Chapter 1 INTRODUCTION OF IT TRANSFORMATION IN TELECOMMUNICATIONS

1.1 Introduction

Telecommunications is a science of information transport using wire, radio, optical, or electromagnetic channels to transmit receive signals for voice or data using electrical means. Telecommunications and broadcasting worldwide are overseen by the International Telecommunication Union (ITU), an agency of the United Nations (UN) with headquarters in Geneva, Switzerland. Most countries have their own agencies that enforce telecommunications regulations formulated by their governments. In India, that agency is the Department of Telecommunication (DoT)\(^1\). In earlier times, this may have involved the use of smoke signals, drums, semaphore, flags or heliograph. In modern times, telecommunication typically involves the use of electronic devices such as the telephone, television, radio or computer. Early inventors in the field of telecommunication include Alexander Graham Bell, Guglielmo Marconi and John Logie Baird. Basic Model of Communication is as refer in Figure 1.1\(^2\).

\(^2\) Rajan, Mohan Sundra and Tyagi, Narendra Kumar, (2001),The Telecom Story and the Internet, First Edition, National Book Trust of India
1.2 History of Telecommunication

The high level journey of telecommunications is referred as below:

1837: Samuel Morse invents the telegraph

1858: Transoceanic telegraph cable was laid

1876: Alexander Graham Bell invents the telephone

1877: Bell Telephone Company was formed

1885: Incorporation of AT&T

1892: Invention of Strowger exchange

1912: Invention of initial crossbar exchange

1971: First electronic exchange

In India smartphone signaling was started in 1813 between Calcutta and Sagar Island, the first experimental electric telegraph line in India was set up in 1839, over a distance of 33 Kilometers from Calcutta towards Diamond Harbour. In 1851 the circuit was established between Calcutta

Figure 1.1 Basic Model of Communication
and Diamond Harbour for the East India Company. The Telegraph service was opened to the public in 1855. Eventually with the progress of time PSTN came into existence. The public switched telephone network (PSTN) is the aggregate of the world’s circuit-switched telephone networks that are operated by national, regional, or local telephony operators, providing infrastructure and services for public telecommunication. The PSTN consists of telephone lines, fiber optic cables, microwave transmission links, cellular networks, communications satellites, and undersea telephone cables, all interconnected by switching centers, thus allowing any telephone in the world to communicate with any other. Originally a network of fixed-line analog telephone systems, the PSTN is now almost entirely digital in its core network and includes mobile and other networks, as well as fixed telephones. PSTN is a combination of core network and access networks.

- **Core Network:** is the Combination of switching centers and transmission systems connecting switching centers. Transmission medium used is Fiber optic or air to send micro waves.

- **Access Network:** is the portion of public switched network that connects access node (edge of access network or last mile) to the

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3 Rajan, Mohan Sunda and Tyagi, Narendra Kumar, (2001), The Telecom Story and the Internet, First Edition, National Book Trust of India

individual subscriber. Generally it is twisted copper wire connected to customer termination equipment.

1.3 Telecom Standards, Protocols and Standard Organizations

**Standards:** These standards should be regarded as tools for rationalizing the range of products on the market, and for achieving and maintaining the right level of quality. Standards Provides a model for development that makes it possible for a product to work regardless of the individual manufacturer.

**Protocols:** Set of rules being agreed upon by all parties in communication; Syntax, Semantics and Timeliness / Logical sequence etc..

**Standard Organizations:** There are number of regulatory authorities which are maintaining standards across the globe. Few references are as mentioned below⁵:-

**ISO**
- International Standard Organization
- Birth : 1947 , Voluntary , Worldwide scope
- Achievement : Invented OSI model

**ANSI**
- American National Standard Institute

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• Private non-profit organization not affiliated to US govt.
• Achievement: ANSI C, ASCII and lot other

**EIA**

• Electronics Industries Association
• Manufacturers association in US
• Achievement: EIA-232 D and EIA-530 standards

**IEEE**

• Institute of Electrical and Electronics Engineers
• Research and Development in almost of all area of engineering – lot of research papers
• Largest professional group in development of standards for computing, communication etc.
• It sponsored LAN project
• Achievement: 802.X protocols

**Regulator Authorities**

• Review of technical specifications, allocate spectrum, charging control
• FCC – Federal Communication Commission [US]
• TRAI – Telephone Regulatory Authority of India
1.4 Factors affecting communication evolution

Most common factors affecting communication evolution are outlined below:

Technology: - Technologies are related to Concepts and this is Base line for Concept to Market strategies, whether any change in concept can be logically developed contributing the main factor for Telecommunications growth

Regulation: - Growth of the Operator depends upon the Country’s regulations which ensures fair competition, supporting polices and transparent decisions which positively impact both Operators and consumers

Markets: - Demand of End Users play a vital role in growing strategies of Telecom Operators which will allow them to sell the services and attain new subscribers. This can also refer to up selling for existing customers.

