

Technological Management and Modern Telecommunication Market Place

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Abstract: The technology revolution led by Internet and ever improving computing power has played pivotal role in justifying the sense of a global village perception. Managing and enabling technological growth is among the top priorities of the organizations today. To meet this priority, organizations must create reliable, secure and cost-effective infrastructures that enable business innovation. Technological management not only includes a pool of up-to-date and state-of-the-art tangible and intangible technological resources, but innovation adoptions, technological road mapping and forecasting with proper time lining are also key ingredients of technology management. Technology management demands a futuristic approach from the companies. The companies have to look forward towards the upcoming technologies that are in the research pipeline and have to strategize their business expansion plans in the light of these developments. Telecommunication sector has seen a boom world over as never seen before and South Asia is no exception in this telecommunication revolution. The infrastructural growth in many of the countries in South Asian region such as India and Pakistan has been iconic. The numbers of companies offering various services and the number of users subscribing to these services have grown in a phenomenal way. This wave of telecommunication business development cannot be understood in isolation of the global telecommunication business trends. With the help of a case study of the business innovations in telecommunication sector, this paper examines the technology management aspects such as road mapping, forecasting and modernization. It is presented that the major telecommunication companies of the world entered late in businesses such as cellular phones, Voice over Internet Protocol (VoIP) and cable/broadband TV due to the poor technological road mapping and forecasting. The newer and smaller companies got the business advantages such as initial high rate of return and market share and led the major telecommunication companies due to aggressive technological forecasting. When major telecommunication companies such as Bell, BT and ATandT put limits on their research activities in the last two decades of the previous century, the telecommunication research was carried on by universities and smaller research companies. This resulted in the technology options (ready in a box) to be purchased by any entrepreneurship. This was a different situation from earlier part of the last century when the research and its fruit was limited to big telecommunication companies. Now it remains a matter of fast technological perception and innovation acceptance to be a successful product introducer and many of the young companies with limited resources took the edge over resourceful big telecommunication companies.

Key words: Technology Management • Business Innovation • Technology Forecast • Telecommunication Business Trend

INTRODUCTION

The world economy has undergone a radical transformation in the last two decades due to technological revolution. Geographical and cultural distances appears shrunk with the advent of airplanes, fax machines, globla computer, telephone linkups and the

world satellite broadcasting. These progressive advances have allowed companies to widen substantially both their markets and their supplier source [1]. According to Doyle [2], businesses have shifted from supply to a demnd environment. The periority management is how to identify and develop goods and services which are more attractive to customers than those of competitors [2].

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Two factors underlie these major changes; globalization and technological change. The explosive growth of global trade and international competition. No country today can remain isolated from the world economy. The other force is technological change. The last decade has witnessed remarkable advances in the availability of information and the speed of communication [1]. Swedish Technology Foresight [3], proposes that it appears as the world is in the midst of a technological breakthrough of a kind that will affect our entire society, both in terms of behaviors and structures. Technology continues to advance at very rapid rate in many industries including telecommunication sector. Some historians even claim that most historical change is technology driven [1].

Telecommunication sector has seen a boom world over as never seen before and South Asia is no exception in this telecommunication revolution. The infrastructural growth in many of the countries in South Asian region such as India and Pakistan has been iconic. The numbers of companies offering various services and the number of users subscribing to these services have grown in a phenomenal way. This wave of telecommunication business development cannot be understood in isolation of the global telecommunication business trends.

With the help of a case study of the business innovations in telecommunication sector, this paper examines the technology management aspects such as road mapping, forecasting and modernization. It is presented that the major telecommunication companies of the world entered late in businesses such as cellular phones, Voice over Internet Protocol (VoIP) and cable/broadband TV due to the poor technological road mapping and forecasting. The newer and smaller companies got the business advantages such as initial high rate of return and market share and led the major telecommunication companies due to aggressive technological forecasting. When major telecommunication companies such as Bell, BT and ATandT put limits on their research activities in the last two decades of the previous century, universities and smaller research companies carried on the telecommunication research. This resulted in the technology options (ready in a box) to be purchased by any entrepreneurship. This was a different situation from earlier part of the last century when the research and its fruit was limited to big telecommunication companies.

