

TO STUDY THE PATTERN OF CELL PHONE USERS AND SERVICE PROVIDERS BASED ON STATISTICAL TECHNIQUES IN KOLHAPUR DISTRICT

Prakash S. Chougule¹ Tejaswi S.Kurane² Suresh T.Salunkhe³ Shubhangi S. Patil.⁴ Rohit C. Sadalage⁵ Smita A.Koli⁶

Associate Professor¹, Assistant Professor², Principal³, Research Student^{4,5,6}

Rajarshi Chhatrapati Shahu College, Kolhapur (MS), India

Abstract:

A research study was conducted with an objective to understand the customers' perception choice in selecting cellular mobile telecommunication service providers. Customers' perception is widely varied in accordance with the Communication quality, call service, facilities, price, customer care and service provider's attributes. A systematic questionnaire was developed to collect the required primary data from the cell phone users. Collected data were analysed, reliability and factor analysis were using various statistical methods.. The outcome of this research shows a comprehensively integrated framework to understand the relationships among several dimensions. The study shows communication and price were most influential and most preferential factors in selecting telecommunication service provider. However, product quality and availability has a significant impact on customer perception choice in selecting cellular mobile service provider.

Keywords: Service quality; cell phone, customer preference. Chi-Square Test, Z- Test, ANOVA, Level of significance..

INTRODUCTION:

A cell phone, one of the most daily used device for communication is easy to communicate and text message with sound and pictures or videos. During ancient time, it was hard to phone or send to message from one place to another place. Now days there are a lot of new means of communication that have made our life easy and simple because of fast development in the electronic device. One of the most used device for communication is known as mobile phone or cell phone. Landline, Telecommunication, technology is more expensive and more time demanding to build in rural areas and mobile phones. People used to carry mobile phones even they have landline phone. We know that service providers are also play the important role in communication process. Without service provider we can't use cell phone for calling and messaging purpose.

This days, different sorts of mobile phones are available in the market not only for phone but also for entertainment, internet, message, fashion, others. The success of telecommunication industry depends on prudent efforts and feasible investments. In a competitive market, service providers are expected to compete on both price and quality of services and also it is necessary for the service providers to meet the consumers' requirements and expectations in price and service quality (Melody, 2001). The positive relationship of service quality with customer satisfaction (Danaher and Mattsson, 1994; Kim et al., 2004), customer preference (Ranaweera and Neely, 2003), profitability (Fornell, 1992; Danaher and Rust, 1996).

In this study, we study the demographic factors are associated with the use of cell phone, with monthly expenditure and with time spending on mobile phones. Also we study the behavior of customers towards buying mobile phones and satisfaction of customers with quality of cell phones. Similar kind of study performed for the service provider facility.

OBJECTIVES:

- To study the relationship between demographical variable with mobile and SIM card users.
- To study the satisfaction of consumers with existing service provider.
- To find the most preferred mobile phones in Kolhapur district.
- To find the most preferred service provider in Kolhapur district.
- To find the factors which are most attracted for changing/switching the service provider.

STUDY MATERIAL:

We constructed a questionnaire consisting of different questions was used to collect information regarding the use of cell phone and service provider. The technique used for the data collection was one-to-one interviews by using convenient sampling scheme. The study area for this project was taken purposively in rural and urban areas of Kolhapur district. The 289 sample size is taken for this study from that 148 mobile users are taken from rural area and 141 mobile users taken from urban area.

STATISTICAL TOOLS USED:

- Graphical Representation
- Chi-square test for independence
- Test for equality of population proportion
- Two sample t-test for equality of population means
- ANOVA Test.

SOFTWARE USED:

- Microsoft world
- MS-Excel

STATISTICAL ANALYSIS:

a) Average times spend on Mobile:

Average time spend by mobile users on mobile in Kolhapur city in Min/day is given below,

Mean: 166.36

Standard Deviation:139.94

b) Average expenditure on Mobile:

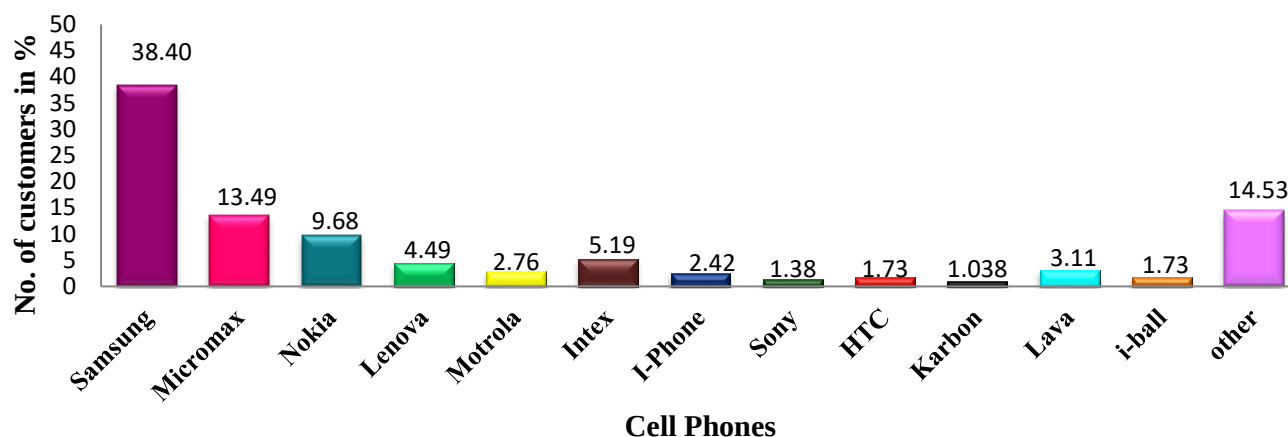
Average expenditure on mobile in Kolhapur city in rupees per month is given below,