Standards: - Any new product or feature should meet the Telecom standards and protocols which can be interoperate with other domestic and Global Service Providers.
1.5 An Overview of Enterprise Telecom Solutions

Telecom business encompasses a complete range of telecom services for an Enterprise. These include bouquet of services in the area of telephony, networked telephony, data connectivity, video, Internet and managed services. In a short span of time since its initialization Enterprise Business has become market leader in chosen verticals. The unique architecture has enabled Indian enterprise customer to have unlimited capacity available. Network based on cutting edge technologies, backed by systems and processes designed for performance is the business need of most of the Enterprises. Most of the Telecom Operators customized the Telecom solutions according to the requirement of customer, however high level classification can be done into two units - Voice based and Data based services.
### Table 1.1 Enterprise Solutions

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<th>Enterprise Data Services</th>
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<td>Video Conferencing</td>
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#### 1.5.1 Enterprise Voice Services:

Enterprise Voice solutions include all the products and Services for customer having a Voice based facilities and usage.

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6 [http://www.rcom.co.in/Rcom/business/HTML/](http://www.rcom.co.in/Rcom/business/HTML/)
• Audio Conferencing:

This product simplifies the audio communication for number of users. Every Project owner in an enterprise can own a virtual conference bridge. The Leader or chairperson gets a permanent Conference Code and Local Dial in Number which gives him the convenience of conducting a conference for project updates, partner meetings and other such applications anytime, anywhere without any prior reservation.

• Office Centrex:

Smart Office Centrex offers high-end digital PBX (Public branch Exchange) functionalities like Direct Inward Dialing, free Intercom calling, Voice Mail and Attendant Console. Every user gets a direct number and a direct line so that he can be reached without going through the operator. This can be implemented in most of the Businesses which are operating intra city and to avoid calling charges with minimum rentals.

• E1 Direct Inward Dialing

A direct line for every user, E1 DID service gives you 30 digital channels over a 4-wire system. Each channel can be configured as incoming, outgoing or two-way, allowing highly effective management of voice traffic. Benefits include: Direct Line for every user, improved Digital quality, saving on recurring costs, lesser wires, higher uptime, Direct Line Number
Display (DLND), Enhanced service Availability and No congestion or busy signals.

- Converged Voice VPN

This solution offers a nationwide converged voice VPN (Virtual Private Network) across mobiles & landlines such that all users are able to talk to each other using a short digit or a companywide VPN numbering plan. This service is applicable for Local and National Long Distance calls. Benefits include: One Office Experience, One Bill, One Number, Free of Capex and Administration Convenience.

- Toll Free Services

A toll-free telephone number is a special telephone number that is free for the calling party, the cost of the call instead being charged by the telephone carrier to the called party. All Telecom Operator helps transform business-critical needs of Enterprises into intelligent strategic solutions to improve productivity; it can be a contact Center or an enterprise office.

- International Toll Free:

International Toll-Free Service (ITFS) allows you to reach out to your customers around the world. ITFS offers a single unique number in an international location, through which your caller can reach you in India free of charge. With ITFS, there are no barriers for doing business globally.
Mostly the Organizations are based in India, having customers / employees / business partners in other geographical locations or the Organizations want to carry voice traffic from other countries to India or the Organizations are looking for carrier class delivery of switched voice traffic with high availability and end-to-end redundancy.

- Public Call Office (Wire line)

Wide array of public telephony services are easy to install, maintain and use, and provide clear, uninterrupted and seamless connectivity. PCO not only connects the populace residing in the remotest villages, it also offers income-generation opportunities to millions of entrepreneurs.

- Hosted Contact Center Services (HCCS)

Now days, businesses constantly need services to reach out to the global customer through a faster, reliable and economical communication platform. The rise of globalization has therefore brought in a multiplicity of service delivery organizations, geographies, business practices, call center technologies and communication networks. Operators offer its customers a global contact center experience, combining on demand solutions with value added transport services and a next generation contact center suite. This approach eliminates the investment on procuring, installing, managing the contact center and network infrastructure. Hosted Contact Center Services (HCCS) are the next generation contact center suite of
services. It is built on an OPEX model, powered by high end management and analytical tools that offers modular features and differentiated value along with transport services.

1.5.2 Enterprise Data Services:

Enterprise Data solutions include all the products and Services for customer having a Data based facilities and usage.

