

Financial Sustainability, Service Demand and Telecom Infrastructure Growth in India

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Abstract

India's telecommunications industry significantly contributes toward the enhancement of digital and physical infrastructure. In the past few years, the industry has undergone dramatic changes due to increased service demand, greater data consumption, and improved financial performance. The objective of this research paper is to examine how financial sustainability, service demand, and telecommunications infrastructure development are interconnected in India. The research will utilize secondary data obtained from official government publications (e.g., reports) covering a period from 2020-21 to 2024-25. Financial sustainability is evaluated based on gross telecommunications revenues and the average revenue per user (ARPU); service demand is evaluated based on subscriber metrics and average wireless data consumption; and telecommunications infrastructure development is evaluated based on the total number of telecommunications towers and mobile base transceiver stations (BTS) within India. Both trend analysis and compound annual growth rate (CAGR) analysis will be used to analyze growth rates related to financial, demand and infrastructure variables. The results of this analysis indicate that while subscriber growth does play an important role in growing telecommunications infrastructure in India, network expansion and increase in capacity to accommodate users are much more directly driven by increased revenues and greater ability of service providers to monetize services through investments in both passive and active infrastructure. This study contributes to earlier research by offering an integrated explanation of how service demand and financial support are driving India's telecommunications infrastructure to expand. The results of this study offer useful information to both industry players and policymakers.

Keywords: Telecom Infrastructure Growth, Financial Sustainability, Service Demand, Gross Revenue, ARPU, Data Usage, India Telecom Sector.

Introduction

Indian telecommunications has shown the infrastructure growth which supports both India's digital transformation and its economic development. The Indian telecom sector has experienced rapid growth during the last ten years as its service adoption, subscriber base and network capacity makes India as one of the largest telecommunications markets in the world. The expansion of telecom sector by improving network access and supporting digital access and also supporting e-governance, e-commerce, healthcare and educational activities which in result helps in overall growth of India in the global stage (India Brand Equity Foundation, 2025).

The expansion of wireless broadband subscriptions is key driver for this transformation because it demonstrates growing needs for high-speed internet service in both urban and rural areas. The total subscriber base which mostly uses wireless services keeps growing which creates a demand for more infrastructure development to sustain service quality and network coverage during changing usage patterns. Telecommunications infrastructure requires more mobile towers and base transceiver stations because of the increasing demand which has resulted in network asset densification throughout the industry (India Brand Equity Foundation, 2025).

The telecom industry has achieved great infrastructure development through 5G service deployment and expansion of 4G service users which requires advanced network connections for future healthcare and educational fields and automated industrial operations. Continuous infrastructure development highlights that telecommunications are vital for sustaining the digital economy in India and its ambitious plan for infrastructure development (India Economic Observer, 2026).

In general, the relationship between service demand, technological innovation, and network expansion indicates how the growth of the telecom industry is essentially linked to the development of larger infrastructure, thereby becoming a key element of India's future development path.

Literature Review

According to the India Brand Equity Foundation (Ibef, 2024) analysis report, the evolution of India's telecom sector highlights its growing contribution to infrastructure development. The rapid growth in broadband and internet subscribers has increased the demand for network connectivity, requiring continuous expansion and densification of telecom towers and mobile base stations. The shift from voice-centric to data-driven operation indicates increasing consumption of data and wider adoption of digitalization, increasing the need for robust and scalable infrastructure. Also, it further states that improvements in revenue performance and low-cost tariffs have enhanced service operators' capacity to invest in network upgrades, spectrum utilization and infrastructure expansion in both urban and rural areas.

According to the published research paper by Barot & Japee (2021) on the investment, infrastructure growth and key players Bharti Airtel, Reliance Jio and BSNL, the telecom sector infrastructure growth is known. The researcher examines the rapid growth, current trends and future potential of India's telecom industry growth, which is significantly driven by policy reforms and technological improvements like 4G and 5G deployment. The findings show an increase in internet users, mobile subscribers and data usage, which is supported by government initiatives like incentives, policy reforms and rural connectivity projects. It also stated continuous growth due to innovation in technologies, policy support and increased demand in rural areas. The researcher also supports that for digital and economic transformation of telecom, its infrastructure growth is essential.

Kathuria et al. (2019) study's the financial situation of the telecom sector and points out that there is a rising trend in the number of subscribers and data usage, but telecom companies are struggling financially to achieve the development of the industry. The high cost of spectrum charges, intense competition in the prices and high regulatory fees are the main reasons the telecom industry feels financial pressure. As a result, debt level increases, which limits the firm's ability to invest in network expansion and infrastructure growth. This study directly connects steady revenues to infrastructure growth in the Indian telecommunication sector.

