

Gauging the Relation of Customer Satisfaction & Network Quality with Net Promoter Score (Zong)



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BUSINESS PROJECT ACCEPTANCE CERTIFICATE

It is Certified that final copy of EMBA Business Project written by Zaheer Ahmad Registration No. 328255 of EMBA 2K20 has been vetted by undersigned, found complete in all aspects as per NUST Statutes/Regulations/MS Policy, is free of errors, and mistakes and is accepted as fulfillment for award of EMBA degree. It is further certified that necessary amendments as pointed out by GEC members of the scholar have also been incorporated in the said business project.

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DECLARATION

I certify that this research work titled “*Gauging the relation of Customer Satisfaction and Network Quality with Net Promoter Score (Zong)*” is my own work. The work has not been presented elsewhere for assessment. The material that has been used from other sources it has been properly acknowledged / referred.

Zaheer Ahmad
EMBA-2020-328255

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With profound gratitude,

Zaheer Ahmad

ABSTRACT

The research project, titled "Gauging the Relation of Customer Satisfaction and Network Quality with Net Promoter Score," delves into the intricate web of relationships between customer satisfaction, Network quality of service (QoS), and the Net Promoter Score (NPS) for Zong. This study analyzes the data from the third and fourth quarters of 2022, aiming to untangle the critical connections between these key variables.

In this study, the backdrop of Pakistan's telecom landscape, where major players like Zong have played a pivotal role in transforming the industry. With a population exceeding 208 million people, Pakistan's telecom sector has become a crucial driver of digital inclusion, bridging remote communities with the global digital wave. The report highlights the sector's remarkable growth, with mobile and internet penetration soaring, transforming communication paradigms.

The core research variables are elucidated, with NPS taking center stage as the dependent variable. Customer Satisfaction is recognized as a crucial independent variable, while Network QoS assumes another pivotal role within the study. The Net Promoter Score, as an essential metric, provides businesses with profound insights into how customers perceive their products, services, or overall brand. By asking a simple but profound question, "How likely are you to recommend us to a friend or colleague?" on a scale from 0 to 10, the NPS categorizes customers into promoters, passives, and detractors. This methodology offers several benefits to businesses, including a standardized approach to measure customer loyalty and a focus on actionable feedback.

The research project's findings, based on multi-variable regression analysis, underscore a robust correlation between NPS, Customer Satisfaction, and Network QoS. Cities with higher Customer Satisfaction and superior Network QoS tend to exhibit more favorable NPS scores. The report concludes with practical recommendations for elevating both Network QoS and Customer Satisfaction, recognizing their direct impact on subscriber base and Average Revenue Per User (ARPU). This research provides valuable insights into the intricate dynamics of customer perception, network quality, and business success within Pakistan's telecom sector.

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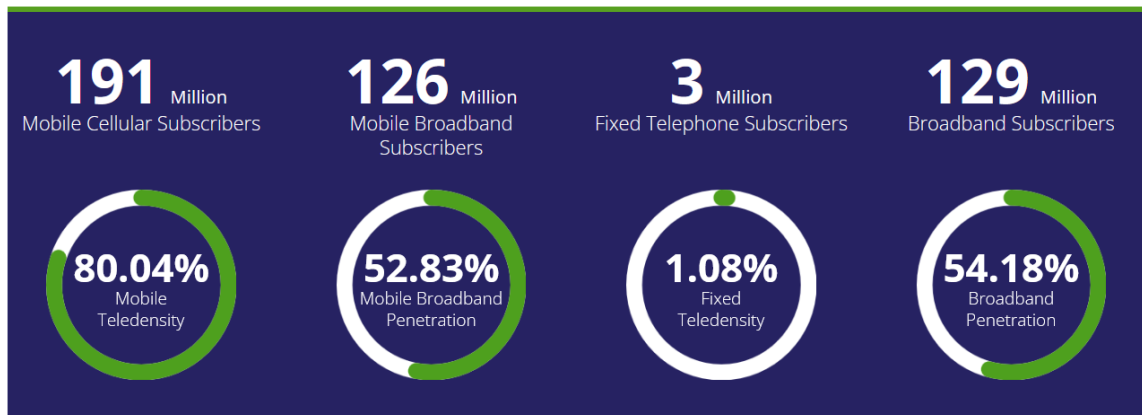
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CHAPTER 1: INTRODUCTION

1.1 Telecom Landscape of Pakistan

The telecom landscape of Pakistan has undergone a transformative journey, catalyzed by technological advancements and favorable regulatory reforms. With over 208 million people, Pakistan's telecom sector has become a vital driver of digital inclusion, connecting remote communities to the global digital wave. The nation's mobile and internet penetration has surged remarkably, reshaping communication paradigms. As per available data from Pakistan Telecommunication Authority (PTA), Tele density in Pakistan has crossed 80% of the population, whereas, 53% is the mobile broadband penetration.



* Figures are updated as of Jul 2023.

Figure 1.1 Tele density of Pakistan

Following key telecom operators have been instrumental in this evolution.

- **PTCL:**

A pioneering provider, PTCL offers nationwide landline and broadband services. Its contributions span from basic communication to critical business connectivity.

- **MOBILINK JAZZ:**

Leading in mobile networks, it serves millions with diverse communication options. Jazz's 4G services have made high-speed internet accessible to a wider demographic.

- **TELENOR:**

Renowned for innovation, Telenor enhances digital transformation through mobile and data services. It has introduced novel initiatives in financial technology and digital empowerment.

- **ZONG:**

With a robust 4G network, Zong caters to high-speed connectivity demands. Its rapid growth signifies the increasing appetite for data-driven services.

- **UFONE:**

Offering distinct voice and data services, Ufone has carved a significant market niche. Its customer-centric approach reflects in its user-friendly offerings.

- **SCO:**

Focusing on remote regions, SCO facilitates connectivity in challenging terrains. Its efforts are bridging the digital divide in less accessible areas.

- **WATEEN TELECOM:**

A significant broadband player, Wateen promotes internet access expansion. Its contributions are pivotal in fostering digital literacy and online services.