- Business Broadband Internet

Today, any executive sitting at home can prepare a strategic plan for a company based in another country, on a server situated in a third country, that is remotely maintained by IT specialists. In a world of increasing competitiveness and globalization, organizations and individuals are increasingly finding that they cannot function without the Internet and Internet-based applications. India, at the very center of the outsourcing revolution, is also poised on the brink of a huge broadband boom. In India, Operators offer the best-in-class broadband Internet solutions, based on its robust, cutting-edge global network.

- Leased Lines

Enterprises use Leased Lines to interconnect their important nodal centers such as primary data center, back up site, call center and regional hubs.
Hence circuit uptime and scalability-on-demand becomes most important. Leased Line is the oldest and most basic data connectivity service but is still popular among Enterprises. Leased Line service suite not only provides the traditional version of leased line but also some of the more advanced flavors that are required by enterprises for different business applications.

- Ethernet Connectivity Services

Ethernet Leased Line services can be used for the interconnection of Ethernet networks between two or more Enterprise offices. WAN (Wide Area Network) bandwidth requirements are growing at rates exceeding 30% per year fuelled by bandwidth hungry real time network applications and business growth. Ethernet Leased Line services offer the ease and scalability of Ethernet LAN (Local Area Network) technology across a wide area communication network that makes them the right choice for building WANs of growing businesses. Scalability is unmatched compared to traditional access technologies.

- International Private Leased Circuit India

An IPLC (International private leased Circuit) is a dedicated, leased point-to-point digital circuit for the bulk transport of data, voice and video which can be deployed between India and Global locations. It allows
simultaneous two-way transmissions of digital signals at speeds ranging from 64 Kbps to 155 Mbps.

- Virtual Private Network

Enterprise Chief Information Officers are mandated to extend IT automation to every site and office and regardless of size and geography to increase productivity, serve customers better and reduce inventory and other costs\(^7\). The CIO’s role has become more important than before, to induct new technology and IT systems that are inevitable for achieving the business goals of reducing cost, reducing time to market new products, serving more customers and increasing productivity. It is equally important for the CIO to reach out the benefits of IT automation to every site and office of the enterprise regardless of geography and on a 24x7 basis.

- Managed security services

The global market demands universal connectivity, especially now a days when processes need to be executed at a rapid pace. Today companies use the Internet to expedite business processes by connecting with partners, suppliers, customers and mobile employees. The Internet is vulnerable to security risks & these continue to grow exponentially. Security threats have become more sophisticated and ever evolving. Single-purpose security solutions are no longer sufficient, therefore

\(^7\)www.mckinsey.com/~/-/MGI_The_social_economy_Full_report.ashx
Organizations moving towards outsourcing the secured services to Telecom Operators.

- **SSL (Secure Socket Layer) Office Connect**

Employees of an enterprise travelling abroad, working from home or working from any point outside their office can connect to their office network with SSL (Secure Socket Layer) based remote access solution, through an internet connection. The security policies can be set by the enterprise administrator and the same are applied automatically and seamlessly whenever a user tries to connect to his company Virtual Private Network.

- **Wireless Data Virtual Private Network**

Wireless Data Virtual Private Network (WDVPN) enables enterprises to connect their remote terminals and mobile workforce for accessing Enterprise Resource Planning systems, Customer relationship management systems and other applications. The Enterprise application servers can be either hosted at third party Internet Data Center or connected through a private leased line between Wireless Data Network and the enterprise servers.
- Video Conferencing

Business is no more conducted at one office and during office hours. Globalization requires all enterprises doing business internationally and domestically across geographies, to collaborate. A given job needs more skill sets than were required before and it is not possible to find all of them at one place and in one company. Collaboration is the mantra most large enterprises have adopted and they are finding it increasingly useful. The challenge is to induct the right combination of collaboration tools that can effectively help knowledge executives to exchange ideas and communicate in real time as effectively as a face-to-face meeting.

1.6 Telecom Transformation

It is a term that describes the evolution of the telecommunications industry from a capital-intensive, technology-focused model to a user-centric service-delivery model. The reasons for this transformation vary in different parts of the world, but some concerns are common to most Telecom Service Providers. Drivers for transformation include threats such as competitive pressures and the disruptive business models of players in other technologies affect the traditional business of the service providers. In order to maintain their market, the service providers are introducing new attractive services to the end-users, which require modifications to their
current infrastructure (legacy infrastructure) into what is typically termed as a Next-Generation infrastructure. The process of converting or modifying the network elements, end-user services and business-processes of the service provider to achieve the competitive advantages offered by the newer technologies is known as Transformation. The introduction of the new infrastructure, services and business-processes may or may not be accompanied by the dismantling of the existing setup. In cases where service providers are looking to reduce operating expenses in addition to creating new end-user services, elimination of the legacy network becomes a requirement.