As per the research paper published by ANBAZHAGAN & GANESAMOORTHY (2018) on the topic of "Telecommunication Industry in India – A Study on its Trend and Growth", which analyses India's telecommunication rapid growth, focusing on total subscribers and wireline and wireless subscribers in the span of ten years from 2006 to 2016. The main objective of the research is to examine the trends and growth patterns in this area. The researcher has concluded that there is a significant increase in total subscribers, especially in wireless subscribers, which rose at an annual rate of 20.13%, whereas there is a decline in wireline subscribers. Also there is a remarkable increase in internet users with a growth rate of 25.97%, and internet penetration increased from 3.95 to 34.83 subscribers per 100 people. The study reveals expansion, primarily driven by the wireless service and internet adoption.

According to a paper written by Kaur & Neena (2016) on "Changing Structure, Performance, and Growth of Telecommunications in India", which highlights its rapid transformation from a government monopoly to a competitive private industry largely driven by wireless mobile service. The key objective of

the research is to analyze the change in wireline and wireless usage, public and private participation and GSM and CDMA technologies. The results of the research show increased growth in wireless subscribers, especially GSM, with private entities like Bharti Airtel and Reliance Jio leading expansion. Rural internet connectivity has improved, however it still falls behind urban areas. The reduction in tariffs has made telecom services affordable, improved connectivity and boosted economic growth. Despite challenges in rural infrastructure and lower broadband penetration, the industry's liberalization has contributed to India's service-led growth and socio-economic development.

Research Gap

This study is conducted to address the limited understanding of how the financial sustainability of telecom operators and rising service demand jointly contribute to infrastructure growth in India. While existing research discusses revenue trends, subscriber expansion, and policy issues, it does not explain how these factors contribute into sustained investment in telecom infrastructure. Given the strategic importance of telecom networks for India's digital and economic development, there is a need for an integrated analysis that links financial performance with physical infrastructure expansion, which forms the central motivation of this study.

Research Objective

- To examine the growth trends in financial indicators and usage-based variables in the Indian telecom sector by analyzing CAGR during the period 2020–21 to 2024–25.
- To assess the impact of financial performance and usage intensity on the expansion of telecom infrastructure in India over the study period.

Research Methodology

• **Research Design**

The study utilizes a descriptive and analytical research approach to examine at the development patterns and structural relationships between financial sustainability, service demand, and the evolution of telecom infrastructure in India.

• **Source of Data**

This study is based on secondary data. The use of secondary data ensures the reliability, consistency, and comparability of data throughout the study period.

• **Study Period**

The analysis spans a five-year period from 2020–21 to 2024–25, encompassing recent structural developments in the Indian telecom market, including significant increase in data usage and infrastructure construction.

- **Gross Revenue:** Analyzed on a year-wise basis for the entire period

- **Subscriber, usage, and infrastructure indicators:** CAGR computed using values for 2020–21 and 2024–25

Variables and its Role in Infrastructure Growth

Table 1: Variables and its Role in Telecom Infrastructure Growth

Category	Variables	Role in Infrastructure Growth
Financial Sustainability	Gross Revenue	Enables capital availability for infrastructure investment
Demand Expansion	Telephone Subscriber	Indicates network reach Requirement
Demand Expansion	Wireless Subscriber	Drives radio network densification
Digital Connectivity	Broadband Subscribers	Necessitates fibre and BTS expansion
Digital Connectivity	Internet Subscribers	Increases network capacity demand
Usage Intensity	Avg. Wireless Data Usage (GB/month)	Requires capacity enhancement and BTS densification
Revenue Efficiency	Monthly ARPU (₹)	Reflects monetization strength supporting infrastructure investment
Passive Infrastructure	Telecom Towers Installed	Expands geographical coverage
Active Infrastructure	BTS Installed (Mobile Base Stations)	Enhances network capacity and service quality

Methods of Analysis

- **Trend Analysis**

Year-wise trends in gross revenue are analyzed to assess the financial sustainability of the telecom sector during the study period.

- **Compound Annual Growth Rate (CAGR) Analysis**

CAGR is used as the primary analytical tool to measure average annual growth in subscriber base, usage intensity, revenue efficiency, and infrastructure indicators.

CAGR formula:

$$\text{CAGR} = (\text{Ending Value} / \text{Beginning Value})^{(1/n)} - 1$$

Where n denotes the number of years.

- **Comparative Growth Analysis**

The analysis will compare the CAGR of financial indicators and demand-side indicators with that of infrastructure growth indicators. The objective of the comparison is to establish whether improvements in financial sustainability and service demand are reflected by expansions in infrastructure.