Mean: 302.57

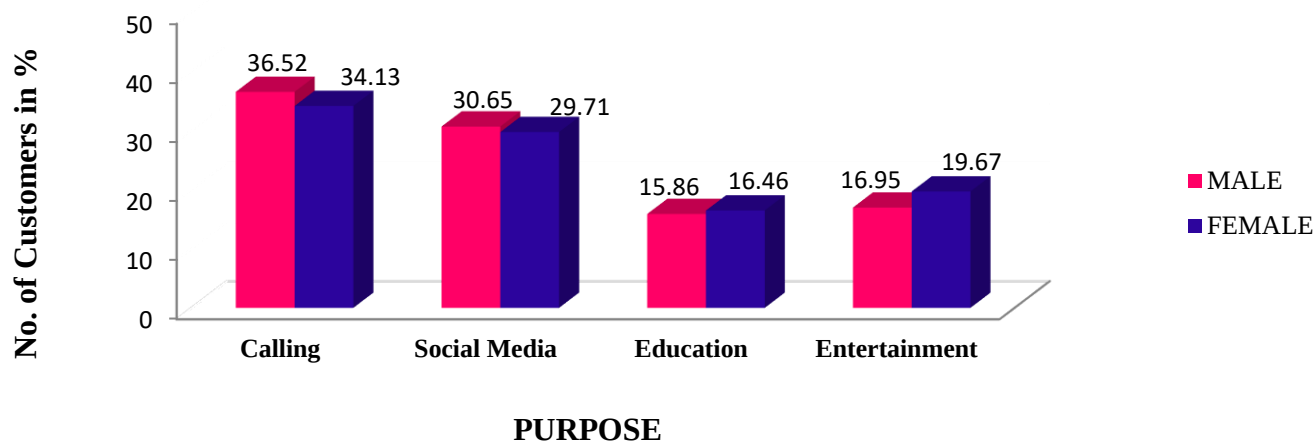
Standard Deviation: 335.85

EXPLORATORY DATA ANALYSIS

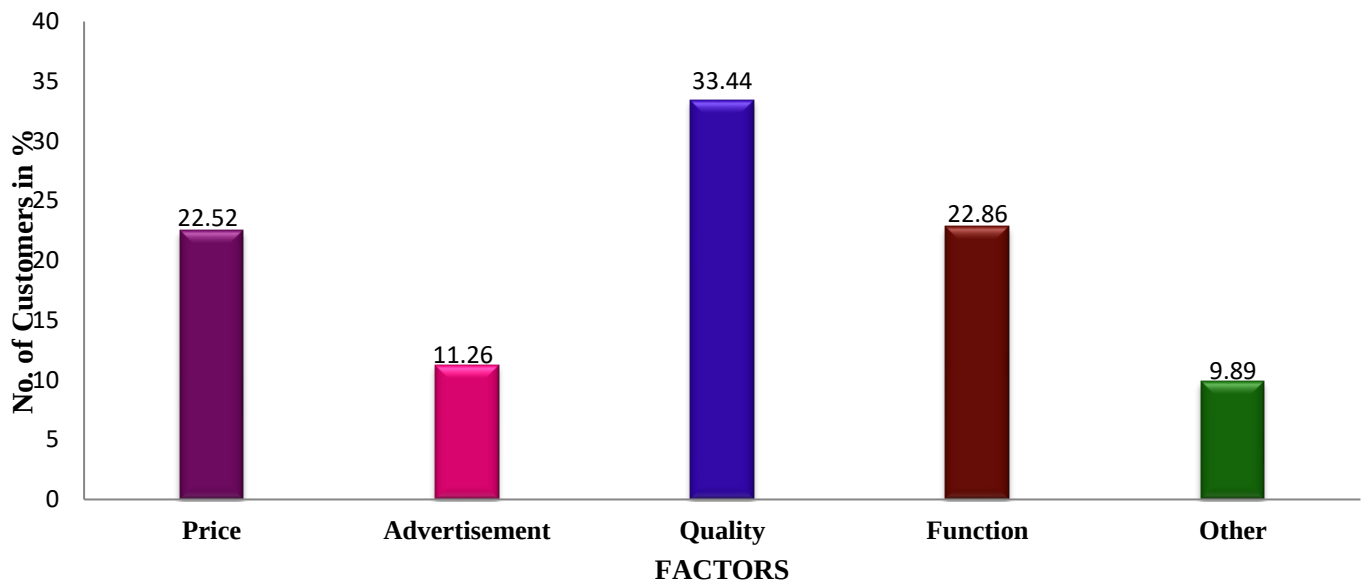
Simple bar diagram for distribution of cell phone in Kolhapur district:



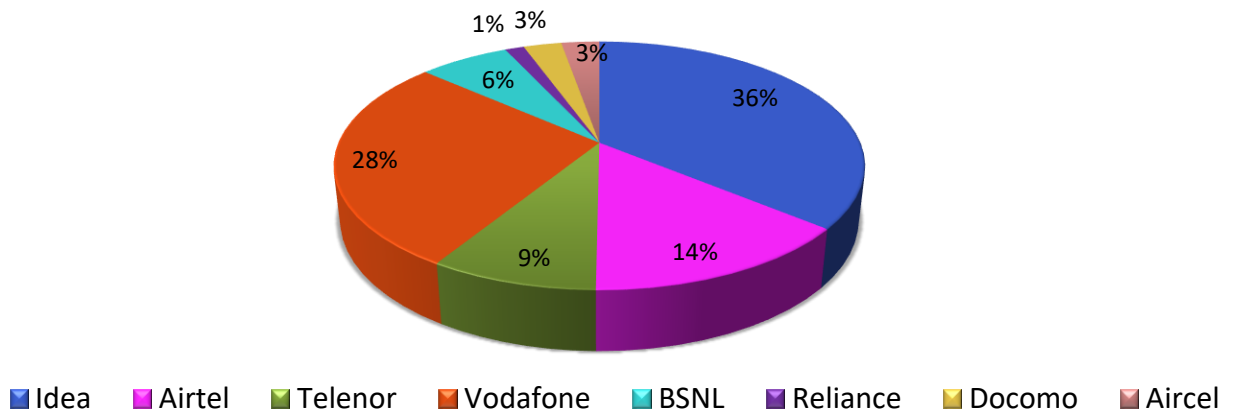
Multiple bar diagram for purpose of using cell phone based on gender