In these transformation scenarios, Telecom Operators replace aging legacy network elements and systems in favor of more efficient technologies. These types of transformation programs may require carriers to transition subscribers and commercial services from the legacy to the new networks. The telecom transformation process is a combination of the following three sub-processes.

- Telecom Network Transformation
- End-user Service Transformation
- IT Systems Transformation

While these are the three main categories of network and systems change within the carrier environment, there are additional fundamental changes
that service providers will undertake to adapt their business and organization to a new operating model.

- Telecom Network Transformation

The Network Transformation sub-process refers to the activities adding new elements in the Core Network, Backbone network and Access network. The typical activities include the following:

- Network planning and design
- Equipment/vendor selection
- Verification of equipment through lab-demos, simulations and interoperability testing
- Devising and using network configuration data transfer mechanisms & tools
- Migration planning and implementation
- Network Deployment
- Cut-over plans along with fallback/roll-back plans

- End-user Services Transformation

This sub-process is aimed at ensuring that the services offered in the legacy network and availed by the end-users continue to be available during the transition phase and up to a planned future. This sub-process is
also concerned with introduction of new end-user services into the next-generation network\(^8\). Typical activities include:

- Identifying mechanisms to stitch legacy services to the new network.
- Designing and developing network abstraction layers for implementing new service applications.
- Developing proof-of-concept to validate new services in labs.
- Developing and executing migration services to transition subscribers from legacy to the new network.

**1.7 IT Systems Transformation**

This refers to the sub-process that is involved in aligning the Operations Support System and Business Support System infrastructure with the transformed network. The typical sets of activities that characterize this sub-process include\(^9\):-

- Streamlining Fulfillment, Assurance and Billing processes
- Rationalizing existing applications to merge, consolidate or retire systems
- Designing and implementing end-to-end solution

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\(^9\) [www.logix.co.in/core-business/Transformational_Services.html](http://www.logix.co.in/core-business/Transformational_Services.html)
1.7.1 Operational Support Systems

Operational Support Systems or OSS are computer systems used by Telecom service providers. The term OSS most frequently describes "network systems" dealing with the telecom network itself, supporting processes such as maintaining network inventory, provisioning services, configuring network components, and managing faults\textsuperscript{10}.

- Brief history of OSS architecture: - Originally OSS systems were mainframe based, stand-alone systems designed to support telephone company staff members in their daily jobs. Essentially these systems were designed to make manual processes through which telephone network was operated, more efficiently. Today’s Service Providers need to manage more complex services and network technologies in order to remain competitive\textsuperscript{11}. Hence next generation Operational Support Services are being developed. These systems make company’s information a more useful and accessible resource to manage the business, provide services, increase customer experience.

- Benefits of OSS: - OSS eases out the network management operations for the service provider and facilitates the following tasks -

  - New Service Activation with shorter time to market

\textsuperscript{10} https://answers.yahoo.com/question/index?qid...
\textsuperscript{11} www.hit.bme.hu/~jakab/edu/litr/TMN/oss.pdf
- Guaranteed service delivery by constant monitoring of Quality of Service.
- Effective Management of Service Provider’s network resources.
- Accurate accounting for service usage.
- Tracking of assets and liabilities in the service provider network.
- Helps in automated, flow-through management, spanning across multiple vendor networks and components, multiple services and technologies
- Single view of customer, services and network in Service provider environment.

- OSS Approaches: - There are two approaches to build systems to provide OSS functionality:
  - Bespoke approach: In this approach an OSS system is developed by the Service Provider in-house based on the business and functional requirements.
  - COTS based approach: COTS stand for ‘Commercial Off-The-Shelf’ and refer to a system that is designed to provide particular functionality. These systems are developed by various ISVs (Independent Software Vendors). Service providers buy and integrate these systems to provide OSS functionality.

Pros and Cons of these approaches are as mentioned below:-
Table 1.2 Software Solution Approaches

<table>
<thead>
<tr>
<th>Approach</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bespoke</td>
<td>Control over system development and enhancement.</td>
<td>Overhead to support and maintain systems</td>
</tr>
<tr>
<td></td>
<td>Can be customized as per specific Service Provider requirements</td>
<td>Increased integration efforts due to customized applications</td>
</tr>
<tr>
<td>COTS</td>
<td>Reduced overheads and maintenance since applications are developed and maintained by Independent Software Vendors.</td>
<td>Higher capital investment due to licenses. Dependability on Independent Software Vendors for System Enhancements.</td>
</tr>
<tr>
<td></td>
<td>Reduced Integration efforts due to standardization.</td>
<td>All the Service Provider’s requirements may not be supported</td>
</tr>
</tbody>
</table>

Figure 1.3 Software Solution Approaches

- OSS Components: Below is the list of Operational Support System components with brief explanation and functions of each component.