Data Analysis and Interpretation

This section of data analysis focuses on the Indian telecommunication sector over a five-year period from (FY2020-21 to FY2024-25). It has been based on the financial performance of the sector, demand, usage, revenue generation, and growth of the telecommunication infrastructure. Through yearly trends and Compound Annual Growth Rate (CAGR), the level of contribution of financial growth and usage growth factors towards the development of telecommunication infrastructure in India has been measured.

Table 2: Gross Revenue of Indian Telecom Sector (₹ crore) from 2020-21 to 2024-25

Year	Gross revenue (₹ Crore)
2020-21	2,73,458
2021-22	2,782,16
2022-23	3,336,97
2023-24	3,360,66
2024-25	3,720,97
CAGR	8%

Source: Data compiled by the author from TRAI Performance Indicator Reports — Quarterly Reports (FY 2020–21) and Yearly Performance Indicators Report (2024–25).

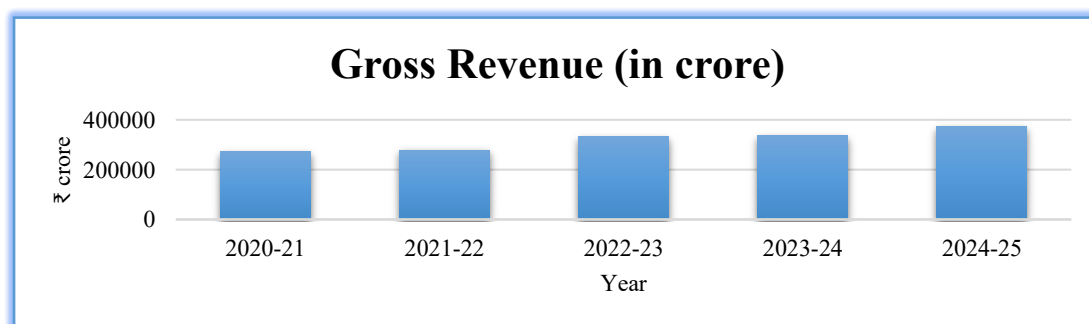


Figure 1: Gross Revenue of Indian Telecom Sector (₹ crore)

Source: Computed by the author based on data presented in Table 2

The gross revenues pertaining to the Indian telecom market, between 2020-21 and 2024-25, depict encouraging growth trends as supported by the hike from ₹2.73 Lakh Crore for the year 2020-21 to ₹3.72 Lakh Crore for the year 2024-25, which records a compound growth rate of approximately 8%. The lower growth rate recorded for the telecom market for the year 2020-21 and 2021-22 could be due to the effect of the COVID-19 pandemic, which had imposed greater mobility constraints across all markets.

An increase in revenue growth rates for 2022–23 is an indication of the rapid recovery from the effects of the pandemic, mainly fueled by rising data usage, tariff rationalization received by providers, and high growth in digital and online services. The continued high revenue growth rates in 2023–24 and 2024–25 are another indicator of the growing financial sustainability of the operations of the telecom service providers.

The rise in gross revenues helps to increase the capital base for the operators and thereby allows the operators to meet their commitment with regard to spectrum and funding of growth, thereby directly contributing to the development of telecom infrastructure in India.

Table 3: Comparative CAGR Analysis of Demand, Usage, Revenue and Infrastructure Variables

Matrix	2020-21	2024-25	CAGR
Telephone subscribers (Million)	1201.2	1200.08	0%
wireless subscribers (Million)	1180.96	1156.99	-1%
Broadband Subscribers (Million)	778.09	944.12	5%
internet subscribers (Million)	825.3	969.1	4%
Average Wireless Data Usage per wireless subscriber in month (GB)	12.33	21.53	15%
Monthly ARPU of Wireless Service(RS.)	103.58	174.78	14%
Telecom Towers (Lakhs)	6.6	8.24	6%
BTS Installed (Lakhs)	22.40	30.02	8%

Source: Data compiled by the author from TRAI Performance Indicator Reports — Quarterly Reports (FY 2020–21), Yearly Performance Indicators Report (2024–25) and Department of Telecommunications Dashboard (n.d.).

