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## *Telecom Revolution in India: From the Past to the Future*

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*Abstract: In the start of 21st century, the telecom industry has the big revolution in India. Mobile phone devices are popular and they increasingly incorporate multiple applications as the result of convergence technology. This had drastic impact on the number of landline and wireless subscribers in India.*

*In this paper researchers have analyzed the correlation between landline and wireless subscribers in India. Researchers have analyzed the variations in number of subscribers using these particular applications in last eleven years (2004 to 2014). In this paper, the number of internet users, internet users through wireless devices and increasing number of requests for mobile number portability (MNP) has been analyzed. The scope of research is the entire India, as researchers want to analyze the impact whole across the nation. Researchers have tried to forecast the number of wireless and landline subscribers for next five years.*

*Key words: landline subscribers, wireless subscribers, telecom revolution, mobile number portability, correlation.*

### I. INTRODUCTION

This paper throws light on the evolution of telecom sector in India. India has the fastest growing telecom network in the world with its high population and development potential. Airtel, Vodafone, Idea, Telenor, Reliance, Tata DoCoMo, Aircel, BSNL & MTNL are the major operators in India. However, rural India still lacks strong infrastructure. India's public sector telecom company BSNL is the 7th largest telecom company in world [3]. Private operators hold 90.05 % of the wireless subscriber market share whereas the two PSU operators BSNL and MTNL hold only 9.95 % market share.

The total number of telephones in the country stands at **1002.05 million**, while the overall teledensity has increased to **79.67%** as of 31 May 2015 and the total numbers of mobile phone subscribers have reached **975.78 million** as of May 2015. In the wireless segment, 2.44 million subscribers were added in May 2015. The landline segment subscriber base stood at **26.27 million** [4], [5].

### II. OBJECTIVE OF THE STUDY

- 1) To observe the impact of telecom revolution on landline subscribers in India.
- 2) To analyze the telecom revolution with reference to number of wireless subscribers.
- 3) To observe the impact on Mobile Number Portability (MNP) and internet users.
- 4) To forecast the number of landline and wireless subscribers in India in upcoming years.



## III. RESEARCH DESIGN

SN	PARAMETER	DESCRIPTION
1	Type of research	Descriptive Research
2	Survey period	Year 2004-05 to Year 2013-14
3	Type of product	Telecom Services
4	Universe	Wireless and Landline subscribers of India
5	Secondary sources	Annual reports of TRAI, Books, Journals, Articles
6	Data interpretation	Though Graphs & Calculations
7	Statistical Tool	Correlation, Percentage & Simple graphical method

## IV. DATA ANALYSIS AND INTERPRETATION

**Telephone System:** The telecommunications system in India is the 2nd largest in the world. The country is divided into several zones, called circles (roughly along state boundaries). Government and several private operators run local and long distance telephone services. It was thrown open to private operators in the 1990s. Competition has caused prices to drop and calls across India are one of the cheapest in the world.

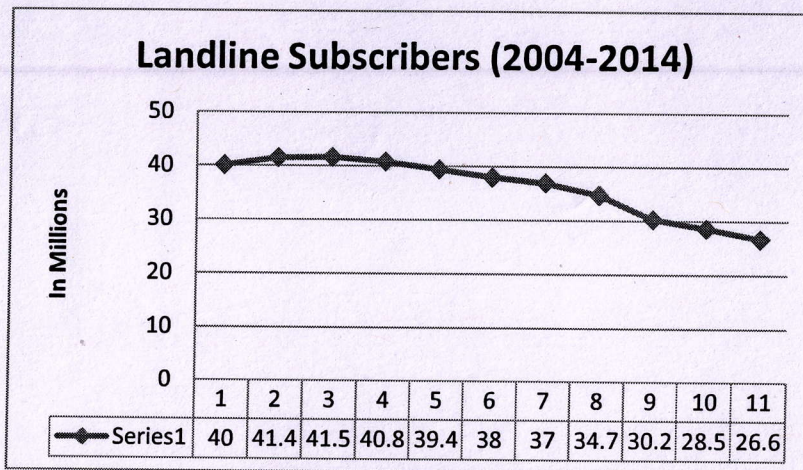
**Mobile Cellular:** The number of mobile phone connections crossed fixed-line connections in 2004. India primarily uses the following bandwidths for cellular connectivity: 2G networks operate in GSM 900 MHz & 1800 MHz bands; 3G networks operate in HSPA 900 MHz & UMTS/HSPA 2100 MHz bands while 4G networks operate in LTE 800/1800/2300 MHz bands

The following table shows the total number of wireless versus landline subscribers in India from the year 2004-05 to 2014-15. This table clearly shows the growth of wireless subscribers in India [1], [2].