  - Workflow Engine – It is the heart of the integrated OSS architecture. It maintains the flow of information across two systems. It also manages and co-ordinates interactions between two systems\(^{12}\).

\(^{12}\) [www.academia.edu/7049510/Operations_Support_Systems_OSSs](www.academia.edu/7049510/Operations_Support_Systems_OSSs)
• Ordering – It is the system where the information for providing a service is maintained. Modern ordering system is generally a GUI which guides the customer care representative through the ordering process\textsuperscript{13}. Ordering systems employ some error checking techniques to maintain overall integrity and stop faulty orders from being raised. Once order is entered, the system generates various tasks for the service activation on the network. These tasks are then passed onto various other systems on OSS stack for further progression and the workflow engine monitors these tasks for sequence and timelines.

• Inventory – The inventory system stores the information about the facilities and the equipment available on its network.

• Service Design, Engineering and Provisioning – These systems manage and track equipment and circuits that physically provide the service. These resources are assigned to a service request at the design stage.

• Element Management, Activation and field service management – Service activation requires several steps like installing lines and equipment with the help of field technicians. Some activations can be performed automatically, these activation systems can

\textsuperscript{13} www.hit.bme.hu/~jakab/edu/litr/TMN/oss.pdf
automatically activate service on various network elements like switches, routers etc.

- Network Management – These systems are responsible for the overall monitoring of the network. They monitor traffic and collect the statistics regarding the network performance. They are responsible for spotting the problem on the network and identify its root cause. These systems communicate with the network elements like switches etc.

- Trouble Management – These systems in an integrated OSS environment when receive triggers from network elements for faults, can send commands to the appropriate systems such as field service management to dispatch technicians to the fault locations.

- OSS Key Areas: Operation Support Systems key area scattered across Order Management, Inventory Management, Trouble Ticket Management and Workforce Management as shown in Table 1.2

<table>
<thead>
<tr>
<th>Order Management</th>
<th>Inventory Management</th>
<th>Trouble Ticket Management</th>
<th>Workforce Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Fulfillment</td>
<td>Physical Inventory includes Network Inventory &amp; Service Inventory</td>
<td>Network Trouble Ticket</td>
<td>Field Engineer Workforce management</td>
</tr>
<tr>
<td>Service Assurance</td>
<td>Logical Inventory, Number Inventory</td>
<td>Customer Trouble Ticket</td>
<td>Field Engineer Workforce management</td>
</tr>
</tbody>
</table>
1.7.2 Business Support Systems:

Business Support Systems (BSS) are the components that a telephone operator or Telco uses to run its business operations towards customer. BSS and OSS platforms are linked in the need to support various end to end services. Each area has its own data and service responsibilities\(^\text{14}\).

- **BSS capabilities:**
  - Provide interface for the customers to contact the communication provider.
  - Manage customer forecasts.
  - Manage Service Provider products and its pricing.
  - Enable customers to raise their orders and faults.
  - Enable customers to keep track of their orders and faults.
  - Update customers on the progress of their orders and faults.
  - Keep track of the outstanding payments and employ debt management measures.
  - Produce various strategic reports which are required by top management to ensure smooth operation of the business.
  - Keep track of the Service Level Norms.

- **Business functional areas:** The role of Business Support Systems in a service provider is to cover four main areas including:

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\(^{14}\) [www.robvic.com/RobVic_business_support_system.html](http://www.robvic.com/RobVic_business_support_system.html)
Management, Customer Management, Revenue Management, Order Management

- Product Management

Product management supports product development, the sales and management of products, offers and bundles to businesses and mass-market customers. Product Management regularly includes offering cross-product discounts, appropriate pricing and customer loyalty programs.¹⁵

- Customer Management

Service Providers require a single view of the customer and regularly need to support complex hierarchies across customer-facing applications. Customer Management also covers requirements for partner management and 24x7 Web-based customers self-service. Customer Management can also be thought of a full-fledge Customer Relationship Management systems implemented to help customer care agents handle the customers in a better and informed manner.

- Revenue Management:

Revenue Management is a BSS focus on billing, charging and settlement, which can handle any combination of OSS services, products and offers.

¹⁵ www.tydic.com/En/ProductDetail.aspx?columnid=38&id=1083
BSS Revenue Management supports OSS order provisioning and partner settlement\(^\text{16}\).

- **Order Management:**

  Order Management as a beginning of assurance is normally associated with Operational Support Systems though Business Support Systems are often the business driver for Fulfillment Management and order provisioning.

- **OSS/BSS Integration:**

  To achieve reduction in costs through automation, and enable smooth seamless functioning, different systems within the OSS/BSS need to be integrated. Since there are many vendors and they were using different standards for developing systems, the necessity was felt to have a common approach for systems development. Some common frameworks adopted by different system vendors are the TMN (Telecommunication Management Network) Framework and the e-TOM (enhanced Telecom Operating Model) framework.