Rest of the paper is organized as follows. Section 2 presents an insight to technological forecasting. Section 3 discusses telecommunication market lookup

specific to Pakistani telecommunication sector. Section 4 gives an overview of the modern telecommunication services. Section 5 consists of the discussion based on the analysis of the poor technological management of telecommunication companies. Section 6 concludes the paper.

Technology Forecasting: Technology Forecasting (TF) was originally concerned with predicting the future of machines. Later on, it started to correlate different variables in the process, broadening the scope. Nowadays, technological forecasting is related to the survival of firms, it is now being linked more and more with strategic approaches [4].

Forecasting is anticipating, projecting or estimating some future event, series of events, or conditions which is outside of the direct control of the organization [5] and TF is the determination of the possible evolution of the technical dimensions of a certain material, product, process or service [6]. Technology management implies concern about the future. All managers must take decisions today that will affect the organization's future [7].

Figure 1 below gives an example of how technology forecasting can position the management from the perspective of a telecommunication company. It suggests that the business core of the telephone operating companies is likely to be eaten away by alternative information routes in the future. This implies that the telephone company management must initiate new areas today, or watch their companies decline tomorrow.

Intuition and Forecasting: Various authors share the common view that TF is an activity that generates information as an aid for decision making. Moreover, the intent with such an activity is that when data are collected, analyzed and combined systematically, it will yield a better result than only using intuition [6, 7]. However, the view of how to get there and what to accept as a technology forecast differ to some extent.

James Bright (1998) defines TF as a quantified prediction of the timing and the character of the degree of change in a technical parameter [8]. This implies that one need accurate numbers to represent a technological parameter (speed, length, time etc) to be able to call it an anticipation of the future, a "forecast".

Technological Forecasting Management Process: No technology springs directly from the mind of an inventor to immediate use. Martino [6] suggest that it passes

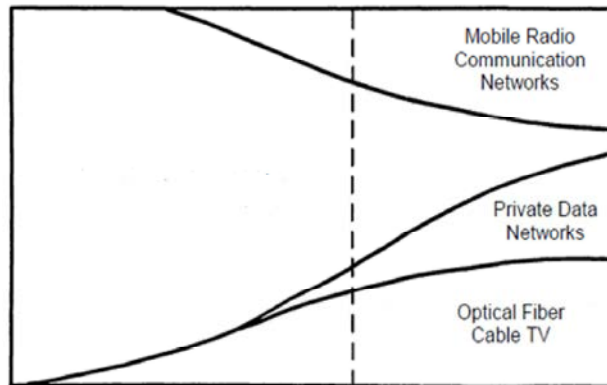


Fig. 1: Earlier business trends on left and emergence of multidimensional aspects of telecommunication business on the right

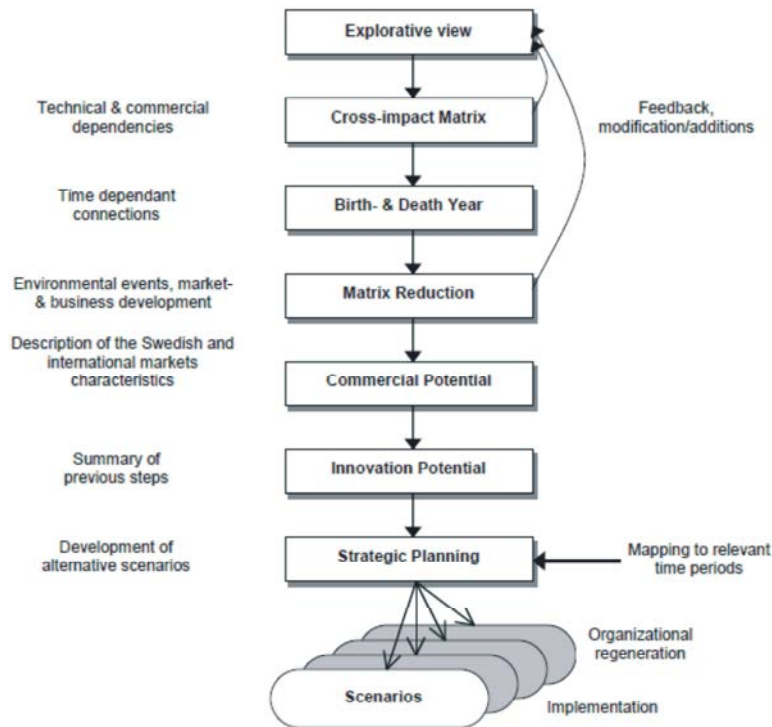


Fig. 2: Technology Management Process

through a number of stages along the way from scientific discovery or recognition of opportunity and need, through widespread adoption and diffusion to other areas, as illustrated in Figure 2.

