



Industry Report on Indian IT Infrastructure

For Marushika Technology Limited

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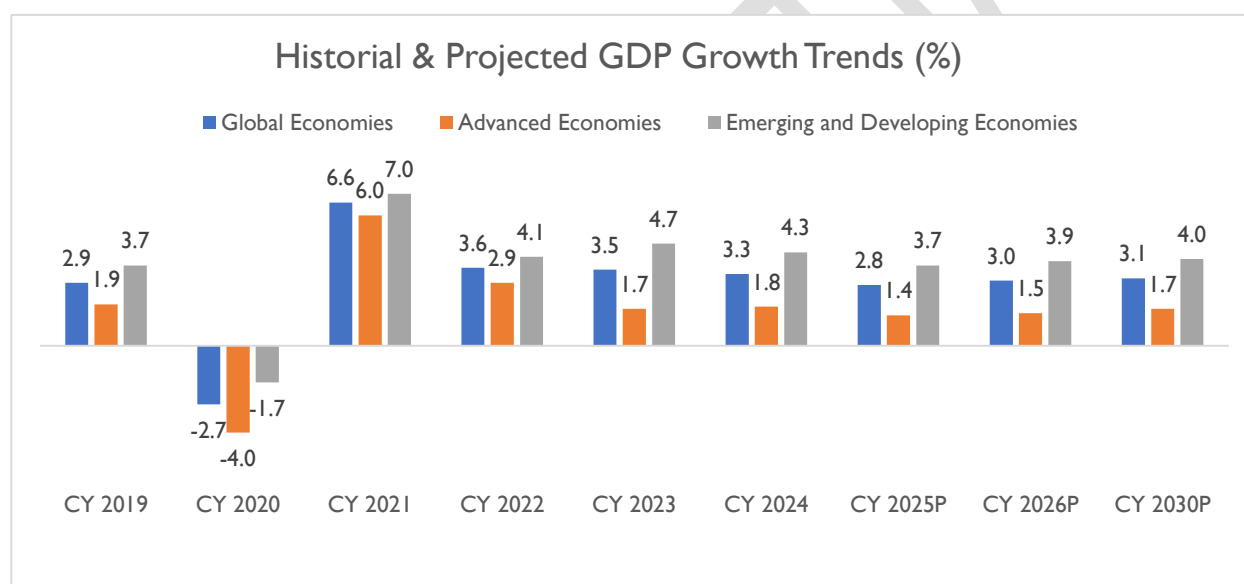
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Global Macroeconomic Landscape

Global Economic Overview

The global economy, which recorded GDP growth at 3.3% in CY 2024, is expected to show resilience at 2.8% in CY 2025. This marks the slowest expansion since 2020 and reflects a 0.5%-point downgrade from January 2025 forecast. Moreover, the projection for CY 2026 has also reduced to 3.0%. This slowdown is majorly attributed due to numerous factors such as high inflation in many economies despite central bank effort to curb inflation, continuing energy market volatility driven by geopolitical tensions particularly in Ukraine and Middle East, and the re-election of Donald Trump as US President extended uncertainty around the trade policies as well as overall global economic growth. High inflation and rising borrowing costs affected the private consumption on one hand while fiscal consolidation impacted the government consumption on the other hand. As a result, global GDP growth is estimated to moderate by 2.8% in CY 2025 as compared to 3.3% in CY 2024.

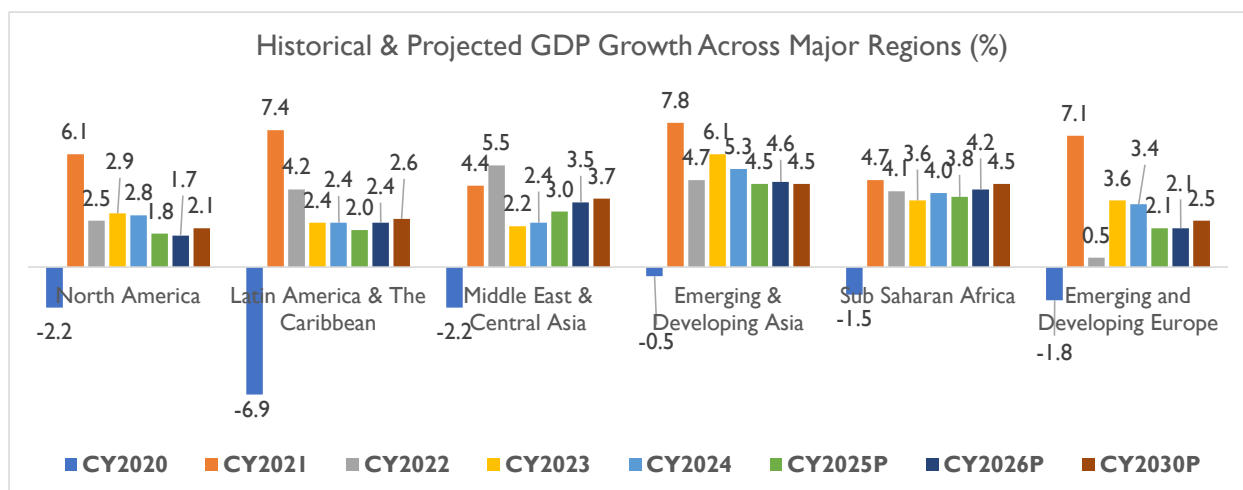


Source – IMF Global GDP Forecast Release April 2025

Note: Advanced Economies and Emerging & Developing Economies are as per the classification of the World Economic Outlook (WEO). This classification is not based on strict criteria, economic or otherwise, and it has evolved over time. It comprises of 40 countries under the Advanced Economies including the G7 (the United States, Japan, Germany, France, Italy, the United Kingdom, and Canada) and selected countries from the Euro Zone (Germany, Italy, France etc.). The group of emerging market and developing economies (156) includes all those that are not classified as Advanced Economies (India, China, Brazil, Malaysia etc.)

Historical and Projected GDP Growth

GDP growth across major regions exhibited a mixed trend between 2022-23, with GDP growth in many regions including North America, Emerging and Developing Asia, and Emerging and Developing Europe slowing further in 2024. In 2025, GDP growth rate in Emerging and Developing Asia (India, China, Indonesia, Malaysia, etc.) is expected to moderate further to 4.5% from 5.3% in the previous year, while in the North America, it is expected to moderate to 1.8% in CY 2025 from 2.8% in CY 2024.



Source-IMF World Economic Outlook April 2025 update.

Except Middle East & Central Asia, all other regions like Emerging and Developing Asia, Emerging and Developing Europe, Latin America & The Caribbean, Sub Saharan Africa and North America, are expected to record a moderation in GDP growth rate in CY 2025 as compared to CY 2024. Further, growth in the United States is expected to come down at 2.71% in CY 2025 from 2.80% in CY 2024 due to lagged effects of monetary policy tightening, gradual fiscal tightening, and a softening in labour markets slowing aggregate demand.

Global Economic Outlook

The global economy is navigating a period of exceptional uncertainty. Policy shifts, particularly those reshaping trade, have alarmed financial markets and bruised business sentiment. The U.S.'s reciprocal tariffs, which represent additional costs for businesses from almost all countries with which the U.S. trades, charge trade partners an import duty at a discounted rate of approximately half the rate that the trade partner currently imposes on the U.S. According to U.S. President Donald Trump, reciprocal tariffs, ranging from 10% to 50%, are meant to address trade barriers limiting U.S. exports. The *effective* tariff rate includes other tariffs imposed at an earlier date and cumulatively may now be higher than duties charged on U.S. imports. It is unclear whether the reciprocal tariffs represent a negotiating tool, and may therefore be temporary, or form part of broader long-term protectionist measures and industrial strategy.

Responses to reciprocal tariffs have been varied, with some economies promising swift countermeasures. More than 50 markets have sought negotiations with the US. While Malaysia is seeking a united response across ASEAN, the Chinese Mainland has retaliated with duties on all imports from the U.S., declaring it will "fight to the end". In early April, the U.S. confirmed the most aggressive steps yet, with a cumulative 145% tariff on some products imported from the Chinese Mainland. Brazil has readied itself by passing a bill allowing for retaliation, Australia has ruled out retaliatory levies, and the EU remains open to negotiation while preparing a package of countermeasures.

Tariffs and their unpredictable application have weighed on consumer and business sentiment, sunk global stock markets, raised recession risks, and made a global slowdown more likely. Our latest Global Business Optimism Insights report for indicates a further decline in business optimism as firms continue to grapple with trade-related policy uncertainty and its broader economic implications. Export-driven sectors reported sharp declines in optimism. Financial risk perceptions remain elevated as businesses contend with high borrowing costs and persistent inflation expectations. More broadly, the uncertainty is reflected in delayed capital expenditure and a pullback in hiring.

Tariffs have begun to exert pressure on central banks by contributing to inflationary pressures and increasing financial market volatility. Central banks are adjusting forward guidance and policy frameworks and may begin to consider the likelihood of softer growth being a bigger priority than high inflation by starting to cut interest rates to support economies. For businesses, this uncertainty translates into unpredictable cost structures, fluctuating credit availability, and the management of operational costs through diversified supply networks.

The latest Dun & Bradstreet Global Business Optimism Insights report reveals a further decline in business optimism, though at a more moderate pace than in the prior quarter, as businesses continued to grapple with trade-related policy uncertainty and its broader economic implications. Export-driven sectors such as automotives, electricals, and metals saw sharp declines in optimism, particularly in the U.S., Mexico, South Korea, and Japan, where rising tariffs and shifting trade policies have fueled cost pressures and demand volatility. Financial risk perceptions remain elevated.

Global Growth Projection

At broader level, the global economy is expected to experience a slowdown in 2025, with GDP growth projected to decline to 2.8%, down from 3.3% in 2024. This deceleration reflects persistent inflationary pressure, geopolitical uncertainties and tightened monetary policies. However, a slightly recovery is anticipated in 2026, with growth projected to improve to 3.0%. Global inflation is expected to decline steadily, to 4.3% in 2025 and to 3.6% in 2026. Inflation is projected to converge back to the target earlier in advanced economies, reaching 2.2% in 2026, whereas in emerging market and developing economies, it is anticipated to decrease to 4.6% during the same period. Trade tariffs function as a supply shock for the countries imposing them, leading to a decrease in productivity and an increase in unit costs. Countries subject to tariffs experience a negative demand shock as export demand declines, placing downward pressure on prices. In each scenario, trade uncertainty introduces an additional layer of demand shock since businesses and households react by delaying investment and spending, and this impact could be intensified by stricter financial conditions and heightened exchange rate volatility. Moreover, Global trade growth is expected to slow down in 2025 to 1.7%. This forecast reflects increased tariff restrictions affecting trade flows and, to a lesser extent, the waning effects of

cyclical factors that have underpinned the recent rise in goods trade. Geopolitical tensions as seen in the past such as the wars in Ukraine and the Middle East could exacerbate inflation volatility, particularly in energy and agricultural commodities.

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India Macroeconomic Analysis

India emerged as one of the fastest growth economies amongst the leading advanced economies and emerging economies. In CY 2024, even amidst geopolitical uncertainties, particularly those affecting global energy and commodity markets, India continues to remain one of the fastest growing economies in the world and is expected to grow by 6.2% in CY 2025 and 6.3% in 2026.

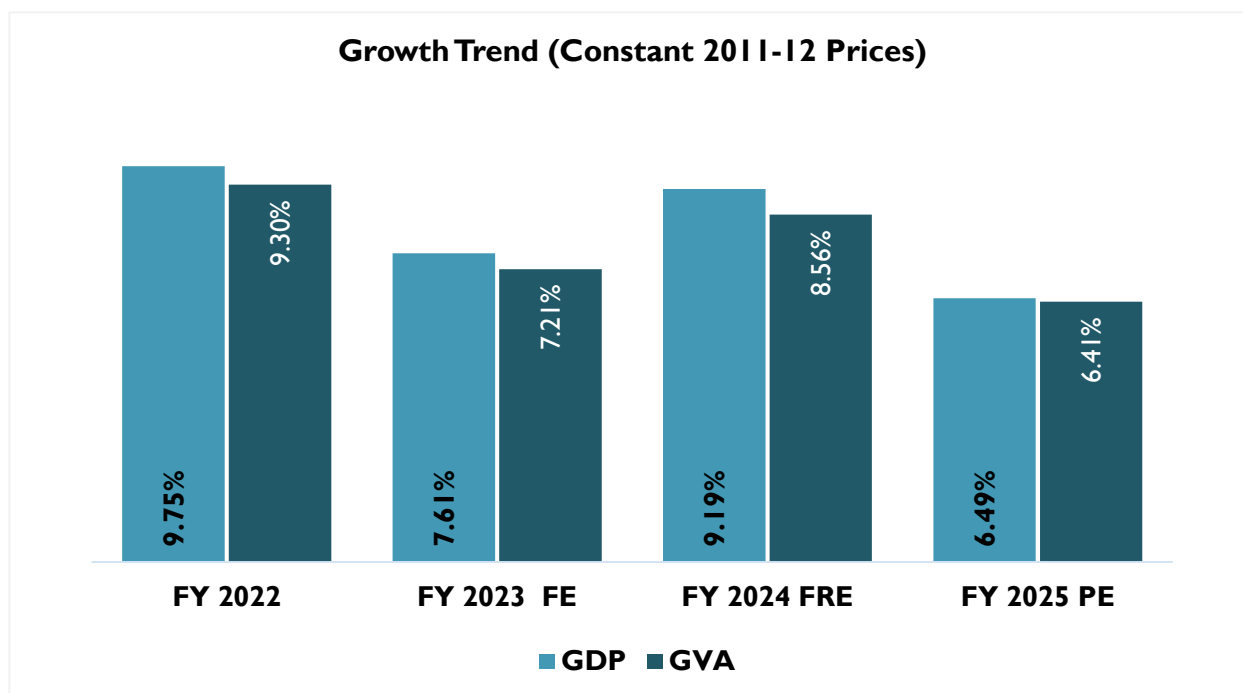
Country	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024	CY 2025	CY 2026	CY 2030
							P	P
India	-5.8%	9.7%	7.6%	9.2%	6.5%	6.2%	6.3%	6.5%
China	2.3%	8.6%	3.1%	5.4%	5.0%	4.0%	4.0%	3.4%
United States	-2.2%	6.1%	2.5%	2.9%	2.8%	1.8%	1.7%	2.1%
Japan	-4.2%	2.7%	0.9%	1.5%	0.1%	0.6%	0.6%	0.5%
United Kingdom	-10.3%	8.6%	4.8%	0.4%	1.1%	1.1%	1.4%	1.4%
Russia	-2.7%	5.9%	-1.4%	4.1%	4.1%	1.5%	0.9%	1.2%

Source: World Economic Outlook, April 2025

The Government stepped spending on infrastructure projects to boost the economic growth had a positive impact on economic growth. The capital expenditure of the central government increased by average 26.52% during FY 2023-FY 2024 which slowed to 7.27% in FY 2025 which is expected to translate in moderating GDP growth of 6.5% in 2024. In the Union Budget 2025-2026, the government announced INR 11.21 billion capex on infrastructure (10.12% higher than previous year revised estimates) coupled with INR 1.5 trillion in interest-free loans to states. This has provided much-needed confidence to the private sector, and in turn, expected to attract the private investment.

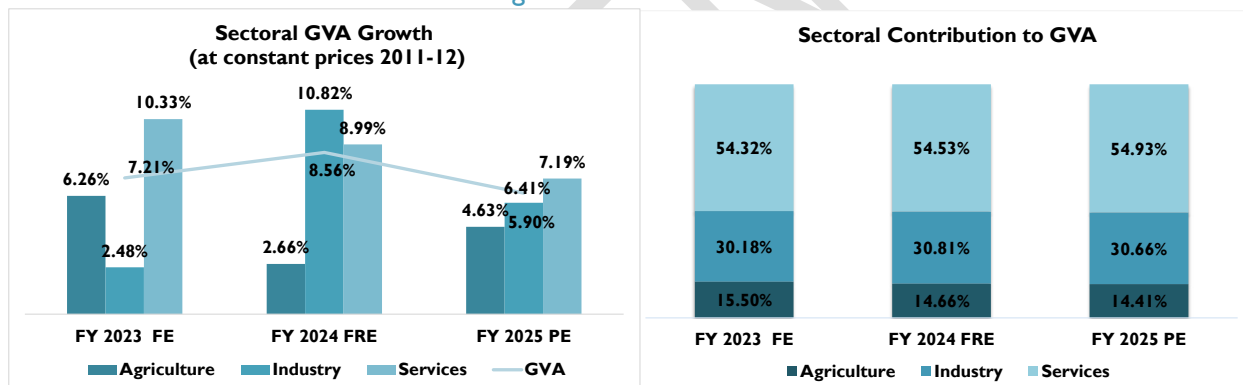
Historical GDP and GVA Growth trend

As per the latest estimates, India's GDP at constant prices is estimated to grow to INR 187.96 trillion in FY 2025 (Provisional Estimates) with the real GDP growth rates estimated to be 6.5% for FY 2025. Similarly, real Gross Value Added (GVA) growth stood is estimated to have moderated to 6.4% in FY 2025. Even amidst global economic uncertainties, India's economy exhibited resilience supported by robust consumption and government spending.



Source: Ministry of Statistics & Programme Implementation (MOSPI), National Account Statistics: FY2025.
FE is Final Estimates, FRE is First Revised Estimate and PE is Provisional Estimates

Sectoral Contribution to GVA and annual growth trend



Source: Ministry of Statistics & Programme Implementation (MOSPI)
FE is Final Estimates, FRE is First Revised Estimate and PE is Provisional Estimates

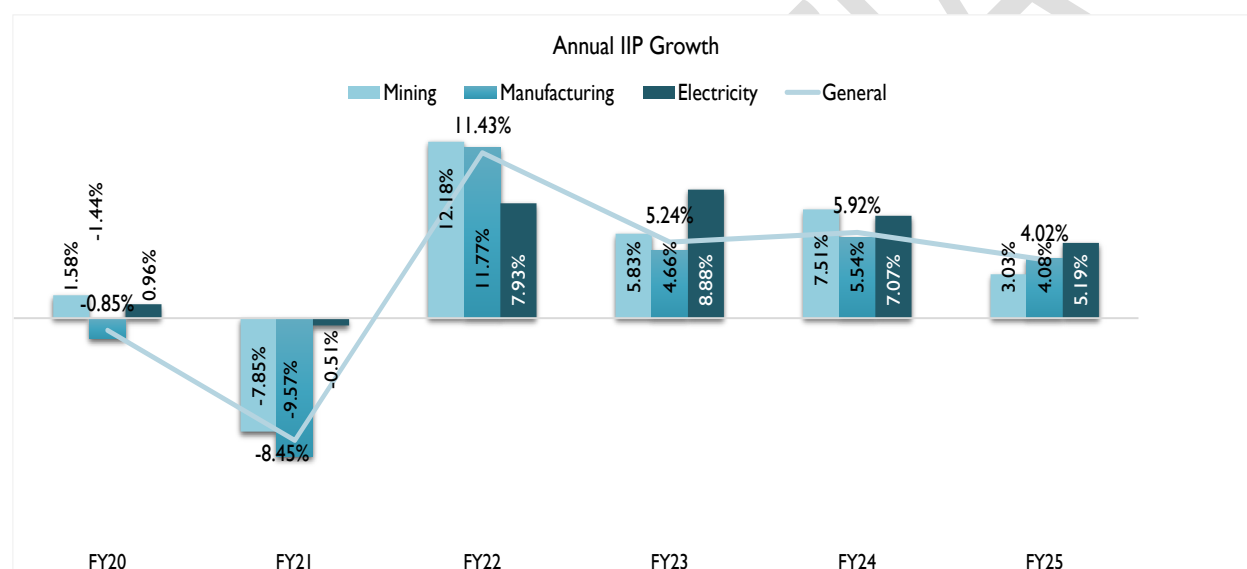
Sectoral analysis of GVA reveals that the industrial sector experienced a moderation in FY 2025, recording a 5.90% y-o-y growth against 10.82% year-on-year growth in FY 2024. Within the industrial sector, growth moderated across sub sector with mining, manufacturing, and construction activities growing by 2.69%, 4.52%, and 9.35% respectively in FY 2025, compared to 3.21%, 12.30%, and 10.41% in FY 2024. Growth in the utilities sector too moderated to 6.03% in FY 2025 from 8.64% in the previous year. The industrial sector's contribution to GVA moderated marginally from 30.81% in FY 2024 to 30.66% in FY 2025.