**1.8 IT Transformation Framework**

Based on the connotation of IT Transformation Framework and the condition of Indian Telecom Operator’s IT systems, we propose an IT

\(^{16}\) en.wikipedia.org/wiki/Business_support_system
Transformation framework of OSS/BSS implementation for Indian Telecommunication delivering Enterprise Solutions, which includes 5 pillars, i.e., Due Diligence, Optimized Solutions, System Development & Testing, Transition & User Adoption, Operations, Administration and Maintenance.

**Figure 1.4 IT Transformation Framework**

- **Due Diligence**: Due diligence includes below Work breakdown structure

- **Review existing documentation**: The first step to transformation is review of all existing documentation to capture readily available details pertaining to people, process and system. This is a key step giving inputs to planning on Due Diligence requirement, timelines and cost.

- **Analyze business environment**: This is a basic step which analyzes the current business environment along with operating model. High
level details pertaining to business scenario, mandatory requirements according to line of business etc. are captured.

- **Capture As-Is process**: This is one of the most key steps wherein the existing process is captured along with system architecture. The success to these steps determines the success to overall transformation and implementation of strategic stack. This step also involves capturing the process handshakes, teams involved, Activity/process ownership, roles and responsibilities and upstream/downstream processes. SIPOC (suppliers, inputs, process, outputs, and customers) and RACI (Responsible, Accountable, Consulted, and Informed) are two powerful tools used in this step to showcase the process in alignment to people and their roles.

- **Role & Activity Analysis**: This is an integral part of AS IS capturing process; however, it is very important as it forms the basis of quantification of any improvement proposal pertaining to process/system. Here the details of role, responsibilities along with timeline at activity level are captured.

- **System Mapping**: This is an integral part of As-Is capturing process; all the process steps are mapped to systems in use. The process to system mapping and the system to system mapping is also captured to highlight the interfaces between various process steps.
• **Gap Analysis:** Once the AS-IS process is captured in detail, the next step is to analyze the issues/gaps with the existing process impacting profit, CSAT (Customer Satisfaction), CT (Cycle Time) and RFT (Right First Time). A detailed analysis is done and hypothesis is proposed against all the identified failure points. A cross functional team including process/business analyst, solution designer, component designer check the feasibility of each hypothesis to come out with agreed and feasible solution. FMEA (Failure Mode and Effects Analysis), Activity Analysis, CTQ (Critical to quality), CTP (critical to process) identification, Fishbone diagrams etc. are important tools used here. Sometimes, the user stories documented as a part of requirement gathering/AS IS capture is also addressed in this phase to analyze the potential process improvement opportunities along with C-SAT, CT and RFT improvement through initial opportunity assessment.

• **Optimized Solutions:** Following activities are considered under Optimized solutions:-

  • Identification of Automation possibilities: The gap analysis results highlight all the automation possibilities. The key focus is to minimize the manual intervention to process and make the process more system driven to minimize the CT and increase RFT with high level of accuracy in system driven processes.
- **Identification of process re-engineering & improvement areas:** The gap analysis results highlight all the process reengineering possibilities. The key focus is to reduce CT and increase the RFT. Value-adding (VA), non-value-adding (NVA) analysis is a powerful tool here to identify and eliminate the redundant steps in process and address all the areas impacting customer experience.

- **Cost-Benefit Analysis:** Once the process re-engineering, improvement and automation areas are identified they are validated against the cost involved and resulting benefit that the change would bring in. The decision to go ahead/reject any change (process re-engineering, improvement and automation suggestion) would need a strong backing in terms of cost benefit analysis. The overall benefit resulting out of a change should always be beneficial when compared with the cost involved in implementing the change successfully. This step decides the transformation roadmap and finalizes on requirements that should be addressed.

- **System Development & Testing:** Following points/steps are covered under system development and Testing.

- **Design new methodologies / solutions as per the requirement:** On the basis of finalized requirements, the solution design is prepared addressing the change requirement. Initially a high level design is prepared and is followed by Cross Functional Team discussions to drill
down on the requirements and come out with a component/low level
design. The solution is validated against the requirement and is signed
off by all the stakeholders before entering the development stage.

- Development and testing: On basis of finalized solution design the
development would be done along with testing and user adoption. Any
change in requirement can be addressed till this stage only. Any
changes coming in post this stage may involve significant rework and
high impact on costing and timelines of project.

- Transition & User Adoption Testing: - Following activities are
covered under the Transition & User Adoption Testing.

