Chapter 2 REVIEW OF LITERATURE

During the last few years, Telecom operators have made immense investments in IT systems. The implications of these investments for performance have been widely discussed and continuously going on. This chapter explains the model, frameworks and the theoretical contexts and provides an overview to the relevant literature related to the IT Transformation and its impact on Telecom Operators. The study of the available literature in these areas provided the conceptual base both for defining and analyzing the existing systems and in the design of the proposed framework.

The structure and the nature of telecommunications industry have been changed aggressively however the Be Spoke Systems & Processes are still in use. For Business Growth of Telecom Operators, Change in Technology and products are continuous, therefore IT Transformation Strategy is essential for Telecom Operators. It has also been established beyond doubt that in today’s complexities of business and management, no Operator can afford to survive and grow without an effective IT Transformation Strategy. IT Transformation helps in improvements across Verticals and process areas of an Operator i.e initiating with Concepts to Marketing, Identifying opportunities to Provisioning and Billing and finally acceptance of Troubles to satisfied solutions. Operators now a days are focusing on Cost Re structuring to achieve the base requirement of the
competition which is Operational excellence, this further ensure cost
effective service development and delivery and to develop consistency in
products and services, management approaches and GOTO market
processes. Few operators working towards more on Customer intimacy to
Understand the true needs of the customer and provide tailor needs of
products and services to meet those requirements and ensuring Speedy
market responsiveness. Moreover all the operators are working towards
Delivery enablement and Operational excellence to enhance organization
alignment and adaptability.

The study of the available literature in these areas provided the conceptual
base both for defining and analyzing the existing system and in the design
of the proposed models of IT Transformation. Outcome of some of the
important studies have been discussed below:

2.1 Studies related to Evolution of Telecom Industry

Economides Nicholas, Himmelberg (1994) described about network
externalities. In markets, this fact can give rise to the existence of a critical
mass point, that is, a minimum network size that can be sustained in
equilibrium, given the cost and market structure of the industry. It
describes the conditions under which a critical mass point exists for a
network good. They also characterize the existence of critical mass points
under various market structures. Surprisingly, neither existence nor the size of the minimum feasible network depends on market structure. Thus, even though a monopolist enjoys an additional degree of freedom through its influence over expectations, and even though monopolistic and oligopolistic markets will in general provide a smaller sized network than perfect competition, the critical mass point is nonetheless the same. They extend these results by making the model dynamic and by generalizing it to allow durable goods. Introducing network externalities to a dynamic model of market growth increases the speed at which market demand grows in the presence of a downward time trend for industry marginal cost. They use this prediction to calibrate the model and obtain estimates of the parameter measuring a consumer’s valuation of the installed base (i.e., the network effect) using aggregate time series data on prices and quantities in the US fax market.

**Fransman (2001)** has focused on two questions: How has the Telecoms Industry changed since the mid-1980s, when liberalization began in Japan, the UK, and the US, and what are the causes of this change? How has the Internet affected the Telecoms Industry? In analyzing the causes of change, particular emphasis was placed on the changing technological and learning regimes that refer essentially to the processes of knowledge

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17Economides, Nicholas and Himmelberg, Charles; (1994); “Critical Mass and Network Evolution in Telecommunications”; Available at: http://www.stern.nyu.edu/networks/tprc.pdf
creation and use in the industry. Furthermore, through the analysis of the Internet, it was seen how a paradigmatic transformation of the industry was brought about by a set of ideas, and associated technologies and services that originally emerged from outside the Telecoms Industry, ideas that at first were strongly rejected by the industry’s technological representatives. The importance of interpretive ambiguity, and the role that it has played at key turning points in the evolution of the Telecoms Industry, suggests that it might be necessary for us as economists to review the way in which we understand the decision-making processes that are, together with selection environments, the ultimate drivers of evolutionary economic processes\textsuperscript{18}.

**McGill, Suzanne (2013)** explained with the help of a schematic representation beginning from the Early Era (1792) to the Internet protocol Technology (2005). The telecommunication industry has come a long way in its 200 years. Today, we’re experiencing the move from traditional phone networks to internet protocol (IP) phones. The new IP-based trend has made the traditional regulatory approach outdated. Over one third of all small to medium sized enterprises (SMEs) are now using VoIP technology. The new IP based trend has made the traditional regulatory approach outdated. With the passage of time and technology, Plain old telephony