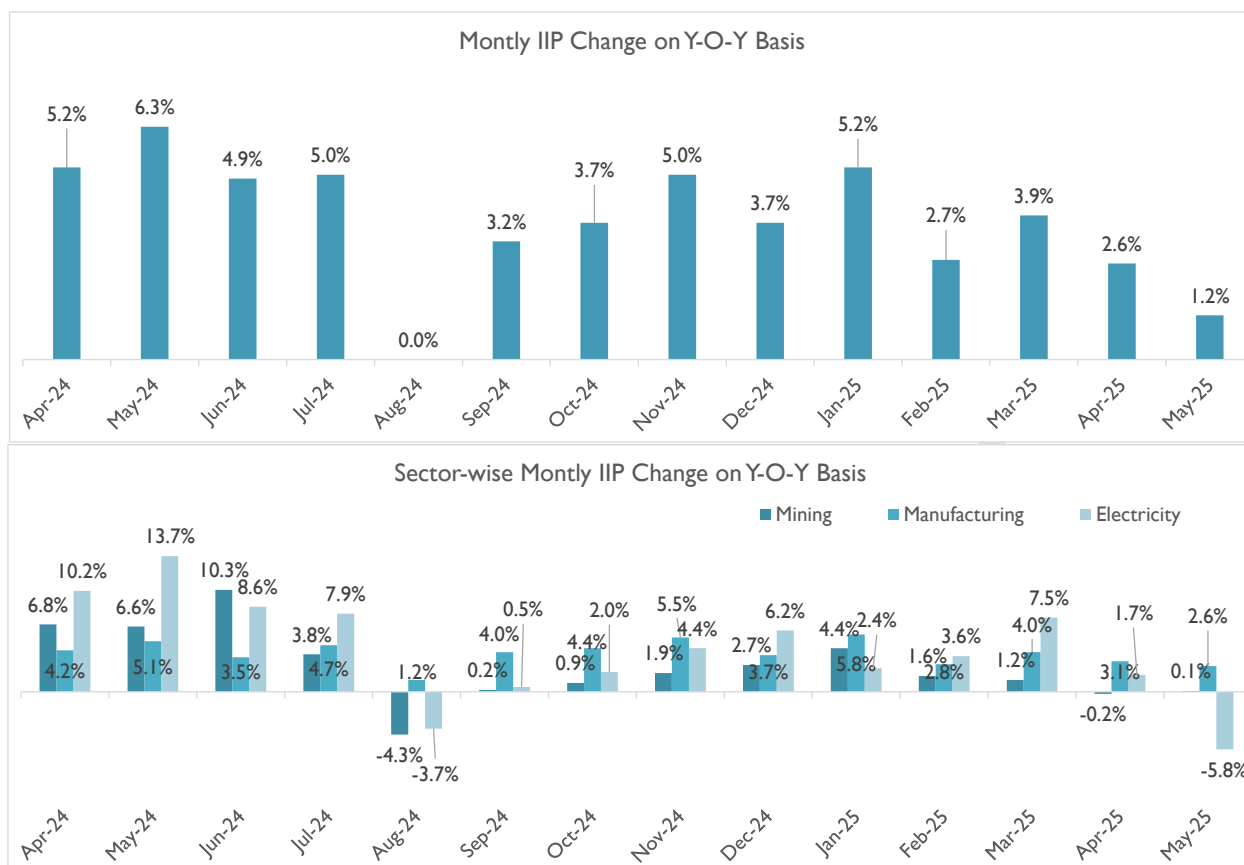
The services sector continued to be the main driver of economic growth, although its pace moderated. It expanded by 7.19% in FY 2025 from 8.99% in FY 2024. The services sector retained its position as the largest contributor to GVA, rising from 54.32% in FY 2023 to 54.53% in FY 2024, with a further increase to 54.93% in FY 2025.

The agriculture sector saw an acceleration, with growth increasing from 2.66% in FY 2024 to 4.63% in FY 2025. However, its contribution to GVA declined marginally from 14.66% in FY 2024 to 14.41% in FY 2025. Overall, Gross Value Added (GVA) growth moderated to 6.41% in FY 2025 from 8.56% in FY 2024

Annual & Monthly IIP Growth

Industrial sector performance as measured by IIP index exhibited moderation in FY 2025, recording a 4.02% y-o-y growth against 5.92% increase in the previous year. The manufacturing index showed moderation and grew by 4.08% in FY 2025 against 5.54% in FY 2024. Mining sector index too moderated and exhibited a growth of 3.03% in FY 2025 against 7.51% in the previous years while the Electricity sector Index, also witnessed moderation of 5.19% in FY 2024 against 7.07% in the previous year.



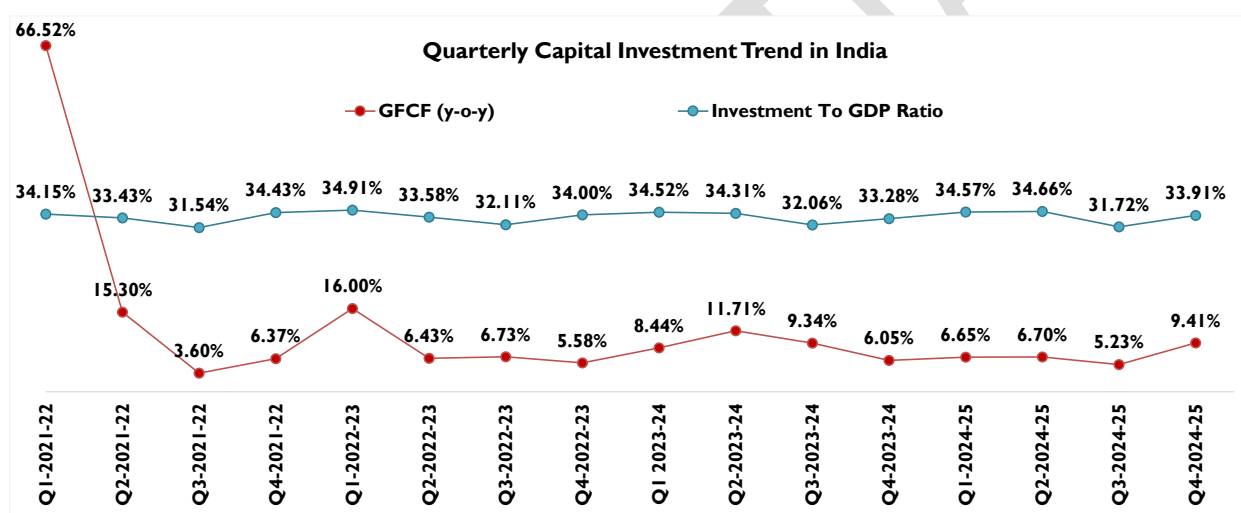
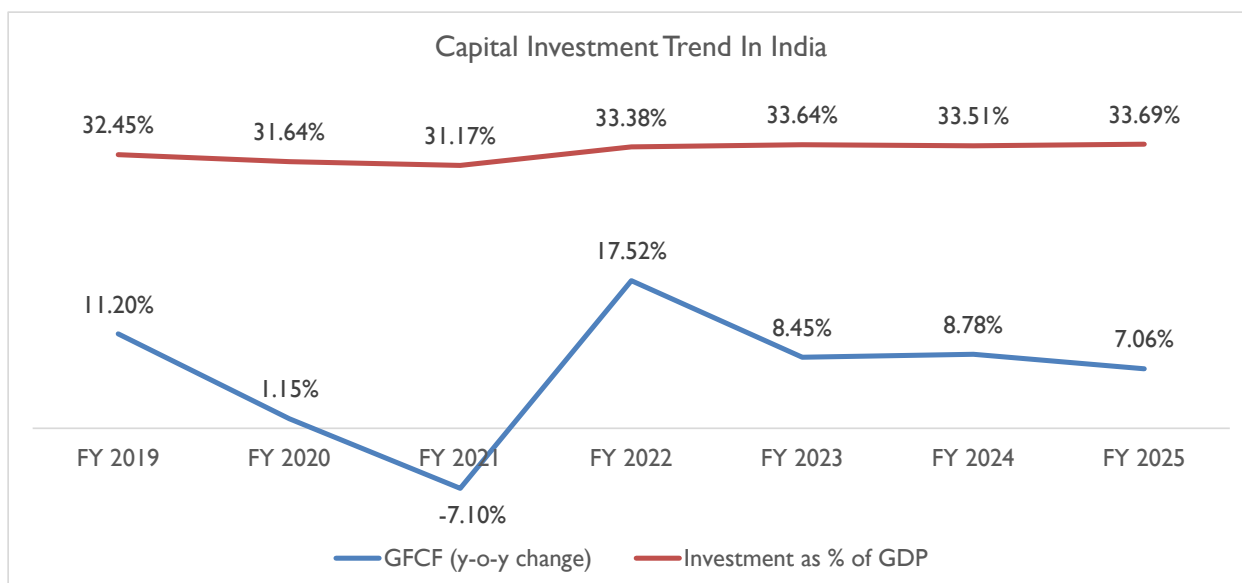


Source: Ministry of Statistics & Programme Implementation (MOSPI)

The IIP growth rate for the month of May 2025 is 1.2% which was 2.6% in the month of April 2025. The growth rates of the three sectors, Mining, Manufacturing and Electricity for the month of May 2025 are (-)0.1%, 2.6% and (-)5.8% respectively.

Annual and Quarterly: Investment & Consumption Scenario

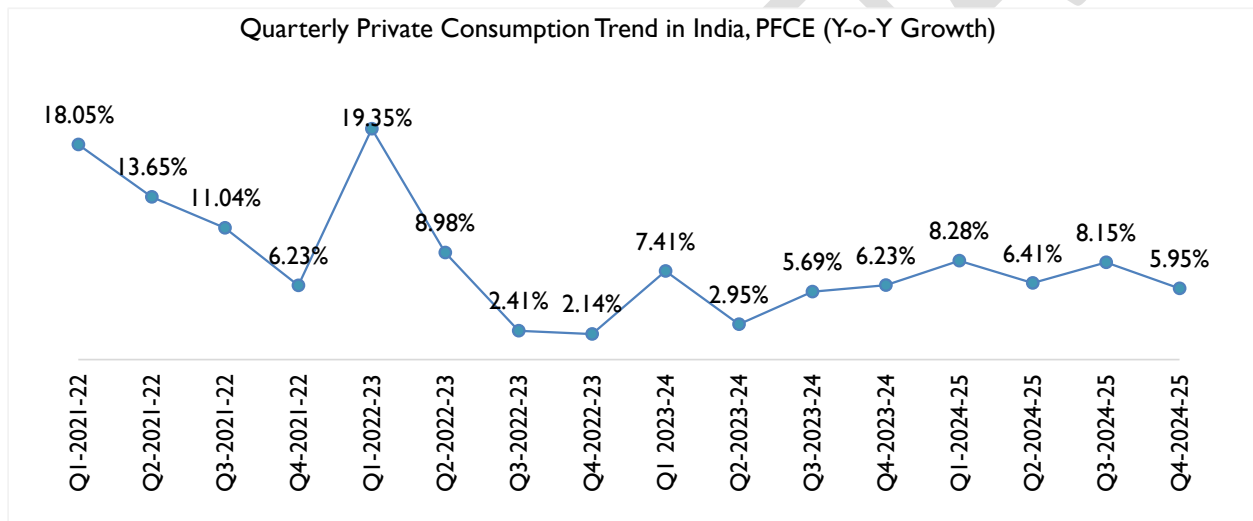
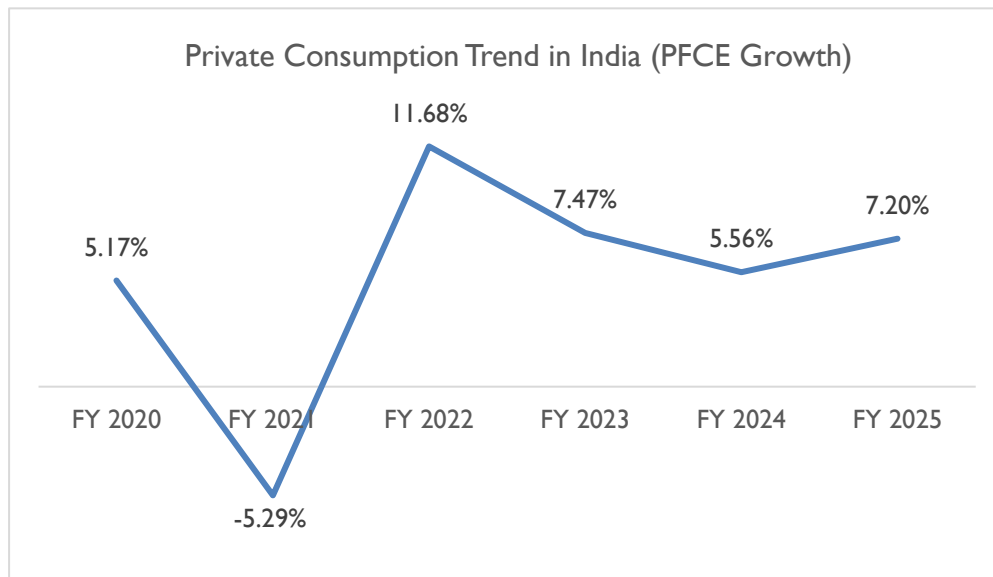
Other major indicators such as Gross fixed capital formation (GFCF), a measure of investments, has shown fluctuation during FY 2025 as it registered 7.06% year-on-year growth against 8.78% yearly growth in FY 2024, taking the GFCF to GDP ratio measured to 33.69%.



Source: Ministry of Statistics & Programme Implementation (MOSPI)

On quarterly basis, GFCF exhibited a fluctuating trend in quarterly growth over the previous year same quarter. In FY 2024, the growth rate moderated to 6.05% in March quarter against the previous two quarter as government went slow on capital spending amidst the 2024 general election while it observed an improvement in Q1 FY 2025 by growing at 6.65% against 6.05% in the previous quarter and moderated in the subsequent two quarter. On yearly basis, the growth rate remained lower compared to the same quarter in the previous year during FY 2025. The GFCF to GDP ratio measured 33.91% in Q4 FY 2025.

Private Consumption Scenario



Sources: MOSPI

Private Final Expenditure (PFCE) a realistic proxy to gauge household spending, observed growth in FY 2025 as compared to FY 2024. However, quarterly data indicated some improvement in the current fiscal as the growth rate improved over the corresponding period in the last fiscal.

Inflation Scenario

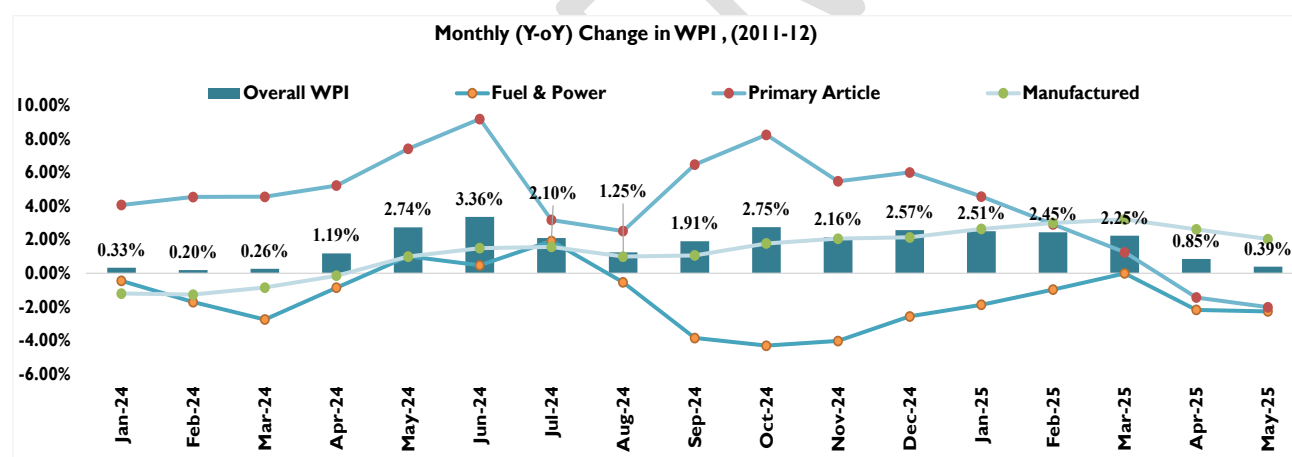
The inflation rate based on India's Wholesale Price Index (WPI) exhibited significant fluctuations across different sectors from January 2024 to May 2025. The annual rate of inflation based on All India Wholesale Price Index (WPI) number is 0.39% (provisional) for the month of May 2025 (over May 2024). Positive rate of inflation in May 2025 is primarily due to increase in prices of manufacture of food products, electricity, other manufacturing, chemicals and chemical products, manufacture of other transport equipment and non-food articles etc.

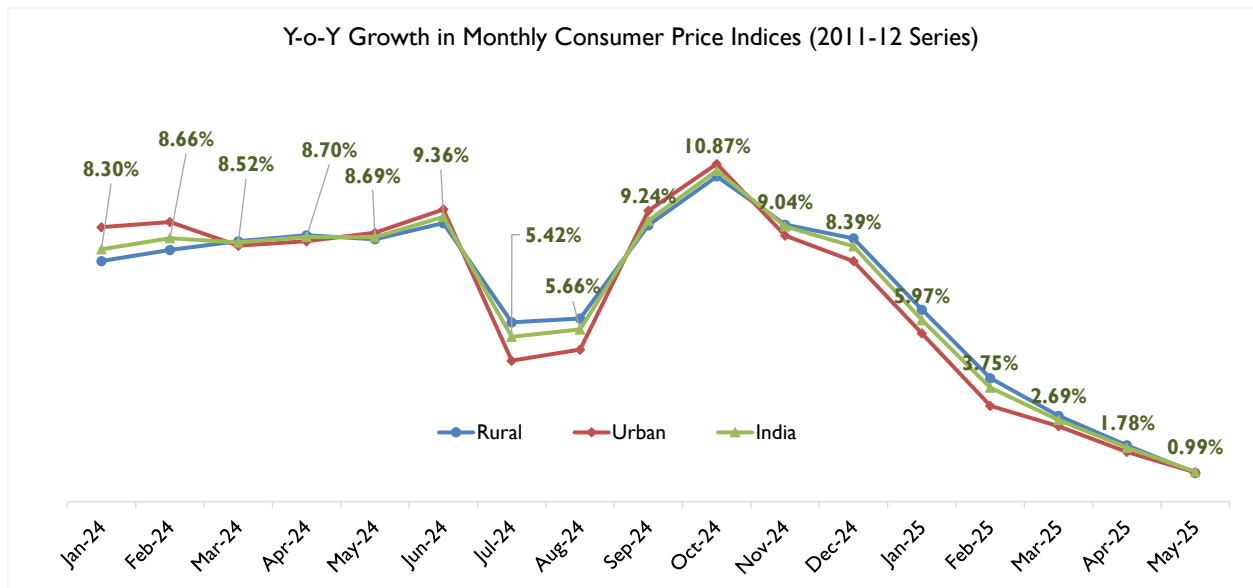
By May 2025, Primary Articles (Weight 22.62%), The index for this major group decreased by 0.05 % to 184.3 (provisional) in May 2025 from 184.4 (provisional) for the month of April 2025. Price of

minerals (-7.16%) and non-food articles (-0.63%) decreased in May 2025 as compared to April 2025. The price of food articles (0.56%) increased in May 2025 as compared to April 2025.

Moreover, power & fuel, the index for this major group declined by 0.95% to 146.7 (provisional) in May 2025 from 148.1 (provisional) for the month of April 2025. Price of mineral oils (-2.06%) decreased in May 2025 as compared to April 2025. The price of coal (0.81%) and electricity (0.80%) increased in May 2025 as compared to April 2025.

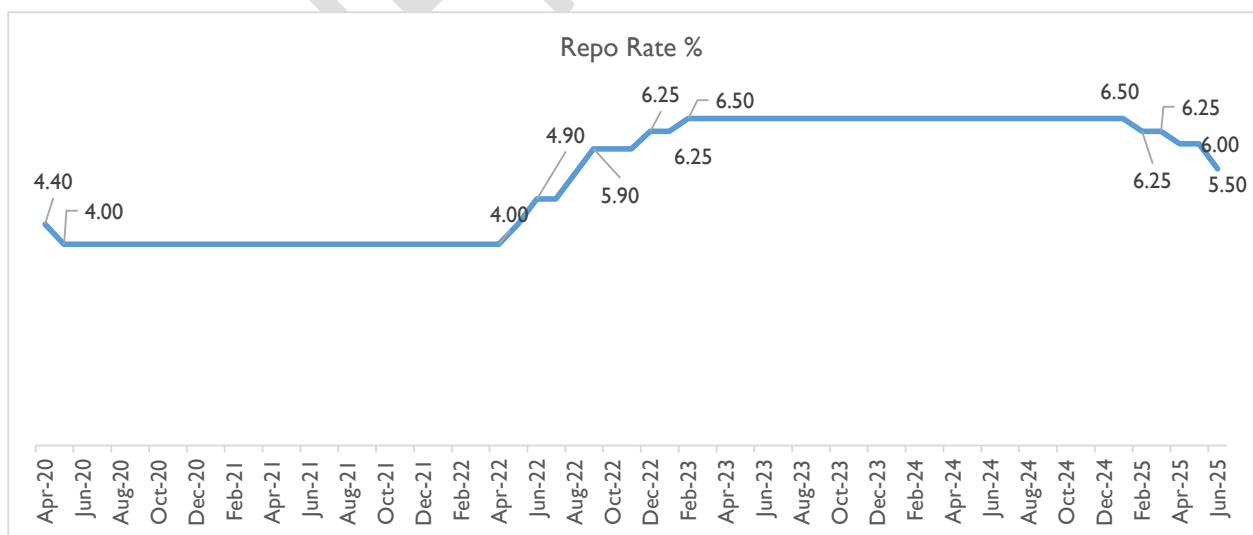
Furthermore, Manufactured Products (Weight 64.23%), The index for this major group remained unchanged at 144.9 (Provisional) in May 2025. Out of the 22 NIC two-digit groups for manufactured products, 10 groups witnessed an increase in prices, 9 groups witnessed a decrease in prices and 3 groups witnessed no change in prices. Some of the important groups that showed month-over-month increase in prices were other manufacturing; manufacture of other non-metallic mineral products; computer, electronic and optical products; pharmaceuticals, medicinal chemical and botanical products and textiles etc. Some of the groups that witnessed a decrease in prices were manufacture of food products, basic metals; rubber and plastics products, chemical and chemical products and electrical equipment etc. in May 2025 as compared to April 2025.





Source: MOSPI, Office of Economic Advisor

Retail inflation rate (as measured by the Consumer Price Index) in India showed notable fluctuations between January 2024 and May 2025. Overall, the national CPI inflation rate moderated to 0.99% by May 2025, indicating a gradual easing of inflationary pressures across both rural and urban areas. Rural CPI inflation peaked at 10.69% in October 2024, declining to 0.95 % in May 2025. Urban CPI inflation followed a similar trend, rising to 11.09% in October 2024 and then dropping to 0.96% in May 2025. CPI measured above 6.00% tolerance limit of the central bank since July 2023. As a part of an anti-inflationary measure, the RBI has hiked the repo rate by 250 bps since May 2022 and 8 Feb 2023 while it held the rate steady at 6.50 % till January 2025. On 6th June 2025, RBI reduced the repo rate by 50 basis points which currently stands at 5.50%.