- Transition Planning: This step involves the planning of migration of
services from existing to new developed stack. This step would address
all the scenarios pertaining to migration. It would address the cost,
resource requirement, timelines etc. for the migration. Apart from this,
the planning stage would also consider current business environment to
decide on the migration period to minimize adverse user impact and
facilitate user adoption with migration of services to new stack.

- Risks & Mitigation Plans: This is integral part of the planning stage
wherein all the possible risks are explored pertaining to migration and
suitable mitigation plans are initiated. This is a very important step and
ensures smooth migration of services from legacy to strategic stack.
- Activity-based Costing: This is a step which goes in parallel with entire transformation journey and decides on the costing related to various activities involved. The major input to this step is derived out of the agreed commercial model for the transformation project and according the costing is deduced.

- Data migration to live environment: This is the most important step of migration wherein the data from existing system is transferred to the new system. The success of this step accounts for the success of transformation. The user experience as well as use of enhanced capabilities / new system completely depends on the quality of data migration.

- Data reconciliation and error correction: Post migration of data to new system the quality of data is validated and any issues arising out of migration is addressed in this stage.

- User Adoption: This is the final stage of transformation wherein the users are trained to adapt to the new system/enhanced functionalities. It incorporates training plans, training, rolling out training modules, and FAQ (frequently asked questions) list and support center/helpdesk for enhanced /new capabilities.

- Operations, Administration & Maintenance: This is post go live stage to support the new system stack and to attain all agreed SLA’s (Service Level agreements) and KPI’s (Key Performance Indicators) in live
environment. Below mentioned schematic diagram reflecting the all the aspects of Operations, administration and Maintenance of the deployed components.

![Schematic Diagram](image)

**Figure 1.5 Operations, Administration and Maintenance**

### 1.9 Objectives of the Study

1. To study the requirement of Information Technology Transformation Strategy for the telecommunication companies.
2. To study the possible challenges faced by the telecommunication sector during IT Transformation.
3. To define the Base line Parameters for Transformation Strategy (OSS/BSS).
4. To Analyze the impact of Information Technology Transformation strategy on the following:-

- Operating cost of the company
- Trends in the business income
- Customer satisfaction

1.10 Need of the Study

IT Transformation will help Operator’s to stay agile and respond better to the dynamic environment and mitigate the challenges with the considerable Business Values. The structure and the nature of telecommunications industry have been changed dramatically however the Operating Models of the leading Telecom players have not changed. These changes are due to either regulations or engineered for financial reasons. In an environment of slewing growth, severe price based competition and high customer acquisition costs, wire line companies are struggling to return their cost of capital. These trends have exerted tremendous pressure on the telecommunications industry. This mounting pressure results into below listed competitive market necessities:-

- **Competitive market imperatives**

  - Cost Re structuring
• Achieve the base requirement of the competition which is Operational excellence, this further ensure cost effective service development and delivery

• Develop consistency in products and services, management approaches and GOTO market processes

• **Customer intimacy**
  • Understand the true needs of the customer and provide tailor needs of products and services to meet those requirements
  • Ensuring Speedy market responsiveness

• **Enhance Organization alignment and adaptability**
  • Create strong cross functional interfaces to deliver bundling solutions
  • Build organization flexibility to manage rapid and dynamic change

• **Operators Challenges for Enterprise Solutions:**
  • Transforming operations
  • Reengineering business processes
  • Innovating constantly
• Deploying flexible technology architecture to easily accommodate business and regulatory demands with ease

- **Business Value:** The following benefits will provide Operators with a great competitive advantage:

  • Reduced costs with increased productivity and operational efficiency
  • Higher employee productivity with resource optimization techniques
  • Faster time-to-market for new products and services
  • Decreased time to manage resources and regulate services
  • It leads to Cost Reduction in overall Telecom operations and improved system Utilization.
  • Undertaken to know through survey that how it leads to Reduced Cycle Time (CT) and Increased Right First Time (RFT)
  • An empirical study is required to know how IT transformation leads to Improved Customer Experience.

- **No Indian reference study**

  No such study is available in Indian Telecom Operators catering Enterprise segment to match theoretical benefits with the actual ones,
most of the available studies related to Telecom Operators operating in Mobility domain.

- **Available Global reference study**

Global Enterprise Telecom Operators like BT Global Services, AT&T already engaged ITES and consulting organizations to implement IT Transformation projects however Indian TSP’s considering only Transition or Outsourcing options to reduce the Operational cost at this moment.

**1.11 Research Methodology**

The present study on ‘IT Transformation Strategy - A study of Indian Telecommunications’ has been undertaken with a view to suggest a systematically design Model of IT Transformation to help Telecom Operators providing Enterprise Business Solutions to manage the Operations Support Systems and Business Support Systems more efficiently across all the process areas. **System Random Sampling** has been conducted to access the actual information and developing a framework for design, development, implementation and other related aspects of a suitable IT Transformation Framework. A pilot test of the composite questionnaire was conducted. Some ambiguities have been removed and a general discussion of the response confirmed the reasonability of the instrument for measuring IT Transformation
effectiveness.