\textsuperscript{18} FRANSMAN, Martin,(2001), “Evolution of the Telecommunications Industry into the Internet Age,” Communications and strategies-no.43, 3\textsuperscript{rd} quarter, P.no.57-113. Available at: http://www.idate.org/fic/revue_telech/459/C&S43_FRANSMAN.pdf
has been completely outdated and over a third of all small to medium-sized enterprises are using VoIP technology today. IP based companies are trend setters in the industry while changing the way businesses are using their phone system. During 1800 there was an Early Era (1782) included smoke signal, then Telegraph system (1844) followed by Early Alliances (1856), Telegraph goes international (1866), Telephone is Born (1876) and Automated Telephone (1891) evolved. During 1900 there are 20th century developments, by 1914 there are over 3 million phones in US, and followed by a Transatlantic Voice communications (1956) was established using Radio in 1927. Satellite came into play during 1957 followed by mobile phones in 1973 and digital technology in 1980 and finally World Wide Web came into show during 1995 which connects more than half of American households to Internet by 2000s. Internet protocol Technology incepted in 2005 which is a service based on Voice over Internet protocol communication. A descriptive technology that has rapidly gained ground on traditional telephone network technologies since early to mid-2000s. IP technology uses a broadband connection to transmit conversations as data packets replacing the traditional POTS system.

**Ojiako, Udechukwu (2008)** focused on how successful organizations are using information systems and technology (IS/IT) to transform business
operations. This paper aims to summarize and evaluate the key perspectives and concepts of change management. These perspectives and concepts are used to conduct an overview of the transformation of a major UK telecommunications company is using IS as a driver. This focused on trying to understand the whole range of systems-related problems that may confront an organization during the introduction of new operational systems as part of organizational change and transformation. The primary objective is to identify best practice. This case study focusing on large organization to understand the approach used to try and elicit learning

Olawalelge (1985) described that from nearly twenty years ago; the International Telecommunication Union adopted a resolution that led to the establishment of the renowned Independence Commission for worldwide Telecommunication development. The principal objective was to curtail and bridge the continuously widening gap in telecommunication development between the industrialized and no industrialized nations of the world. The result was the “Missing Link” report submitted in January 1985. The target set in the “Missing Link” was that by the early part of the 21st century “virtually the whole of [human kind should be brought] within easy reach of a telephone and of all the benefits this can bring”. Today we

talk of the “digital divide” and are still overloaded with the same problems that affected us during the analogue era, which eventually led to the Lord Maitland’s Commission. The world has witnessed great changes in the telecommunication environment, which now tend to culminate in the realization of a Global Information Society.

**Pearson Education Corporation (1998)** published a study on “Telecommunications Evolution and Future”, which presented the difference between telephony and telecommunications, Introduced the concept of balanced tele-computing, and described in summary fashion how telecommunications evolved into what it is today as well as projected where it is heading in the future. Telecommunications is the convergence of voice, data (WAN), LAN, video, image, and wireless communications technologies with PC and microelectronic technologies to facilitate communications between people or to deliver entertainment, information, and other services to people. Balanced tele-computing focus on matching system-communications tools to job functions. The implication is that we balance what a PC or hand-held device does with what the supporting network and servers do. Finally, the future of constant and instant unobtrusive communications was described. This is a future moving

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toward one device, one network, one provider, and one application\textsuperscript{22}.

\textbf{Penning's, et.al (2005),} illustrated that the telecommunications industry has been through some major developments in its lifetime. It started out with a mixture of privately owned and state-owned companies throughout the world. In the first half of the 20th century, the telecommunications industry turned into a relative stable industry, which was completely government-owned. During the last decades, due to the liberalization and the privatization wave in the world, the telecommunications industry has rapidly changed. In the 1990s, the New Economy emerged and created new market opportunities for telecommunications firms. The succeeding phase was one of more open competition. However, liberalization and privatization not only turned around the outlook of the telecommunications market but also the speed and extent of technological developments. Due to innovations, the telecommunications industry, together with other industries, is rapidly transforming into a new industry, the so-called multimedia-information industry. Deregulation, globalization, the emergence of the New Economy and introduction of new technologies such as mobile phones and broadband have forced the telecommunications companies to reconsider their strategy, their technological base and their product portfolio. In that context, companies

\footnotesize{\textsuperscript{22} Pearson Education “Study on Telecommunications Evolution and Future”; Available at: http://www.pearsonhighered.com/assets/hip/us/hip_us_pearsonhighered/samplechapter/0130281360.pdf}
have tried to develop and gain access to desired capabilities and resources and expanded across national boundaries to sustain their competitive advantages. This study also presented a general overview of major trends in inter-firm partnerships and M&A’s in the telecommunications industry since 1985, examining both the general developments and the distribution according to internationalization and industries. In relative terms, the growth of alliances with partners outside the telecommunications industry superseded the increase in the number of alliances within the industry. 