Sources: CMIE Economic Outlook

Growth Outlook

The Union Budget 2025-26 has laid the foundation for sustained growth by balancing demand stimulation, investment promotion and inclusive development. Inflation level is reaching within the

central bank's target; the RBI may pursue further monetary easing that will support growth. The medium-term outlook is bright, fueled by the emphasis on physical and digital infrastructure spending. With a focus on stimulating demand, driving investment and ensuring inclusive development, the budget introduces measures such as tax relief, increased infrastructure spending and incentives for manufacturing and clean energy. These initiatives aim to accelerate growth while maintaining fiscal discipline, reinforcing India's long-term economic resilience. The expansion of tax relief i.e zero tax liability for individuals earning up to INR 12 lacs annually under the new tax regime is expected to strengthen household finances and, consequently, boost consumption.

The external sector remains resilient, and key external vulnerability indicators continue to improve. However, tariff-related uncertainty is likely to weigh on exports and investment, prompting us to cut our FY26 GDP growth forecast to 6.3%.

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IT Infrastructure Industry Overview

The IT industry plays a pivotal role in driving India's overall economic growth. The industry contributed 7.5% to India's GDP in FY 2023, up from 7.4% in FY 2022. The IT industry added an impressive 3.2 lakh new jobs in FY 2023, taking the total workforce to 5.72 million people.

IT infrastructure services provide the foundation for India's digital transformation by building and managing data centers, networks, and cloud platforms. This ensures ubiquitous internet access, critical for connecting citizens, businesses, and government entities. Reliable and secure IT infrastructure facilitates the adoption of digital technologies like cloud computing, AI, and IoT across sectors like healthcare, education, banking, and agriculture. This translates to improved efficiency, transparency, and innovation within these sectors.

Government initiatives like Digital India rely heavily on robust IT infrastructure for delivering citizen-centric services like e-KYC, e-payments, and online education platforms.

Key Segments within IT Infrastructure

Workplace Services:

The workplace services segment within the IT infrastructure sector goes beyond just maintaining and managing technology within an organization's physical space. It encompasses a comprehensive approach to supporting an increasingly complex and digital work environment. The workplace is evolving rapidly, with remote and hybrid work models becoming increasingly common. This demands flexible and scalable workplace services that cater to a distributed workforce. Cloud-based solutions are gaining traction in workplace services, providing cost-effectiveness, accessibility, and improved collaboration capabilities. Workplace services are no longer siloed but are increasingly integrated with broader business objectives, focusing on user experience, productivity, and overall employee engagement.

In India, IT infrastructure is playing a vital role in transforming training and skilling by making learning more accessible, scalable and efficient. Emerging technologies such as artificial intelligence (AI), machine

learning (ML), cloud computing, and cybersecurity are continually reshaping the IT landscape, necessitating ongoing training and education. This dynamic technological environment compels organizations to invest in IT training to ensure their workforce remains competent and competitive. Moreover, immersive technologies like Virtual reality and augmented reality are being increasingly integrated into training programs, especially in sectors such as healthcare, manufacturing and engineering. These technologies allow learners to practice and stimulate real world task in a controlled, making training more engaging and effective.

Key Services and Trends:

- End-user Support: Evolving from traditional helpdesks to self-service portals and AI-powered chatbots for faster and more personalized assistance.
- Network and Security Management: Emphasis on proactive monitoring, threat detection, and zero-trust security models to ensure data protection and compliance.
- Mobility Management: Managing diverse device types, securing access to corporate resources, and facilitating secure mobile productivity tools.
- Unified Communications and Collaboration: Integrating voice, video, and data tools for seamless communication and collaboration across locations and devices.
- Workplace Automation: Automating routine tasks like device provisioning, password resets, and patching vulnerabilities for improved efficiency and reduced downtime.
- Digital Workspace Management: Providing a personalized and secure digital workspace with access to applications, data, and tools based on individual roles and needs.
- Workplace Analytics: Utilizing data insights to optimize IT services, improve user experience, and identify areas for cost reduction.

Data Security:

Data security plays a critical role in today's digital landscape, safeguarding sensitive information from ever-evolving threats. This segment within IT infrastructure focuses on protecting data from unauthorized access, use, disclosure, disruption, modification, or destruction. Cybercriminals are constantly evolving their tactics, making data security an ongoing challenge. This necessitates staying updated on the latest threats and adopting a layered security approach. Data privacy regulations like GDPR and CCPA are becoming increasingly stringent, demanding robust data protection measures. The growing adoption of cloud services introduces new security considerations, requiring securing data across on-premises and cloud environments.

Key Services and Trends:

- Network Security: Implementing firewalls, intrusion detection/prevention systems (IDS/IPS), and vulnerability management solutions to protect networks from unauthorized access and malicious activity.

- **Endpoint Security:** Deploying antivirus, anti-malware, and endpoint detection and response (EDR) solutions to secure individual devices from malware and intrusions.
- **Identity and Access Management (IAM):** Establishing robust IAM practices including multi-factor authentication and role-based access control to ensure only authorized users can access specific data and systems.
- **Data Encryption:** Encrypting data at rest and in transit using industry-standard algorithms to protect its confidentiality even if compromised.
- **Data Backup and Recovery:** Implementing comprehensive backup and recovery strategies to ensure data can be restored quickly and efficiently in case of disasters or cyberattacks.
- **Cloud Security:** Utilizing cloud-specific security solutions like cloud access security brokers (CASBs) and data loss prevention (DLP) to secure data in cloud environments.
- **Security Information and Event Management (SIEM):** Using SIEM tools to aggregate and analyze security data from various sources, identifying potential threats and providing insights for improved security posture.

Physical infrastructure/data Center services:

The physical infrastructure/data center services segment forms the backbone of the IT infrastructure sector. It focuses on providing the physical foundation and associated services to house and manage the critical IT equipment that powers our digital world.

Services and Solutions:

Colocation: Organizations rent space and power within a data center provider's facility to house their IT equipment. This offers cost-efficiency, scalability, and access to advanced infrastructure.

Managed Hosting: Service providers manage and maintain IT infrastructure on behalf of an organization, including servers, storage, network equipment, and operating systems. This frees up internal resources and expertise.

Disaster Recovery: Providers offer backup data centers and infrastructure to ensure business continuity in case of outages or disruptions at the primary location.

Cloud Data Center Services: This encompasses various cloud deployment models (public, private, and hybrid) where infrastructure elements like servers, storage, and networking are delivered as a service.

Edge Computing Services: Infrastructure deployed closer to where data is generated (e.g., factory floor, retail store) to process and analyze data locally, minimizing latency and improving performance.

Trends Shaping the Segment:

- **Hyperscale Data Centers:** Growing demand for large, scalable data centers capable of supporting massive computing workloads, often driven by cloud providers and large enterprises.
- **Edge Computing Adoption:** The rise of IoT and real-time applications necessitates processing data closer to its source, leading to increased adoption of edge computing services.
- **Green and Sustainable Data Centers:** Growing focus on reducing the environmental impact of data centers through energy-efficient technologies, renewable energy sources, and innovative cooling solutions.

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The Building Blocks of IT Infrastructure: Hardware and Software Components

IT infrastructure serves as the foundation for all digital operations, from simple email access to complex cloud computing environments. This intricate ecosystem relies on a delicate balance between hardware (physical components) and software (programs and applications) working in harmony. Hardware and software components work together seamlessly to create a functional IT infrastructure. Operating systems, middleware, and system management tools ensure smooth coordination between hardware resources and various applications.

Hardware:

Servers: The workhorses of IT infrastructure, servers are powerful computers dedicated to specific tasks like storing data, running applications, and managing network resources. Different types of servers include:

- **File servers:** Store and manage shared files for users within an organization.
- **Application servers:** Host and run specific applications, such as web servers for websites or databases for storing structured data.
- **Mail servers:** Manage email services like sending, receiving, and storing email messages.
- **Domain Name System (DNS) servers:** Translate domain names into IP addresses, allowing users to access websites easily.

Storage Devices: Provide space for storing and accessing data. Common storage solutions include:

- **Hard Disk Drives (HDDs):** Traditional storage devices offering high capacity at a relatively lower cost but slower access speeds.
- **Solid-State Drives (SSDs):** Use flash memory for faster data access speeds but are typically more expensive per unit of storage than HDDs.
- **Storage Area Networks (SANs):** High-performance networks dedicated to data storage, often used for mission-critical applications requiring rapid access.

Network Devices: These components connect various devices and computers within a network, enabling communication and data transfer. Examples include:

- **Routers:** Direct data packets across different networks, like sending data from your computer to the internet.
- **Switches:** Connect devices within a network, allowing them to communicate with each other.
- **Firewalls:** Security devices that filter incoming and outgoing network traffic, protecting the network from unauthorized access and malicious activity.

Personal Computers (PCs): These are the user workstations where individuals access and utilize various software applications. Different types include:

- Desktops: Traditional desktop computers suitable for office environments and individual use.
- Laptops: Portable computers offering mobility and remote working capabilities.
- Thin clients: Low-powered devices relying on a central server for processing power, offering a cost-effective solution for basic computing tasks.

Software:

Operating Systems (OS): The core software that manages hardware resources and provides a platform for running other applications. Examples include:

- Windows: Widely used desktop and server operating system by Microsoft.
- macOS: Operating system for Apple computers, known for its user-friendly interface.
- Linux: Open-source operating system known for its versatility and security features.

Middleware: This software acts as a bridge between different software applications and operating systems, facilitating communication and data exchange. Examples include:

- Web servers: Deliver web content to clients.
- Application servers: Host and manage applications.
- Database management systems (DBMS): Manage and organize data in databases.

Application Software: Provides specific functionalities for users to perform tasks like word processing, data analysis, web browsing, or running games. Examples include:

- Microsoft Office: Suite of productivity applications including Word, Excel, PowerPoint, and Outlook.
- Adobe Creative Suite: Software programs for graphic design, video editing, and web development.
- Enterprise Resource Planning (ERP): Software that integrates various business processes like accounting, human resources, and supply chain management into a single system.

System Management Software: Tools used for monitoring, managing, and maintaining IT infrastructure components. This includes:

- Network management software: Provides insights into network performance, identifies potential issues, and helps ensure smooth operation.
- Security software: Antivirus, anti-malware, and firewall software protect systems from security threats like viruses, malware, and unauthorized access.

- **Backup and recovery software:** Enables regular backups of data and systems to ensure data recovery in case of disasters or system failures.

The Indispensable Role of IT Infrastructure in the Business Landscape:

In today's digital age, a robust and well-functioning IT infrastructure forms the backbone of any successful business. It's the foundation for storing, processing, and accessing data, enabling seamless communication, and powering critical business applications. IT infrastructure is no longer just a technical consideration; it's a strategic investment that empowers businesses to thrive in the digital age. By understanding the multifaceted role of IT infrastructure, businesses can make informed decisions, optimize their technology investments, and leverage its capabilities to achieve their strategic goals.

Enabling Core Business Functions:

Data Storage and Management: IT infrastructure provides secure and reliable storage for all kinds of business data, from financial records to customer information. This enables efficient data analysis, decision-making, and compliance with regulations.

Communication and Collaboration: IT infrastructure empowers communication and collaboration within and outside the organization. It facilitates email communication, video conferencing tools, instant messaging platforms, and file sharing, fostering efficient information exchange and teamwork.

Application Functionality: Business applications like CRM systems, ERP software, and custom-developed tools rely heavily on IT infrastructure for smooth functioning. This ensures that employees can perform their tasks effectively and efficiently.

Driving Business Growth and Efficiency:

Enhanced Productivity: A well-maintained IT infrastructure empowers employees to be more productive. Reliable and secure access to data and applications minimizes downtime and frustration, enabling them to focus on core tasks.

Improved Customer Experience: IT infrastructure plays a crucial role in delivering exceptional customer experiences. It facilitates seamless online interactions, e-commerce platforms, and efficient customer service channels, leading to increased customer satisfaction and loyalty.

Agility and Scalability: Modern IT infrastructure is designed to be scalable and adapt to changing business needs. This allows businesses to easily accommodate growth, expand into new markets, and launch new products or services quickly and efficiently.

Competitive Advantage and Innovation:

Data-Driven Decision Making: IT infrastructure enables businesses to collect, analyse, and utilize data effectively. This data-driven approach allows them to gain insights into customer behaviour, market trends, and competitor activities, leading to improved decision-making and enhanced competitiveness.

Innovation and Technology Adoption: A robust IT infrastructure provides a platform for innovation and the adoption of emerging technologies like automation, artificial intelligence, and cloud computing. This enables businesses to develop new products and services, optimize processes, and gain a competitive edge.

Security and Risk Management:

Data Protection: IT infrastructure should be equipped with robust security measures to safeguard sensitive data from unauthorized access, breaches, and cyberattacks. This ensures data integrity, protects business reputation, and fosters trust with customers and partners.

Business Continuity: A well-planned IT infrastructure incorporates disaster recovery and backup solutions. This minimizes downtime and ensures business continuity in case of unexpected disruptions, preventing significant financial losses and operational hiccups.

Transition in IT infrastructure space

The Paradigm Shift: Emergence of Cloud Infrastructure and Its Impact

Cloud computing has revolutionized the way businesses manage their IT infrastructure. The shift from traditional on-premise setups to cloud-based models has fundamentally altered how IT resources are provisioned, managed, and consumed.

Traditional Hardware-Dominated Infrastructure

- **Capital Expenditure (CapEx) model:** Businesses had to invest heavily in procuring and maintaining physical IT infrastructure, including servers, storage, networking equipment, and data centers.
- **Capacity Planning:** Organizations needed to forecast their future needs, often overprovisioning resources to handle peak demand, leading to underutilized capacity.
- **In-House Management:** IT teams were responsible for the entire hardware and software lifecycle – procurement, deployment, maintenance, upgrades, and troubleshooting.
- **Limited Scalability:** Scaling IT resources up or down to match changing needs was often a time-consuming and expensive process.
- **Security & Compliance Challenges:** Ensuring robust security and meeting compliance standards in a traditional on-premise environment could be complex and demanding.

The Rise of Cloud Infrastructure

- **Operational Expenditure (OpEx) model:** The cloud introduced a pay-as-you-go approach where businesses pay for only the computing resources they use, converting IT costs into operational expenses.
- **On-Demand Provisioning:** Businesses can quickly provision resources as needed, without upfront investments or capacity planning concerns.
- **Managed Services:** Cloud providers handle much of the IT infrastructure management, including hardware maintenance, software updates, and security patching, freeing up internal IT resources.
- **Rapid Scalability:** Cloud infrastructure provides near-instant scalability to accommodate fluctuating workloads, eliminating the need for overprovisioning and supporting business agility.
- **Enhanced Security & Compliance:** Cloud providers invest heavily in advanced security measures and often offer compliance-ready solutions, easing the burden on organizations.

Driving Factors for Cloud Adoption

- **Cost Savings:** The pay-as-you-go model eliminates significant upfront capital expenditures and reduces ongoing IT management costs.
- **Agility & Flexibility:** Cloud allows businesses to experiment, innovate, and adapt quickly to market demands by readily scaling resources to support growth or new initiatives.
- **Focus on Core Business:** Reduced IT management burden allows organizations to focus on their core competencies and business goals.
- **Accessibility:** Cloud-based resources can be accessed from anywhere, enabling remote work and collaboration.
- **Technological Advancements:** Continuous innovation and improvements in cloud technology, such as microservices and containerization, offer greater flexibility and better performance.

Challenges and Considerations

- **Vendor Lock-in:** Migrating to the cloud can sometimes create potential dependency on a specific cloud provider, making switching difficult.
- **Security & Privacy Concerns:** While cloud providers implement robust security measures, some organizations still have reservations about storing sensitive data in the cloud.

- **Regulatory Compliance:** Understanding and adhering to compliance requirements specific to the cloud and the industry is crucial.
- **Hybrid Cloud Landscapes:** Many organizations adopt a hybrid cloud approach, blending on-premise infrastructure with cloud services, leading to increased complexity.

IT Infrastructure Management Services

IT Infrastructure Management Services (IMS) encompass a range of services focused on the planning, design, implementation, operation, and ongoing management of an organization's IT infrastructure. This includes hardware, software, networks, data centers, and the associated processes necessary to deliver reliable and efficient IT services. IMS are critical for ensuring the smooth operation, security, and optimization of the technical backbone that supports businesses in India's rapidly expanding digital economy.

Key IMS Offerings in India

Managed Data Center Services

- **Colocation:** Renting space and power in a data center to house IT equipment. Provides robust physical infrastructure and security.
- **Managed Hosting:** Outsourcing the entire management of servers, storage, and networking equipment to a service provider.
- **Disaster Recovery as a Service (DRaaS):** Backup and recovery sites, often in the cloud, to facilitate business continuity during unexpected disruptions.

Network Management Services

- **Network Operations Center (NOC):** Real-time monitoring, troubleshooting, and optimization of network performance and availability.
- **SD-WAN Management:** Software-defined wide area network solutions for improved network flexibility and cost optimization.
- **Managed Security:** Firewall management, intrusion detection, and security information and event management (SIEM) to protect networks from threats.

Cloud Infrastructure Services

- **Infrastructure as a Service (IaaS):** Provisioning of virtualized compute, storage, and network resources on demand.
- **Platform as a Service (PaaS):** Cloud-based platforms for software development and deployment.

- Software as a Service (SaaS): Cloud-delivered applications accessible over the internet.
- Cloud Migration and Management: Assisting businesses to move workloads and applications to the cloud, along with ongoing optimization.

Endpoint Management Services:

- Desktop and Laptop Management: Centralized management of PCs and laptops, covering software distribution, patching, and configuration.
- Mobile Device Management (MDM): Securing and managing mobile devices (smartphones, tablets) used for business purposes.
- Helpdesk and Support: Providing technical support to end-users for a wide range of hardware and software issues.

Key Components of IT Management Services:

Storage Management

In today's data-driven world, efficient storage management has become an essential component of any successful IT infrastructure. This critical aspect of IT infrastructure management services ensures that data is provisioned, utilized, protected, and optimized effectively. Key Services:

Storage Provisioning: This service involves allocating storage space to meet the specific needs of applications and users. IT specialists consider factors like expected data size, performance requirements, and access patterns when allocating storage. Efficient provisioning optimizes storage utilization, prevents overprovisioning and under provisioning, and ensures applications have access to the resources they need.

Storage Area Network (SAN) Management: Organizations with high-performance storage demands often utilize SANs. These dedicated networks connect servers to high-speed storage devices. SAN management services involve monitoring SAN performance, optimizing resource allocation, ensuring data integrity, and maintaining a healthy and secure SAN environment.

Data Backup and Recovery: Protecting critical data from unexpected events like hardware failures, cyberattacks, or natural disasters is paramount. IT specialists implement robust data backup and recovery strategies. This involves regularly backing up data to on-premise or cloud storage locations, testing backup procedures, and ensuring swift and efficient data recovery in case of data loss.

Storage Performance Monitoring and Optimization: IT specialists continuously monitor storage performance metrics like capacity utilization, I/O (Input/Output) operations per second, and response times. Performance analysis helps identify potential bottlenecks and opportunities for

optimization. This might involve implementing storage tiering strategies, using caching solutions, or upgrading storage hardware or software.

Data Lifecycle Management: Data comes in various forms, with different access needs and retention requirements. Establishing and enforcing data lifecycle management (DLM) policies helps manage data throughout its lifecycle. DLM encompasses defining procedures for classifying data based on its value, implementing retention schedules for archiving or deletion, and ensuring compliance with relevant regulations and legal requirements.

Benefits of Effective Storage Management:

- **Improved Data Availability:** Efficient storage provisioning and optimized performance ensure applications have access to the data they need, when they need it.
- **Enhanced Data Security:** Robust backup and recovery strategies protect against data loss and enable swift recovery in case of disruptions.
- **Reduced Costs:** Optimized storage utilization and efficient resource allocation minimize unnecessary storage expenses.
- **Compliance Adherence:** DLM practices help organizations adhere to data retention and regulatory requirements.

Systems Management

Within IT infrastructure management services, systems management plays a crucial role in ensuring the smooth functioning and health of individual systems and software applications. It's akin to the central nervous system, continuously monitoring, managing, and maintaining the various components that make up an organization's IT environment. Key Services:

Server Management: Servers are the workhorses of IT infrastructure, hosting critical applications and services. IT specialists perform various tasks related to server management, including:

- **Installation and Configuration:** Installing operating systems and configuring servers according to specific needs and security standards.
- **Patching and Updates:** Regularly applying software updates and security patches to address vulnerabilities and maintain system stability.
- **Performance Monitoring:** Monitoring server performance metrics like CPU, memory, and disk utilization to identify potential bottlenecks and optimize resource allocation.
- **Security Management:** Implementing security measures like firewalls, intrusion detection systems, and user access controls to protect servers from cyber threats.

Application Management: Applications are the tools used to perform various business functions. Effective application management involves:

- **Deployment and Configuration:** Deploying applications across different servers or environments, ensuring proper configuration and compatibility.
- **Monitoring and Maintenance:** Continuously monitoring application performance, identifying and resolving errors, and performing regular maintenance tasks to ensure smooth operation.
- **Upgrades and Migration:** Managing application updates and migrations to newer versions, ensuring compatibility with updated hardware and software.

Operating System Management: The operating system (OS) is the core software that manages hardware resources and provides a platform for applications to run. IT specialists handle:

- **OS Installation and Configuration:** Installing and configuring operating systems across various devices, ensuring compatibility with hardware and software environments.
- **Patching and Updates:** Keeping operating systems updated with the latest security patches to minimize vulnerabilities and maintain stability.
- **User Management:** Managing user accounts and access privileges to ensure proper access control and system security.

Software Asset Management: Managing software licenses effectively is crucial for compliance and cost optimization. This service involves:

- **License Management:** Tracking and managing software licenses to ensure compliance and avoid exceeding license agreements.
- **Software Deployment and Usage Monitoring:** Monitoring software deployments and usage patterns to identify potential misuse and optimize licenses.
- **Software Asset Optimization:** Identifying opportunities to consolidate software licenses, reduce unnecessary software usage, and optimize costs.

System Performance Monitoring and Optimization: Continuously monitoring system performance is essential for ensuring optimal resource utilization and preventing potential issues. IT specialists:

- **Collect and Analyze Data:** Gather performance metrics like CPU, memory, disk, and network utilization.
- **Identify Bottlenecks and Issues:** Analyze collected data to identify potential bottlenecks and performance issues impacting system efficiency.
- **Implement Optimization Strategies:** Implement strategies such as resource allocation adjustments, hardware upgrades, or software optimization to improve system performance.