Following are the key operator-wise market share and subscribers trends.:

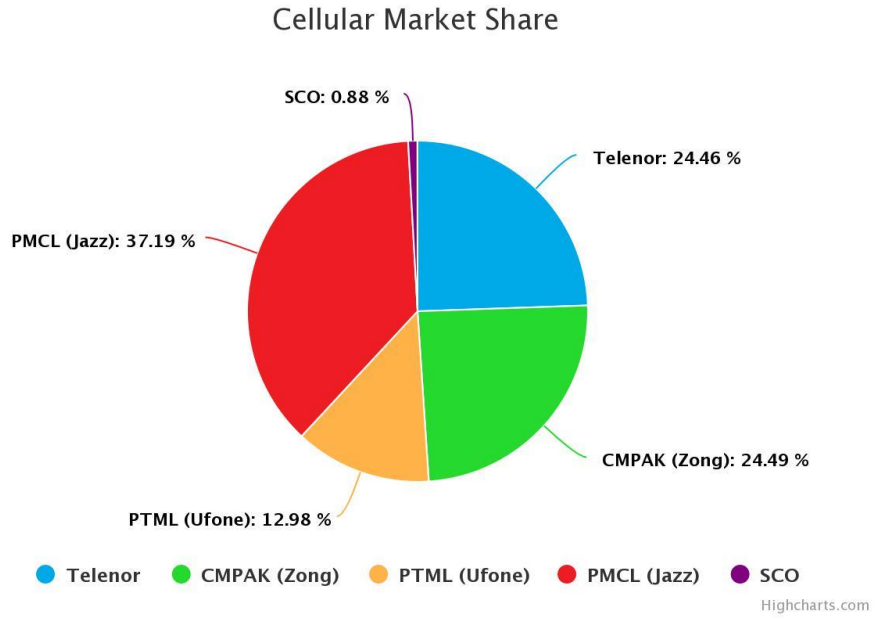


Figure 1.2 Cellular Market Share of Pakistan

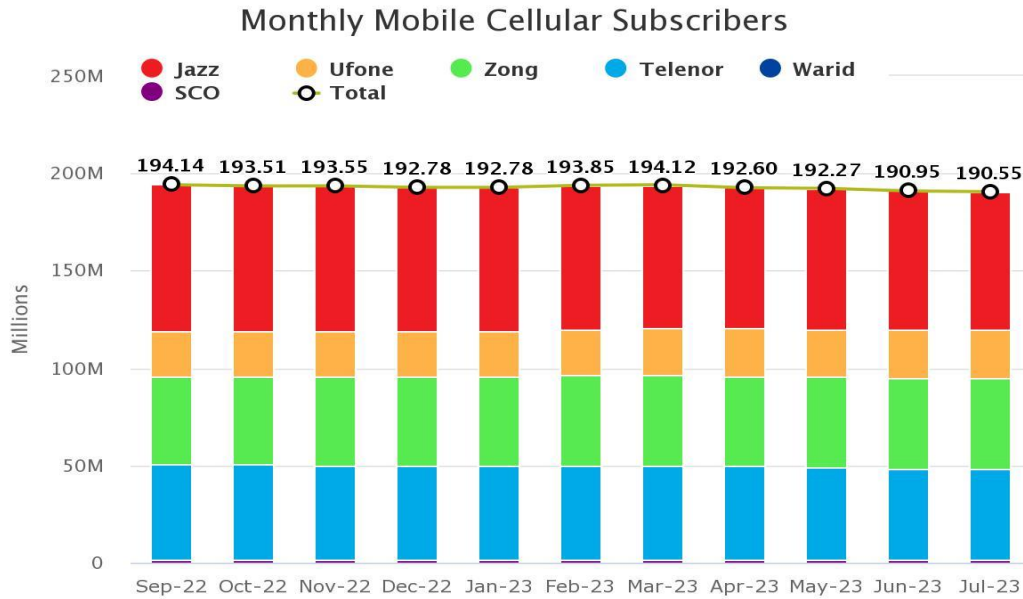


Figure 1.3 Operator-wise Cellular Subscribers

Category	Jazz	Ufone	Zong	Telenor	Warid	SCO	Total
Sep-22	75008289	23472217	44801737	49191137	0	1669747	194143127
Oct-22	74592587	23463540	45005051	48769202	0	1680479	193510859
Nov-22	74625597	23508786	45208550	48531425	0	1676533	193550891
Dec-22	73696223	23558141	45430622	48415495	0	1679063	192779544
Jan-23	73432773	23661518	45735278	48285002	0	1662745	192777316
Feb-23	73784666	23894076	46101716	48414488	0	1657193	193852139
Mar-23	73673067	24154596	46365690	48283490	0	1646567	194123410
Apr-23	72418082	24223082	46355196	47964189	0	1637029	192597578
May-23	72357409	24303909	46462746	47481359	0	1667877	192273300
Jun-23	71334141	24503956	46512493	46921677	0	1676367	190948634
Jul-23	70864146	24730951	46669804	46599799	0	1682811	190547511

This exploration of Pakistan's telecom landscape delves into these operators, regulatory frameworks, and challenges, showcasing the sector's impact on society and the economy. The industry's growth is underscored by the rise in mobile subscriptions from 75 million in 2010 to over 191 million in 2023, reflecting a burgeoning digital shift. This transformation not only signifies enhanced communication but also opens doors for economic growth, innovation, and societal progress.

1.2 Brief Introduction of Zong

China Mobile Pakistan (CMPak) is a 100% owned subsidiary of China Mobile Communications Corporation, one of the largest mobile operators in the world. The pioneering overseas set up of China Mobile came through acquisition of a license from Millicom to operate a GSM network in Pakistan. Taken over in 2007 with a market share of only 2%, Zong has seen exponential growth in the last few years to increase to 24.5%.

Currently, CMPak engages in the provision of cellular mobile voice and data services to the Pakistani market through 2G, 3G and 4G technologies and is eyeing for 5G technology. The company was the first operator network in Pakistan to invest in 4G services and the only telecom company to make full payments for the acquisition of 4G.

Consequently, CMPak owns the widest 4G network and 4G subscriber base across Pakistan. The company has successfully established its network of over 14,000 4G sites in around 300 cities, with an investment of approximately US\$3 billion dollars and has created more than 300 thousand direct and indirect employment opportunities across Pakistan. With a vision to lead the digital revolution in Pakistan, Zong 4G has defined its business strategy in line with Pakistan's digital agenda and is spearheading the country through its unmatched and innovative products, services and solutions.