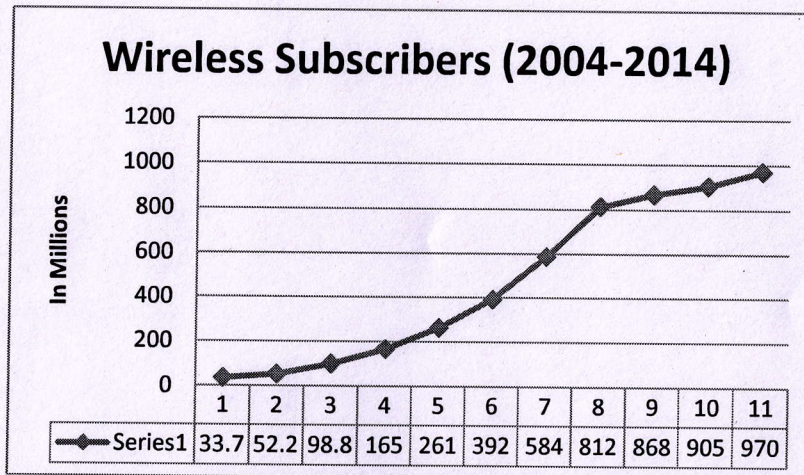
SN	YEAR	WIRELESS SUBSCRIBERS ( IN MILLIONS)	LANDLINE SUBSCRIBERS ( IN MILLIONS)
1	2004-05	33.69	40.02
2	2005-06	52.22	41.43
3	2006-07	98.77	41.54
4	2007-08	165.11	40.75
5	2008-09	261.07	39.42
6	2009-10	391.60	37.96
7	2010-11	584.32	36.96
8	2011-12	811.59	34.73
9	2012-13	867.80	30.21
10	2013-14	904.51	28.49
11	2014- 15	969.89	26.59

TABLE I: Wireless Vs Landline Subscribers in India (Source: www.trai.gov.in/annual\_reports)





Graph 1: Landline subscribers in India from 2004 to 2014.



Graph 2: Wireless subscribers in India from 2004 to 2014.

Researchers have calculated spearman's coefficient of correlation between wireless (mobile) and landline subscribers as follows:

WIRELESS (IN MILLIONS)	LANDLINE (IN MILLIONS)	U	V	U <sup>2</sup>	V <sup>2</sup>	U*V
33.69	40.02	-357.9	-0.73	128099	0.5329	261.3
52.22	41.43	-339.4	0.68	115178	0.4624	-230.8
98.77	41.54	-292.8	0.79	85749	0.6241	-231.3
165.11	40.75	-226.5	0	51297	0	0
261.07	39.42	-130.5	-1.33	17038	1.7689	173.56
391.6	37.96	0	-2.79	0	7.7841	0
584.32	36.96	192.72	-3.79	37141	14.3641	-730.56
811.59	34.73	420	-6.02	176391	36.2404	-2528.4
867.80	30.21	476.2	-10.54	226766	111.0916	-5019.15
904.51	28.49	512.91	-12.26	263076	150.3076	-6288.28
969.89	26.59	578.29	-14.16	334419	200.5056	-8188.59
<b>N=11</b>		<b>832.97</b>	<b>-50.15</b>	<b>1435159</b>	<b>523.6817</b>	<b>-22782</b>

TABLE II: Correlation Analysis Calculation

Karl Pearson's Coefficient of correlation

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{(n-1)s_x s_y} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}}$$

Calculated value r = - 0.94355



Thus as 'r' value is close to -1, there is high degree of negative correlation.

Coefficient of determination is  $r^2 = 0.89$

This means that 89 % of the total variation in number of landline subscriber can be explained by the linear relationship between two variables.

Probable error of Correlation Coefficient:  $PE(r) = 0.6745 (1 - r^2) = 0.022$

Researchers have calculated a future value by using existing values. The predicted value is a y-value for a given x-value. The known values are existing x-values and y-values, and the new value is predicted by using linear regression.

The equation for FORECAST is  $(a + bx)$ , where:

$$a = \bar{y} - b\bar{x} \quad \text{And} \quad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

Where,

- X is the data point for which you want to predict a value.
- Known y's is the dependent array or range of data.
- Known x's is the independent array or range of data.

The forecasted values are as follows:

YEAR	FORECASTED WIRELESS SUBSCRIBERS (IN MILLIONS)	FORECASTED LANDLINE SUBSCRIBERS (IN MILLIONS)
2015-16	1070.55	23.50
2016-17	1163.44	20.11
2017-18	1244.50	16.48
2018-19	1309.15	12.59
2019-20	1354.75	8.40

