either satisfied or very satisfied with the voice quality. One hundred and thirteen participants felt that the price for the quality was fair. However, 54 (20%) participants felt that the price for the received telephony quality was expensive (Fig. 4). More than half felt that the customer services provided by the mobile network provider were fair (64.8%). Some participants (13.3%) felt that the customer service to be poor. Almost one third (30.7%) of the participants felt that they would leave the current mobile network provider if a good offer is advertised by the competitor.

Association between education level and mobile network provider is shown in Fig. 5. From the results, we can see that the users who have college education prefer to use Mobilink and CM Pak. Those users whose education level is a bachelor's degree tend to use Ufone and for Master and above qualification, Warid is the most popular network service provider.
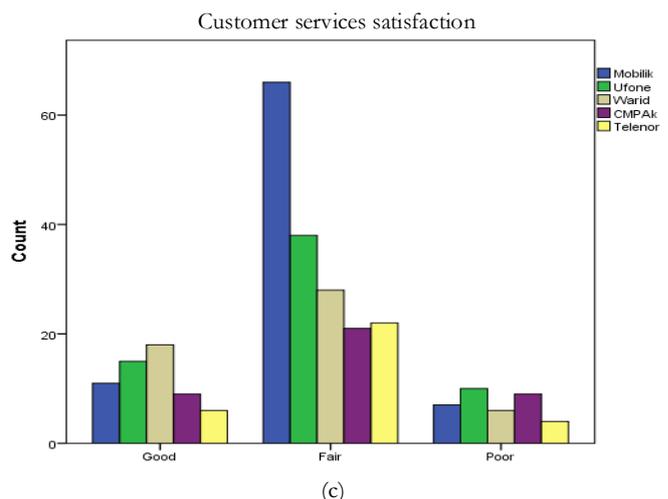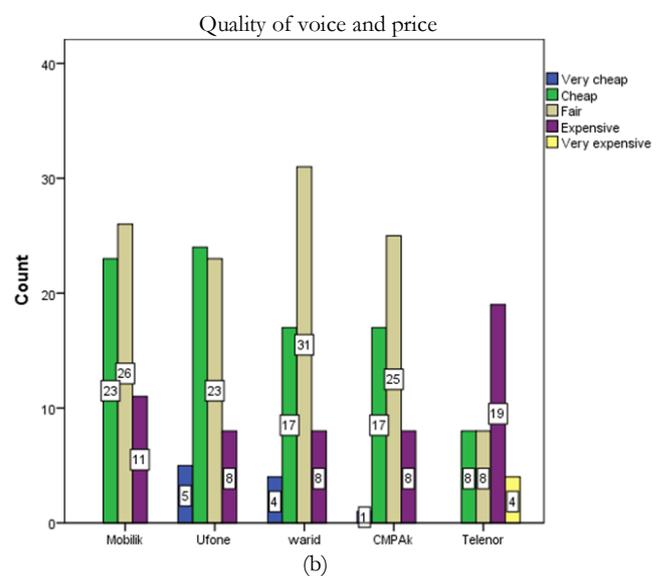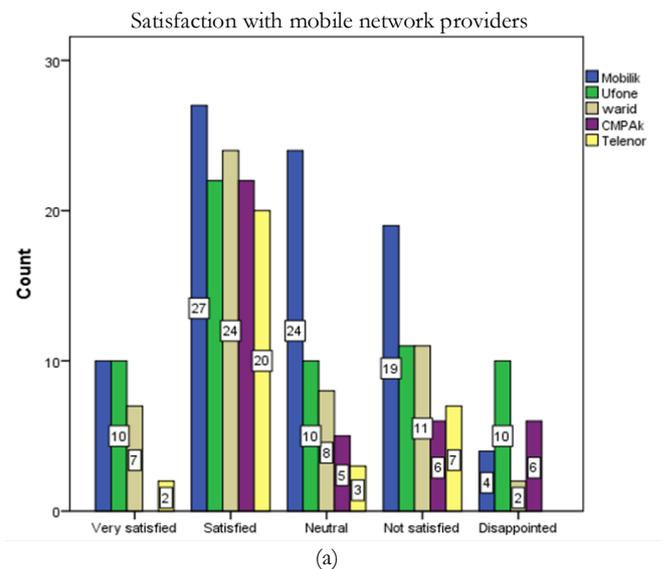