As a responsible corporate organization, over the past 15 years Zong has focused its inclusive sustainability efforts on uplifting the underprivileged strata of the society through long-term projects ranging from Digital Intelligent Innovation focusing on eeducation, e-health, Green and low carbon and inclusive growth. The company provides freelance trainings to children and youngsters of different age groups in collaboration with various orphanages, old age homes, and schools. The company also committed to building vocational centers for girls and women, teaching them different skills in order to ensure financial independence and social empowerment. Zong 4G stands as an award-winning network in Pakistan and has won several recognitions and accolades for its outstanding customer services, best network quality, innovative products and impeccable array of customer-centric solutions and services.

1.3 Problem Statement – Surviving in a highly saturated industry

The telecom industry in Pakistan has reached a state of saturation, characterized by intense competition and limited growth opportunities. Several factors contribute to this saturation:

1. Market Saturation:

Pakistan boasts a high mobile penetration rate, with nearly every citizen owning a mobile phone. This leaves little room for new subscribers, as the market approaches its saturation point.

2. Price Wars:

Fierce competition has led to price wars among telecom operators, resulting in declining average revenue per user (ARPU). This hinders the profitability and sustainability of the industry.

3. Regulatory Hurdles:

Frequent regulatory changes and taxation policies have put pressure on telecom operators' margins, making it challenging to invest in network expansion and innovation.

4. Economic Factors:

Pakistan's economic challenges, including inflation and low GDP growth, have constrained consumer spending on telecom services.

5. Limited Rural Expansion:

Telecom companies have largely tapped into urban markets, leaving rural areas underserved due to the high cost of infrastructure development

A study of London School of Economics (LSE) depicts that The growth of a company is closely tied to the advocacy it receives through word of mouth (Marsden, 2005). The more clients, customers, or consumers who act as advocates, the greater the potential for growth. Even a relatively small improvement in the company's net promoter score, which is calculated by subtracting detractors from promoters in terms of word of mouth, can have a significant impact. Increasing this score by just 7 points can lead to an average growth boost of 1%. Similarly, a reduction in negative word-of-mouth by 2% can unlock an additional 1% in growth. Notably, companies with above-average net promoter scores tend to experience growth rates four times faster than those with below-average scores.

CHAPTER 2: RESEARCH VARIABLES & MODELING

In this research project, relation of Customer Satisfaction and Network quality with Net Promoter Score of Zong has been gauged. Customer Satisfaction (CS) and Network Quality of Service (QoS) are Independent variables (IV), whereas, Net Promoter Score (NPS) is Dependent variable (DV). The Data of 2 quarters Q3, & Q4 of 2022 has been used for this analysis.

2.1 Net Promoter Score

Net Promoter Score (NPS) is an independent variable (DV) in this analysis. NPS provides businesses with insights into how customers perceive their products, services, or overall brand. It goes beyond traditional satisfaction surveys by focusing on a fundamental question: "How likely are you to recommend us to a friend or colleague?" This question is typically answered on a scale from 0 to 10.

Based on the responses, customers are categorized into three groups:

a) Promoters (Score 9-10):

These are customers who are not only satisfied with your offerings but are also enthusiastic about them. They are likely to actively promote your brand and refer others.

b) Passives (Score 7-8):

Passives are satisfied customers, but they are not overly enthusiastic. They are unlikely to actively promote your brand but are also unlikely to speak negatively about it.

c) Detractors (Score 0-6):

Detractors are dissatisfied customers who may have had a negative experience with your product or service. They could potentially spread negative word-of-mouth and harm your brand's reputation.

The Net Promoter Score is calculated by subtracting the percentage of detractors from the percentage of promoters. The resulting score ranges from -100 to 100. A positive score indicates that you have more promoters than detractors, which is a good sign of customer loyalty and satisfaction. Conversely, a negative score suggests that you have more detractors than promoters, indicating areas that need improvement.

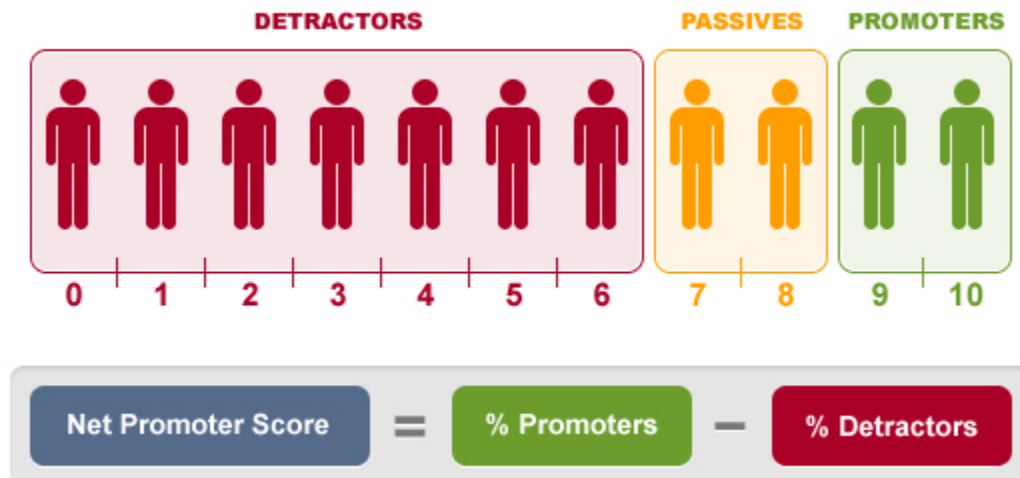


Figure 1.4 Net Promoter Score

NPS offers several benefits to businesses, including a simple and standardized way to measure customer loyalty, a focus on actionable feedback, and the ability to benchmark against competitors and industry standards. However, it's important to remember that while NPS is a valuable tool, it should be used in conjunction with other metrics and qualitative data to gain a comprehensive understanding of customer sentiment.

Here's an example breakdown:

- Promoters: 60%
- Passives: 25%
- Detractors: 15%

$$\text{NPS} = \text{Promoters} - \text{Detractors} \text{ NPS} = 60\% - 15\% = 45$$

A Net Promoter Score of 45 indicates a relatively positive level of customer satisfaction and loyalty. A study from London School of Economics (LSE) depicts that a 7 Points growth of NPS may lead to 1% revenue growth.