Benefits of Effective Systems Management:

- **Improved System Uptime and Availability:** Ensures systems and applications are running smoothly and accessible to users, minimizing downtime and disruptions.
- **Enhanced Security:** Proper patching, configuration, and access control measures minimize the risk of security breaches and protect sensitive information.
- **Optimized Resource Utilization:** Efficient allocation of resources prevents underutilization and overprovisioning, leading to cost savings.
- **Improved Productivity:** Enhanced system stability and application performance minimize disruptions and allow users to focus on their tasks.

Network management

Network management forms the backbone of efficient communication and data exchange within an IT infrastructure. IT infrastructure management services encompass a range of network management services essential for guaranteeing network performance, availability, and security. Key Services:

Network Monitoring:

Continuously monitoring network traffic patterns, bandwidth utilization, and device status is crucial for identifying potential issues and ensuring smooth network operation. IT specialists utilize various tools and techniques, such as:

- **Network Traffic Analyzers (NTAs):** Analyze traffic patterns and identify anomalies or suspicious activity.
- **Ping and Traceroute tools:** Measure network latency and identify potential connection issues.
- **Performance Monitoring Tools:** Monitor key metrics like bandwidth usage, packet loss, and response times.

Network Performance Optimization:

Optimizing network performance ensures efficient data flow and minimizes network congestion, leading to a seamless user experience. IT specialists utilize various strategies like:

- **Bandwidth Shaping:** Prioritizing critical network traffic to ensure essential applications have adequate bandwidth.
- **Quality of Service (QoS):** Managing network traffic flow to prioritize specific types of data based on their importance (e.g., prioritizing voice calls over video streaming).
- **Network Configuration Adjustments:** Tuning network settings like switches, routers, and firewalls to optimize traffic flow and reduce latency.

Network Security Management:

Protecting the network from unauthorized access, cyberattacks, and data breaches is paramount. IT specialists implement various security measures such as:

- **Firewalls:** Filter incoming and outgoing network traffic, blocking suspicious activity.
- **Intrusion Detection/Prevention Systems (IDS/IPS):** Detect and prevent unauthorized access attempts and malicious activities on the network.
- **Vulnerability Management:** Regularly scan for vulnerabilities in network devices and software and apply necessary patches to address them.

Configuration Management:

Maintaining consistent configurations across all network devices ensures stability, security, and simplifies troubleshooting. IT specialists utilize configuration management tools to:

- **Automate configuration deployments:** Apply the same configuration to multiple devices simultaneously, minimizing errors and inconsistencies.
- **Version control:** Track changes made to configurations and roll back to previous versions if necessary.
- **Compliance management:** Ensure network configurations comply with internal security policies and external regulations.

Capacity Planning:

Proactive planning for future network needs ensures sufficient capacity to accommodate growth and avoid network congestion. IT specialists analyze:

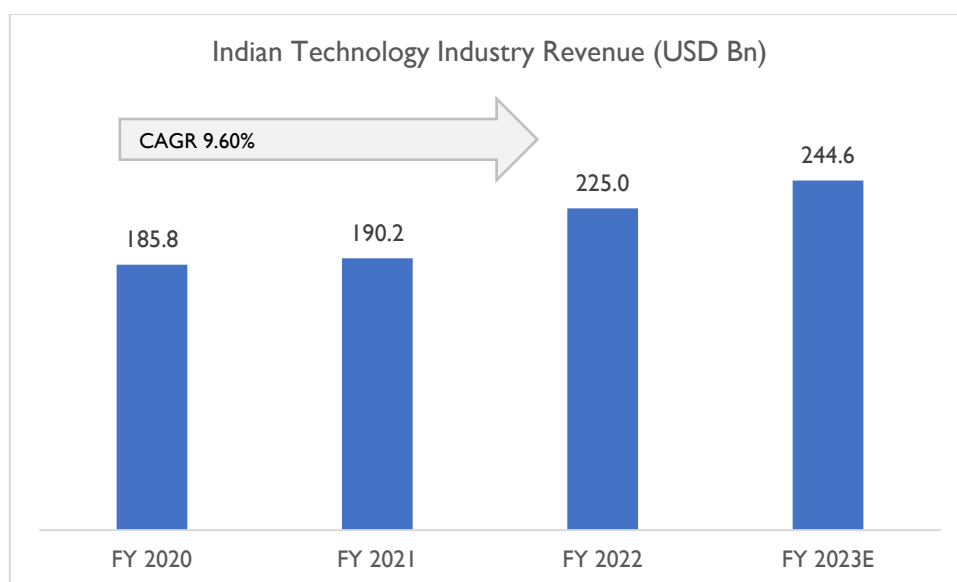
- **Network traffic patterns:** Historical data on network usage and trends to forecast future demands.
- **Business requirements:** Anticipated growth in users, applications, or bandwidth needs based on business plans.
- **Technology advancements:** Emerging technologies that might impact network traffic (e.g., Internet of Things (IoT) devices).

Benefits of Effective Network Management:

- **Improved Network Performance and Availability:** Minimizes network downtime, ensures efficient data flow, and optimizes application responsiveness.
- **Enhanced Network Security:** Proactive identification and mitigation of security threats protects sensitive data and organizational resources.
- **Reduced Costs:** Efficient resource allocation and proactive maintenance minimize potential downtime and associated costs.
- **Scalability and Adaptability:** Effectively adapting the network to accommodate changing business needs and new technologies.

Market Scenario of the Indian IT Industry

According to NASSCOM, the Indian Technology Industry is estimated to have clocked a revenue of USD 244.6 billion in FY 2023. Between FY 2020 – FY 2023, the revenue in the Indian Technology industry grew at a CAGR of 9.60%, recording a phenomenal growth.



Source: NASSCOM

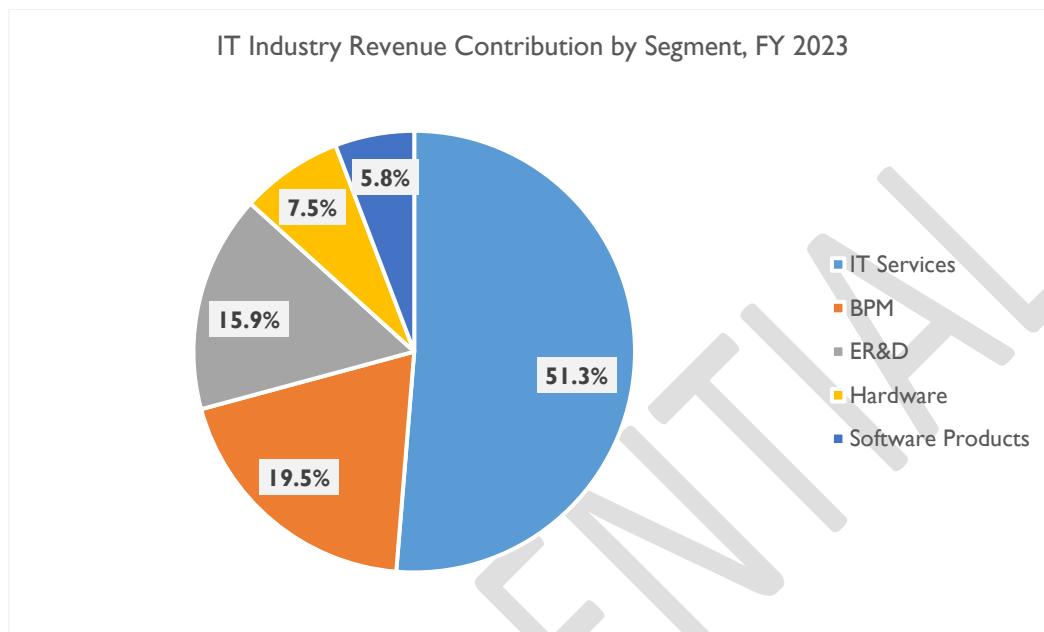
Annual turnover in the industry grew by nearly 8% in FY 2023, down from approximately 15.5% that was recorded during the previous year. This slowdown in growth during FY 2023 was primarily caused by unfavourable macroeconomic conditions, geopolitical uncertainties, and cautious spending by clients in the technology sector, resulting in delays in closing deals.

Over the past four quarters or so, technology firms, particularly those providing software services and generating a significant portion of their revenue from international markets like North America and Europe, have experienced subdued business activity due to the economic slowdown in these regions. However, there have been some positive factors, such as stronger performance in the engineering, research, and development (ER&D) sector, and the continued growth of global capability centers (GCCs), with India remaining a preferred location.

Indian IT industry is export oriented with exports contributing to nearly 79% of total industry revenue in FY 2023. India's IT export revenue is estimated to have grown to USD 194 billion in FY 2023 from USD 178 billion in FY 2022, registering 9% Y-o-Y growth, while domestic IT industry revenue is estimated to have grown by 4.1% on Y-o-Y basis to reach USD 51 Bn in FY 2023.

Market Segmentation

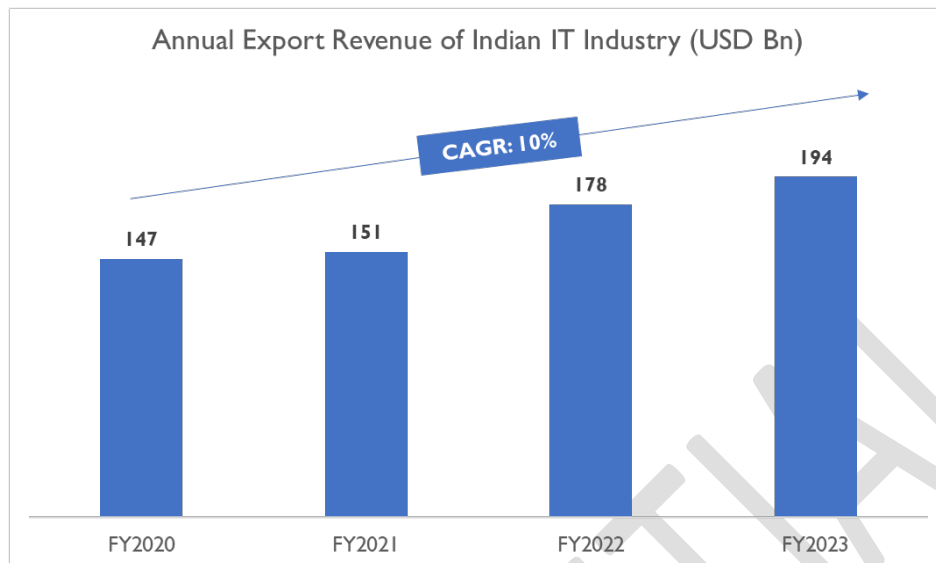
By segmentation, the overall IT industry (excluding e-Commerce and including hardware) is estimated to earn 51.3% of the revenue from IT services while 19.5% from BPM services, 15.9% from ER&D, 7.5% from the IT hardware sector and 5.8% from software products in FY 2023. T



Source: NASSCOM

During the past two years, COVID-19 pandemic accelerated the technology adoption across industries as businesses relied on digital tools for resilience and business continuity. The overall industry revenue has been driven by the fast-paced digitization and cloud adoption. Digital revenue share stood at 30-32%, recording an incremental revenue of USD 13 bn in FY2022, registering 25% growth on y-o-y basis. The industry observed over 290 cross border M&As deal with their primary focus as digital.

Export Revenue



Source: Dun & Bradstreet Research

Indian IT industry is export driven, with export contributing ~79% of the industry revenue in FY 2023. Within exports, IT services export accounts for the largest share while the share of hardware in export is negligible, as IT hardware manufactured in India is primarily consumed to meet domestic demand. IT services export contributed the most to total industry revenue with nearly 51% share followed by BPM and the ER&D. In FY 2023, the value of export revenue generated by IT industry is estimated to be USD 194 Bn, registering 9% y-o-y growth. Factors such as economy of scale, business risk mitigation, utilization improvement and superior competency have all lead to the growth of the Indian BPM industry.

The USA, UK and EU remain the major markets for the IT software and services exports, accounting for ~90% of the total IT industry exports, however, there are new challenges surfacing in these traditional geographies. Consequently, India is exploring new opportunities in Asia Pacific (APAC), Latin America, Middle East Asia, Europe, Japan, China, and Africa along with catering to the demand to traditional market.

Demand Drivers

Large Talent Pool & Cost Competitiveness

Presence of a large employee base with high IT skills and a cost differential with their peers in the developed markets of the US and Europe has helped the country emerge as a sought-after IT outsourcing destination. As per industry estimates, labour cost efficiency is up to 30-40% more than source countries (primarily US) that gives huge opportunity for the outsourcing business model to expand. Indian IT industry is a global talent powerhouse and a representative of millennials, showcasing

diversity, and leadership in digital skills that too at competitive costs. India boasts of a digitally skilled talent pool of 1.6 million with over 30% increase in learning and development budget of companies. To fulfill the robust digital driven IT growth, tech companies are upskilled with 2.8 lakh employees in the digital space in FY 2022. In FY 2022, India's digital talent pool surged to 1.6 million from 1.17 Mn in FY 2021, registering 36.8% y-o-y growth.

Global Technology Spending

Organizations worldwide have been preferring computerization as well as automation to streamline costs and increase operation efficiency, business. Moreover, amidst strict restriction during Covid, business looked technology as a solution to keep the business running and respond to consumer increasingly reliance to several online platform including gaming, digital content, social media, and E-commerce. Consequently, the global IT spending surged to USD 4.4 trillion in 2022. It is further slated to grow by 2.4% to USD 4.5 trillion in 2023. This created great opportunities for the export-oriented Indian IT industry which grew substantially.

Preferred Outsourcing Destination

Indian IT industry has earned more than 25 years of outsourcing experience and possesses a strong ecosystem. Indian companies are steadily upgrading their capabilities to rapidly adapt with emerging demand. With expanding GCC base and tech value proposition, India's continued to ranked 1st as sourcing destination with nearly 60% share in global outsourcing market which witnessed significantly higher growth of 8-10% reaching USD 262 billion in 2022.

Growing Technology Absorption in Domestic Market

While the first phase of India's technology industry development was driven by export of software and services, the current boom is largely led by domestic demand. A major source of growth in domestic IT-BPM revenue has been Government initiatives and technology adoption programmes by government for its citizen and inter-departmental services. Enterprise services comprising of M-wallets/m-banking for financial inclusion; digital marketing; online payments; analytics; automotive (EV/autonomous vehicles); etc. and smart projects comprising of smart city, transportation, utilities buildings, etc., E-commerce.

Changing Solution Landscape of Indian IT industry

Growing Demand for Analytics & Data Science Solutions, AI Driven Solution

The penetration of digital technologies, due to the proliferation of handheld electronic devices and integration of sensors, has led to an avalanche of data. It is estimated that 2.5 quintillion bytes of data is produced every day. The rapidly increasing volume as well as complexity of data could be attributed to growing mobile traffic, cloud computing, as well as developments in the deployment of Internet of

Things (IoT) and Artificial Intelligence (AI) technologies. The advent of 5G, and democratization of IoT & AI is expected to increase the data generation in the coming years.

The growth in data (volume & complexity) was accompanied by an equally astounding improvement in computing power as well as advances in storage capabilities. Together this led to the advance of Big Data as well as Data Analytics – disciplines that use cutting edge digital technology to extract actionable insights from the mountain of data that is being generated on a regular basis. Today, a large volume of data is regularly analyzed and interpreted as part of business processes. Aspects like sales forecast, customer behavior, customer retention, market studies, and marketing effectiveness are decoded using data analytics tools.

Artificial Intelligence, as a concept, has been around for decades but the practical application was lacking earlier due to the shortcoming in technology tools. The advances in computing power & storage capability have helped in exploring the true potential of AI applications. Today, AI research is flourishing around the world, with regions like USA, China, India, and Europe making rapid progress. The avenues that are witnessing rapid progress within the domain of AI are Neural Networks, Natural Language Processing, Machine Learning & Probabilistic Reasoning, Computer Vision, Fuzzy Systems, and Search & Optimization.

Current Scenario

According to IDC (International Data Corporation), the global revenue for AI (including software, hardware, and services) was estimated to value at USD342 Billion in 2021, increasing by nearly 15.2% over previous year. Annual revenue growth is expected to accelerate with 18.8% yearly growth in 2022. Covid induced digital penetration are serving as a catalyst for innovation and transformation with global artificial intelligence (AI) spending expected to grow over USD 500 Bn by 2024.

Amongst three segment, AI Software is the largest segment accounting for nearly 88% of the market revenue, and include software applications like CRM AI Applications, ERM AI Applications, AI for content workflow, management applications, production applications, and collaboration applications. AI services is the second largest segment within the industry, after AI software and comprise of AI IT services and AI business services and expected to be the fastest growing segment from 2023 onwards. The hardware segment comprises of server & storage applications that support deployment of AI software and services and currently is the fastest growing segment.

Indian Scenario

In India the BFSI sector is the pioneer in adopting analytics tools and services, with few companies integrating AI (Artificial Intelligence) and ML (Machine Learning) related initiatives. After banking and finance, analytics is finding increasing usage in marketing and advertising domain, where customer data is increasingly used to developed marketing strategies.

Indian analytics industry is a mix of startups, traditional IT firms, captive units of global IT firms, and pureplay multinational analytics companies. The nature of work executed ranges from basic data analysis to complex services incorporating AI/ML concepts. The biggest differentiator in this industry is qualified manpower, which is in short supply. The manpower shortfall in this industry is estimated to run into thousands. The education infrastructure in India is yet to integrate analytics into their curriculum, resulting in the dearth of new professionals entering the labor pool.

Demand Landscape in India

Indian economy has witnessed a drastic transformation in the past couple of decades, moving away from a closed & controlled economy to a more open and market friendly economy. This transformation has created innumerable market opportunities in the form of new product categories, new market segments and new geographies. India became a major exporter of goods ranging from auto components to textiles to pharmaceutical products, and in the process helped in creating several home-grown multinational conglomerates. These MNCs have successfully expanded their operations to multiple countries across the world. Corporates are increasingly relying on data analytic solutions to navigate this changing business environment.

Thus, the changing business scenario is acting as a driver leading to mainstream uses of data and analytics solutions.

- **Changes in Business Environment:** Indian businesses no longer operate in isolation. Rather the economy of a country is closely linked to the global economy as well as economies of its trading partners. Thus, any change in the business environment, in any of the major global economy will have a direct link on the business scenario in the country. The pace of this change has quickened over the past few years, leaving Companies to grapple with sudden & unexpected changes.
- **New product launches, customer surveys, and sales channels:** The changes in business environment and advent of technologies have created a need to bring changes in product mix, develop new sales channels, and improve customer surveys. However, to undertake these initiatives a Company need to have a solid understanding of the path their industry is currently traversing. Highlighting the opportunities and pitfalls in the coming years could serve as a helpful tool for a Company to design their strategy.

Fortunately for companies, the innovations in digital technologies allow them to capture and process data that is being generated and create insights that help them navigate this changing business landscape. According to Gartner, over the next couple of years AI technology & services will increasingly move from the pilot stage to operational deployment where it will be used to solve the

business problems. Since India is one of the early movers in data & analytics solutions, the forecast of operationalization of AI services is expected to materialize in Indian market too.

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Domestic IT Market in India

With a thriving ecosystem encompassing diverse sectors, the domestic IT market in India mirrors the nation's relentless pursuit of technological advancement and innovation. Information technology in India is an industry consisting of two major components: IT services and hardware as well as Business Process Management (BPM). In fact, E-commerce has also been included in this industry since FY 2013 and contributes substantially to the growth of the industry. India is amongst the largest exporters of IT services in the world as it enjoys a cost advantage over other nations along with the required skills. Tier I cities like Bengaluru are 8-10 times more cost efficient than other low-cost destinations (considering required manpower skills as well).

While IT services continues to have the dominant share in the industry, E-commerce is incremental in increasing market share of the domestic IT industry. IT companies are found in clusters in India, largely concentrated in urban cities like Bangalore, Chennai, Hyderabad, Mumbai, and Pune, cities that have easy availability of skilled workforce.

Overview of the Domestic IT Market

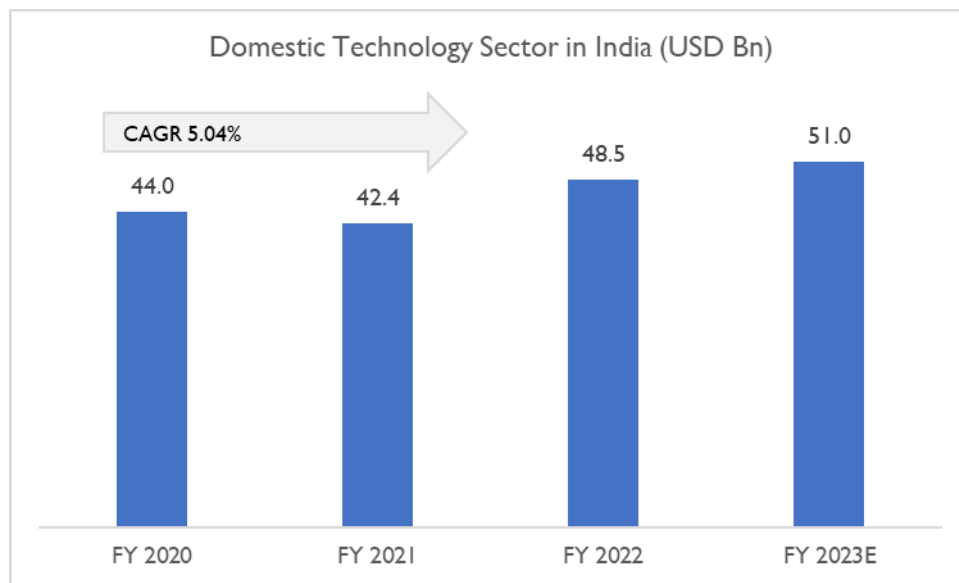
The domestic IT market in India encompasses a wide spectrum of industries, including telecommunications, banking and finance, healthcare, retail, manufacturing, and government sectors. It comprises hardware, software, and services, with a robust network of indigenous and multinational players catering to diverse requirements.