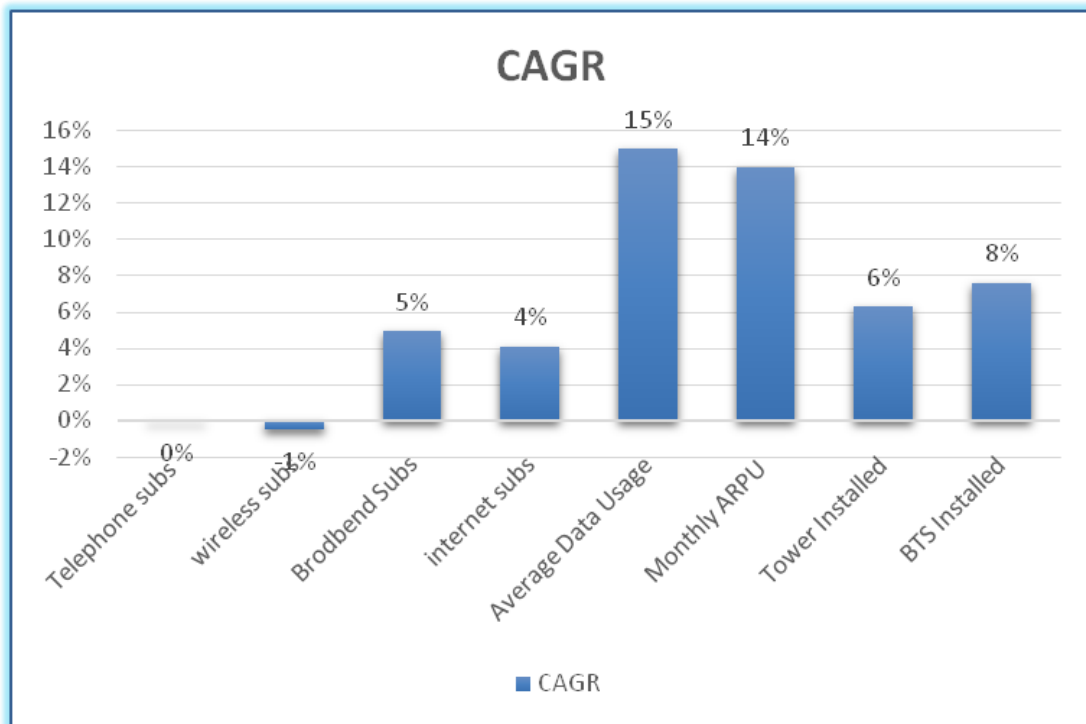


Figure 2: CAGR Comparison of Indian Telecom Indicators (2020-21 to 2024-25)

Source: Computed by the author based on data presented in Table 3

Interpretation of Demand-Side Indicators

- Telephone and Wireless Subscribers**

While telephone subscribers record zero CAGR, wireless subscribers show a negative CAGR of -1%. This implies that the Indian telecom market has achieved a mature and saturated stage in terms of

subscriber acquisition. More than a sign of sectoral weakness, this trend reflects the high level of penetration attained in the telecom market, with most users already connected. It also underlines consolidation of multiple SIM usage by consumers into a rationalization of subscribers. Most importantly, the trend reflects the structural shift from in quantity-driven growth to quality-driven growth-that is, from adding subscribers to higher usage, improved service quality, and better revenue realization from existing users.

Growth in Digital Connectivity Indicators

- **Broadband Subscribers (CAGR: 5%)**

The broadband subscribers increased from 778.09 to 944.12 in the research period, registering a CAGR rate of 5%. This growth is primarily driven by the expansion of fibre-based networks across the country, improving the availability and reliability of broadband connectivity. Also, high-speed internet demand is on the rise due to increased reliance by households and businesses on these digital services. The growth in the adoption of work-from-home practices, e-learning platforms, and over-the-top streaming services has added immense force to the demand for stable, high-capacity internet connections, thus reinforcing the expansion of the infrastructure in digital connectivity.

- **Internet Subscribers (CAGR: 4%)**

The compound annual growth rate for internet subscribers was registered at 4% during the period of study, which indicates a continuous growth in internet adoption across the country. This is also presenting a continuous need for improvement in network capacity, particularly in semi-urban and rural regions where internet adoption is rapidly increasing. However, at the same time, the usage intensity factor has identified itself as a significant driver for infrastructure development, given the rise in wireless data usage per subscriber per month from 12.33 GB to 21.53 GB month-on-month, which includes a high CAGR of 15%. This rise has been fueled by more and more subscribers engaging in video streaming, the adoption of cloud-based services, widespread adoption of digital payments and e-governance initiatives, and more recently, with the advent of 4G and 5G technologies. Hence, there exists a significant need to address and densify the existing infrastructure to cope with increased usage intensity. Therefore, there is a need to consider the impact of increased usage intensity as a driving force for infrastructure development.