The Data in the below table related to Q3 & Q4 (2022) data of NPS. Further division has been done into three regions: North, Central & South. North covers KPK, GB, AJK and a few cities of Punjab like Rawalpindi, Islamabad. Central Region covers mainly Punjab, whereas, South region covers Sindh and Baluchistan provinces of Pakistan.

SAMPLED NPS SCORE (Q3 & Q4, 2022)									
Quarter	Region	Sample Size	NPS Score	Promoters	Passives	Detractors	High ARPU	Medium ARPU	Low ARPU
Q3-2022	NWD	2400	21%	46%	29%	25%	20%	21%	19%
Q3-2022	North	1700	14%	38%	38%	24%	13%	17%	11%
Q3-2022	Central	1700	22%	41%	40%	19%	23%	25%	25%
Q3-2022	South	1700	22%	35%	52%	13%	22%	22%	23%
Q4-2022	NWD	2600	23%	52%	18%	30%	20%	21%	30%
Q4-2022	North	1500	14%	44%	26%	30%	10%	8%	33%
Q4-2022	Central	1500	42%	63%	16%	21%	36%	44%	55%
Q4-2022	South	1500	32%	57%	18%	25%	34%	33%	29%

Table 2.1 NPS Score (Q3 & Q4 2022)

2.2 Network Quality of Service

Telecom Network Quality of Service (QoS) is one Independent variable (IV). QoS refers to the set of parameters and standards that govern the performance and reliability of telecommunications services offered by network operators. QoS ensures that users experience consistent and satisfactory service levels, regardless of the type of communication, data transfer, or application they are using.

In the context of Pakistan, the Pakistan Telecommunication Authority (PTA) is responsible for defining and enforcing QoS regulations to maintain the integrity and effectiveness of telecom services.

PTA defines and enforces QoS standards that telecom operators must adhere to. These standards cover various aspects of network performance, including:

i. Call Quality:

PTA sets standards for call clarity, voice transmission, and call setup times to ensure that voice communication remains clear and uninterrupted.

ii. Data Speed and Reliability:

QoS standards encompass the speed and reliability of mobile data and broadband connections. These standards ensure that users receive the promised data speeds and that the service remains reliable.

iii. Coverage and Availability:

PTA monitors the coverage and availability of mobile networks to ensure that users have access to services in both urban and rural areas.

iv. Internet Latency and Jitter:

For online applications like video streaming and online gaming, PTA sets standards for latency (delay) and jitter (variation in latency) to provide a seamless experience.

v. Network Resilience and Redundancy:

PTA may require operators to have redundancy and failover mechanisms in place to minimize service disruptions during network failures.

vi. Customer Complaints Handling:

Telecom operators are required to have efficient customer complaint resolution mechanisms to address user grievances related to QoS issues promptly.

vii. Emergency Services Support:

QoS standards may include provisions to ensure that emergency calls (like 911) are prioritized and have unhindered access to the network.

PTA conducts regular audits and assessments to ensure that telecom operators comply with these QoS standards. Non-compliance may lead to penalties, warnings, or other regulatory actions to safeguard consumer interests and maintain the quality of telecommunications services across Pakistan. The goal of PTA's QoS regulations is to provide a high level of service quality to consumers while fostering healthy competition and technological advancements within the telecommunications sector.

To gauge the QoS, PTA conducts regular surveys and publishes Quarterly Reports in this regard. These Reports may also lead to penalties for different mobile operators of Pakistan.

For this research, PTA's QoS reports of Q3 & Q4 (2022) have been considered. Data has been sampled for 29 cities throughout the country.

QUARTER	REGION	SAMPLED CITIES	Network Accessibility > 99%	Call Setup Success Rate > 98%	SMS Success Rate > 99%	User Data Throughput Download - Fixed Duration > 2/3Mbps	User Data Throughput Upload - Fixed Duration > 512/786 Kbps	Signal Strength (RSRP) > -100dBm
Q3 -2022	CENTRAL	PAK PATTAN	1.000	0.99	0.99	10.4	21940	-80.4
Q3 -2022	CENTRAL	HAFIZABAD	1.000	1.00	1.00	11.98	21280	-82.9
Q3 -2022	CENTRAL	WAZIRABAD	1.000	1.00	1.00	27.43	24956	-82.7
Q3 -2022	CENTRAL	LODHRAN	1.000	0.99	1.00	4.65	16035	-75.5
Q3 -2022	NORTH	RAWALPINDI	1.000	0.99	1.00	15.98	19484	-77.2
Q3 -2022	NORTH	ATTOCK	1.000	0.99	0.99	8.89	17390	-78.3
Q3 -2022	SOUTH	HYDERABAD	1.000	0.98	0.99	14.28	22657	-78.7
Q3 -2022	SOUTH	KARACHI	1.000	1.00	1.00	21.6	23545	-74.9
Q3 -2022	SOUTH	KHANPUR	1.000	1.00	1.00	6.19	19114	-77.8
Q4-2022	CENTRAL	BHAKKAR	1.000	0.99	0.99	29.82	19503	-79
Q4-2022	CENTRAL	BUREWALA	1.000	1.00	0.99	11.3	14515	-78
Q4-2022	NORTH	CHAKWAL	1.000	0.99	1.00	21.38	26289	-76.5
Q4-2022	CENTRAL	FAISALABAD	0.999	0.98	0.99	29.29	9257	-79.4
Q4-2022	NORTH	JEHLUM	1.000	1.00	1.00	20.31	20709	-82.5
Q4-2022	CENTRAL	LAYYAH	1.000	1.00	0.99	7.8	16873	-80.5
Q4-2022	CENTRAL	OKARA	1.000	0.99	1.00	22.69	19353	-72.5
Q4-2022	CENTRAL	SAHIWAL	1.000	0.99	0.98	20.8	17568	-78.9
Q4-2022	CENTRAL	GOJRA	1.000	0.99	0.98	27.09	16330	-86.4
Q4-2022	CENTRAL	MANDI BAHAUDDIN	1.000	1.00	0.99	18.37	13602	-82.2
Q4-2022	CENTRAL	SHAKARGARH	1.000	0.99	1.00	23.41	16371	-78.6
Q4-2022	NORTH	ATTOCK	1.000	0.99	0.99	20.07	18055	-78.5
Q4-2022	NORTH	BANNU	1.000	0.98	0.98	25.01	18028	-84.3
Q4-2022	NORTH	HARIPUR	1.000	0.97	1.00	14.44	18588	-79.8