Fig. 4. (a). Satisfaction with the mobile network providers (b). Quality of voice and price (c). Customer services satisfaction.
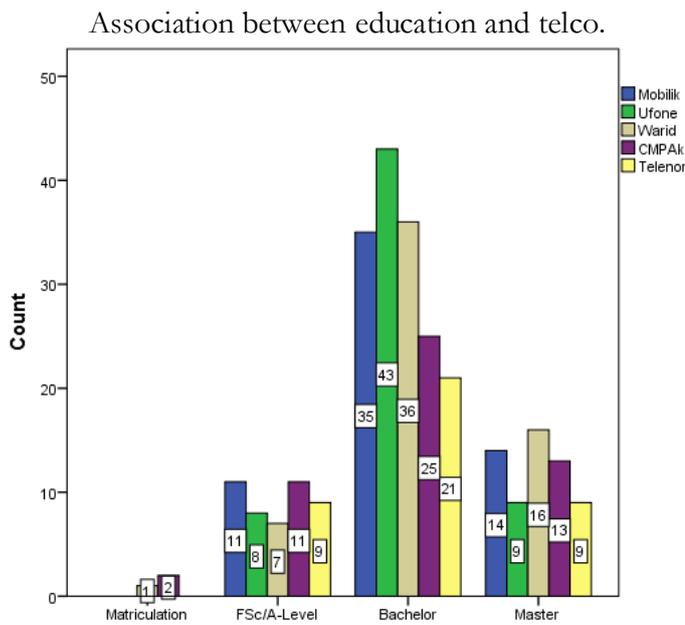
Fig. 5. Association between education level and mobile network provider.

According to our data, the most preferred network by females is Mobilink and among males is Warid. The complete data analysis is shown in Fig. 6.
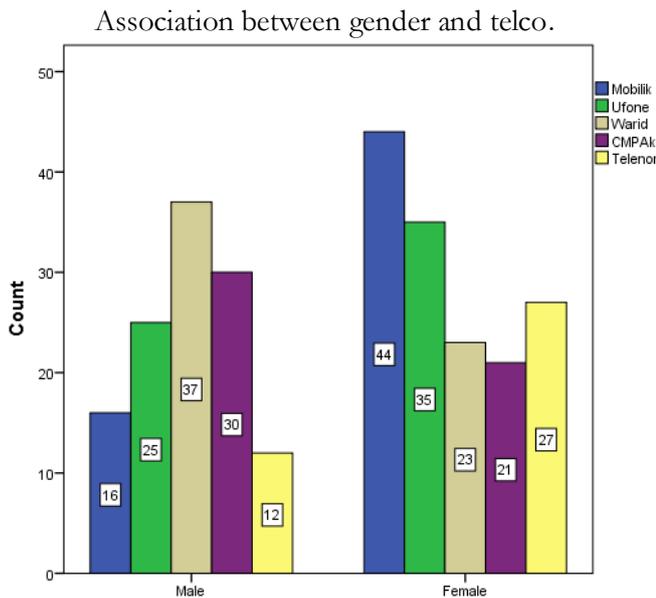

Fig. 6. Association between gender and mobile network provider

4.4. Preference and Satisfaction with Internet Service Provider

The situation for the internet service provider is quite different as compared to a mobile phone service provider. The majority (96.29%) of the participants were using mobile internet. The personal use of the internet for almost half of the participants (45.2%) was more than 5 GB. Only seven (2.6%) stated that they use less than 1 GB. After the mobile internet, the next widely used internet technology is DSL however, it counts only 2.96% (8 users).

Not sufficient participants were available to conclude a proper market insight for the rest of the technologies i.e. WiMAX, HFC, EvDO as there are only two majority players in the internet service provider domain. Figure 7 discusses the statistics of customer satisfaction of the internet.
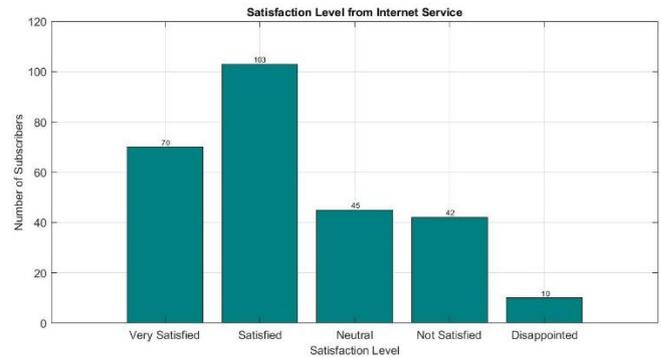

Fig. 7. Satisfaction level of internet service provider.