Apart from this model, another important factor includes the examination of market opportunities in terms of technology push compared to market pull. Technology push is, according to Porter *et al.* [7], propelled by technology-driven firms that emphasize on new product development. Market pull or market-driven firms on the other hand let the marketing function dictate what the firm will develop and produce based on actual need of the

customers. Today most of the high-tech firms tend to be technology driven, but this does not necessarily mean that customer needs are neglected [9].

Further, Preez and Pistorius [10], suggest other important factors as the estimation of potential market size and evaluation of the entity life cycle and market segmentation in geographic and demographic terms. Differences in the psychographics and behavioral characteristics of buyers in these segments are of significance as well.

Next section gives an analysis of the services offered by telecommunication industry.

Business Adoption Trends of Various Telecommunication Companies: If we look at the global level, Japan, Europe and America have been leaders in industry trends, for example, the Wireless Industry Trade Association (CTIA) estimates that there are nearly 285.6 million wireless subscribers in the United States as of today on its web site posting. That is quite an accomplishment for an industry that started less than 25 years ago.

This wireless telephone evolution was really started by ATandT prior to its divestiture. This narrative is not about how great and wonderful ATandT was, but rather about how the wireless industry got its start. At the beginning, it was called the cellular mobile telephone.

ATandT's Bell Telephone Laboratories was one of the early inventors of Cellular Telephone Service in the United States. ATandT had been working on the concept of cellular telephone service or "Advanced Mobile Phone Service" (AMPS) since the mid-sixties.

If we examine telecom industry from a local perspective, in 1947 Pakistan's Telecom sector inherited the British Post, Telegraph and Telephone [PTT] Departments with a miniscule base of 7000 telephone lines. For 30 years this entity depended on its old mechanical, analog 'Strouger' switches and analog telephone lines, protected in its monopoly, both local and global. By 1962 this PTT Department was split up into the Telephone and Telegraph Department and the Postal Departments. By 1991 this was further re-organized through the PTC Act 1991 opening this public sector to the private sector companies. Pakistan Telecommunication Company Limited (PTCL) was incorporated as a public limited company, with the objective of providing domestic and international telecommunication and related services. About 95% of the assets and liabilities of PTC, at net book value, were transferred to PTCL whereas the remaining 5% assets were vested in PTA, FAB, NTC and PTET. The vesting of assets to new entities took place with effect from 1st January 1996.

By 1996, PTCL management was operating in defense mode trying to play catch-up, which it did well to learn fast. It sent its engineers to various western countries and companies to learn new Data Networking and Internet and Wireless Technologies but the sheer size of this New Wave Technologies was of Tsunami proportions, as the western countries and companies also learned to their discomfort and loss of competitive advantage. Ufone (Pakistan Telecom Mobile Ltd) a wholly-owned subsidiary of PTCL commenced its operations on 29th of January 2001 as a GSM 900 service provider. PTCL [11].

During 1994-2003, as Private cellular operators [PakTel, Instaphone, Mobilink] raced ahead with Mobile Voice Networks [both AMPS and GSM], PTCL launched their private Mobile Network company, Ufone, in 2001. Paktel is a mobile telecommunication company in Pakistan. It was the first ever company granted license to carry out cellular phone services in Pakistan, set up by Cable and Wireless. It carried out AMPS services until 2004, when the company launched GSM services as well. Its main competitor emerged in late 1990s as Instaphone and soon began to dominate the market. However after the launch and rapid success of Mobilink in 1998, both services lost market share. In 2003, Millicom Corporation, who at that time was majority owners of Instaphone, bought Paktel for a sum rumored to be \$1. Millicom installed a new management team headed by John Tumelty, former CEO of Instaphone and Chief Financial Officer David Ordman. In January 2007 Millicom sold Paktel for \$284 million to China Mobile [12].