Q4-2022	NORTH	KOHAT	1.000	0.99	0.99	29.85	23180	-82
Q4-2022	NORTH	MANSEHRA	1.000	0.99	0.99	11.75	19977	-77.7
Q4-2022	NORTH	PESHAWAR	1.000	0.97	0.98	20.57	20101	-80.8
Q4-2022	SOUTH	QUETTA	1.000	0.97	0.93	16.41	16877	-75.4
Q4-2022	SOUTH	ZHOB	1.000	0.99	0.88	13.87	18612	-74.7
Q4-2022	SOUTH	ZIARAT	1.000	0.99	1.00	34.88	23266	-83.2

Table 2.2 City-wise QoS Score (Q3 & Q4 2022)

PTA QoS RESULTS (Q3-2022)						
Region	Average of Network Accessibility	Average of SMS Success Rate	Average of Call Setup Success Rate	Average of User Data Throughput Download - Fixed Duration > 2/3Mbps	Average of User Data Throughput Upload - Fixed Duration > 512/786 Kbps	Average of Signal Strength (RSRP) > -100dBm
CENTRAL	99.9950%	99.77%	99.48%	13.615	21052.75	-80.375
NORTH	99.9950%	99.35%	98.64%	12.435	18437	-77.75
SOUTH	100.0000%	99.29%	99.07%	14.02333333	21772	-77.13333333
NWD	99.9967%	99.51%	99.16%	13.48888889	20711.22222	-78.71111111

Table 2.3 Region-wise QoS Score (Q3 2022)

PTA QoS RESULTS (Q4-2022)						
Region	Average of Network Accessibility	Average of SMS Success Rate	Average of Call Setup Success Rate	Average of User Data Throughput Download - Fixed Duration > 2/3Mbps	Average of User Data Throughput Upload - Fixed Duration > 512/786 Kbps	Average of Signal Strength (RSRP) > -100dBm
CENTRAL	99.9610%	97.93%	98.93%	23.559	15875.1	-80.73
NORTH	99.9925%	99.03%	98.58%	20.4225	20615.875	-80.2625
SOUTH	99.9925%	94.13%	98.03%	18.7575	17020.75	-79.1
NWD	99.9782%	97.64%	98.64%	21.54545455	17807.31818	-80.26363636

Table 2.4 Region-wise QoS Score (Q4 2022)

Region	QoS Score	
	Q3-2022	Q4-2022
NWD Score	99.778%	99.376%
North	99.831%	99.600%
Central	99.874%	99.470%
South	99.727%	98.692%

Table 2.5 Overall QoS Score (Q3 & Q4 2022)

2.3 Customer Satisfaction

Customer satisfaction is second Independent variables (IV). Customer Satisfaction refers to the level of contentment, approval, and overall positive sentiment that customers experience when interacting with a company's products, services, or brand. It is a key metric used by businesses to gauge how well they are meeting their customers' needs and expectations.

High customer satisfaction is a desirable outcome for businesses for several reasons:

i. Repeat Business:

Satisfied customers are more likely to become repeat customers, which can lead to increased sales and revenue.

ii. Customer Loyalty:

Customers who are satisfied are more likely to remain loyal to a brand, reducing the chances of them switching to competitors.

iii. Positive Word of Mouth:

Satisfied customers are more inclined to share their positive experiences with others, leading to organic, positive word-of-mouth marketing.

iv. Brand Reputation:

Consistently high levels of customer satisfaction contribute to a positive brand reputation, which can attract new customers.

v. Reduced Complaints and Returns:

Satisfied customers are less likely to have complaints about products or services, leading to fewer returns and associated costs.

Customer satisfaction and Net Promoter Score (NPS) are closely related metrics, and the impact of customer satisfaction on NPS is significant. Customer satisfaction forms the foundation upon which NPS is built, and improvements in customer satisfaction often lead to higher NPS scores. Here's how customer satisfaction affects NPS:

a. Loyalty and Advocacy:

Customer satisfaction is a measure of how content and pleased customers are with a company's products, services, and interactions. Satisfied customers are more likely to have a positive perception of the company and its offerings. When customers are satisfied, they tend to become promoters, meaning they are more likely to recommend the company to others. This positive sentiment drives higher NPS scores, as NPS specifically measures customers' likelihood to recommend.

b. Positive Word of Mouth:

Satisfied customers are more inclined to share their positive experiences with friends, family, and colleagues. When customers are satisfied, they naturally become advocates for the company, leading to organic word-of-mouth marketing. This advocacy contributes to higher NPS scores, as it aligns with the NPS question about recommending the company.

c. Lower Detractor Rates:

Detractors are customers who are unhappy with a company's products or services. Higher levels of customer satisfaction mean that there are fewer dissatisfied customers who would fall into the detractor category. Reducing the number of detractors directly impacts the NPS calculation by increasing the percentage of promoters relative to detractors.

d. Retained and Loyal Customer Base:

Satisfied customers are more likely to stay loyal to a company over time. When customers are satisfied, they have less reason to switch to competitors. This leads to a higher proportion of loyal customers who are willing to recommend the company, driving up the NPS.

e. Feedback and Improvement:

Customer satisfaction feedback often highlights areas for improvement. When a company takes proactive steps to address customer concerns and enhance the overall experience, it results in improved satisfaction levels. This, in turn, can lead to increased NPS scores as customers recognize and appreciate the company's efforts.

f. Long-Term Value:

Satisfied customers are more likely to engage in repeat business, make additional purchases, and maintain longer relationships with a company. This long-term value that satisfied customers bring aligns with the concept of NPS, which seeks to measure customers' long-term loyalty and value.

In essence, customer satisfaction is a driving force behind NPS. While customer satisfaction measures the general contentment of customers, NPS specifically focuses on measuring customers' likelihood to recommend. The more satisfied customers are, the higher the likelihood they will recommend the company, resulting in a positive impact on NPS scores. Therefore, efforts to enhance customer satisfaction often lead to improved NPS and, in turn, greater customer loyalty and business success.