The fixed wire line operators Reliance Communication Limited, Bharti Airtel Limited, Bharat Sanchar Nigam Limited, Mahanagar Telephone Nigam Limited, Tata Teleservices (Maharashtra) Limited are being chosen based of customer base, operating circles and Business growth.

Briefly in this study, the following steps have been taken:

- Review of the literature has been carried out in order to understand the Evolution of telecom industry, Introduction of IT in Telecom industry and Studies related to IT transformation in other industries.
- Study of different methods to find an appropriate model for analyzing the impact of IT Transformation on Telecom Operator’s performance.
- Field work done by gathering Objective specific data and distributing the questionnaire.
- Data analysis and data interpretation.

**Sampling Design**

The sampling design of the study was based on System Random sampling technique; Total Employees working for Wire line Enterprise Business were 3503 as on April 2010, in 5 Service Operators - Reliance Communication Limited, Bharti Airtel Limited, Bharat Sanchar Nigam Limited, Mahanager Telephone Nigam Limited, Tata Teleservices
(Maharashtra) Limited. We have arranged all the contacts alphabetically and every 10th FTE have been contacted for the response. We have contacted 350 FTE’s and document the response, however 323 FTE’s responses were valid and due to technical nature of the study and not appropriate response we have ignored 27 responses.

- **Data collection:**

The information needed for the purpose of collecting data is by means of primary and secondary sources. The collection of empirical data to go with the purpose of this study, it is important to understand the user’s perceptions.

- **Primary data**

Primary data is the data which is collected afresh for the first time. Such data are published by authorities who themselves are responsible for the collection. The primary data were collected on a specially structured pre-tested questionnaire from the selected Full Time Employees through personal interview method. Engagement with the respondents captured with below modes:

- Face-2-Face discussions
- Skype, Email communication
- Online Surveys and response
- Audio Conferencing with the different level groups.
• Secondary data

Secondary sources were explored first to assess past research conducted on Evolution of Telecommunication, Introduction of IT in Telecommunication, IT Transformation across the industries and in Telecom operators. The data which has already been collected by some other sources and that has been available across various modes. Mainly Secondary data has been collected from:

- Telecom Brochures and Magazines
- Articles from newspapers and journals
- Research Papers
- Annual reports and press releases
- Service Portfolios of Telecom Consulting Companies

• Data sources: Data necessary for the study has been collected from the Full Time Employees of the Telecom Operators working for Enterprise Business Solutions with 5 in scope Operators including - Reliance Communication Limited, Bharti Airtel Limited, Bharat Sanchar Nigam Limited Mahanagar Telephone Nigam Limited, Tata Teleservices (Maharashtra) Limited.

• Measurement:
The employees of various Wire line operators were asked through personal interviews to evaluate the IT Transformation strategies planned or provided by their Operators. Employees' satisfaction towards various parameters measured by capturing the level of satisfaction, working load and pain points on different aspects of End to End processes of the companies on a 5-point Likert scale. Responses to all the aspects were obtained in terms of ‘highly satisfied’, ‘satisfied’, neither satisfied nor dissatisfied’, ‘dissatisfied’ and highly dissatisfied’.

- **Statistical Framework:**

  Before going for statistical analysis, the Likert scale responses were assigned weights in respective order of 5, 4, 3, 2 and 1. To analyze the data, both simple as well as advance statistical techniques were applied. Simple techniques included frequencies, percentages, averages, etc., while the advance techniques included Cronbach alpha for questionnaire’s reliability, Chi Square Analysis, 1 way ANOVA and 2 way ANOVA tests have been used.

1.12 Limitations of the Study

During research there are various factors which made significant impacts are mentioned as below:-
It has been observed that few respondents are being inclined towards their own pain points during response. Most of the Customer facing teams complaining towards the revenue losses due to poor services and slippage in delivery commitments however Customer Delivery Units response was towards the unfair commitments to customer for Sales pitching and Fast Go to market. It has been observed that there is a biased approach in Full Time Employees accordance to their operating Units and Head of Department’s directions.

This study is Pan India based, as researcher follows the Organization structure of the operators in study, however there are few class B cities where researched cannot made it for Face-2-Face discussions due to travelling cost as this was non-sponsored research.

During this research, the third party Vendor Employees, Contractual team members and sharing services teams like Legal, Finance, Travel Desks etc. are not considered. The reason behind being not considered is that these teams are working in a Co-location manner and part of the overall Telecom Business not dedicated to Enterprise Business solution.