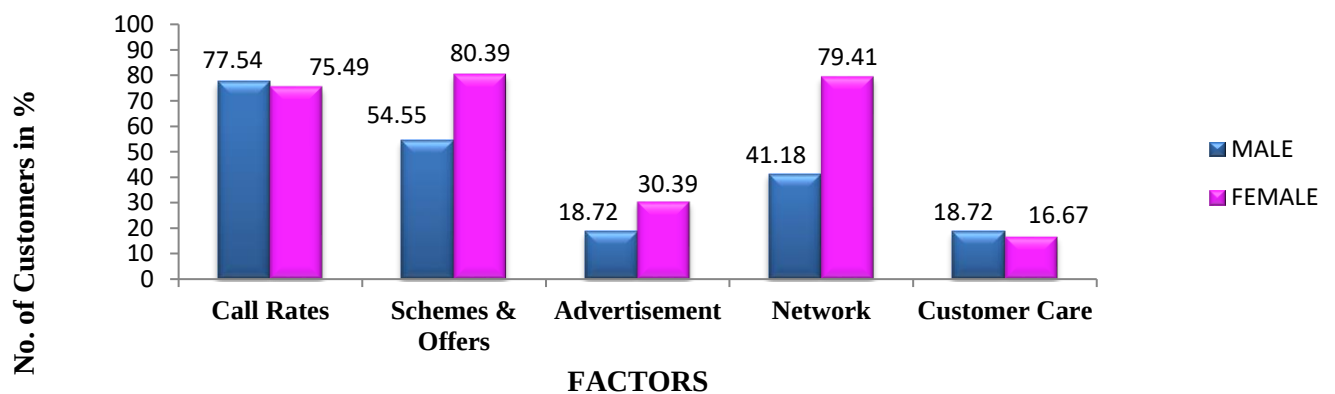
Simple bar diagram for customer thinking towards buying the cell phone



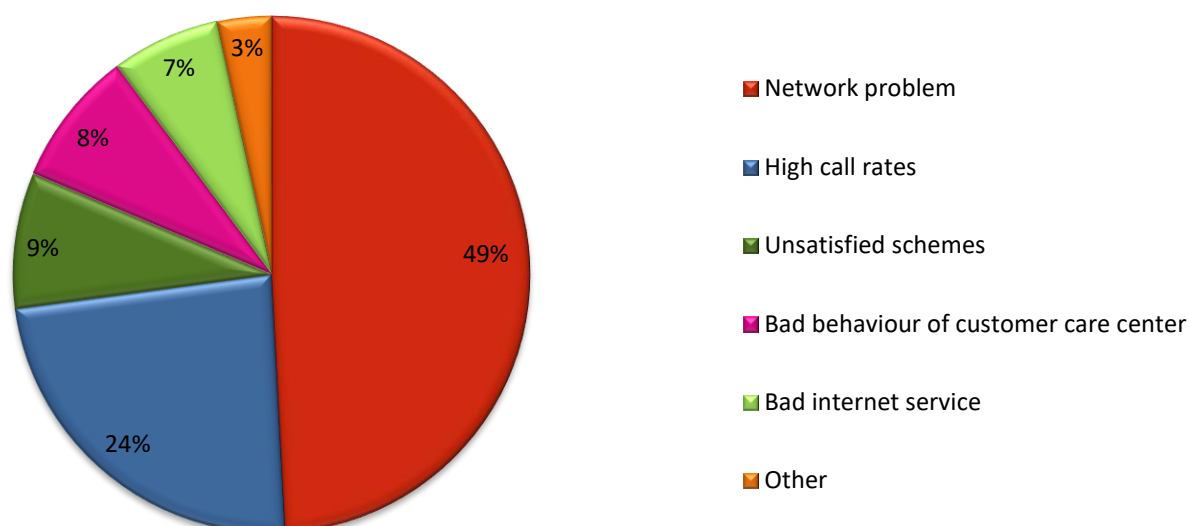
Pie-chart for distribution of service provider in Kolhapur city:



Multiple bar diagram for customer thinking towards selecting service provider:



Pie chart for reason behind porting the network:



Rating of Customers for Cell phone characteristics:

Names	Mobile Design	Battery backup	Camera Quality	Functioning	Service Facility	Overall
Motorola	4.70	4.50	4.37	4.50	3.97	4.41
Sony	4.50	4.33	4.00	4.17	4.33	4.27
Lenova	4.28	4.14	3.91	4.06	4.00	4.08
HTC	4.25	3.92	4	4.00	3.83	4.00
Other	4.02	3.93	3.70	4.05	3.74	3.89
Samsung	3.91	3.84	3.41	3.58	3.63	3.67
Micromax	3.60	3.81	3.53	3.80	3.56	3.66
Nokia	3.87	4.10	3.49	3.25	3.53	3.65
Intex	4.00	3.59	3.22	3.78	3.13	3.54
i-phone	3.83	3.50	3.58	3.33	3.33	3.52
i-ball	3.50	2.83	3.33	3.67	3.83	3.43
Carbon	4.03	3.56	2.81	2.92	3.31	3.32
Lava	0.83	3.54	4.04	4.08	3.63	3.22