Key factors that drive the growth in the Indian IT Industry are:



Market Scenario of the Domestic IT Industry

The domestic technology sector in India is estimated to have reached USD 51 billion in FY 2023, growing by nearly 4.9% annually. The strong rise in FY 2022 is attributed to the economic activity picking up in the market after a decline observed in FY 2021. Between FY 2020 – FY 2023, the domestic technology sector in India experienced a health CAGR of 5.04%, recording substantial growth.



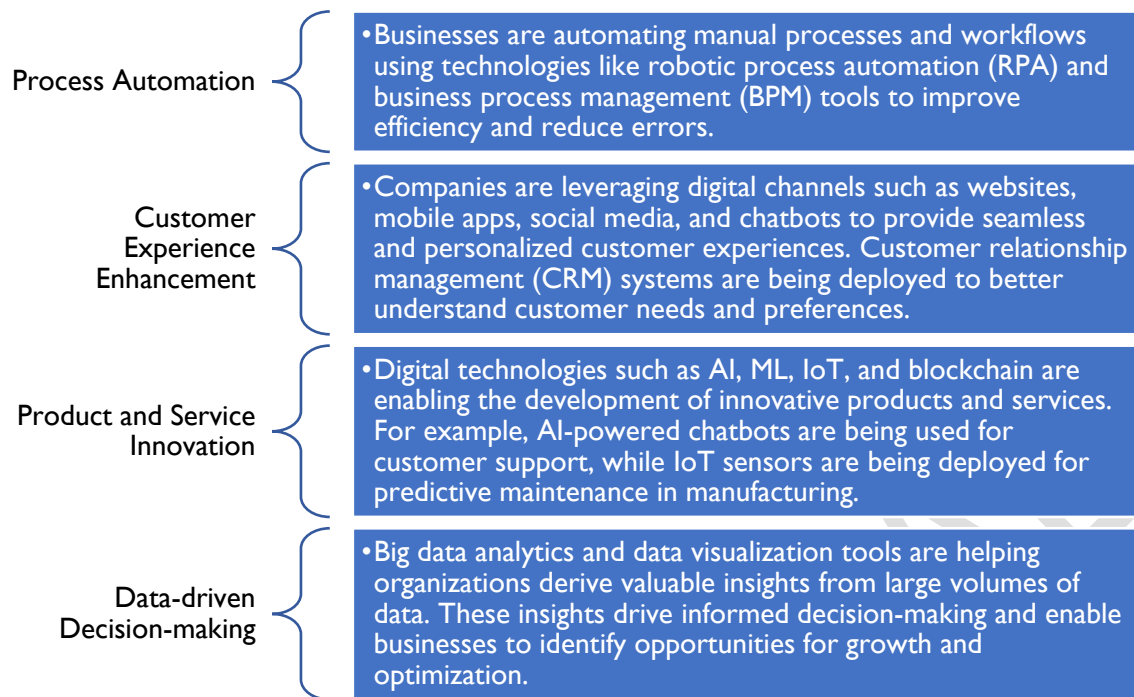
Source: NASSCOM, D&B Research and Estimates

Key factors driving IT spending in India

Digital Transformation

Digital transformation involves the integration of digital technologies into all aspects of business operations, fundamentally changing how businesses operate and deliver value to customers. Indian businesses are undergoing a significant digital transformation to improve operational efficiency, enhance customer experience, and drive innovation. This transformation involves adopting technologies such as cloud computing, big data analytics, artificial intelligence, machine learning, and IoT to digitize processes, products, and services.

In India, digital transformation initiatives driving IT spending in India are:



Thus, businesses are aggressively investing in advanced technologies like cloud computing, AI, IoT, and big data analytics to revolutionize their operations, boost efficiency, and stay ahead in a fiercely competitive market.

Government Initiatives

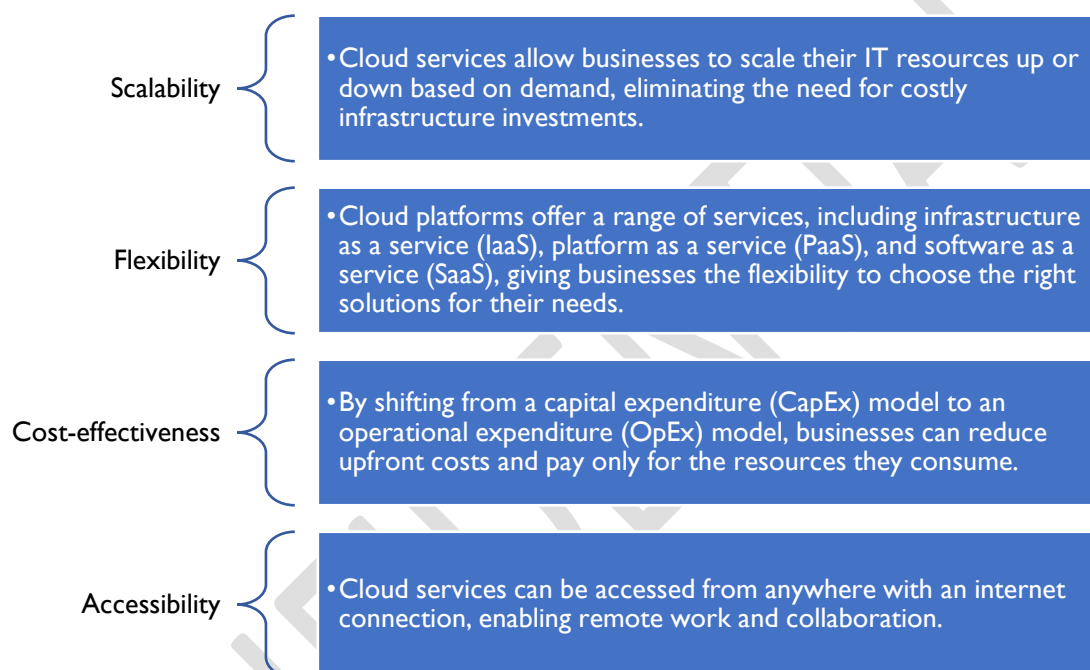
The Indian government has launched several initiatives to promote digitalization and innovation across various sectors. These initiatives include:



These initiatives involve projects such as e-governance, digital infrastructure development, broadband connectivity expansion, and promoting electronic manufacturing. Thus, government initiatives are propelling IT expenditure by spearheading nationwide digitization efforts, upgrading digital infrastructure, expanding connectivity, and fostering innovation-led growth.

Cloud Adoption

Indian businesses are increasingly adopting cloud computing services due to benefits such as scalability, flexibility, cost-effectiveness, and faster time-to-market. Cloud adoption enables organizations to access IT resources on-demand, without the need for significant upfront investment in hardware or infrastructure.



These benefits of cloud adoption are compelling organizations to ramp up IT spending as they transition towards cloud-based solutions to meet evolving business needs.

Data Privacy and Security

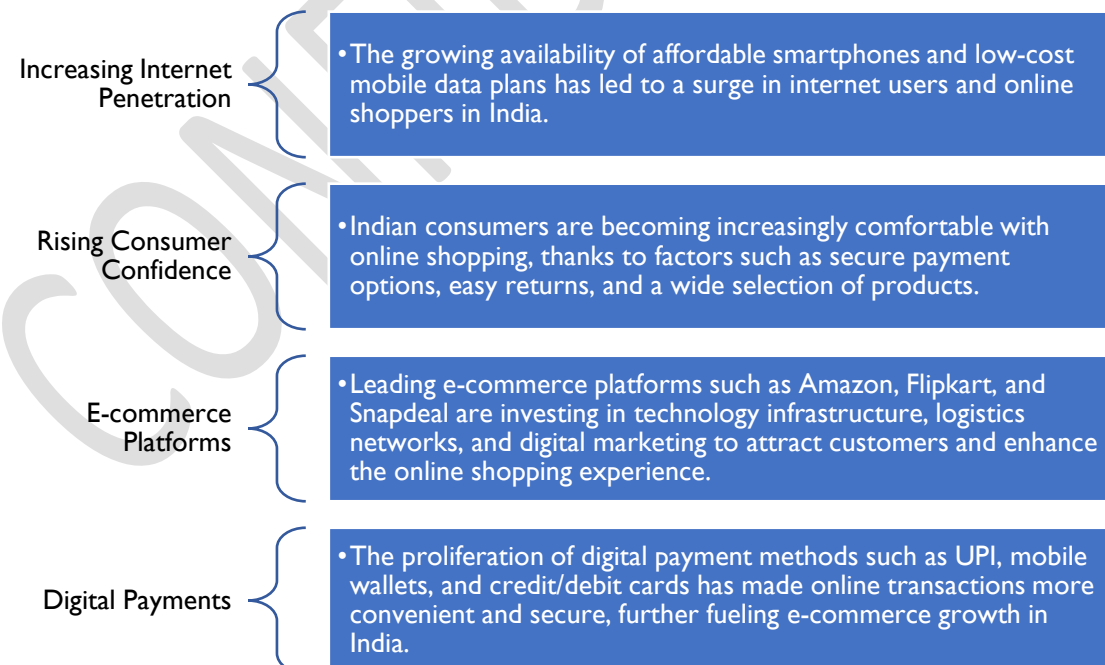
With the proliferation of cyber threats and the growing importance of data privacy regulations, Indian organizations are investing in cybersecurity solutions to protect sensitive data and ensure compliance. This includes investments in technologies such as encryption, threat detection and response, and identity and access management (IAM):



Thus, with cybersecurity threats on the rise and stringent regulations in place, businesses are channelling substantial resources into raising up their cybersecurity measures, ensuring data protection, and maintaining compliance, thus driving IT spending.

E-commerce Boom

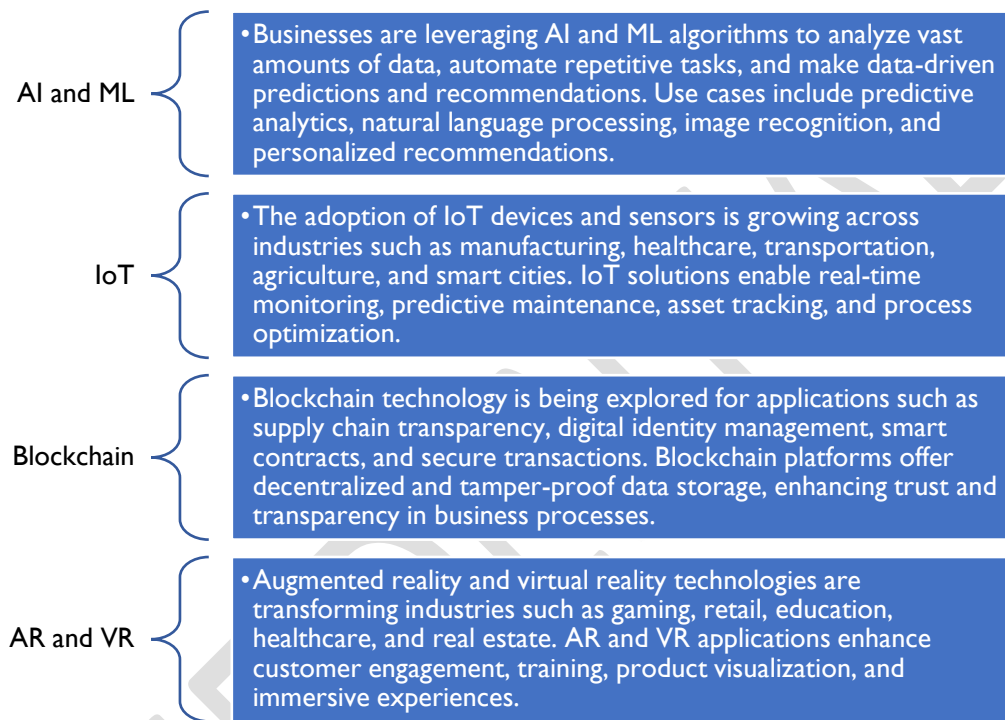
India's booming e-commerce market is driving IT spending as businesses invest in e-commerce platforms, digital marketing, logistics management, and customer relationship management (CRM) systems. India's e-commerce market has witnessed rapid growth in recent years, driven by factors such as:



With the explosive growth of e-commerce in India, businesses are doubling down on IT investments to bolster their online presence, enhance customer experiences, optimize logistics, and scale their operations to capitalize on the booming digital marketplace.

Emerging Technologies

Indian businesses are increasingly exploring emerging technologies such as artificial intelligence, machine learning, Internet of Things, blockchain, and augmented reality to drive innovation and gain a competitive edge. These technologies are being used in various industries, including healthcare, finance, manufacturing, retail, and agriculture, to automate processes, improve decision-making, and create new business models.



The race to harness the power of emerging technologies like AI, ML, blockchain, and AR is pushing organizations to allocate significant budgets towards innovation initiatives, research, and development to unlock new possibilities and drive digital transformation.

Domestic IT Spending in India:

Government Spending

Government Flagship Digital Policies

While digitization of common citizen services has improved operational efficiencies as well as service delivery, it has generated massive data necessitating the requirement for a robust and flexible digital infrastructure. Subsequently the Government has scaled up its spending and budgetary allocation towards digital infrastructure updation, and adoption of cloud infrastructure.

Digital India Initiative

The Digital India program has spurred the development of citizen-centric applications like CoWIN and DigiLocker, emphasizing innovation, service quality, and operational efficiency. These apps have led to increased data generation and the need for flexible, scalable solutions. These solutions have significantly impacted vaccination distribution, worker registration, and document issuance, showcasing the tangible benefits of cloud technology adoption.

The scheme launched in 2015 is an umbrella program which covers programs including Aadhaar, country-wide rural broadband connectivity, common service centers, Bharat Interface for Money (BHIM), Aadhar enabled payment system, and MyGov program.

The Union Government in August 2023 approved the extension of Digital India programme for five years (period 2021-22 to 2025-26) with an outlay of INR 14,903 crore. The extension would focus on skill upgradation, IT infrastructure modernization, and improvement in cyber security, among others.

Adoption of Hybrid Cloud Model

Rapid digitization of citizen services has created massive volume of data, with varying sensitivity levels. This has created the need for a hybrid cloud strategy, which provides both flexibility as well as enhanced data security. The hybrid cloud model has facilitated initiatives such as the MyGov Saathi app, engaging over 2.5 crore users. Additionally, entities like the IT Regulators of India and the Development Authority of Maharashtra leverage hybrid cloud models for government-to-consumer operations.

The Government of India has embraced a cloud-first approach, aiming to make it the default option for ministries/departments to enhance citizen-centric services and internal efficiency. The introduction of MeghRaj in 2013 facilitated cloud technology benefits within the government sector, leading numerous ministries/departments to initiate their cloud journey. Despite progress, some entities hesitate due to concerns like data security, control after migration, data loss, and application compatibility. Central and state governments are actively promoting cloud awareness.

Impact on IT infrastructure

The most direct benefit is a surge in demand for IT infrastructure solutions. Government projects often involve large-scale data center upgrades, network expansion, and cloud adoption, all of which require robust hardware, software, and implementation services. This translates to increased revenue and project opportunities for IT infrastructure providers.

The government's initiatives often involve implementing advanced technologies like cloud computing, Big Data analytics, and cybersecurity solutions. This pushes IT infrastructure providers to innovate and offer new solutions, keeping them at the forefront of technological advancements. Government IT projects tend to be large-scale and often involve multi-year contracts. This provides stability and recurring revenue for infrastructure providers, allowing them to invest in research and development and expand their capabilities.

Increased Demand for Products and Services:

- **Hardware:** Increased spending translates to a greater demand for hardware components like servers, storage solutions, networking equipment, and security solutions. This creates a larger market for companies that manufacture, sell, and maintain these products.
- **Software:** Government projects often require specialized software solutions for data management, analytics, communication, and cybersecurity. This opens doors for software providers who can cater to these specific needs.
- **Services:** Implementation, integration, and management of these complex IT systems require expertise. IT infrastructure providers benefit by offering services like system design, deployment, data center management, and ongoing maintenance.

Focus on Emerging Technologies:

- **Cloud Adoption:** The government's push for cloud migration creates a demand for cloud service providers (CSPs) who offer public, private, or hybrid cloud solutions. This benefits companies like Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP) along with domestic players.
- **Cybersecurity Solutions:** As the government stores and manages more data, robust cybersecurity measures become crucial. This creates opportunities for companies specializing in network security, data encryption, and intrusion detection systems.

Project Opportunities:

- **Large-Scale Infrastructure Projects:** Government initiatives like "Digital India" and "Smart Cities Mission" involve building large-scale IT infrastructure like data centers, fiber optic networks, and citizen service platforms. These projects provide lucrative contracts for IT infrastructure providers who can design and build these networks.

- **Specialization and Innovation:** Government projects often have unique requirements, prompting infrastructure providers to develop specialized solutions and niche expertise. This fosters innovation within the sector and allows companies to differentiate themselves.

IT infrastructure modernization in public domain

IT infrastructure modernization in the public domain of India is a multifaceted and dynamic process driven by the need to adapt to technological advancements, enhance service delivery, and improve governance efficiency. As one of the world's largest democracies, India's public sector faces immense pressure to keep pace with the demands of its growing population while leveraging technology to bridge socio-economic disparities. The modernization efforts encompass various aspects, including upgrading hardware and software systems, transitioning to cloud-based platforms, adopting emerging technologies, and promoting digital literacy among citizens.

One of the central pillars of IT infrastructure modernization in India's public domain is the adoption of cloud computing technology. Cloud solutions offer scalability, flexibility, and cost-effectiveness, allowing government agencies to optimize resource utilization and improve service delivery. By migrating data and applications to cloud platforms, government entities can enhance accessibility, ensure data security, and facilitate seamless collaboration among departments. Additionally, cloud-based services enable remote access to government resources, making it easier for citizens to avail themselves of essential services and interact with government agencies online.

Another key aspect of IT infrastructure modernization is the integration of emerging technologies such as artificial intelligence (AI), machine learning (ML), and blockchain. These technologies hold immense potential to transform governance by automating routine tasks, enhancing decision-making processes, and strengthening cybersecurity measures. AI and ML algorithms can analyze vast amounts of data to derive insights, predict trends, and improve policy formulation. Blockchain technology, with its decentralized and tamper-proof ledger system, can enhance transparency, accountability, and trust in government transactions, particularly in areas like land records management, supply chain monitoring, and digital identity verification.

Furthermore, IT infrastructure modernization efforts in the public domain are aligned with the government's broader agenda of promoting digital inclusion and citizen engagement. Initiatives such as Digital India aim to bridge the digital divide by expanding internet connectivity, promoting digital literacy, and delivering government services through digital platforms. By leveraging technology to make governance more transparent, accessible, and citizen-centric, India's public sector is striving to empower citizens, foster economic growth, and build a more resilient and inclusive society in the digital age.

Timeline of IT modernisation in India:

2006-2010: Early Initiatives and Foundation Building in India

- 2006: The Indian government launches the National e-Governance Plan (NeGP) to improve government services through the use of information technology.
- 2009: The Government of India introduces the "MeghRaj" initiative to establish a national cloud computing infrastructure, laying the groundwork for future cloud adoption in the public sector.

2011-2015: Transition to Digital Platforms

- 2012: The launch of the "Digital India" campaign aims to transform India into a digitally empowered society and knowledge economy.
- 2014: The introduction of the Aadhaar program provides a unique digital identity to residents of India, facilitating access to government services and promoting financial inclusion.
- 2015: The Government of India announces the "Digital India Week" to promote various digital initiatives, including broadband connectivity, digital literacy, and e-governance services.

2016-2020: Accelerated Modernization and Integration of Emerging Technologies

- 2016: The implementation of the Goods and Services Tax (GST) necessitates the development of a robust IT infrastructure for tax administration, leading to the creation of the GST Network (GSTN).
- 2017: Cloud adoption gains momentum as government agencies increasingly migrate their IT workloads to cloud platforms for improved scalability and cost-efficiency.
- 2018: The launch of the "Ayushman Bharat" initiative leverages technology to provide health insurance coverage to millions of Indian citizens, showcasing the integration of IT in public welfare programs.
- 2019: The Government of India unveils the National Artificial Intelligence Strategy to promote the responsible adoption and ethical use of AI across various sectors, including governance and public services. Similarly, the emergence of machine learning applications enhances data analytics capabilities for informed decision-making in government operations.

2021-2024: Focus on Digital Inclusion and Citizen-Centric Services

- 2021: The COVID-19 pandemic accelerates the adoption of digital technologies in the public sector, with a heightened emphasis on remote work, online education, and telemedicine.

- 2022: The expansion of broadband connectivity and the deployment of rural internet infrastructure initiatives, such as BharatNet, aim to bridge the digital divide and promote digital inclusion in remote areas.
- 2023: The integration of blockchain technology in government services, such as land records management and digital identity verification, enhances transparency, security, and efficiency. Blockchain applications also facilitate secure and tamper-proof transactions in various administrative processes, including procurement, authentication, and regulatory compliance.

Cloud infrastructure adoption in public domain: key trends, select use cases, and progress

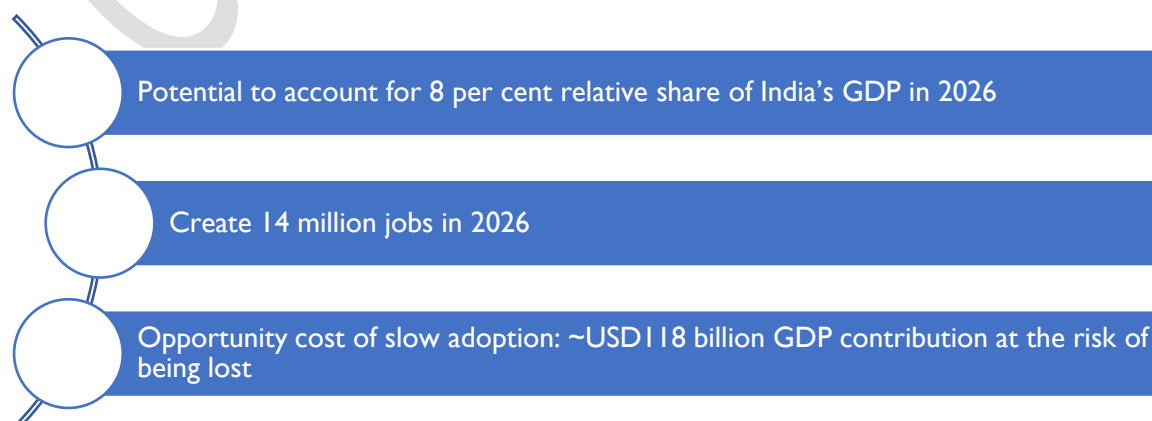
India has paved the way for extensive cloud adoption in government ministries, departments, and public sector organizations by facilitating collaboration with various Cloud Service Providers (CSPs) through open procurement channels, new policies, awareness campaigns, and capacity building initiatives. This collaborative effort aims to bridge the gap between CSPs and government entities. Over time, ministries and departments have begun evaluating, planning, and implementing cloud services across the government sector.