5. Limitation of the Research

There are a couple of limitations to the findings in the present study. Firstly, the target sample size was 377, but we were only able to achieve 270 samples, so our study is under powdered. Since the study was conducted only in Lahore city, Pakistan, therefore, the results may not be generalizable to the population of other cities. Since Lahore is the second-largest city of Pakistan, the views of people from small cities and other rural areas may differ from the views of participants of the present study. Due to the above-mentioned limitations, our results are liable to tier 1 and tier 2 errors. For the internet service provider data, for WiMAX and EvDO, there was no respondent and for HFC, there were only two respondents. The prime reason for such statistics is that these technologies are not making their impact in the market so very sparse user density for them. Therefore, no significant relationship can be established for socio-demographic characteristics and the choice of internet technology. Non-response bias occurs when people are unwilling or unable to respond to a survey due to a factor that makes them differ greatly from people who respond. For our study, non-respondents are few which don't make any impact on the results and the possible reason for non-respondents is the lack of technological awareness. Lastly, we did not perform a factor analysis for our questionnaire. However, face and content validity and reliability of the questionnaire have been performed.

6. Conclusion and Recommendations

From the results of our study, it can be concluded that there is a great variation among people in terms of their usage of mobile phones and internet services. However, not all the socio-demographics characteristics have significantly influenced the preference for specific telephony and internet service providers. In general, the

participants were satisfied with the quality of service which they are getting from their telephone and internet service providers, however, some participants were unhappy with the quality of services provided by telephone and internet service providers. Similarly, in general, customers believe that the price which they are paying to avail of any telecommunication service is fair. Furthermore, in general, the participants were happy with the quality of customer services and they were only willing to changes the telephone and internet services only if some other competitor offers a better grade of services.

The following are the recommendations based on our study for the telecommunication operators and service providers. There is a need to improve the quality of mobile phone and internet services. Participants usually prefer cheaper rates, the better quality of services and state of the art facilities in the domain of telecommunication industries. It is hoped that the market forces will determine the best rate and the quality of services to the customers. Last but not the least, we can see from the statistics that the end-user in the telecommunication network prefers wireless communication technologies and there is an exponential growth in the number of wireless communication users, the future generation networks should take care of this fact while designing their networks.

References

[1] T. Lupo and S. A. Delbari, "A knowledge-based exploratory framework to study quality of Italian mobile telecommunication services," *Telecommunication Systems*, vol. 68, no. 1, pp. 129-144, 2018.

[2] V. V. Glukhov, I. V. Ilin, and A. A. Lepekhin, "Towards business optimization and development of telecommunication companies: Tools analysis and their adaptation opportunities," in *Internet of Things, Smart Spaces, and Next Generation Networks and Systems*. Springer, 2018, pp. 471-482.

[3] Emerging Pakistan. (2019). *IT & Telecom | Emerging Pakistan* [Online]. Available: https://www.emergingpakistan.gov.pk/sectors/it-telecom/ [Accessed: 15 Jan. 2019]

[4] P. Viriri and M. Phiri, "Determinants of customer satisfaction in Zimbabwe telecommunication industry," *Journal of Communication*, vol. 8, no. 1, pp. 101-104, 2017.

[5] M. K. Kim, S. F. Wong, Y. Chang, and J. H. Park, "Determinants of customer loyalty in the Korean smartphone market: Moderating effects of usage characteristics," *Telematics and Informatics*, vol. 33, no. 4, pp. 936-949, 2016.

[6] M. S. Hanif, S. Yunfei, and M. I. Hanif, "Growth prospects, market challenges and policy measures: Evolution of mobile broadband in Pakistan," *Digital Policy, Regulation and Governance*, vol. 20, no. 1, pp. 42-61, 2018.

[7] S. Mustafa, M. Arshad, and N. Moin, "The potential of ICT SMEs in Pakistan," *Archives of Business Research*, vol. 6, no. 11, 2018.

[8] K. Ishii, "Internet use via mobile phone in Japan," *Telecommunications Policy*, vol. 28, no. 1, pp. 43-58, 2004.

[9] R. E. Rice and J. E. Katz, "Comparing internet and mobile phone usage: Digital divides of usage, adoption, and dropouts," *Telecommunications Policy*, vol. 27, no. 8-9, pp. 597-623, 2003.