Rating of Customers for Service providers Facility:

Name	Network	Call rates	Schemes	Behavior of customer care center	Overall
Idea	4.44	3.71	3.40	3.69	3.81
Telenor	3.49	4.10	4.00	3.41	3.75
Aircel	2.75	4.25	4.50	3.50	3.75
Vodafone	4.02	3.46	3.65	3.29	3.61
Docomo	3.33	3.92	3.33	3.58	3.54
Airtel	3.64	3.50	3.39	3.51	3.51
BSNL	3.77	3.03	3.10	3.97	3.47
Reliance	3.00	2.50	2.50	3.00	2.75

TESTING OF HYPOTHESIS :

a) Test for independence mobile type and area:

Null Hypothesis: H_0 : Use of mobile type is independent on area.

V/S H_1 : Use of mobile type is dependent on area.

Level of significance $\alpha = 5\%$

(a)=No. of android mobile users in urban area=111&(b)=No. of android mobile users in rural area =91

(c)= No. of non-android mobile users in urban area=30&(d)= No. of non-android mobile users in rural area= 57

N=Population size=289

Calculation:

$$\chi^2 = \frac{N \times (ad-bc)^2}{(a+b) \times (c+d) \times (a+c) \times (b+d)} \sim \chi^2_1$$

Calculated value: $\chi^2 = 10.2$ and **Critical value** $= \chi^2_{1,0.05} = 3.841$

b)

c) Test for independence of mobile type and gender:

Null Hypothesis: H_0 : Use of mobile type is independent on gender.

V/S H_1 : Use of mobile type is dependent on gender.

Level of significance $\alpha = 5\%$

(a)=No. of males who use android mobile = 133 & (b)=No. of females who use android mobile = 69

(c)= No. of males who use non-android mobile = 54& (d)= No. of females who use non-android mobile = 33

N=Population size=289

Calculation:

The test statistic is,

$\chi^2 = \frac{N \times (ad-bc)^2}{(a+b) \times (c+d) \times (a+c) \times (b+d)} \sim \chi_1^2$
Calculated value: $\chi^2 = 0.379$ and Critical value: $\chi_{1,0.05}^2 = 3.841$

d) Test for equality of proportion of mobile users who port the service in urban and rural area:

Population 1= Mobile users in urban area.& Population 2= Mobile users in rural area.

P_1 = Proportion of mobile users who port the service in urban area.

P_2 = Proportion of mobile users who port the service in rural area.

n_1 = Sample of mobile users in urban area=141 & n_2 = Sample of mobile users in rural area=148

p_1 = Sample proportion of mobile users who port the service in urban area =0.1844

P_2 = Sample proportion of mobile users who port the service in rural area =0.1689

Level of Significance= α = 5%

Hypothesis:- $H_0: P_1=P_2$ V/S $H_1: P_1 \neq P_2$

Calculation: $\hat{p} = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2} = 0.1765$ and $\hat{q} = 0.8235$

Under H_0 , the **Calculated value of Z** is, $|Z_0| = 0.3455$

Critical value = $Z_{\frac{\alpha}{2}} = 1.96$

e) Test for equality of proportion of mobile users in rural and urban area who use postpaid service:

Population 1= Mobile users in rural area.& Population 2= Mobile users in urban area.

P_1 = Proportion of mobile users in rural area who use postpaid service.

P_2 = Proportion of mobile users in urban area who use postpaid service.

n_1 = Sample of mobile users in rural area= 148 & n_2 = Sample of mobile users in urban area=141

p_1 = Sample proportion of mobile users in rural area who use postpaid service=0.1487

p_2 = Sample proportion of mobile users in urban area who use postpaid service=0.1135

Level of Significance= α = 5%

Hypothesis:- $H_0: P_1=P_2$ V/S $H_1: P_1 \neq P_2$

Calculation: $\hat{p} = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$ and $\hat{p} = 0.1315$ and $\hat{q} = 0.8685$

Under H_0 , the **Calculated value of Z** is, $|Z_0| = 0.8850$

Critical value = $Z_{\frac{\alpha}{2}} = 1.96$

f) Test for equality of proportion of non-android mobile users in rural and urban area:

Population 1= Mobile users in rural area.& Population 2= Mobile users in urban area.