For this research, Customer Complaint and Satisfaction reports of Q3 & Q4 (2022) have been considered. Data has been sampled for 29 cities throughout the country just like QoS reports of PTA.

Quarter	REGION	SAMPLED CITIES	Customer Satisfaction
Q3 -2022	CENTRAL	PAK PATTAN	73.85%
Q3 -2022	CENTRAL	HAFIZABAD	74.23%
Q3 -2022	CENTRAL	WAZIRABAD	75.00%
Q3 -2022	CENTRAL	LODHRAN	74.29%
Q3 -2022	NORTH	RAWALPINDI	62.10%
Q3 -2022	NORTH	ATTOCK	64.31%
Q3 -2022	SOUTH	HYDERABAD	70.96%
Q3 -2022	SOUTH	KARACHI	71.98%
Q3 -2022	SOUTH	KHANPUR	75.00%
Q4-2022	CENTRAL	BHAKKAR	83.26%
Q4-2022	CENTRAL	BUREWALA	85.04%
Q4-2022	NORTH	CHAKWAL	62.20%
Q4-2022	CENTRAL	FAISALABAD	82.83%
Q4-2022	NORTH	JEHLUM	66.00%
Q4-2022	CENTRAL	LAYYAH	84.99%
Q4-2022	CENTRAL	OKARA	84.58%
Q4-2022	CENTRAL	SAHIWAL	83.67%
Q4-2022	CENTRAL	GOJRA	84.31%
Q4-2022	CENTRAL	MANDI BHAUDDIN	85.81%
Q4-2022	CENTRAL	SHAKARGARH	84.13%
Q4-2022	NORTH	ATTOCK	61.31%
Q4-2022	NORTH	BANNU	61.12%
Q4-2022	NORTH	HARIPUR	62.12%
Q4-2022	NORTH	KOHAT	60.30%
Q4-2022	NORTH	MANSEHRA	62.53%
Q4-2022	NORTH	PESHAWAR	60.51%
Q4-2022	SOUTH	QUETTA	74.50%
Q4-2022	SOUTH	ZHOB	72.73%
Q4-2022	SOUTH	ZIARAT	100.00%

Table 2.6 City-wise CS Scores (Q3 & Q4 2022)

2.4 Variables scaling

In this section, scaling of all the three variables has been done to simplify the data for onwards analysis on SPSS. The scaling has been done from 0 to 3. Below are the definitions of this scaling:

- 0: Poor
- 1: Satisfactory
- 2: Good
- 3: Excellent

Scaling of NPS, Customer Satisfaction and QoS				
	0	1	2	3
QoS	Poor	Satisfactory	Good	Excellent
	95% - 97.90%	97.90% - 99.33%	99.34% - 99.39%	99.39% - 100%
Satisfaction	Poor	Satisfactory	Good	Excellent
	30% - 50%	51% - 66%	67% - 72%	70% - 100%
NPS	Poor	Below Industry Average	Industry Average	Above Industry Average
	0% - 10%	11% - 20%	21%	22% - 50%

Table 2.7 DV & IV scaling

QUARTER	REGION	SAMPLED CITIES	Actual Numbers			Scaled Numbers		
			QoS	CUSTOMER SATISFACTION (CS)	NPS	Overall QoS	Overall Satisfaction	Overall NPS
Q3 -2022	CENTRAL	PAK PATTAN	99.74%	73.85%	22%	3	3	3
Q3 -2022	CENTRAL	HAFIZABAD	99.92%	74.23%	22%	3	3	3
Q3 -2022	CENTRAL	WAZIRABAD	99.95%	75.00%	22%	3	3	3
Q3 -2022	CENTRAL	LODHRAN	99.88%	74.29%	22%	3	3	3
Q3 -2022	NORTH	RAWALPINDI	99.70%	62.10%	14%	3	1	1
Q3 -2022	NORTH	ATTOCK	99.63%	64.31%	14%	3	1	1
Q3 -2022	SOUTH	HYDERABAD	99.46%	70.96%	22%	3	2	3

Q3 -2022	SOUTH	KARACHI	99.83%	71.98%	22%	3	2	3
Q3 -2022	SOUTH	KHANPUR	97.98%	75.00%	22%	1	3	3
Q4-2022	CENTRAL	BHAKKAR	99.66%	83.26%	42%	3	3	3
Q4-2022	CENTRAL	BUREWALA	99.81%	85.04%	42%	3	3	3
Q4-2022	NORTH	CHAKWAL	99.84%	62.20%	14%	3	1	1
Q4-2022	CENTRAL	FAISALABAD	99.39%	82.83%	42%	3	3	3
Q4-2022	NORTH	JEHLUM	100.00%	66.00%	14%	3	1	1
Q4-2022	CENTRAL	LAYYAH	99.90%	84.99%	42%	3	3	3
Q4-2022	CENTRAL	OKARA	99.80%	84.58%	42%	3	3	3
Q4-2022	CENTRAL	SAHIWAL	99.63%	83.67%	42%	3	3	3
Q4-2022	CENTRAL	GOJRA	99.67%	84.31%	42%	3	3	3
Q4-2022	CENTRAL	MANDI BAHAUDDIN	99.93%	85.81%	42%	3	3	3
Q4-2022	CENTRAL	SHAKARGARH	99.78%	84.13%	42%	3	3	3
Q4-2022	NORTH	ATTOCK	98.56%	61.31%	14%	1	1	1
Q4-2022	NORTH	BANNU	97.48%	61.12%	14%	0	1	1
Q4-2022	NORTH	HARIPUR	98.10%	62.12%	14%	1	1	1
Q4-2022	NORTH	KOHAT	98.69%	60.30%	14%	1	1	1
Q4-2022	NORTH	MANSEHRA	98.63%	62.53%	14%	1	1	1
Q4-2022	NORTH	PESHAWAR	98.24%	60.51%	14%	1	1	1
Q4-2022	SOUTH	QUETTA	98.17%	74.50%	32%	1	3	3
Q4-2022	SOUTH	ZHOB	97.94%	72.73%	32%	1	3	3
Q4-2022	SOUTH	ZIARAT	98.10%	100.00%	32%	1	3	3

Table 2.8 NPS, CS & QoS Scaling

CHAPTER 3: REGRESSION RESULTS AND CONCLUSION

3.1 Multi-variables Regression Analysis

Multi-variable regression analysis is a statistical technique used to understand the relationship between a dependent variable and two or more independent variables. It builds upon the concept of simple linear regression, which involves examining the relationship between a dependent variable and a single independent variable.