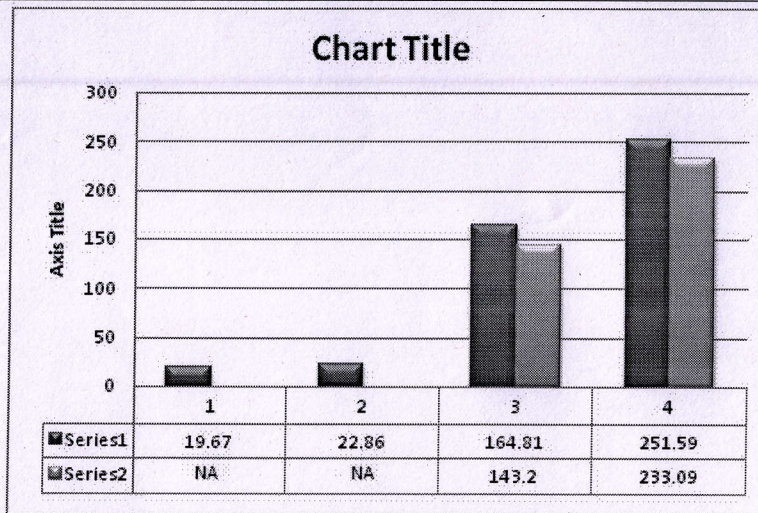
TABLE III: Forecasted Number of Subscribers for Next Five Years (2015-16 to 2019-20)

**Internet Users:** Number of Internet users in India is the 3rd largest in the world next only to China and the United States of America. The total internet subscribers are 251.59 million. The wireless internet subscribers are 233.09 million at the end of March 2014 [1], [2].

YEAR	TOTAL INTERNET USERS (IN MILLIONS)	TOTAL WIRELESS INTERNET SUBSCRIBERS (IN MILLIONS)
2010-11	19.67	N.A.
2011-12	22.86	N.A.
2012-13	164.81	143.20
2013-14	251.59	233.09

TABLE IV: Number of Internet Users in India (2010-11 to 2013-14)





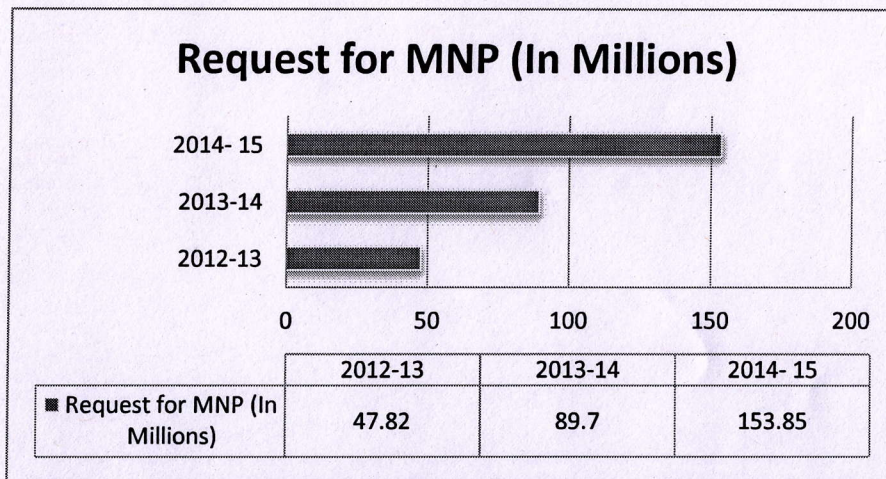
Graph 3: Total Internet Users and Total Wireless Internet Subscribers

**Mobile Number Portability (MNP)**

MNP or mobile number portability, allows you to switch your mobile phone operator from one mobile phone network provider to another mobile phone provider and keep your existing mobile phone number. Number portability is allowed within a circle, nationwide or intra-circle. The following table shows noticeable increase in MNP requests from customers, indicating dissatisfaction for their existing service providers. Total 15.86 % from total subscribers are availing MNP facility [1], [2].

YEAR	REQUEST FOR MNP (IN MILLIONS)
2012-13	47.82
2013-14	89.70
2014- 15	153.85

TABLE V: Number of MNP users in India (2012-13 to 2014-15)



Graph 3: Total Internet Users and Total Wireless Internet Subscribers

**V. CONCLUSION**

Researchers have found that there is high degree of negative correlation between number of landline and wireless subscribers in India during the period from year 2004-05 to 2014-15. Total 89 % of the variation in number of landline subscribers can be explained by the linear relationship between two variables. The internet users through wireless devices are drastically increasing since year 2012-13. In India 15.86 % from total subscribers are availing MNP facilities.

**VI. LIMITATION OF THE STUDY**

The necessary data required for the year 2010-11 and 2011-12 for total number of wireless internet subscribers was not available.



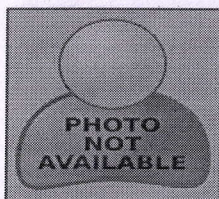
## VII. FUTURE SCOPE OF THE RESEARCH

The future scope of this research is to analyze the environmental factors in the 'mobile revolution in India'. There is need to study how the data traffic is outstripping the voice traffic.

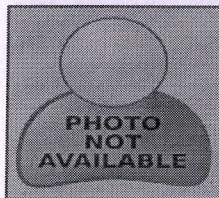
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**Rohan P. Dahivale**, received the BE (E&TC) degree and MBS (Materials & Productions Management) degrees in Management from University of Pune in 2003 and 2011, respectively. During 2003-2010, he worked in Telecom Sector. He now is pursuing Ph.D. under the guidance of Dr. Vikas Inamdar.



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