### 2.2 Studies related to IT transformation in other industries

**Allen, Hawkins & Sat (2001)** highlighted that Telecommunication services and IT systems both removes geographical restraints and allows continuous multilateral interaction. It allows much higher volumes of trades to be handled and in a customized way that until recently would have been technically impossible or prohibitively expensive. This paper also discussed the effects of electronic trading on market architecture. On the one hand, it can stimulate a proliferation of venues by making markets more contestable as a result of them being cheaper to enter and enabling greater variety of products and specialization of trading services. But on the other, it can enable sources of liquidity and to harness efficiencies that

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23 Penning, Jacqueline, Van Kraneunburg, Hans and Hagedoorn, John;”(2005); Past, Present and Future of the Telecommunications Industry”; Available at: http://arno.unimaas.nl/show.cgi?fid=3204
contribute to consolidation. This suggested that volatility remains same and liquidity is more mobile in electronic financial market\textsuperscript{24}.

**BIS CGFS (2001)** examined developments in IT systems and their implications on the Japanese government securities and foreign exchange markets. As the electronic trading has the potential to enhance operational efficiency and price discovery functions, such issues as enhancing market liquidity, automating operation processes and ensuring the contestability of electronic trading services need to be addressed to obtain the full benefits. This study identified several characteristics of financial transactions that were more adaptable to electronic trading including the ease of standardization, high market liquidity, relatively weak concerns over the creditworthiness of counterparties and small market impact. This concluded that electronic trading systems should be regarded as indispensable building blocks of the infrastructure of financial markets, as trading volume is projected to increase into the future\textsuperscript{25}.

**Brown, Thomson & Walsh (1998)** examined certain characteristics of the order flow through an electronic open limit order book, using order data. The important issue in this study was the information content of the order

\textsuperscript{24}Allen, Helen; Hawkins, John and Sato, Setsuya; (2001); “Electronic trading and its implications for financial systems”; Available at: www.bis.org/publ/bispap07.pdf

\textsuperscript{25}BIS CGFS; (2001); “Increasing use of Electronic Trading Systems and Its Implications on Japanese Financial Markets”; Market Review; July; weblink: www.boj.or
flow when the market structure is an Electronic Open Limit Order Book (EOLOB). The characteristics of the information content of the order flow on the Australian Stock Exchange were evaluated by extending innovative model of Easley, Keifer and O'Hora (EKO 1997 a and b). The study asserted that informed traders choose smaller orders than uninformed traders appear largely indifferent between placing a small or large order but both type of traders did not materially differ in their choice of limit or market orders. Intra-day periods reflected a desire for immediacy in the preference for a market order over a limit order. The proportion of informed investors was similar between good and bad news days.

D’Agostino (2008) studied that many corporate IT departments realized the need to revisit how they deliver services to the rest of the enterprise. In many cases, such undertakings can transform the departments. To understand the nature of this transformation better, the Economist Intelligence Unit conducted an independent survey in January 2008, sponsored by Cisco, that asked corporate IT professionals worldwide of varying seniority, company size and industry to explain their views on how IT transformation:-

- Initiatives meant to significantly improve the way corporate IT departments operate

\[26\] Philip; Thomson, Nathanial and Walsh, David,(1998); “Characteristics of the Order Flow through an Electronic Open limit Order Book”; Second Draft; March; University of Western Australia, available at [www.af.acel.uwa.edu.ca](http://www.af.acel.uwa.edu.ca).
● Support their businesses
● Can best improve their company?

IT operating models—the method by which IT departments are organized and managed—play a key role in the IT department’s ability to serve the overall business27.

**Fung, Lien, Tse, and Tse, YiuKuen (2003)** investigated the effects of the migration from open outcry trading to IT transformed trading on the Hang Seng index futures market. For this change in the spread, volumes and open interest in the futures contract were analyzed. This stated that the bid-ask spreads of the futures contract decreased and the contribution of the future price in information transmission increased. Further, the asymmetry in volatility spillover reduced. This suggested that the anonymity in trading and the higher speed of order execution in the electronic trading system attract informed traders and increased the information. So automation has brought so many benefits28.

**Gwilym, Mc Manus & Thomas (2003)** analyzed the impact of transition from open outcry to IT transformed trading in UK Long Gilt futures market regarding price clustering and bid-ask spread behavior. Standardized

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28Fung, Joseph; Lien, Donald; Tse, Yiuman and Tse, YiuKuen; (2003); “Effects of Electronic Trading on the Hang Seng Index Futures Market”; August; available at www.aber.ac.uk
ranges between observed and expected proportions occurring at each final digit of price were employed as a metric for the level of price clustering. Effective spread, quoted spread, mean trade size was tested for analyzing the market behavior. Their study makes a unique contribution in comparing micro structural characteristics of three trading systems. Price clustering was not materially affected by the transition to electronic trading; there was a greatly increased concentration of large trades at more popular prices. There was substantial reduction in mean trade size. The mean daily number of transactions and quotations increased substantially, which was entirely consistent with static volumes and decreased mean trade size. Bid-ask spreads widened significantly after automation, which was largely accounted for by the findings that the spreads under electronic systems demonstrate an increased sensitivity to price volatility. They were of the view that volatility increases after automation.