In 2013, India's IT Regulators introduced the 'GI Cloud Strategic Direction,' outlining a roadmap for cloud adoption by ministries and departments, mandating them to analyze, adopt, and leverage cloud technology for current and future applications to optimize IT infrastructure utilization. This adoption enables the government to procure new tools and technologies to enhance existing applications, previously deemed unfeasible or impractical. To this end, India's IT Regulators advocate a "Cloud first" approach when designing new IT services or upgrading existing applications, aiming to maximize both financial and non-financial benefits of cloud adoption.

2013	Task force: Strategic Direction Paper and Implementation Roadmap
	Working group: Recommendations for cloud adoption.
2014	National Informatics Centre (NIC) first national cloud launched
	Working Service function chains approval for cloud management office CMO
2015	Institute of Smart Governance (NISG) proposal to prepare CMO request for proposal (RFP) approved
	Empanelment of CSPs initiated
2016	Audit criteria finalized
	10 CSPs empaneled
2017	Three additional CSPs empaneled
	CMO RFP published
2018	CMO set up to assist government ministries/department in adopting cloud
	Onboarding of CMO agency dash M/S PWS
2019	Re-empanelment of 12 CSPs
	Cloud services bouquet
	CSPs onboarded on gem platform
	Capacity-building programme for cloud initiated
2020	Six additional CSPs empaneled
	Guidelines on security, procurement, data centre, SLA/ master service agreement (MSA), best practices
2021	Empanelment opened perpetually

Source: NASSCOM; Cloud Service Provider (CSP)

Potential impact of cloud adoption in India



Key Trends & Analysis of Technology Specific Flagship Government Policies Its Impact on Domestic IT Spending

Cloud technology has become integral in the IT industry, empowering government bodies to streamline and enhance the management of IT resources while facilitating the integration of new digital technologies. It fosters agility, scalability, and cost-efficiency in an era marked by exponential data growth. By offering computational infrastructures that can dynamically scale to accommodate peak loads and securely manage data from various sources concurrently, cloud technology addresses the evolving needs of the IT landscape.

Key Trends in the public sector domain are:

Accelerated development of citizen-centric applications requires scalable and flexible infrastructure.

The government's focus on citizen-centric applications aimed at innovation, quality service delivery, and operational ease has generated significant data and necessitated flexible and scalable digital infrastructure. To meet this demand, the government has facilitated cloud adoption through policies, budget allocations, and infrastructure migration.

Use case & progress:

The Digital India program has spurred the development of citizen-centric applications like CoWIN and DigiLocker, emphasizing innovation, service quality, and operational efficiency. These apps have led to increased data generation and the need for flexible, scalable solutions. Cloud-based technologies support elasticity, accessibility, and interoperability, prompting government ministries and departments to adopt cloud solutions as part of their digital transformation efforts. Government initiatives support cloud adoption through policies, budget allocations, and infrastructure upgrades to optimize service delivery.

Impact:

The Digital India initiative has driven cloud technology adoption within the government sector, exemplified by the success of cloud-based solutions like CoWIN, e-SHRAM, and DigiLocker. These solutions have significantly impacted vaccination distribution, worker registration, and document issuance, showcasing the tangible benefits of cloud technology adoption.

Massive computing requirements and data generation are leading to the adoption of the hybrid cloud approach

Ministries and departments are confronted with high volumes of data of varying sensitivity levels, necessitating technologies that facilitate the use of different systems and applications for data processing. Consequently, the hybrid cloud model has emerged as a solution, enabling the running of

applications on various cloud models. For instance, the MyGov Saathi app has effectively engaged over 2.5 crore MyGov Saathis.

Use case & progress:

Ministries and departments manage substantial data volumes of diverse sensitivity levels, necessitating technologies for seamless data storage, retrieval, management, and security. The adoption of a hybrid cloud model has become prominent, offering scalability, flexibility, security, cost optimization, and enhanced connectivity. This model supports heavy workloads during critical events like exam result announcements and elections. However, widespread adoption within the government sector hinges on ministries and departments gaining clarity on data classification and selecting the appropriate cloud service model for each data category.

Impact:

The hybrid cloud model has facilitated initiatives such as the MyGov Saathi app, engaging over 2.5 crore users. Additionally, entities like the IT Regulators of India and the Development Authority of Maharashtra leverage hybrid cloud models for government-to-consumer operations.

Unique requirement of the government and citizen-centric service delivery is leading to usage of diversified cloud service models

Ministries and departments have distinct requirements such as efficient solution delivery, data security, high data storage needs, and online education and telemedicine consultations. This has spurred a significant shift in demand from traditional cloud service models like Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS) to diversified cloud service delivery model solutions such as Backup as a Service (BaaS), Database as a Service (DBaaS), Communication Platform as a Service (CPaaS), Unified Communication as a Service (UCaaS), and Storage as a Service (STaaS).

Use case & progress:

Ministries and departments, with their specific needs, have shifted demand from traditional cloud service models to diversified cloud service delivery models, catering to their unique requirements. This transition enables them to leverage the modern capabilities of cloud service models effectively.

Impact:

The introduction of diversified cloud-based service models has allowed various ministries and departments to explore cloud-based service applications. For instance, UCaaS supports the Army wide area network (AWAN) for the Army Secure Indigenous Messaging Application (ASIGMA), while CPaaS facilitates online education in remote areas of India, ensuring quick content upload and security.

Focus of user ministries/departments to secure the data generated.

Data generated within the government sector is highly sensitive, necessitating a heightened focus on securing it over the cloud. To address this, policymakers and all user ministries/departments have established guidelines and standards for safeguarding data across various hosting environments. Furthermore, the government ensures that all Cloud Service Providers (CSPs) comply with these guidelines, with a mandate to store data within the country. Additionally, strictly confidential data is stored on government-owned on-premises infrastructure and cloud platforms like Meghraj and the GI Cloud.

Use case & progress:

The government sector's data, classified based on sensitivity, requires meticulous management over existing IT infrastructure. With the proliferation of digital applications, there's an increased emphasis on securing data over the cloud. To achieve this, policymakers and ministries/departments focus on adopting secure technologies for hosting applications and data. Guidelines and standards are published to safeguard data across different hosting environments, ensuring CSP compliance with data preservation within the country. Empaneled CSPs must adhere to stringent regulations, ensuring data confidentiality and jurisdiction under Indian law.

Impact:

Ministries and departments nationwide are embracing cloud-based solutions tailored to their data classification needs. Sensitive data is stored on government-owned infrastructure and cloud platforms like Meghraj and the GI Cloud. Publicly available data from applications with large user bases, such as CoWIN and e-SHRAM, resides on public cloud platforms.

Extensive investment to expand cloud infrastructure by the government and Cloud Service Providers

The Government of India aims to boost the development of data centres and cloud infrastructure by providing financial incentives and fostering public-private partnerships. By 2025, the government plans to invest 3-4% of capital and attract USD 4 billion in data centre investments. Major Cloud Service Providers (CSPs) are encouraged to establish data centres in cities like Bengaluru, Hyderabad, and Mumbai, stimulating significant private investment in cloud infrastructure.

Use case & progress:

Government policies have been liberalized to attract investments in the country, with Budget 2022 granting 'Infrastructure Status' to data centres to facilitate lower-rate credit availability. Several ministries/departments have already invested over INR 100 crore in cloud infrastructure. The government aims to attract substantial investment for data centres by 2025 and plans public-private partnerships for cloud infrastructure development. Major CSPs are establishing data centres,

particularly in Tier I cities like Bengaluru, Hyderabad, and Mumbai. Private investments in cloud infrastructure have reached up to INR 15,000 crore, with some states like Bihar establishing their own data centres and partnering with CSPs for data recovery services.

Impact:

Significant investments, up to INR 15,000 crore, from major players have been directed towards expanding existing data centres and building new cloud infrastructure within India. Additionally, states like Bihar have developed their own data centres and engaged CSPs for data recovery services, indicating a positive impact on the country's digital infrastructure development.

Mixed landscape of digital infrastructure leads to sporadic adoption of cloudfirst within the government sector

The Government of India has embraced a cloud-first approach, aiming to make it the default option for ministries/departments to enhance citizen-centric services and internal efficiency. The introduction of MeghRaj in 2013 facilitated cloud technology benefits within the government sector, leading numerous ministries/departments to initiate their cloud journey. Despite progress, some entities hesitate due to concerns like data security, control after migration, data loss, and application compatibility. Central and state governments are actively promoting cloud awareness. The Ministry of Southern India has issued an order to shift to the cloud, offering flexibility to departments.

Use case & progress

The cloud-first approach, defined by the Government of India, encourages ministries/departments to prioritize cloud usage for services and internal functions. MeghRaj, introduced in 2013, serves as the government's cloud computing environment, driving cloud adoption in delivering e-services. While many have embraced the cloud, some are cautious due to concerns. Initiatives by central and state governments aim to address awareness gaps. Noteworthy instances include e-Sanjeevani OPD providing virtual medical support and Kutumba offering unique identity to resident families in Karnataka.

Impact:

Through the adoption of the cloud-first approach, ministries and departments have utilized cloud-based solutions to provide value to citizens. Examples include:

- A. e-Sanjeevani OPD, developed by the Centre for Development of Advanced Computing, offers virtual medical support during nationwide lockdowns.
- B. Kutumba, a platform designed to provide unique identities to resident families of Karnataka and serve as a repository of resident attributes, streamlining access to government services

and benefits. The Kutumba project collects public data and creates a comprehensive record to simplify the documentation of citizens' demographic and personal data.

National Landmark:

In 2018, the Government of Maharashtra introduced its public cloud policy to ensure accessibility to public cloud services for all government departments. Subsequently, it mandated the use of cloud infrastructure for data storage needs across departments.

Emphasis on reducing the procurement lifecycle through the empanelment of Cloud Service Providers

The Government of India has implemented strategic measures to streamline the procurement process for adopting cloud-based services. Initiatives include leveraging public procurement portals like GeM and CPPP, as well as publishing guidelines to regulate cloud technology procurement within the government sector. These efforts aim to standardize procurement processes and enhance accessibility to local Cloud Service Providers (CSPs), Managed Service Providers (MSPs), and System Integrators (SIs).

Use case & progress:

The Government of India has introduced cloud services on public procurement portals such as GeM and CPPP to simplify procurement procedures. Additionally, the IT Regulators of India have published reports and guidelines to build an architectural vision and regulate cloud technology procurement. These initiatives have standardized processes, enhancing connectivity between states and the Centre and reducing paperwork for government engagements. The increased accessibility to local CSPs, MSPs, and SIs has facilitated faster approvals across government engagements. However, as ministries/departments are still adjusting to cloud technology, continuous efforts by the government and service providers are needed to further streamline procurement lifecycles.

Impact:

The availability of procurement guidelines and the empanelment of CSPs by the IT Regulators of India have enabled ministries/departments to swiftly onboard CSPs and launch applications such as CoWIN, Aarogya Setu, and eSHRAM. Additionally, some states have hired SIs to better understand guidelines and available cloud services, leading to accelerated cloud adoption.

Private sector spending

IT modernization in corporate sector (including digital transformation initiatives)

In recent years, India's corporate sector has embarked on a transformative journey driven by IT modernization and digital transformation. This paradigm shift has been catalyzed by rapid technological advancements, changing consumer behaviours, and evolving market dynamics. As organizations across

various industries strive to stay competitive and relevant in an increasingly digital world, the adoption of innovative technologies and digital strategies has become imperative.

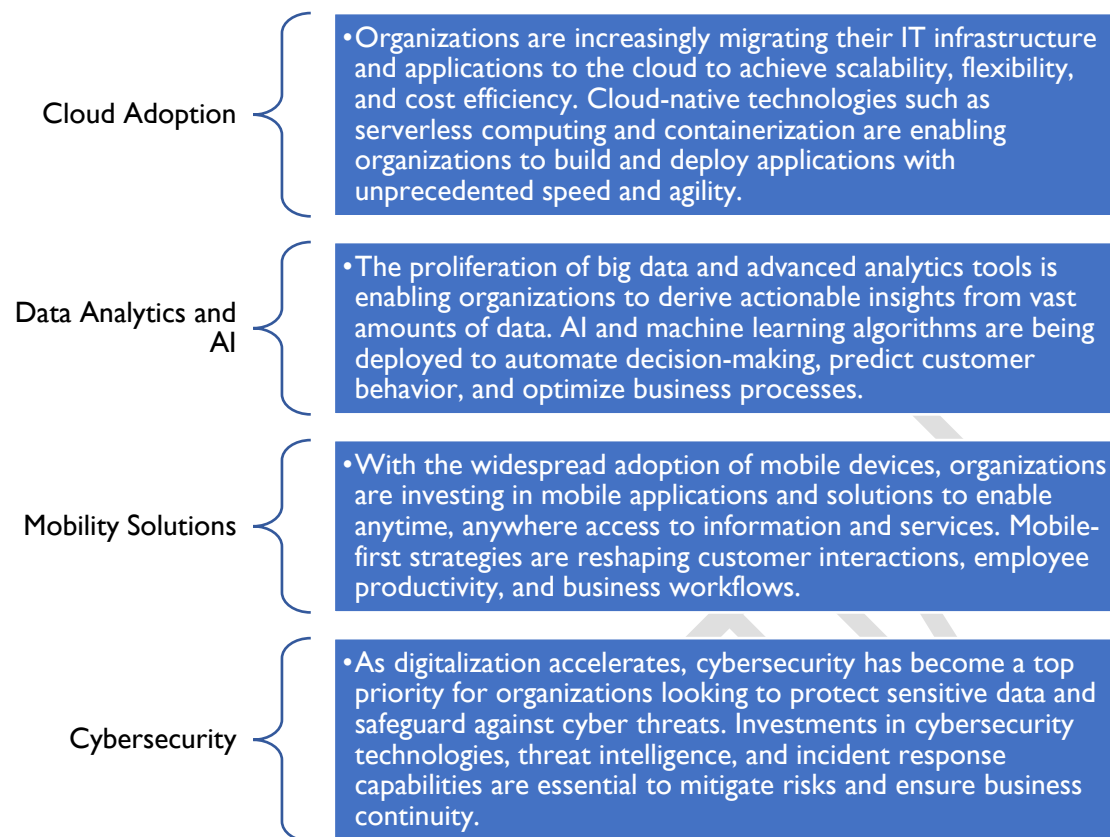
The digital era has ushered in a new wave of transformation, reshaping traditional business models and revolutionizing industry landscapes. Digital transformation encompasses the integration of digital technologies across all aspects of business operations, including customer engagement, product development, supply chain management, and workforce collaboration. In India, digital transformation has emerged as a strategic imperative for organizations seeking to enhance agility, drive innovation, and deliver superior customer experiences in a rapidly evolving marketplace.

Several key factors are driving the push towards IT modernization in India's corporate sector:

- **Technological Innovation:** The relentless pace of technological innovation, fuelled by advancements in cloud computing, artificial intelligence, machine learning, and data analytics, is empowering organizations to reimagine business processes and unlock new opportunities for growth and efficiency.
- **Changing Consumer Expectations:** Today's consumers demand seamless, personalized, and convenient experiences across digital channels. Organizations are under pressure to adapt to these changing expectations by leveraging digital technologies to deliver exceptional customer experiences.
- **Competitive Pressures:** Intense competition in domestic and global markets is compelling organizations to embrace digital transformation as a means of gaining a competitive edge. Businesses that fail to innovate and modernize risk being left behind in an increasingly digital marketplace.

Key Trends

A variety of initiatives and trends are shaping the landscape of IT modernization and digital transformation in India's corporate sector:



Digital Transformation Initiatives Driving Growth in the Corporate Sector of India

Digital transformation has become a cornerstone of growth and innovation for the corporate sector in India. Fuelled by technological advancements and changing market dynamics, organizations across industries are embracing digital initiatives to enhance efficiency, agility, and customer-centricity. Given below are the key digital transformation initiatives driving progress in India's corporate sector:

E-commerce and Omnichannel Strategies:

With the proliferation of smartphones and internet connectivity, e-commerce has emerged as a pivotal driver of digital transformation in the corporate sector of India. Organizations are investing in robust e-commerce platforms and omnichannel strategies to reach customers across multiple touchpoints seamlessly. From online marketplaces to mobile applications, companies are leveraging digital channels to enhance customer engagement, drive sales, and build brand loyalty.

Cloud Computing and Infrastructure Modernization:

Cloud computing has revolutionized the way businesses manage and deploy IT infrastructure, enabling scalability, flexibility, and cost efficiency. Organizations in India are migrating their workloads to cloud

platforms such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform to streamline operations, accelerate innovation, and drive digital transformation. By leveraging cloud-native technologies, companies can modernize their IT infrastructure, improve agility, and unlock new capabilities for growth.

Data Analytics and Business Intelligence:

Data has emerged as a strategic asset for organizations seeking to gain actionable insights and make informed decisions. Digital transformation initiatives in India's corporate sector include investments in data analytics and business intelligence tools to harness the power of data. From predictive analytics to real-time dashboards, companies are leveraging advanced analytics techniques to uncover trends, identify opportunities, and drive operational efficiency. Data-driven decision-making is becoming increasingly central to business strategies, enabling organizations to stay competitive in a rapidly evolving marketplace.

Artificial Intelligence and Machine Learning:

Artificial intelligence (AI) and machine learning (ML) are transforming business processes and customer experiences across industries. In India, organizations are leveraging AI and ML technologies to automate repetitive tasks, personalize customer interactions, and optimize operations. From chatbots and virtual assistants to predictive maintenance and fraud detection, AI-powered solutions are driving efficiency, innovation, and value creation. By harnessing the power of AI and ML, companies can unlock new revenue streams, improve productivity, and deliver superior customer experiences.

Cybersecurity and Risk Management:

As digitalization accelerates, cybersecurity has become a top priority for organizations looking to protect their assets, data, and reputation. Digital transformation initiatives in India's corporate sector include investments in cybersecurity solutions and risk management frameworks to mitigate threats and vulnerabilities. From network security and endpoint protection to threat intelligence and incident response, companies are adopting a proactive approach to cybersecurity to safeguard against cyber-attacks and data breaches. By implementing robust security measures and fostering a culture of cybersecurity awareness, organizations can build trust with customers, partners, and stakeholders.

Rise of technology start-ups and its impact on IT infrastructure industry

India has emerged as a hub for technology start-ups in recent years, with a growing ecosystem fostering innovation and entrepreneurship. This surge in start-up activity has not only transformed the business landscape but also significantly impacted the IT infrastructure industry.

India's technology start-up ecosystem has witnessed exponential growth fuelled by factors such as increasing internet penetration, availability of skilled talent, supportive government policies, and access to venture capital funding. Start-ups across various sectors including e-commerce, fintech, healthtech, edtech, and SaaS have proliferated, leveraging technology to address diverse market needs.

The exponential growth of India's technology start-up ecosystem can be attributed to several key factors:

- **Increasing Internet Penetration:** According to TRAI, India witnessed a substantial increase in internet subscribers, reaching 1,181.13 million by September 2023. This rise in internet connectivity has facilitated greater access to digital services, driving demand for innovative tech solutions.
- **Abundance of Skilled Talent:** India's vast pool of skilled talent, particularly in the fields of technology, engineering, and business, has been instrumental in fueling the growth of technology start-ups. The availability of qualified professionals has enabled start-ups to build robust teams and drive innovation across various sectors.
- **Supportive Government Policies:** The Indian government has introduced several initiatives and policies to support the growth of the start-up ecosystem, including Startup India, Make in India, and Digital India. These initiatives provide incentives, funding support, and regulatory frameworks to nurture and promote entrepreneurial ventures.
- **Access to Venture Capital Funding:** India has emerged as a lucrative destination for venture capital investment, attracting significant funding from domestic and international investors. According to S&P Global Market Intelligence, India ranked fourth globally in terms of venture capital investment, with the financial technology sector leading the funding charts.

India's start-up landscape is home to more than 100,000 start-ups, with a capital infusion exceeding an impressive \$146 billion between 2014 and 2023. This substantial investment signifies a strong financial bedrock for fostering innovation and expansion. Additionally, the presence of over 20,000 active start-up investors and 112 unicorns, collectively valued at over \$500 billion, firmly establishes India as a leading global hub for entrepreneurial ventures. Factors that show the remarkable growth and potential of India's technology start-up ecosystem are:

- **Global Attraction:** India's prominence as a global start-up destination is evident, with the country capturing 4.2% of global venture capital investments, securing its position as the fourth-most popular destination for start-ups worldwide in 2022.
- **Resilient Growth:** Despite global economic challenges, India witnessed a record-breaking 26,542 startup registrations in 2022, underscoring the resilience and dynamism of the start-up landscape.

- **Expansive Ecosystem:** With over 92,000 recognized start-ups as of February 2023, India boasts a diverse and expansive entrepreneurial ecosystem, fostering innovation across various sectors.
- **Funding Dynamics:** The financial technology sector has emerged as a frontrunner in funding, attracting a cumulative \$9.7 billion in investments in 2021 and 2022, signalling investor confidence and market potential.
- **Future Projections:** Projections indicate a significant growth trajectory, with the number of tech start-ups expected to soar from 68,000 in 2023 to 1.8 lakh by 2030, promising abundant opportunities for innovation, job creation, and economic growth.