In multi-variable regression, the aim is to investigate how changes in multiple independent variables relate to changes in the dependent variable while considering the influence of other variables. This approach is valuable when you want to assess how various factors collectively impact the outcome variable.

i. Data Collection:

Gather a dataset containing information on the dependent variable and several independent variables for each observation.

ii. Model Specification:

Choose a statistical model that represents the relationships among the variables. In multi-variable regression, the model is typically represented as an equation that includes the dependent variable and multiple independent variables, each with their respective coefficients.

iii. Parameter Estimation:

Employ statistical methods to estimate the coefficients in the regression equation. The goal is to find the coefficients that best match the observed data.

iv. Hypothesis Testing:

Conduct tests to determine if the coefficients are statistically significant. This helps identify which independent variables have a meaningful impact on the dependent variable.

v. Model Assessment:

Evaluate the overall fit of the regression model to the data. Common metrics used for assessment include R-squared and adjusted R-squared, which indicate the proportion of variance explained by the model.

vi. Assumption Checking:

Verify whether the regression assumptions are met. These assumptions involve properties like linearity, independence of errors, constant variance, and normal distribution of residuals.

vii. Interpretation:

Interpret the coefficients of the independent variables. A positive coefficient suggests a positive relationship between the independent variable and the dependent variable, while a negative coefficient indicates a negative relationship.

viii. Prediction and Inference:

Utilize the regression model for making predictions about the dependent variable based on specific values of the independent variables. Additionally, the model can provide insights into how changes in the independent variables influence the dependent variable.

3.2 Analysis Results

By Simply plotting the NPS Scores, Customer Satisfaction and Network Quality of Service (QoS) for the 29 cities of Pakistan, it is evident that NPS follows the same trend as that of Customer satisfaction and , relatively, Network QoS. For Each city, higher the customer satisfaction, higher shall be the NPS. For some cases of Network QoS, there are some exceptions that may relate to customer perception of Network Quality .

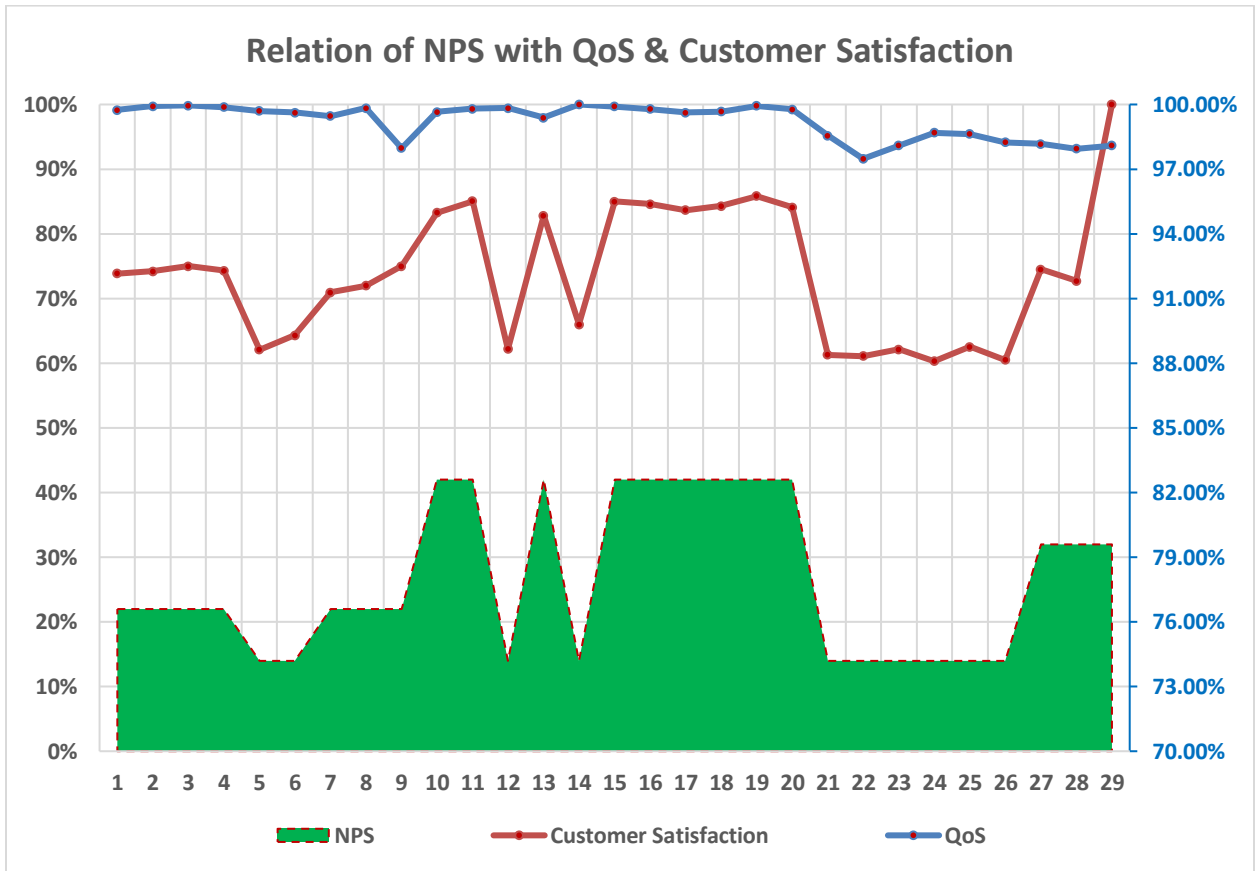


Figure 1.5 Relation of NPS, CS & Network QoS

To gauge the relation of NPS with Customer Satisfaction and Network QoS, multi-variable Regression Analysis has been done. This analysis has been performed through SPSS. The result of regression analysis give a p-value of 0.001. A model Summary and coefficient relations are provided below:

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.966^a	.933	.928	.259
a. Predictors: (Constant), Customer_Satisfaction, QoS				