Lee, Sin and Hong (1997) emphasized about the survey conducted regarding impact of IT driven broking on their foreign exchange trading activities as well as experience with key market attributes such as liquidity, price transparency, technical reliability & market volatility. Responses of 83 Banks of Singapore were examined and descriptive statistical methods

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29Gwilym, Owainap; McManus, Ian and Thomas, Stephen; (2003); “Floor versus electronic trading of government bond futures”; weblink:www.aber.ac.uk
were used. This resulted that proportion of spot volume traded through direct dealing for all banks declined. This had little effect on trading volume. Bid-Ask spread had narrowed, volatility declined, prices had become more transparent. It became easy to execute large orders at the best or close to the best price in the market. This leads to reduction in brokerage commission. This concluded that big banks felt volume of inter-bank market making activity had declined but medium and small banks felt volume had increased.

**Segev Arie & Wang Richard (2001)** carried a research with the objective to discuss data quality challenges in the context of e Business Transformation. It presents the major differences between traditional and e Business as they relate to business models, organizations, processes and technologies, and then outline the differences with respect to data quality approaches. The scenarios described pose significant data quality (and other) challenges, and the paper discusses work in progress to construct a data quality strategy and implementation methodology. Taxonomy of the scenarios and understanding the various data quality pitfalls are part of a data quality strategy designed to effectively deal with multiple points of data quality enhancement.

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30Lee, Andrew T.K; Sin, Low Buen and Hong, Walt Wing; (1997); “Impact of Computers on Financial Markets: The Case of Electronic Foreign Exchange Broking in Singapore”; Working paper No. 97-05; May; weblink: www.ntu.edu.sg/nbs

31ArieSegev& Richard Wang ;Data Quality Challenges in Enabling e Business Transformation; Available at: http://web.mit.edu/tdqm/www/tdqmpub/DQChallengeNov01.pdf
Sioud & Hmaied (2003) examined the effects of automation on the liquidity, volatility, returns and efficiency of shares traded on the Tunisian stock exchange. The exchange completely computerized its trading system in 1996 from order entry to order execution, and eliminated the traditional floor on which brokers exchange securities. The trading mechanism adopted is the SUPERCAC UNIX developed by EURONEXT. Event study methodology and other statistical tools were used. This resulted in increased liquidity. This analyzed that higher trading volume provided support for electronic trading because the fixed cost of the system can be spread over a larger volume. This also showed that there was no reduction in volatility and it did not improve market efficiency.\(^{32}\)

William (2009) Highlighted on the business challenges faced by HP in the IT transformation area due to various changing events like mergers & acquisitions, updated value chain, new products, new services, cost reduction initiatives, new government regulations, emerging competitors etc. The various IT transformation strategies like network transformation, data Center transformation were also taken into account as part of IT business transformation.\(^{33}\)

\(^{32}\)Sioud, OlfaBenouda and Hmaied, DorraMezzez; (2003); “The effects of automation on liquidity, volatility, stock returns and efficiency: evidence from the Tunisian stock market”; Review of Middle East Economics and Finance; August; Vol. 1, No.2, pp. 141-154.

\(^{33}\)Dupley, William; HP Global Information Technology Strategist; “IT Transformation Strategies for Global Virtualized Shared services”; Available at: http://www.verney.ca/e2009/presentations/814.pdf
2.3 Studies related to IT transformation in Telecom Industry

Accenture Consulting (2010) guided the client on a transformational journey that is improving IT availability to customers while controlling maintenance costs and improving service. More effective and efficient IT maintenance processes achieved savings of roughly €6 million in 2010, with more savings to come. The unique approach of connecting Lean Six Sigma interventions and behavioral change to drive business results has proven to be very powerful. Concurrent with cost control, IT has earned progressively higher marks in quality, as demonstrated by improved metrics for service-level agreements. Within six months (some examples):

- The PSTN – ISDN department increased the one-time delivery of enhancement from 27 percent to 91 percent. They also managed to decrease the monthly inflow of new incidents by 30 percent.

- Wholesale broadband access noted an increased percentage of clean orders, and the level of incidents resolved rose from 67 percent to 92 percent.

- The number of open problems decreased in multiple virtual private network chains, and by 47 percent in assurance.
• Improved processes helped customer relationship management achieve a sharp decline in time to search for sales prospects, from 18.6 seconds to 3.0 seconds.