[10] J. Lu, J. E. Yao, and C. S. Yu, "Personal innovativeness, social influences and adoption of wireless Internet services via mobile technology," *The Journal of Strategic Information Systems*, vol. 14, no. 3, pp. 245-268, 2005.

[11] D. Thamarapani, "The impact of telecommunication growth on the service sector: A cointegration analysis," *Journal of Management*, vol. 8, no. 1, pp. 58-69, 2013.

[12] A. Wilson, U. David, E. Beatrice, and O. Mary, "How telecommunication development aids economic growth: Evidence from ITU ICT development index (IDI) top five countries for African region," *International Journal of Business, Economics and Management*, vol. 1, no. 2, pp. 16-28, 2014.

[13] M. Saadi, T. Ahmad, M. Kamran Saleem, and L. Wuttisittikulkij, "Visible light communication–An architectural perspective on the applications and data rate improvement strategies," *Transactions on Emerging Telecommunications Technologies*, vol. 30, no. 2, p. e3436, 2019.

[14] P. K. Ray and S. Ray, "Resource-constrained innovation for emerging economies: The case of the Indian telecommunications industry," *IEEE Transactions on Engineering Management*, vol. 57, no. 1, pp. 144-156, 2009.

[15] V. Haridasan and S. Venkatesh, "CRM implementation in Indian telecom industry–Evaluating the effectiveness of mobile service providers using data envelopment analysis," *International Journal of Business Research and Management*, vol. 2, no. 3, pp. 110-127, 2011.

[16] M. Saadi, and L. Wuttisittikulkij, "Visible light communication—The journey so far," *Journal of Optical Communications*," vol. 40, no. 4, pp. 447-453, 2019.

[17] A. Singh and P. V. Ilavarasan, "Predicting consumer's complaint behavior in telecom service: An empirical study of India, Sri Lanka, and Bangladesh, in *Information and Communication Technology for Intelligent Systems*. Singapore: Springer, 2019, pp. 465-472.

[18] S. Y. Imtiaz, M. A. Khan, and M. Shakir, "Telecom sector of Pakistan: Potential, challenges and business opportunities," *Telematics and Informatics*, vol. 32, no. 2, pp. 254-258, 2015.

[19] Pakistan Telecommunication Authority. (2019). *Telecom Indicators* [Online]. Available:

https://www.pta.gov.pk/en/telecom-indicators [Accessed: 20 Feb. 2019]

[20] T. Arshad, M. F. Awan, T. Ahmad, and S. Qaisar, "Performance evaluation of mobile broadband cellular networks in Pakistan," in *2016 IEEE 41st Conference on Local Computer Networks Workshops (LCN Workshops)*, Nov. 2016, pp. 104-111.

[21] H. K. Hallingby, "The status of the mobile phone number as general purpose identifier–Elaboration on cases from Norway and Pakistan," in 27th European Regional Conference of the International Telecommunications Society (ITS), Cambridge, United Kingdom, 7th-9th September, 2016.

[22] K. K. Humborstad, "How governments are creating the business case for biometrics," *Biometric Technology Today*, vol. 2015, no. 7, pp. 9-11. 2015

Muhammad Saadi (F'16) received the Ph.D. degree in electrical engineering from Chulalongkorn University, Bangkok ,Thailand. He received his M.Sc and B.Sc degree from National University of Malaysia, Malaysia and National University of Computer and Emerging Sciences, Pakistan in year 2009 and 2007 respectively. He was with National Electronics and Computer Technology Centre, Aimagin Ltd., Thailand. He is currently an Assistant Professor with the Department of Electrical Engineering, University of Central Punjab, Pakistan. His current research interests include visible light communication, indoor localization and next generation networks. During his Ph.D. he received 90 years Chulalongkorn Scholarhsip in addition Dr. Saadi has received the best paper award twice in ITC-CSCC 2014 and ITC-CSCC 2015. He is regular reviewer of leading journals in the area of wireless communication.

Rabeel Manzoor, photograph and biography not available at the time of publication.

Waqas Tariq Toor, photograph and biography not available at the time of publication.

Sanika. K. Wijayasekara, photograph and biography not available at the time of publication.

Farhat Masood, photograph and biography not available at the time of publication.

Lunchakorn Wuttisittikulkij, photograph and biography not available at the time of publication.