ANOVA^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.458	2	12.229	181.845	<.001^b
	Residual	1.749	26	.067		
	Total	26.207	28			
a. Dependent Variable: NPS						
b. Predictors: (Constant), Customer_Satisfaction, QoS						

Coefficients^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.024	.144		.165	.870
	QoS	.064	.051	.068	1.246	.224
	Customer_Satisfaction	.956	.055	.939	17.248	<.001
a. Dependent Variable: NPS						

Figure 1.6 Regression Analysis Results (NPS, CS & Network QoS)

3.3 Research Conclusion

The simplified graphic analysis as well as regression analysis depict that there is a strong relation of Network Promoter Score (NPS) with Customer Satisfaction and Network Quality of Service (QoS). In the cities where customer satisfaction and Network Quality of Service (QoS) is higher, NPS score are good as well. As the NPS is directly related to increase in subscribers base as well as Average Revenue Per User (ARPU), it is pertinent to improve Network customer satisfaction and Network QoS. In the next section of this report, various suggestions have been provided regarding improving Network QoS and Network Satisfaction.

3.4 Suggestions and Way Forwards

3.4.1 Improving Network QoS

In the realm of modern telecommunications, enhancing the quality of 3G and 4G networks is a critical endeavor to meet the burgeoning demands for seamless connectivity and high-speed data transfer. This pursuit necessitates a strategic amalgamation of advanced technologies, infrastructure investments, and meticulous optimization techniques.

i. Infrastructure Augmentation:

Pivotal to network amelioration is the augmentation of physical infrastructure. This involves erecting additional cell towers and deploying cutting-edge radio equipment to bolster both network coverage and capacity. Employing spatial optimization methodologies, such as radio frequency propagation modeling, ensures optimal antenna placement, mitigating signal attenuation and enhancing coverage.

ii. Spectrum Optimization:

The judicious allocation and management of spectrum resources assume paramount significance. By judiciously selecting spectrum bands and employing

techniques such as dynamic spectrum sharing, network congestion and interference can be circumvented. Procuring additional spectrum, if feasible, can significantly elevate network performance.

iii. Technological Innovations:

Embracing technological breakthroughs is indispensable. Incorporating carrier aggregation techniques, which combine multiple frequency bands for enhanced data rates, as well as deploying advanced antenna systems like Massive MIMO (Multiple-Input Multiple-Output) and beamforming, bolsters spectral efficiency and magnifies throughput.

iv. Network Performance Optimization:

Regular monitoring and iterative optimization are pivotal. Leveraging sophisticated tools for network performance assessment, such as Key Performance Indicators (KPIs) like call setup success rate and data throughput, enables network engineers to identify bottlenecks and inefficiencies. Dynamic parameter optimization algorithms then fine-tune the network for optimal performance.

v. Small Cell Deployment:

The deployment of small cells and Distributed Antenna Systems (DAS) in densely populated urban areas acts as an efficacious strategy to alleviate network congestion. These microcellular installations enhance coverage and capacity in high-density regions where macrocell coverage might fall short.

vi. Quality of Service (QoS) Hierarchies:

Strategic QoS hierarchies cater to the diverse demands of network traffic. By classifying traffic types and assigning appropriate priority levels, critical applications can access the required bandwidth and latency, guaranteeing a premium experience for users.

vii. Robust Backhaul Infrastructure:

Strengthening the backhaul is imperative. Employing high-capacity fiber-optic connections fortifies the transport network, facilitating the seamless transmission of data from the access points to the core network.

viii. Network Redundancy and Resilience:

Ensuring network uptime requires the implementation of redundancy mechanisms and automated failover systems. Employing backup power sources, resilient routing protocols, and diverse network paths curtails service disruptions and fortifies user experience.

ix. User Feedback Incorporation:

Integrate user feedback into the optimization process. Analyzing user-reported network issues can spotlight problematic areas. This insight guides targeted optimization endeavors to resolve user-experienced shortcomings.

x. AI-Infused Network Management:

The integration of data analytics and artificial intelligence (AI) is pivotal. AI algorithms predict network anomalies and provide insights for proactive network optimization. Machine learning-driven algorithms dynamically adjust network parameters, thwarting potential outages and ensuring a proactive and resilient network ecosystem.

In summation, elevating the quality of 3G and 4G networks is a multifaceted endeavor that synergizes technological innovation, meticulous infrastructure enhancements, and advanced analytical methodologies. A comprehensive strategy that adapts to the dynamic landscape of telecommunications is instrumental in forging networks that cater seamlessly to modern connectivity demands.

3.4.2 Improving Customer Satisfaction

i. Customer-Centric Culture and Training:

Developing a customer-centric culture is foundational to improving customer satisfaction. Provide comprehensive training to employees at all levels, emphasizing the importance of understanding and meeting customer needs. Train staff in active listening, empathy, and effective communication. A customer-focused culture ensures that every interaction is tailored to enhance the customer experience.

ii. Efficient Issue Resolution:

Swift and efficient issue resolution is crucial for customer satisfaction. Streamline your customer support processes to minimize response times and resolve issues effectively. Equip your support team with the necessary tools and resources to address customer concerns promptly. Empower front-line employees to make decisions that satisfy customers' needs without unnecessary delays.

iii. Personalization and Relationship Building:

Personalization goes a long way in enhancing customer satisfaction. Utilize customer data and insights to create personalized experiences. Address customers by name, recommend products based on their preferences, and acknowledge their past interactions. Building relationships with customers fosters a sense of loyalty and makes them feel valued.

iv. Continuous Feedback and Improvement:

Regularly seek feedback from customers through surveys, feedback forms, and direct communication. Analyze this feedback to identify areas for improvement and take actionable steps. Communicate to customers how their feedback has

influenced positive changes, demonstrating your commitment to their satisfaction. An iterative approach to improvement keeps your strategies aligned with customer expectations.

v. Innovation and Proactive Solutions:

Anticipate customer needs by innovating your products and services. Develop solutions that address emerging pain points and market trends. Proactively communicate updates and improvements to customers. By staying ahead of the curve and offering cutting-edge solutions, you demonstrate your commitment to meeting customer demands and enhancing their overall satisfaction.

Incorporating these detailed strategies into your approach will contribute significantly to improving customer satisfaction. Remember that customer satisfaction is an ongoing effort that requires consistent dedication to understanding, addressing, and exceeding customer expectations.

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