• Performance coaching helped the mobile product chain increase the number of incidents resolved by 14 percent.

• The cluster contact decreased the number of monthly prior 2 and 3 incidents by 50 percent. They even managed to decrease the number of high cost prio 1 incidents by 45 percent.

• The financial department decreased the delay in the month closure process from 4 days to 0.5 days34.

Accenture Consulting (2012) published a result of survey on “How Communications Service Providers Can Transform Telecom Billing Operations to Support a New Convergent, Digital Business” this is to explore the changing communications marketplace and the role of billing within communications service provider (CSP) business support system (BSS) operations, Accenture interviewed 50 CSP executives from the communications and media industries in Western and Eastern Europe, Latin America, and the Middle East and Africa. The survey covered various aspects of these executives’ priorities, challenges and vision

related to billing in their organizations. The insights gained from those interviews have helped Accenture formulate its perspective on what telecom billing means, now and in the months ahead. Participating companies were large (80 percent had revenues of more than $1 billion) and predominantly based in Europe (70 percent). Executives interviewed were nearly evenly split between representatives of business functions (52 percent) and IT (48 percent). As they seek to develop new business models, products, and services to respond to changes in technologies, customer demand and behavior, and competition, CSPs typically find their current billing capabilities are not up to the challenge. Executives in the Accenture survey reported that numerous and significant shortcomings in their companies’ billing operations are preventing them from more effectively accomplishing their business goals and satisfying customers’ needs.

Alcatel Lucent (2009) described in its white paper regarding The New Economics of Telecom Networks, which studies the network economics to ensure the derivation of the greatest value from their networks when connectivity no longer has the intrinsic value. Hence to satisfy the ever-growing demand for high-bandwidth content and enhanced services, service providers today must evolve not only their networks but also their

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business models. It discusses how cost reduction and business growth objectives have to be balanced carefully lest the achievement of one can defeat the other. This paper discusses non-linear cost reductions, migration strategies which maintain the integrity of system and data and leveraging the innovation to improve network efficiency, aligns processes, reduce complexity and accelerate times to market for new services.\footnote{Alcatel Lucent,(2009); “The New Economics of Telecom Networks: Bringing value back to the Network”; Available at: http://images.tmcnet.com/online-communities/ucp/pdfs/application-enablement/whitepapers/The-New-Economics-of-Telecom-Networks.pdf}

\textbf{Antonius et.al. (2012)} analyzed fixed wireless telecom service provider in Indonesia. KPMG reviewed the current state operations to identify improvement opportunities and new enhanced business processes based on the eTOM business process framework. The eight distinct business areas were aligned like Product Development, Sales and Distribution, Customer Management, Billing and Interconnect, Revenue Assurance, Supply Chain Management, Network Operation and Maintenance, Business Continuity Management/Disaster Recovery. Each business area has been reviewed, KPMG provided a process gap analysis and practical “To-Be” recommendations, including Information Flow Input-Output, Recommended Organization Chart, Service Level Agreement, KPI’s and Application Integration.

Benefits to Client
• Current State Report of our review of core processes from the aspect of People, Process, and Technology;

• Gaps and prioritized focus areas based on the current state findings.

• A clear business process framework and comprehensive approach to identify business process improvements

• Implementation roadmap where key initiatives were identified that led to savings of 21 Million USD\textsuperscript{37}.

\textbf{Baker (2005)} studied that the telecommunications industry had tried to integrate and consolidate its infrastructure. It invested in several integration programs and generations of middleware solutions. However, the results have been mixed. Service providers have succeeded with e-commerce initiatives using their OSS/BSS by enabling better sales, customer care and self-service applications. But integration has largely failed with regard to reengineering outdated processes, reusing IT components and migrating legacy systems to fewer and more nimble platforms. Considering that AT&T had hundreds of redundant, product-based legacy systems, some whose code hadn’t been touched in 15 years, it was going to be difficult. But AT&T realized that even if it could pare its OSS/BSS systems down to a few dozen, it would earn a huge

\textsuperscript{37} Antonius et.al. (2012); “Telecommunication Business Transformation”; Available at: http://www.kpmg.com/ID/en/IssuesAndInsights/.../eTOM%20Brochure.pdf
payback. Once the target architecture was defined, centralized control of
development budgets across AT&T was used to reform or weed out
obsolete systems. So wherever AT&T had large staffs operating old, semi-
automated OSS/BSSs that didn’t conform to the target architecture, it
threatened to cut the budget for future development of those systems. As
a migration path, AT&T created several target architecture-compliant
BSS/OSSs that would support families of related telecom products. One
such BSS is AT&T’s Universal Billing Platform (UBP), the target
architecture for all AT&T billing systems. The plan is for the UBP to
eventually provide an audit trail of every billing event at AT&T.
Furthermore, every new product that AT&T launches will go through the
universal biller38.