Impact on the IT Infrastructure Industry:

The rapid proliferation of technology start-ups has led to a surge in demand for robust IT infrastructure solutions. This demand is driven by several factors:

1. **Cloud Adoption:** Start-ups, particularly those operating in the software-as-a-service (SaaS) domain, rely heavily on cloud computing for scalability, flexibility, and cost-efficiency. This has led to a significant increase in demand for cloud infrastructure services, prompting cloud providers to expand their data center footprint in India.
2. **Edge Computing:** With the proliferation of IoT devices and the need for real-time data processing, edge computing has gained prominence. Start-ups leveraging IoT, AI, and machine learning require edge infrastructure to process data closer to the source, leading to investments in edge computing solutions.
3. **Cybersecurity:** As start-ups handle sensitive customer data and intellectual property, cybersecurity has become a top priority. This has resulted in increased investments in cybersecurity infrastructure, including firewalls, threat detection systems, and encryption technologies.
4. **Data Analytics:** Start-ups are increasingly relying on data analytics to gain actionable insights and drive decision-making. This has spurred demand for infrastructure capable of handling large volumes of data and performing complex analytics tasks, leading to investments in big data platforms and analytics tools.
5. **DevOps and Automation:** Start-ups prioritize agility and rapid product development, driving the adoption of DevOps practices and automation tools. This has led to investments in infrastructure automation, continuous integration/continuous deployment (CI/CD) pipelines, and containerization technologies.
6. **Remote Work Infrastructure:** The COVID-19 pandemic accelerated the adoption of remote work practices, prompting start-ups to prioritize remote-friendly infrastructure solutions. This includes robust networking infrastructure to support remote collaboration tools, virtual

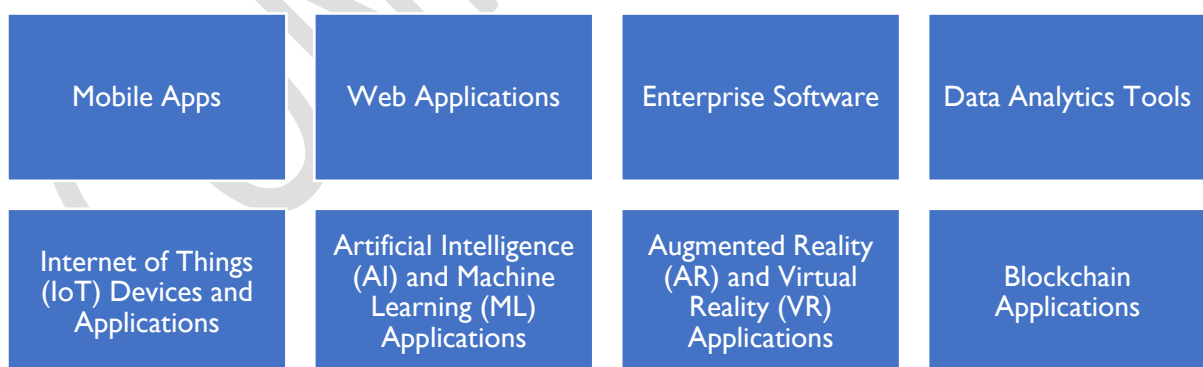
private networks (VPNs) for secure access to company resources, and cloud-based communication platforms. As start-ups continue to embrace remote work as a permanent or hybrid model, there is a growing demand for infrastructure solutions that enable seamless remote operations while ensuring data security and employee productivity. This shift towards remote work infrastructure presents both opportunities and challenges for the IT infrastructure industry, driving innovation in areas such as remote access technologies, virtualization, and endpoint security solutions.

The rise of technology start-ups in India has reshaped the IT infrastructure landscape, driving demand for innovative solutions that can support the dynamic needs of these companies. To capitalize on this trend, IT infrastructure providers must adapt their offerings to cater to the unique requirements of start-ups while addressing challenges such as scalability, cost, talent shortage, and cybersecurity. By embracing innovation and agility, the IT infrastructure industry can effectively support India's thriving start-up ecosystem and contribute to its continued growth and success.

Growth in new technology applications (at consumer & enterprise segments) and its impact

Technology applications refer to software, tools, platforms, and systems developed to perform specific tasks, solve problems, or meet user needs using technological solutions. These applications leverage various technologies such as software development, hardware integration, data analysis, artificial intelligence, and internet connectivity to deliver value to users and organizations across different domains.

Examples of technology applications include:



Technology applications are utilized in both consumer and enterprise segments to meet various needs and objectives.

Consumer Segment

- **Communication:** Consumers use technology applications such as messaging apps, social media platforms, and video conferencing tools for seamless communication and connectivity with friends, family, and peers.
- **Entertainment:** Streaming services, gaming apps, and virtual reality experiences provide consumers with entertainment and leisure options, enhancing their digital lifestyles.
- **E-commerce:** Online shopping platforms and mobile payment apps enable consumers to browse, purchase, and pay for products and services conveniently from the comfort of their homes.
- **Health and Wellness:** Health tracking apps, wearable devices, and telemedicine platforms empower consumers to monitor their health, access medical advice, and engage in fitness activities remotely.
- **Personal Finance:** Banking apps, budgeting tools, and investment platforms assist consumers in managing their finances, making transactions, and planning for the future.

Enterprise Segment

- **Operations Management:** Enterprises leverage technology applications such as enterprise resource planning (ERP) systems, inventory management software, and project management tools to streamline operations, optimize workflows, and enhance efficiency.
- **Customer Relationship Management (CRM):** CRM software enables businesses to manage interactions with customers, track sales leads, and analyze customer data to improve engagement and drive revenue growth.
- **Data Analytics:** Business intelligence (BI) tools, data visualization platforms, and predictive analytics software help enterprises analyze large volumes of data, gain insights, and make informed decisions to drive business outcomes.
- **Collaboration and Communication:** Enterprises utilize collaboration tools, video conferencing platforms, and project management software to facilitate teamwork, communication, and collaboration among employees, regardless of location or time zone.
- **Marketing and Sales:** Marketing automation software, customer relationship management (CRM) platforms, and digital marketing tools assist enterprises in reaching target audiences, generating leads, and driving sales through targeted campaigns and personalized messaging.

In India, there has been a notable surge in the adoption and proliferation of new technology applications across both consumer and enterprise segments. This growth is driven by several factors, including increasing internet penetration, rapid digitalization, and a burgeoning start-up ecosystem.

Consumer Segment

Increased Smartphone Penetration

• India's smartphone penetration has surged due to affordable devices and widespread mobile data availability, leading to increased usage of mobile apps across urban and rural areas. As the world's second-largest smartphone market by active users, India experiences significant growth in mobile app usage, driven by greater affordability and expanding smartphone usage. The COVID-19 pandemic accelerated India's transition to a mobile economy, with businesses embracing digital transactions. The Broadband India Forum projects that the app economy could contribute around 12 percent of India's GDP by 2030, growing four times faster than the wider economy. In 2023, India saw 26.4 billion app downloads and reached one billion smartphone users, representing 48.1% of the population.

Digital Entertainment Boom

• With the advent of streaming platforms, gaming apps, and social media networks, Indian consumers are increasingly turning to digital entertainment options for leisure and recreation. The popularity of platforms like Netflix, Amazon Prime Video, Disney+ Hotstar, and FreeFire highlights the growing appetite for immersive digital experiences.

E-commerce Revolution

• India's e-commerce sector has experienced explosive growth, fuelled by the rise of platforms like Flipkart, Amazon, and Paytm Mall. According to NASSCOM, India's e-commerce market is forecasted to cross a whopping \$200 billion by 2030 due to increased analytics, transactions, and internet penetration. Consumers now have access to a wide range of products and services online, driving the adoption of digital payments and contactless shopping experiences.

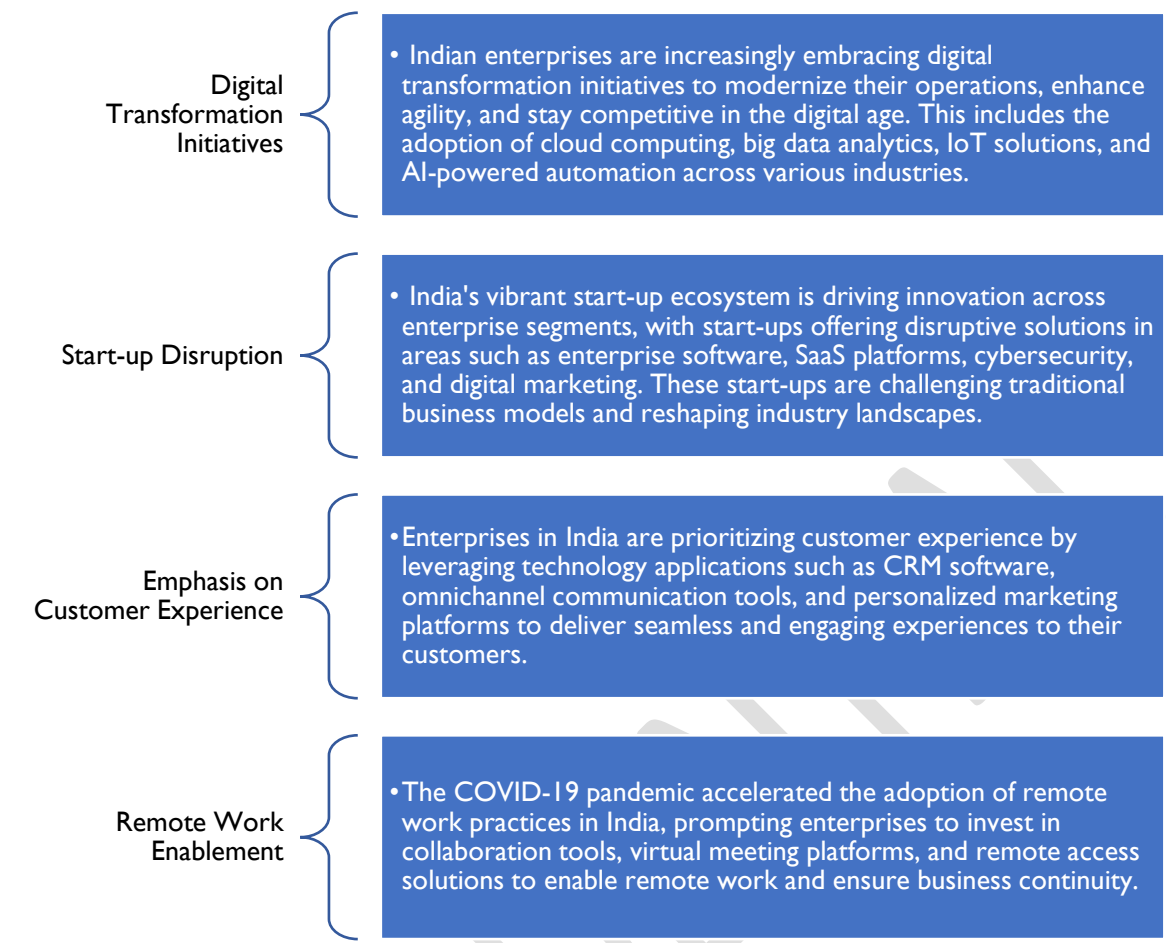
Healthcare Innovation

• Digital health apps, telemedicine platforms, and wearable devices are transforming the healthcare landscape in India, enabling consumers to access medical consultations, track their health metrics, and manage chronic conditions remotely.

Fintech Adoption

• The fintech sector in India has witnessed rapid growth, with consumers embracing digital payment apps, mobile wallets, and investment platforms for seamless financial transactions, savings, and investments.

Enterprise Segment



The surge in new technology applications, both in consumer and enterprise segments, has significant implications across various aspects of society and the economy. This growth signifies a transformative shift in how individuals and businesses interact, operate, and innovate. Following are the key implications of this phenomenon:

- Enhanced Consumer Experiences:** New technology applications are revolutionizing consumer experiences across industries such as retail, entertainment, healthcare, and transportation. From personalized recommendations and immersive content to convenient digital services and seamless transactions, consumers are benefiting from greater convenience, efficiency, and customization.
- Empowerment of Businesses:** For enterprises, the proliferation of new technology applications presents opportunities to streamline operations, optimize processes, and unlock new revenue streams. From advanced analytics and automation to cloud computing and IoT integration, businesses can leverage technology to enhance productivity, agility, and competitiveness in an increasingly digital marketplace.
- Disruption and Innovation:** The rapid adoption of new technology applications is driving disruption and innovation across traditional industries, challenging existing business models and paving the way for novel approaches to value creation. Start-ups and established

companies alike are harnessing emerging technologies such as artificial intelligence, blockchain, and augmented reality to create innovative solutions that address evolving market demands and customer preferences.

4. **Economic Growth and Job Creation:** The growth of new technology applications fuels economic growth by stimulating investment, driving productivity gains, and fostering entrepreneurship. As new markets emerge and existing industries evolve, there is a corresponding increase in job opportunities across various skill levels, from software development and data analysis to digital marketing and customer experience management.
5. **Societal Impacts:** Beyond the economic realm, the proliferation of new technology applications has profound societal implications, influencing how people communicate, collaborate, and interact with the world around them. From the democratization of information and digital inclusion to concerns about privacy, cybersecurity, and ethical use of technology, these developments shape the fabric of society and raise important ethical, legal, and social questions.

The growth of new technology applications represents a paradigm shift in how individuals, businesses, and society as a whole engage with technology and navigate the digital landscape. By understanding and harnessing the potential of these technologies, stakeholders can unlock opportunities for innovation, growth, and positive societal impact in the digital age.

Emergence of India as a Global Capability Center (GCC) hub & its impact on IT infrastructure spending

In recent years, India has emerged as a key hub for multinational companies establishing their Global Capability Centres (GCCs). With over 1,600 GCCs operating in the country and employing more than 1.6 million people, India's prominence in the global business landscape has significantly grown. This write-up delves into the factors driving this emergence, the evolution of GCCs in India, key industry verticals, growth projections, and the transformative impact on the economy.

Evolution of GCCs in India

The journey of GCCs in India dates back to the 1980s when pioneering companies like Texas Instruments set up their offices in Bengaluru. Originally known as captives or GICs (global in-house centres), these entities have evolved significantly over the years, transitioning into sophisticated GCCs. By 2012, the number of GICs had surpassed 760, and today, India hosts over 1,600 GCCs, a testament to its attractiveness as a strategic destination for global operations.

Several factors contribute to India's appeal as a preferred destination for establishing GCCs:

- **Abundance of Skilled Talent:** India boasts a vast talent pool of 2.5 million people with diverse skill sets, particularly in software product engineering. This futuristic talent pool is not only

technically proficient but also possesses a strong work ethic and innovative mindset, essential for driving business growth and competitiveness.

- **Cost-Competitive Operations:** India offers competitive operational costs without compromising on quality standards. This cost advantage, coupled with high-quality services, makes it an attractive proposition for multinational companies seeking to optimize their operational expenses.
- **Strategic Geographic Location:** India's strategic geographic location allows for easy management of satellite operations for neighbouring countries and beyond. This facilitates seamless coordination and enhances operational efficiency for multinational corporations.
- **Culture of Innovation:** The Indian tech ecosystem is characterized by a culture of innovation, fostering creative problem-solving and adaptability. This culture enables GCCs to drive cutting-edge innovations and stay ahead in today's dynamic business environment.
- **Market Access and Growth Opportunities:** With a large domestic market and significant opportunities for further growth and market penetration, India provides GCCs with a platform for expanding their business footprint and tapping into diverse market segments.

Key Industry Verticals and Growth Trajectory

GCCs in India operate across various service lines, including IT services, BPO, engineering services, and software product development. Over the years, they have ascended the value chain, delivering complex work that requires a deep understanding of business context and imperatives. Key industry verticals such as banking and financial services, software, telecom, semiconductor, aerospace, automotive, healthcare, and pharma have witnessed substantial growth driven by GCCs' contributions.

In India, several multinational companies have established Global Capability Centres (GCCs) to drive innovation and operational efficiency. Below are examples of three such companies:

AstraZeneca's Virtual Reality Solution: AstraZeneca's Global Innovation and Technology Centre in Chennai showcases the innovative potential of GCCs in India. By leveraging virtual reality (VR) technology, AstraZeneca has developed an immersive digital replica of its drug production facility in Sweden. This virtual environment allows employees to undergo training and familiarize themselves with the production processes without physically being present on the assembly line. Developed entirely by AstraZeneca's captive unit in India, this VR solution not only enhances training effectiveness but also saves the pharmaceutical giant significant costs associated with traditional training methods. By harnessing the technical expertise and innovation capabilities of its GCC in India, AstraZeneca demonstrates how GCCs contribute to driving efficiency, innovation, and cost savings for multinational corporations.

Rakuten Group's Bengaluru GCC: Rakuten Group, a Japanese conglomerate, has established its Global Capability Centre in Bengaluru. This GCC plays a crucial role in developing and managing digital payment platforms, including Rakuten Pay, which is Japan's equivalent of GooglePay. The Bengaluru GCC oversees the entire product lifecycle, from user experience (UX) design to backend development and strategic planning. By leveraging India's vast talent pool and tech expertise, Rakuten Group's GCC has not only created innovative digital payment solutions but also contributed to the company's strategic goals. The success of Rakuten Pay underscores the pivotal role played by GCCs in driving digital transformation and enhancing customer experiences for multinational corporations.

Lowe's Self-Checkout System: Lowe's, a US-based home improvement retailer, has leveraged its GCC in Bengaluru to develop a robust self-checkout system for its stores. This system, developed in-house at a fraction of the cost of vendor products, has significantly increased the efficiency of transactions at Lowe's stores. With the GCC's expertise in software development and engineering services, Lowe's has successfully implemented innovative solutions to streamline operations and enhance customer satisfaction. The success of the self-checkout system highlights how GCCs in India contribute to driving operational excellence and cost optimization for multinational corporations across diverse industry verticals.

According to projections by NASSCOM, the GCC landscape in India is set to expand further in the coming years. By 2028, the total number of GCCs is expected to surpass 2,100, with revenue exceeding USD 90 billion. Cost savings are no longer the main driving force behind companies' decisions to operate in India. Instead, a combination of skilled talent, a vibrant startup environment, and a digitally savvy industry and customer base is drawing companies to the country.

Impact on IT Infrastructure spending

The emergence of India as a Global Capability Centre (GCC) hub has had a profound impact on IT infrastructure spending, both within the country and globally. This impact can be observed across various dimensions:

- Increased Investment in IT Infrastructure in India:

As multinational companies establish their GCCs in India, there is a growing need for robust IT infrastructure to support their operations. This includes investments in data centers, networking equipment, cloud computing services, cybersecurity measures, and software development tools. The influx of GCCs has led to a surge in demand for advanced IT infrastructure solutions and services, prompting organizations to allocate significant budgets for infrastructure development and upgrades. According to a collaborative survey conducted by Deloitte and industry association NASSCOM, more than 70 percent of companies with

GCCs and engineering service arms in India intend to boost their budgets by 10-25 percent during 2022-23. The survey also highlights that Engineering Research and Development (ER&D) expenditures within the automotive, transportation, and industrial sectors housed in India's GCCs are anticipated to experience the most significant growth, projected to fall within the range of 10-25 percent.

- Adoption of Emerging Technologies:

GCCs in India often focus on driving innovation and digital transformation within their parent organizations. This entails the adoption and implementation of emerging technologies such as artificial intelligence (AI), machine learning (ML), Internet of Things (IoT), blockchain, and advanced analytics. Consequently, there is a heightened emphasis on investing in IT infrastructure that can support these technologies, including high-performance computing systems, storage solutions, and specialized hardware accelerators.

- Expansion of Data Center Footprint:

The growing presence of GCCs in India has led to an expansion of data center infrastructure to accommodate the increasing volume of data generated and processed by these centers. Organizations are investing in building new data centers or expanding existing ones to ensure scalability, reliability, and compliance with regulatory requirements. Additionally, there is a trend towards adopting hybrid and multi-cloud strategies, necessitating investments in cloud infrastructure and management platforms.

- Focus on Security and Compliance:

With the rising cyber threats and stringent regulatory requirements, there is a heightened focus on enhancing cybersecurity measures and ensuring compliance with data protection regulations. Organizations operating GCCs in India are investing in advanced security solutions such as intrusion detection systems, threat intelligence platforms, encryption technologies, and identity and access management solutions. Moreover, there is an increased emphasis on implementing robust data privacy and compliance frameworks to safeguard sensitive information and mitigate risks.

- Collaboration and Connectivity Requirements:

The seamless collaboration between GCCs in India and their parent organizations worldwide necessitates investments in robust connectivity infrastructure. This includes high-speed

internet connectivity, virtual private networks (VPNs), unified communications platforms, and collaboration tools. Organizations are leveraging technologies such as software-defined networking (SDN) and edge computing to optimize network performance, ensure low-latency communications, and support real-time collaboration across geographically distributed teams.

- **Economic Impact on IT Infrastructure Providers:**

The growing demand for IT infrastructure solutions and services driven by the proliferation of GCCs in India presents significant opportunities for IT infrastructure providers, including hardware vendors, cloud service providers, network equipment manufacturers, and cybersecurity firms. These providers stand to benefit from increased demand for their products and services, leading to revenue growth and market expansion.

In conclusion, India's emergence as a GCC hub highlights its growing significance in the global business ecosystem. With a conducive business environment, abundant talent pool, cost-competitive operations, and culture of innovation, India offers a compelling value proposition for multinational companies seeking to establish GCCs. As the GCC landscape continues to evolve and expand, India is poised to remain at the forefront of this transformation, driving economic growth, innovation in Information technology, and market leadership in the years to come.

Changes in data security / cybersecurity landscape and its impact

In recent years, India has witnessed significant changes in its data security and cybersecurity landscape driven by technological advancements, regulatory reforms, and evolving cyber threats. India's digital transformation journey has accelerated, leading to a massive proliferation of data across various sectors such as finance, healthcare, e-commerce, and government services. The widespread adoption of digital technologies, including cloud computing, IoT, and mobile devices, has exponentially increased the volume, velocity, and variety of data being generated, posing new challenges for data security and cybersecurity.