P_1 = Proportion of non-android mobile users in rural area.

P_2 = Proportion of non-android mobile users in urban area.

n_1 = Sample of mobile users in rural area= 148 & n_2 = Sample of mobile users in urban area =141

p_1 = Sample proportion of non-android mobile users in rural area = 0.3851

p_2 = Sample proportion of non-android mobile in urban area= 0.2128

The level of significance α = 5%

Hypothesis: $H_0: P_1=P_2$ against $H_1: P_1 \neq P_2$

Calculation: $\hat{p} = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2} = 0.3010$ and $\hat{q} = 0.699$

Under H_0 , the **Calculated value of Z is**, $|Z_0| = 3.1919$

Critical value: $Z_{\frac{\alpha}{2}} = 1.96$

g) Test for equality of proportion of android mobile users in rural and urban area:

Population 1=Mobile users in urban area.&Population 2= Mobile users in rural area.

P_1 = Proportion of android mobile users in urban area.

P_2 = Proportion of android mobile users in rural area.

n_1 = Sample of mobile users in urban area=141 & n_2 =Sample of mobile users in rural area =148

p_1 =Sample proportion of android mobile users in urban area =0.7872

p_2 =Sample proportion of android mobile users in rural area=0.6149

The level of significance $\alpha=5\%$

Hypothesis: $H_0: P_1=P_2$ against $H_1: P_1 \neq P_2$

Calculation: $\hat{p} = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$ $\hat{p} = 0.699$ and $\hat{q} = 0.301$

Under H_0 , the **Calculated value of Z is**, $|Z_0| = 3.1919$

Critical value = $Z_{\frac{\alpha}{2}} = 1.96$

h) Test for equality of time spend on mobile in rural and urban area[Time: min/day]:

Null Hypothesis:

H_0 : Average time spends on mobile in rural and urban area is equal.

V/S H_1 : Average time spends on mobile in rural and urban area is not equal. Level of significance $\alpha = 5\%$

X: Time spend on mobile in rural area & Y: Time spend on mobile in urban area.

n_1 : Total number of mobile users in rural area & n_2 : Total number of mobile users in urban area.

S_1^2 : Sample variance of time spends on mobile in rural area.

S_2^2 : Sample variance of time spends on mobile in urban area.

Calculation: $S^2 = \frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2} = 19948.95492$

and $S = 141.74077$

Under H_0 , the **Calculated value of t is**, $|t| = 0.495954$

Critical value = $t_{148+141-2, 5\%} = 1.968264$

i) Test for equality of time spend on mobile by male and female[Time: Min/day]

Null Hypothesis:

H_0 : Average time spends on mobile by male and female mobile users are equal.

V/S H_1 : Average time spends on mobile by male and female mobile users are not equal.

Level of significance $\alpha = 5\%$

Notation:

X: Time spend on mobile by male & Y: Time spend on mobile by female.

n_1 : Total number of male mobile users & n_2 : Total number of female mobile users.

S_1^2 : Sample variance of time spends on mobile by male.

S_2^2 : Sample variance of time spends on mobile by females.

$$\text{Calculation: } S^2 = \frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2}$$

$$S^2 = 15795.4242 \quad \text{and} \quad S = 125.6798$$

Under H_0 , the Calculated value of t is, $|t| = 3.1483$

$$\text{Critical value} = t_{187+102-2, 5\%} = 1.968264$$

j) Test for equality of expenditure on mobile in rural and urban area: [Expenditure/month]

Null Hypothesis:

H_0 : Average expenditure on mobile in rural and urban area is equal.

V/S H_1 : Average expenditure on mobile in rural and urban area is not equal.

Level of significance $\alpha = 5\%$

X: Expenditure on mobile in rural area & Y: Expenditure on mobile in urban area.

n_1 : Total number of mobile users in rural area & n_2 : Total number of mobile users in urban area.