Breedveld et.al.(2005) experienced and researched studies of more than
200 transformation efforts in telecommunications and a broad range of
other industries—revealed that a few common elements determine the
outcome of almost all change projects. According to them, Success or
failure comes down to a combination of the following: The duration of the
project or the time between major review milestones:-

- The performance integrity of the project team.
- The organizational commitment to change, specifically that of senior
  managers and Local-area staff.

38 Baker, Dan; “Case Study: AT&T’s Migration to Service-Oriented Architecture”; Available at:
http://www.billingworld.com/articles/feature/Case-Study-ATTs-Migration-to.html
• The additional organizational effort required for implementation beyond usual work requirements.

When taken together and considered properly, these four elements offer a litmus test for assessing the probability of success of any given transformation project or set of projects. What is more, they can help shine a spotlight on some very specific actions that can improve the probability of success before implementation even begins. Using these elements, managers of telecom operators embarking on change programs can in effect load the dice, stacking the odds in favor of success\(^{39}\).

**Diop et.al (2011)** described that Operator across the world are increasingly realizing the imperative of transforming their IT systems. Driven by the need to focus on new products and services, while countering increased competition from Internet players, operators are looking to ensure their IT systems are in sync with the need of the hour. Key factors driving this change include a renewed push from Telco’s to cut down on their time-to-market while cutting down on their costs. Telco’s will have to bear in mind that a successful IT transformation is the result of the coming together of a variety of elements from the business and IT side of operations. In doing so, the first step is to identify and understand the building blocks of a business transformation. Thereon, a strong

\(^{39}\) Breedveld et.al., (2005); “Opportunities for Action”; Available at: http://www.bcg.com/documents/file14474.pdf
understanding of the key success factors of a transformation program completes the early steps towards creating a large-scale successful IT transformation\textsuperscript{40}.

**Ernst & Young (2013)** indicates that Telecommunications operators are facing a rapidly transforming business model. Competition from technology companies is creating fierce challenges over the ownership of customers and service innovation, and pricing pressures and network capacity are intensifying scrutiny on return on investment. Additionally, regulatory pressures and shareholder expectations require agility and cost efficiency.

E\&Y Global Telecommunications Center is a virtual hub that brings together people, cultures and leading ideas from across the world, to help you address your global, regional and local challenges. These may include next generation services and product profitability, customer lifecycles and revenue assurance, working capital management, risk, regulatory strategies and compliance, potential cost reductions, mergers and acquisitions, financial and operational improvements, accounting and tax strategies\textsuperscript{41}.

**Jia, Chen (2013)** emphasized few areas to be very well considered like

\textsuperscript{40}Diop et.al.(2011); “IT Renewal: A Business Transformation” Cap Gemini’s telecom, media & entertainment journal, Issue 61; available at: http://www.nl.capgemini-consulting.com/resource-file-access/.../Insights_0.pdf

\textsuperscript{41} Ernt & Young,(2013); “EY_Metrics_transformation_in_telecommunications” available at: http://www.ey.com/Publication/vwLUAssets/EY_Metrics_transformation_in_telecommunications/$FILE/EY_Metrics_transformation_in_telecommunications.pdf
Extreme agility, Value through Big data and an open, cooperative ecosystem. Further he explained Telco’s must be able to launch services at a speed near or equal to that for light operators. Currently, Internet companies measure time to market (TTM) in hours, while some Telco’s still live in a world of months or even years. To bridge the gap, Telco’s must make their services and processes automated and agile. In the digital economy, big data is productivity. Operators own user information and traffic data collected from their pipes, which are the basic production materials for location-based services (LBS), precision marketing, and other services based on data analysis. However, processing big data into smaller bits of wisdom and leveraging them for value creation remains largely theoretical. Operators are transforming themselves from monopolists of Telco services to participants in an open ecosystem, a transformation accompanied by remarkable changes to their business model. However, the transformation to digital operation cannot be accomplished overnight. Operators need to thoroughly understand the essence of digital operation, as Traditional BSS is inadequate in the face of today’s Telco business challenges. Huawei advocates a strategy of transformation towards the business enablement suite (BES), which should keep operators out of the dumb pipe trap as they embrace what Huawei calls digital operations and effective enablement$^{42}$.