Current Challenges for Organisations in India

- **Rise in Cyberthreats:** The proliferation of cyber threats has surged in the digital era, underscoring the critical importance of cybersecurity. India is confronted with a broad spectrum of cyber threats, ranging from financial fraud and data breaches to sophisticated cyber-espionage campaigns.
- **Diverse Attack Techniques:** Given its expansive population, India has become a focal point for cybercriminals who employ various attack techniques such as phishing, ransomware, and social engineering tactics to exploit vulnerabilities.

- **Targeted Sectors:** Key sectors including financial institutions, e-commerce platforms, and government entities are particularly targeted due to the sensitive nature of their data, amplifying the need for robust cybersecurity measures.
- **Ransomware Surge:** A notable surge in ransomware incidents has resulted in significant disruptions to businesses, lasting from a few days to several weeks, further emphasizing the evolving and pervasive nature of cyber threats.

The IBM Security Data Breach Report of 2022 revealed that the average cost of data breaches in India reached a record high of ₹17.5 crores (₹175 million) rupees, equivalent to around \$2.2 million, for the fiscal year of 2022. This marks an increase of 6.6% from the previous year and a staggering 25% rise from the average cost in 2020.

During the first half of the fiscal year 2023-24, the healthcare, education/research, and utilities sectors were the most impacted industries in terms of weekly cyber attacks per organization. Additionally, the retail, hospitality, manufacturing, and transportation sectors are urged to enhance their cybersecurity measures due to increasing threats.

On average, each organization in India experienced 2,157 cyber attacks per week in the last six months, compared to 1,139 attacks per organization globally.

Furthermore, the first half of 2023 witnessed several significant cybersecurity incidents in India, ranging from financial frauds to data breaches. Notably, the Odisha Economic Offenses Wing apprehended 60 fraudsters involved in various online scams that yielded ₹100 crore. The Kangra Co-operative Bank suffered a ₹7.79 crore cyber fraud, emphasizing the urgent need for stronger cybersecurity measures in the banking sector.

In another incident, a major data breach occurred in the Ministry of Health and Family Welfare, where a hacking group known as Phoenix allegedly breached the Health Management Information System, jeopardizing sensitive hospital data nationwide. Concurrently, a scam targeted Indian investors, exploiting the growing popularity of cryptocurrencies. Fake platforms deceived unsuspecting investors into losing over ₹1,000 crore, highlighting the necessity for increased awareness among crypto investors.

Response to Cyberattacks

Amidst the rising tide of cyber threats, India's cybersecurity landscape is witnessing a robust response, with various stakeholders including businesses, individuals, and governmental bodies collaborating to fortify their digital defenses.

A notable initiative involves the collaboration between national security agencies and the Defence Cyber Agency, engaging in rigorous cyber defense exercises to enhance preparedness and resilience.

Additionally, the Union Home Ministry has established a dedicated helpline to assist individuals affected by cyber scams, aiming to swiftly block stolen funds, refund victims within 24 hours, and raise awareness about the importance of safeguarding sensitive information online.

In August 2023, the government enacted the Digital Personal Data Protection (DPDP) Act, 2023, a landmark cross-sectoral legislation aimed at safeguarding personal data amidst concerns of heightened surveillance. This legislative milestone has bolstered confidence among multinational corporations operating in India.

Further demonstrating proactive measures, initiatives like the National Counter Ransomware Task Force underscore India's commitment to countering specific threats like ransomware. Collaborative efforts, such as the formation of the International Counter Ransomware Task Force, exemplify India's willingness to collaborate globally for enhanced cybersecurity.

Concurrently, Indian businesses and individuals are taking proactive steps against cyber threats by enrolling in online courses offered by institutions like the Defence Research and Development Organisation, focusing on cybersecurity and AI education to bolster their expertise.

The deployment of innovative tools such as USB Pratirodh and AppSamvid, aimed at providing enhanced control and protection against malware, reflects India's tech-driven approach to cybersecurity. Additionally, breakthrough solutions like the Artificial Intelligence and Facial Recognition-powered Solution for Telecom SIM Subscriber Verification (ASTR) showcase India's technological advancements in combatting fraudulent activities in the cybersecurity domain.

Impact on IT Sector

Increased Spending on IT Infrastructure

With the escalating cyber threats, organizations are compelled to invest more in strengthening their IT infrastructure to safeguard against potential breaches and cyber attacks. This surge in spending on IT infrastructure encompasses the implementation of robust cybersecurity measures, including advanced threat detection systems, encryption technologies, and secure network architecture.

Growing Demand for Cybersecurity Solutions and Services:

The heightened awareness of cybersecurity risks has fuelled a surge in demand for cybersecurity solutions and services across various industries. This increased demand encompasses a wide range of cybersecurity offerings, including threat intelligence platforms, endpoint security solutions, penetration testing services, and security consulting services. As a result, cybersecurity providers are witnessing a significant uptick in business opportunities and revenue growth.

Rise in Cybersecurity Jobs and Skill Development:

The evolving cybersecurity landscape has created a growing demand for skilled professionals capable of combating sophisticated cyber threats. Consequently, there is a surge in cybersecurity job opportunities across the country, ranging from cybersecurity analysts and engineers to ethical hackers and incident responders. This increased demand for cybersecurity talent has prompted organizations and educational institutions to invest in cybersecurity training and skill development programs to bridge the skills gap and groom the next generation of cybersecurity professionals.

Emphasis on Regulatory Compliance and Data Protection:

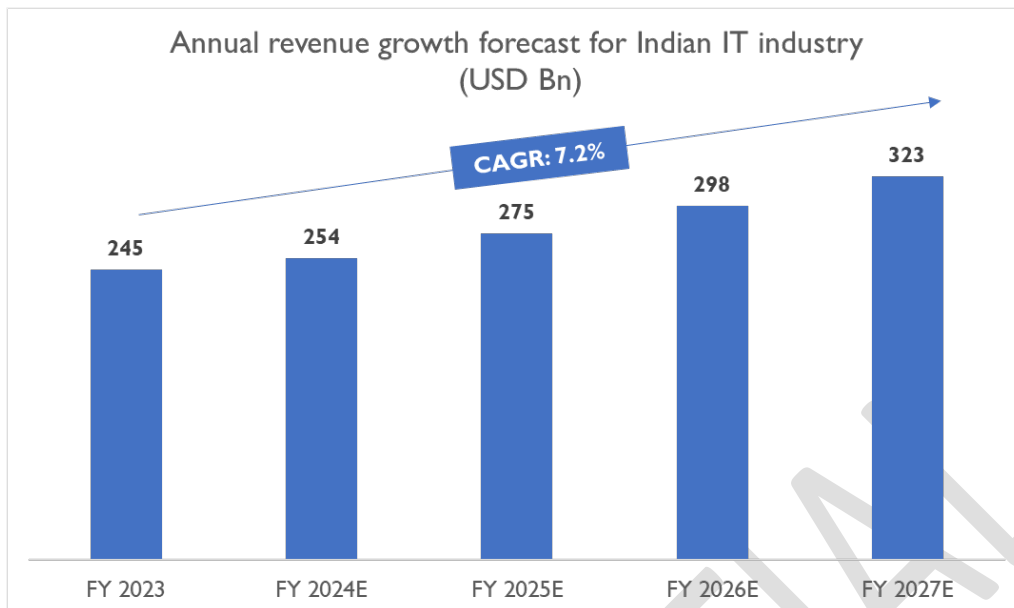
The enactment of regulatory reforms such as the Digital Personal Data Protection (DPDP) Act, 2023, has heightened the focus on regulatory compliance and data protection among organizations operating in India. Companies are now mandated to adhere to stringent data protection requirements and implement comprehensive data security measures to ensure compliance with regulatory standards. This emphasis on regulatory compliance has spurred investments in data protection technologies and compliance frameworks to mitigate regulatory risks and safeguard sensitive customer information.

Rise in Cyber Insurance Adoption:

As organizations recognize the financial implications of cyber incidents, there is a growing trend towards the adoption of cyber insurance policies to mitigate the financial impact of cyber attacks and data breaches. Cyber insurance policies provide organizations with financial protection against the costs associated with data breaches, including legal expenses, regulatory fines, and incident response costs. This rise in cyber insurance adoption reflects a proactive approach towards managing cyber risks and enhancing financial resilience in the face of cyber threats.

Growth Forecast

The Indian IT industry is experiencing a period of significant growth, driven by a confluence of factors. According to estimates, the industry is expected to grow at CAGR of 7.2% to reach USD 323 billion by 2027. The global shift towards digitalization has fueled the demand for IT services across industries. Indian IT firms, with their expertise in software development, cloud solutions, and system integration, are well-positioned to capitalize on this trend. Compared to developed economies, India offers competitive rates for IT services, making it an attractive option for businesses worldwide. This advantage, coupled with a large pool of skilled professionals, continues to attract global clients. The rise of technologies like artificial intelligence, blockchain, and the Internet of Things (IoT) is creating new opportunities for the Indian IT industry. Companies are investing in developing expertise in these areas to meet evolving client needs.



Source: NASSCOM, Industry Articles, D&B Research and Estimates

Notably, the domestic IT market is expected to grow even faster. This rapid expansion presents exciting opportunities for both Indian businesses and the global IT landscape. The Indian government is actively promoting digital adoption through initiatives like "Digital India," which aims to make government services more accessible online and bridge the digital divide. This creates significant demand for IT infrastructure and services within the country. The rising middle class in India is driving demand for consumer-focused IT products and services, such as e-commerce platforms, digital payment solutions, and online entertainment options. India's thriving start-up ecosystem is fueling demand for IT services as these new businesses require solutions for website development, app development, cloud infrastructure, and cybersecurity.

Threats & challenges impacting the IT infrastructure industry

I. Cyber Security Threats

- **Ransomware Attacks:** A persistent and evolving threat, ransomware attacks target critical systems and data, demanding payment for decryption keys. The impact can be devastating, leading to business disruptions, data loss, and reputational damage.
- **Data Breaches:** The increasing interconnectedness of systems and the growing volume of sensitive data make organizations vulnerable to data breaches. This can result in financial losses, legal liabilities, and erosion of customer trust.

- **Supply Chain Attacks:** Attackers are increasingly targeting software supply chains, compromising open-source libraries and third-party vendors to infiltrate target organizations.
- **Cloud Security:** While cloud computing offers numerous benefits, it also introduces new security challenges, including data privacy concerns, unauthorized access, and the potential for data loss.

2. Technological Disruptions

- **Rapid Technological Advancements:** The IT industry is characterized by rapid technological advancements, such as artificial intelligence (AI), machine learning (ML), and the Internet of Things (IoT). Keeping pace with these advancements requires continuous learning and adaptation, which can be challenging for organizations.
- **Emerging Technologies:** The emergence of new technologies, such as blockchain and quantum computing, presents both opportunities and challenges. Organizations need to understand the potential impact of these technologies on their businesses and develop strategies to leverage them effectively.

3. Economic and Political Factors

- **Economic Slowdown:** Global economic uncertainties and potential downturns can impact IT spending, leading to reduced budgets and delayed projects.
- **Geopolitical Risks:** Geopolitical tensions and trade disputes can create uncertainty and disrupt global supply chains, impacting the availability of critical IT components and services.
- **Regulatory Changes:** Changes in government regulations, such as data privacy laws and cybersecurity regulations, can impose new compliance requirements and increase operational costs for IT organizations.

4. Talent Shortages

- **Skill Gaps:** The IT industry faces a persistent shortage of skilled professionals, particularly in areas such as cybersecurity, AI, and cloud computing. This can lead to difficulties in recruiting and retaining talent, impacting project delivery and innovation.
- **Upskilling and Reskilling:** The rapid pace of technological change necessitates continuous upskilling and reskilling of the workforce. Organizations need to invest in training and development programs to ensure their employees have the necessary skills to remain competitive.

5. Sustainability Challenges

- **Environmental Impact:** The growing energy consumption of data centers and the electronic waste generated by the IT industry pose significant environmental challenges.

- **Sustainable Practices:** Organizations need to adopt sustainable practices, such as energy-efficient data centers, responsible e-waste disposal, and the use of renewable energy sources.

Competitive Landscape

The Indian IT infrastructure industry is flourishing, driven by a growing demand for digital solutions. The competitive landscape is dynamic, with established players facing competition from innovative mid-tier players and niche specialists. The market is teeming with both established players and emerging ones, creating a dynamic competitive environment. Major players offer comprehensive IT infrastructure solutions, including data center services, network management, and cloud solutions. These companies leverage their vast experience, global reach, and diverse service portfolios to gain a competitive edge.

Mid-sized players are also making their mark, offering cost-effective solutions and catering to specific market segments. Additionally, niche players with specialized expertise in areas like cloud migration, network security, and disaster recovery are carving out their space, further intensifying the competitive landscape.

Competition is evolving beyond just cost and service offerings. Factors like innovation, agility, and specialization are becoming increasingly important. Companies are differentiating themselves by investing in cutting-edge technologies like artificial intelligence and automation, adopting agile methodologies, and developing domain-specific expertise. Additionally, the rise of cloud-based solutions is disrupting traditional business models, forcing players to adapt and develop new competitive strategies.

The Government of India's Digital India initiative fuels the demand for IT infrastructure solutions as businesses and government entities across the country rapidly digitize their operations to facilitate e-governance, citizen services, and business enablement. The rapid adoption of cloud-based solutions drives the need for IT infrastructure services focusing on cloud migration, management, and optimization. Companies look for providers to help them move workloads to the cloud and manage hybrid cloud environments. Rising cybersecurity threats increase the demand for robust network, data, and infrastructure security solutions. Companies require assistance in vulnerability assessments, threat detection, and incident response. The need for data centers to store and process increasing volumes of data is pushing the requirement for IT infrastructure players with specialized expertise in data center design, build-out, and management.

The domestic IT infrastructure industry in India is highly competitive, featuring a mix of established global players, large Indian conglomerates, and specialized mid-sized firms. Market players offer a full range of IT infrastructure services, from cloud solutions and data center management to network

security and managed services. Mid-sized players compete by providing a mix of cost-effectiveness, niche specialization, and focus on specific industry verticals. They often have strong regional presence and established relationships with specific clientele. Smaller, niche players compete by focusing on specialized areas like cloud migration, network security, cybersecurity, or infrastructure solutions for specific sectors like healthcare or education.

Entering the domestic IT infrastructure industry requires significant technical expertise and investment in skilled resources. Setting up modern data centers, establishing cloud solutions, and building robust networking infrastructure can be capital intensive. Especially to cater to the government sector, where pre-qualifications are mandatory, which often involve a minimum number of years of experience, proven track record of successfully executing similar projects, and financial stability. Additionally, obtaining security clearances and adhering to stringent compliance regulations can be challenging for new entrants. Government contracts often require domain-specific expertise and experience in handling large-scale projects. Additionally, specific security certifications and adherence to data privacy regulations are mandatory.

While the government sector presents unique challenges with its stringent entry barriers and specific requirements, it also offers significant opportunities for players with the right expertise and experience

Key factors shaping competition

Pricing	
Cost-effective Solutions	Indian IT service providers are known for their ability to offer cost-efficient solutions compared to many developed nations. This cost advantage remains a primary factor attracting domestic businesses seeking to maximize the value of their IT investments
Competitive Bidding	The Indian IT market has many established players and emerging firms, leading to a highly competitive bidding environment for projects. This can drive price pressure, particularly for commoditized services

Flexible Pricing Models	IT providers in India often offer flexible pricing models to cater to diverse client needs. These could include fixed-price contracts, pay-as-you-go models, or outcome-based pricing, allowing clients to tailor their IT spend
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Service Offerings	
Broad Range of Services	Indian IT firms offer a comprehensive spectrum of services, including software development, IT infrastructure management, cloud services, cybersecurity, business process outsourcing, and analytics. This allows businesses to find a single vendor for multiple needs.
Specialization in Emerging Technologies	Many Indian IT companies are differentiating themselves by specializing in areas like artificial intelligence, machine learning, blockchain, IoT, and advanced analytics. This specialization in niche areas helps them stand out in a crowded market.
Emphasis on Innovation	Top Indian IT companies invest significantly in research and development to stay ahead of the technology curve. They prioritize innovation, offering cutting-edge solutions for a rapidly evolving digital landscape

Other Factors	
Talent Pool	India's large and skilled IT workforce is a significant driver of the industry's growth and competitiveness. The continuous supply of engineers and IT professionals provides an advantage in terms of resource availability and cost optimization.

Domestic Market Understanding	Indian IT service providers have a deep understanding of the local business dynamics, regulatory requirements, and cultural nuances. This understanding can be a key differentiator when working with Indian businesses..
Government Support	Government initiatives like "Digital India" and "Make in India" have fostered a conducive environment for the domestic IT industry. Programs promoting technology adoption and innovation contribute to the industry's growth.

Profile of key players catering to domestic IT demands

Company Name	Brief Profile	Services Offered
Hitachi Systems Micro Clinic (HISYS-MC)	It is a system integration (SI) company operating under the umbrella of Hitachi Systems India Pvt. Ltd. Established in 1991, HISYS-MC has carved a niche for itself in the Indian IT landscape, empowering businesses with advanced IT solutions.	• Infrastructure Solutions • Cloud Solutions • Networking Solutions • Security Solutions • Digital Workplace Solutions • Managed Services

Company Name	Brief Profile	Services Offered
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Dynacons Systems & Solutions Ltd.	Established in 1995 and headquartered in Mumbai, India, has carved a niche for itself in the IT service industry. They offer a comprehensive suite of IT solutions catering to diverse needs of corporations across various industry verticals.	• Infrastructure Managed Services (IMS) • Break-Fix Services • Managed Print Services (MPS) • Cloud Computing • Systems Integration Services • Applications Development and Maintenance
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Company Name	Brief Profile	Services Offered
Value Point Systems Private Limited	It is a leading IT infrastructure solutions and services provider headquartered in Bengaluru, India. Established in 1991 as a partnership firm and reconstituted as a private limited company in 1995, VPSPL has established itself as a trusted partner for businesses seeking reliable and comprehensive IT solutions.	End-to-End Infrastructure Solutions: VPSPL provides a full spectrum of services to design, build, manage, and optimize IT infrastructure, including: • Network infrastructure solutions (LAN, WAN, wireless) • Data center solutions (design, construction, management) • Cloud computing solutions (migration, management, optimization) • Cyber security solutions (threat

		detection, vulnerability management) - IT infrastructure management (monitoring, maintenance, optimization) Life Cycle Services: VPSPL offers a comprehensive lifecycle approach to IT infrastructure, encompassing: - Consulting and planning - Design and implementation - Management and support - Optimization and upgrade
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Company Name	Brief Profile	Services Offered
Aabasoft Technologies India Private Limited	It is a global Information Technology (IT) and Information Technology Enabled Services (ITeS) solutions provider headquartered in Kochi, Kerala, India. Established in 2002, the company has grown to serve clients across various industries.	- IT Infrastructure - Cloud Services - Web Technology - Mobile Applications - Enterprise Applications - Business Services - Internet Marketing

Company Profile- Marushika Technology Limited I

Marushika is a IT services provider known for its strategic approach and commitment to delivering transformative solutions. The company distinguishes itself by going beyond traditional business interests, prioritizing the resolution of critical challenges faced by enterprises. This focus on resilience and adaptability aligns with the evolving needs of businesses navigating the complex and dynamic IT landscape.

The company offers consulting services include a wide range of technology service offerings such as Cloud, Containerization, DevOps, Digital Transformation, Identity and Access Management, IT Infrastructure, Managed Services, Technology Advisory and Virtualization Services, smart solutions for smart cities, and security surveillance. Moreover, they have partnered with Amazon Web Services (AWS), Crayon India, Delta, Intec, iRAM, NSG, Bharat Electronics Limited, Mahindra Defence Systems, NETIP, QUESS Corp, Central Electronics Limited, Technosys Security Systems etc. to provide world class services to their clients

Marushika offers a comprehensive suite of IT services, encompassing:

- **IT & Telecom Infra Solutions:** The company offers cutting-edge visual and power management systems designed to enhance operational efficiency. It also provides high-quality online UPS for environments such as control rooms, meeting spaces, and public areas. The integrated solutions ensure continuous power supply with performance, even during critical operations.
- **Smart Solutions:** The company provides services in the smart city projects of government of India. Through strategic partnerships with esteemed global and indigenous Original Equipment Manufacturers (OEMs) to support customers with World class Solutions and Customized Services. Moreover, the Main activities and solution includes the following areas are Smart Access Control System, Smart Parking, Smart Lighting, Smart waste Management, Video Wall Smart Telephony Solutions, IPEPBX, IP Phone, Video Phone, Video Conferencing and Power System.
- **Cloud Based IT Solutions:** The company is specialized in Strategic Cloud Transition Consultation, offering a suite of services designed to guide businesses seamlessly through the process of migrating to the cloud. It partners with leading Meity empaneled cloud service provider Amazon Web Services (AWS).
- **Defence Auto-Tech:** The company provides complete management of tracked and wheeled automotive repairs, refurbishments, and reverse engineering of vital parts are essential

¹ As per the information available on company website

services for maintaining military vehicle fleets in optimal condition. These vehicles, including tanks, armoured personnel carriers, and other military transport, face harsh and demanding environments, requiring specialized repair and maintenance solutions to ensure their continued reliability and performance.

- **Digital Training:** The company offers Digital Training Transformation Platforms, that is designed to support the development, delivery, and management of learning programs in a digital environment. The platform enables the creation of customized learning experiences for learners, ensuring that training content is both accessible and engaging.

Key Strengths:

- **End-to-End Solutions:** Providing a comprehensive range of IT services to meet diverse client needs.
- **Innovation Focus:** Continuously exploring and implementing new technologies and best practices.
- **Customer-Centric Approach:** Prioritizing client satisfaction and building long-term partnerships.
- **Strong Operational Excellence:** Delivering reliable and high-quality services with a focus on efficiency.

Company Mission:

To provide customers with an optimal and integrated IT platform that enhances efficiency and user experience. Continuously improve all aspects of IT services delivery and strive to exceed industry standards.

Company Vision:

To be a leading provider of high-quality IT services, achieving profitability while fostering a sustainable and inclusive company culture.