Revenue Efficiency and Infrastructure Financing

- **Monthly ARPU Growth (CAGR: 14%)**

Monthly ARPU grew from ₹103.58 to ₹174.78, representing a CAGR of 14 % during the study period. This represents the improved tariff structure adopted across the sector. It also revealed increased monetization of data services and improvement in the quality of the subscriber base. A rise in ARPU builds internal cash flows of the operators, thus reducing dependence on debt financing. Therefore, operators are in a better position to make sustained investments in tower installations, BTS expansion, and network modernization.

Infrastructure Expansion Analysis

- **Telecom Towers (CAGR: 6%)**

The number of telecommunication towers has increased from 6.45 lakhs to 8.24 lakhs during the period of study, reflecting CAGR of 6 percent. Due to the increase, there was a guarantee of better geographical coverage across the country, especially for the rural areas. Equally, the stability of telecommunication services has improved with increased numbers of telecommunication towers, particularly during peak usage periods.

- **BTS Installed (CAGR: 8%)**

The growth of BTS installations during the period of study was higher than that of telecom towers, at a CAGR of 8 percent from 22.4 lakhs to 30 lakhs. This trend demonstrates that telecom companies have focused on network densification in addition to geographical expansion. The higher numbers of BTS stations have also enhanced network services, particularly in areas with heavy traffic.

Comparative Interpretation

The CAGR results depict a trend of growth that has taken a peculiar shape in the dynamics of growth of the Indian telecom market. In the period under consideration, while the growth of the subscriber

base has been relatively modest, the growth of intensity of usage and ARPU has taken place at 15% and 14%, respectively. On the other hand, the growth of infrastructure, represented by a CAGR of 6-8%, is more in tune with the usage and revenue trends than the subscriber base. The results indicate that the growth of India's telecom infrastructure is caused by high usage and revenue, and not directly dependent on the size of the subscriber base.

Findings

The increase in gross revenue in the Indian telecommunication industry helps to ensure financial sustainability by increasing the ability of service providers to raise internal resources for capital-intensive investments. Simultaneously, the increasing per-subscriber usage of data services is generating a huge demand for better network capacity, which pushes service providers toward more and improved infrastructure. Further increase in average revenue per user create even high capability for investment by improving financial performance and enabling long-term infrastructure development. As a result, infrastructure development in the telecommunication industry is increasingly driven by usage intensity and service quality demands rather than just subscriber growth. Taken together, these developments confirm that the role of financial and usage-driven growth drivers is critical in determining the evolution of telecom infrastructure in India.

Discussion

Analysis of the data reveals that the Indian telecom market is undergoing a transition from growth driven by an increase in the number of subscribers to growth driven by revenue and data usage. During the period of this study, the number of telephone and wireless subscribers remained more or less constant, indicating that the market has reached saturation. However, gross revenue, data usage per subscriber, and ARPU have shown significant growth. This trend clearly indicates that the expansion of telecom infrastructure is increasingly dependent on the usage intensity of telecom services rather than the addition of new subscribers. The steady increase in the number of broadband and internet subscribers has increased the need for improved network capacity and quality. As a result, telecom service providers have increased their infrastructure by deploying more towers and base transceiver stations to support the growing data traffic.

The development of telecommunications infrastructure is one of the most important factors that contribute to the sustained growth of the Indian industrial sector. This is because improved telecommunications infrastructure enables the efficient use of digital services, manufacturing automation, e-commerce, financial technology, and logistics. The increased use of data and the availability of reliable telecommunications connectivity improve productivity, reduce delays in business operations, and enable the use of advanced technologies. The strong financial performance of telecommunications companies, on the other hand, supports continued investments in telecommunications infrastructure development, which is beneficial for both rural and urban industrial development. Therefore, the results of this study show that the development of telecommunications infrastructure, fueled by revenue growth and increased data usage, is a basic foundation for sustained industrial growth and economic development in India.

Limitation and Future Direction

The results derived from the study reveal that the growth in gross revenue and ARPU has resulted in the improvement of financial sustainability among telecom operators, but the high cost of spectrum is hindering the effective growth of revenue into infrastructure development. The growth in wireless data traffic and internet and broadband users shows that there is a lot of demand for services. However, the development in telecom tower and BTS deployment is slowed down by delays in approvals. The study also shows that regional variations in telecom subscriber growth suggest that infrastructure development differs in both urban and rural areas. Additionally, the increase in data traffic suggests that there is a strong need for improved network expansion, which require a larger capital investment than the existing rate of revenue growth. To address these limitations, policy measures focused on cost rationalisation, faster approvals, and targeted rural infrastructure investment are essential for aligning financial sustainability and demand growth with sustained telecom infrastructure development in India.

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