$^{42}$Jia,Chen,(2013); “Smart transformation, efficient enablement” available at: http://www.huawei.com/en/static/HW-
Leping Wei (2005) describes the historic change of the macro development environment of telecommunication industry and pointed out the heavy task of technology transformation telecom industry will face to and necessity evolving towards to next generation network (NGN). It analyzed basic concept and characteristics of NGN and also investigated evolution towards to next generation switching network based on soft switch and IMS, evolution towards to next generation mobile network represented by 3G and beyond 3G, evolution towards to next generation Internet based on IPv6, evolution towards to seamless broadband access based on multiple technologies and evolution towards to next generation transport networks based on optical networking. Finally it pointed out that the convergence at different senses will play a center role for next generation networks and services development and will become major objective for long term. However, transformation is not an easy job and people must well prepare to face to many challenges never encounter before43.

Matta, Excell & Ramji (2007) Highlighted the priorities for transforming BT into a 21st century business by Providing services to customers when they want them, Serving the customers wherever they are with BT’s global capabilities and local expertise, Unleashing innovation of the customers,
partners and 3rd party developers. Also mentioned the various Transformation Objectives of British Telecom (All Lines of Business) being identified towards the improvement of Right First Time and Cycle Time; aiming to Simplify and speed up the way BT works44.

**Mckinsey (2014)** analyzed the future role of Telco’s in Information Communication Technology markets more focused towards Transformational ICT outsourcing for large enterprises which includes Network-intensive outsourcing, Provisioning of standard platforms in an on demand mode, Emphasis on End to End incident management and Service Level agreements, Integration of Private and Public clouds with emphasis on security and disaster recovery, End User managed complexities and Leveraging the strong SMB footprint in Voice and Data to expand into application for up/cross selling, last but not the least Partnering with software players for complementary skills45.

**Mogg et al (2012)** focused upon the digital transformation to cater Smartphone usability and suggest solutions for Telecom Service Providers including Cost-efficient broadband network build-up - When relationships with end customers are eroded, cost efficiency and bandwidth become critical if a company is to remain competitive. Only those Telco’s that have

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44Matta, Dina; Excell, Paul; Ranji, Al-Noor; “BT Transformation: The first 100 days”; Available at: www.btplc.com/Thegroup/.../October2007/AnalystRoundtable.ppt
suitably dimensioned infrastructures will be able to defend their market position in the long run, or at least to engage in successful cooperation with larger players. Realignment and radical streamlining of operating models - The different infrastructure strategies will leave the Telco market – and Telco companies – more fragmented than ever. For strategic and financial reasons, Telco’s must therefore undertake wide-reaching realignment and resizing of their operating models. If they want to offer cost-efficient broadband access, market players need an efficient network company (a "NetCo") and a flexible, customer-centric sales and service company ("SalesCo"). In addition, corporate services ("HQ") must oversee the interaction between the various units in order to set the right priorities for strategy, innovation, partnerships and talents. A separate OTT service group should be attached to HQ and be tasked with committing to selective cooperative ventures and investing in the lucrative but risky OTT game. This separation is necessary if due provision is to be made for different markets, response times and investment cycles that differentiate core Telco access businesses from new OTT businesses. Financial resources to drive digital transformation and intelligent consolidation if undertaken properly, digital transformation and intelligent consolidation are evidently worth the trouble. They can enable European regional groups to eliminate the typical 15% conglomerate discount. But it doesn't end there. Boldly pruning their portfolios would also enable them to free up further
cash, also by aggregating ShopCos and CallCenterCos at the European level and selling them\textsuperscript{46}.

Niebuhr et.al (2010) discussed that the Telecom operators around the world are in a race to offer customers a multiplicity of converging products and services, to be paid for by equally complex and various pricing plans. The result: greater and greater pressure on often outmoded billing systems to account for and collect payment for all these differentiated plans. Telecom executives are becoming painfully aware of the need to make sure their billing systems can keep up with the fast pace of product and pricing change. Unfortunately, finding the right billing transformation strategy hasn’t gotten any easier. Executives must balance hard-core business requirements, technology realities, and economic benefits, and distinguish careful analysis from market hype. The options: Design an evolutionary road map that is tailored to deliver business stability and capability improvements at the right speed and cost, step-by-step. Or make a well-grounded, deliberate decision to engage in a complete billing revolution. Either path will be daunting, but no operator can afford to put the decision off and allow competitors to reap the benefits of better revenue capture, faster time-to-market, and more satisfied subscribers\textsuperscript{47}.

\textsuperscript{46}Mogg et.al.(2012) “Telco 2020 – How Telcos transform for the Smartphone Society”; Available at: http://www.rolandberger.com › Media › All publications

Palmberg, Christopher (2002) concluded the aim of contribution of Nokia to the recent rapid growth of the Finnish telecom industry. A conventional explanation of Nokia's success, and the growth of the telecom industry, relies on aggregate studies in the Porterian framework that misses the dynamics of the underlying interactions between technologies, institutions, and organizations. The key proposition advanced is that the role of the public telecom operator (PTO), as a competent technology procurer, has played a hitherto neglected, key role in this success and growth prior to the mid-1980s, after which Nokia achieved its international breakthrough. This proposition is advanced through the application of the Schumpeterian–Dahménian tradition of technological systems and ‘competence blocs’ to case studies in the development of Nokia's switching platform technology and equipment for the NMT-standard, the crucial competence areas underlying Nokia's success48.