S_1^2 : Sample variance of expenditure on mobile in rural area.

S_2^2 : Sample variance of expenditure on mobile in urban area.

$$\text{Calculation: } S^2 = \frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2} = 110917.7907 \quad \text{and} \quad S = 333.04323$$

Under H_0 , the Calculated value of t is, $|t| = 1.4338$

$$\text{Critical value} = t_{148+141-2, 5\%} = 1.968264$$

k) Test for equality of expenditure on mobile by male and female: [Time: min/day]

Null Hypothesis:

H_0 : Average expenditure on mobile by male and female mobile users is equal.

V/S H_1 : Average expenditure on mobile by male and female mobile users is not equal.

Level of significance $\alpha = 5\%$

X: Expenditure on mobile by male. and Y: Expenditure on mobile by female.

n_1 : Total number of male mobile users. and n_2 : Total number of female mobile users.

S_1^2 : Sample variance of expenditure on mobile by male.

S_2^2 : Sample variance of expenditure on mobile by females.

$$\text{Calculation: } S^2 = \frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2} = 111205.4982 \quad \text{and} \quad S = 333.4748$$

Under H_0 , Calculated value of t is, $|t| = 2.7560$

$$\text{Critical value} = t_{187+102-2, 5\%} = 1.968264$$

ANOVA Test:

ANOVA TEST FOR TIME SPENDS:

Null Hypothesis:

H_0 : Average daily time spends on mobile by students, housewife, employed and unemployed people is same.

V/S

H_1 : Average daily time spends on mobile by students, housewife, employed and unemployed people is not same.

Level of significance $\alpha = 5\%$

Calculation:

$G = 48079$

Correction factor (C.F.) = 7998582.149 & $S_{Tr}^2 = 62674.50298$ & $S_E^2 = 19199.19769$

$S_T^2 = 5659794.851$ & $S_{Tr}^2 = 188023.5089$ & $S_E^2 = 5471771.342$ & $S_T^2 = 19652.06545$

Under H_0 , the test statistic is, $F = 3.2644$

ANOVA Table:

Source of variation	Degrees of freedom	Sum of square	Mean sum of square	F-Ratio	P-VALUE
Treatment	3	188023.5089	62674.50298	3.2644	0.02183
Error	285	5471771.342	19199.19769		
Total	288	5659794.851	19652.06545		

ANOVA TEST FOR EXPENDITURE:**Null Hypothesis:**

H_0 : Expenditure on mobile by students, housewife, employed and unemployed people is same. V/S

H_1 : Expenditure on mobile by students, housewife, employed and unemployed people is not same.

Level of significance $\alpha = 5\%$

Solution:

$G = 87442$ & Correction factor (C.F.) = 26457105.1 & $S_{Tr}^2 = 447692.506$ & $S_E^2 = 21545.2837$

$S_T^2 = 32597510.9$ & $S_{Tr}^2 = 1343077.52$ & $S_E^2 = 6140405.87$ & $S_T^2 = 113185.8017$

Under H_0 the test statistic is $F = 20.7791$

ANOVA Table:

Source of variation	Degrees of freedom	Sum of square	Mean sum of square	F-Ratio	P-Value
Treatment	3	1343077.52	447692.506	20.7791	0.00
Error	285	6140405.87	21545.2837		
Total	288	32597510.9	113185.8017		

Major Findings:

- Samsung mobile is most popular cell phone in Kolhapur district. After that people preferred Micromax and Nokia cell phone.
- Cell phone is mostly used for calling purpose and for use of social media.
- Customers want quality with reasonable price of cell phone.

- We see that Idea and Vodafone have high call rates but mostly customers preferred Idea and Vodafone service providers because of network quality. So we can say that customers see network quality rather than call rates.
- Network problem and high call rates are major factors behind the switching service provider's facility.
- Overall performance of Motorola and Sony cell phones are best among the other cell phones.
- Idea is most popular service provider but for call rates and various schemes and offers Aircel is best service provider as compared with all other service providers.
- Use of android and non-android cell phone is dependent on area and independent on gender.
- Monthly expenditure on cell phones and daily time spending on cell phone is different in male and female.
- Monthly expenditure on cell phones and daily time spending on cell phone is same in both rural and urban area.

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