Severino et.al (2011) identified the need for business transformation in the face of challenges and opportunities faced by telecom operators. With telecommunications increasingly becoming a commodity business, maintaining customer loyalty and delivering growth in the face of fierce price competition and new market entrants requires a new way of operating. Secondly, the paper identifies what an e-business

48Palmberg, Christopher (2002); “Technological systems and competent procurers—the transformation of Nokia and the Finnish telecom industry revisited?” Available at http://www.sciencedirect.com/science
transformation entails i.e developing online capabilities—similar to those of the best online retailers—across their entire business operations, from back-room processes and logistics to customer service and sales. Conclusively it identifies the challenges of e-business transformation as well as the fact that if it is done well, the payoff is substantial in terms of cost savings and growth potential; more important, it gives telecom operators a chance to reset their business model⁴⁹.

Srinivasan & Gnanapriya (2009) indicated that the Telecom Industry continued to evolve through disruptive products, uncertain markets, shorter product lifecycles and convergence of technologies (ICT). The market had moved from network centric to consumer centric and focuses primarily on the customer experience. It resulted in several product management challenges such as an increased complexity and volume offerings, creating product variants, accelerating time-to-market, ability to provide multiple product views for varied stakeholders, leveraging OSS intelligence to BSS layers, product co-creation and increasing audit and security concerns for service providers⁵⁰.

Talreja et.al (2007) described that how unified communication works


towards reducing Total Cost of Ownership for the organization as well as transforms the business. It iterates that position and process for reduction of TCO depends on the specifics of company which include communications-intensiveness of the organization, level of geographical dispersion, type of employees among many more. Apart from reduction in TCO, the authors discussed other benefits of integrated infrastructure like increased productivity time efficiencies and improved customer service. Lastly, this paper addresses the fact that business transformation is not limited to any single organization but stands to provide same benefits indifferent sectors be it – retail, financial r telecommunications\textsuperscript{51}.

Tan Yanming, ZENG Jianqiu (2009) studied Value Chain of Telecom VAS under Transformation Background, which has driven by technology and market, telecom industry is becoming a part of several converged industries in information society gradually from an independent industry which provides telecom products like voice or data. Under such background, it introduces a new value chain model of telecom value-added ser-vices in the new environment, providing theoretic support for transformation of telecom operators\textsuperscript{52}.


\textsuperscript{52}TAN, Yanming and ZENG, Jianqiu (2009);“Study on Value Chain of Telecom VAS under Transformation Background” Available at http://www.scirp.org/Journal/PaperInformation.aspx?paperID=915
**TCS (2009)** addresses the broad theme of how to improve business and IT alignment. In order to achieve any sort of progress in IT transformation, it’s mandatory to have a road map of where you are and where you are going to be. The key challenges faced by the organizations are Complexity in the systems, strategic hypothesis and Initiatives to carry out the strategy. This process starts with the Reduce cost of running IT services, Chargeback IT cost to make IT self-funding, Manage Change amongst people and processes, Divert spending to strategic IT investment. Lastly IT transformation is a discipline in its own right in which skills, abilities and knowledge must be consciously and purposefully pursued\(^53\).

**Telecoms.com Intelligence (2013)** conducted a survey regarding the “BSS Transformation Requirements for a 4G World” for some of the world’s top service providers to better understand this timely topic. What are the top reasons for BSS transformation, and what are the top challenges service providers are facing before going forward? What systems are most ‘at risk’ and what is the best strategy for change? Most service providers face the same challenge when it comes to their BSS environments. They have a patchwork of multiple vendor solutions, implemented over many years, which lack full and effective integration and were not designed to keep pace with today’s new technologies, services

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and industry standards. As a result they often struggle to provide the consistent level of service and support that next generation data services and new offerings require – delaying or even eliminating opportunities to gain a competitive edge in the market\textsuperscript{54}.

\textbf{Wavelet et.al (2012)} aims to identify what must be transformed and how the transformation must be implemented. It exemplifies that though simplification, harmonization, and customer focus are key new elements of transformation, yet the path to such transformation needs to change according to each operator's specific business goals. Enforcing it further is discussed a case of network transformation success of an operator in Latin America. Conclusively, a telecom business transformation program involves complex challenges hence process of the same should be strictly prioritized and execution based on projected impact\textsuperscript{55}.

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