Arfeen that started with Instaphone Wireless and Supernet Data Networks [Frame-Relay Networks] has launched Telecard Pay phone initially using landlines from PTCL. In 2000 it launched fixed wireless [using CDMA technologies] payphones in Karachi under the name "Foree Fone and Na Taar Na Intizzar".

In summary, this section gives awareness about how various telecommunication companies in Pakistan get started and how they took various business initiatives.

The next section gives an analysis of the modern telecommunication services offered by various telecommunication companies.

Modern Telecommunication Services: Earlier telecommunication business models rely upon subscriber line rentals, sometimes including usage charges. Increasingly, new revenue streams appeared in the form of either access (usually to a Web-based service) or carriage charges (usually paid by a content provider) or revenue sharing with the providers of content and application services. Other services include the provision of private leased circuits (PLCs) either for point-to-point communications or to support a wide area network (WAN), 'virtual' private networks (VPNs) which do away with the requirement to lease physical links, managed data networks and so on. With the emergence of all-IP Next Generation Networks (NGNs), Internet Protocol Virtual Private Networks (IPVPN) can integrate enterprise voice and non-voice communications.

Telecommunications can be conveniently divided into three categories; analogue, digital and Internet and broadband. Digital started taking over in the 1980s and

became prevalent in the 1990s with the introduction of the Asymmetric Transfer Mode (ATM) digital switch, the workhorse of the network, supported by Synchronous Digital hierarchy (SDH) or Synchronous Optical Network (SONET) high-speed transmission technologies over high grade copper or optical fiber cables.

Internet Protocol (IP) was looked up at as a challenge from outside of the industry and was for a long time resisted by the telecommunications community as an inferior technology for voice and data communications. But the real challenge of IP was not technological -the technology is now well proven – but economic, starting with Voice-over-IP (VoIP) which was used to by-pass the traditional public switched telecommunications network (PSTN) and its tariff gateways, especially the international gateways. The spread of broadband at the turn of the century has facilitated the use of the Internet and the World Wide Web to develop peer-to-peer (P2P) software to upload TV, movie content or music and videos for redistribution globally over broadband networks to any type of device that can attach to the Web, potentially by-passing TV subscription fees, etc.

The parallel development in telecommunications since the 1980s has been the rise of cellular mobile technologies. Like wired telecoms, wireless mobile telecom has developed from analogue (1G) to digital (2G) to Internet (2.5G) and to broadband (3G+). Mobile cellular technology has been primarily focused on the consumer market, acting as a complement to wired telephony in rich countries and as a substitute for often-unavailable wired telephony in low-income developing countries. The visions of 4G and beyond, includes established technologies such as wireless fidelity (WiFi) and emerging technologies such as Worldwide Interoperability for Microwave Access (WiMax) have seen convergence. The most prominent example of convergence is TV over telecom networks. In the wired world this means IPTV and Web-TV. In the wireless world it means mobile TV.

By far the most successful new lines of business for the mobile sector over the past decade have been (i) the phenomenal growth in the use of short message service (SMS), especially in markets where the tariff for voice calls is high, (ii) downloads of ring tones, wallpaper and other accessories and (iii) the use of pre-paid service. For example, in most developing countries pre-paid subscribers are over 90% of all users. In many overseas markets, mobile cellular services were declared early as ‘value-added’ rather than as ‘basic’ services and therefore more open to direct foreign investment.

European companies are particularly strong globally in mobile cellular technologies and services. The European Global System for Mobile Communications (GSM) standard dominates the world market outside of the US and East Asia (Japan and Korea) and the GSM extension technology Wideband CDMA (WCDMA) has become the dominant 3G standard worldwide.

This section gives a description of various services offered by telecommunication industry these days.

The next section presents discussion the technology forecasting/management achievements/failures of big telecommunication companies.

Discussion and Citations on Good and Bad Technology Adoption:

In this section, we present a discussion based on Sections 2 and 3 show that major telecommunication companies were not able to forecast the upcoming opportunities very well.

If we look at the technology adoption patterns in the telecommunication industry, it is clear that the traditional telecommunication companies were slow in adopting the services. For example, Paktel and Mobilink followed by Instaphone pioneered the cell phone industry in Pakistan. They were the market leaders and they enjoyed the total market share by offering high priced services. PTCL never considered this opportunity in their TF and they entered late in the cell phone industry in 2001 and cost them lost of market share for a number of years.

Similarly Internet based business were entrepreneur by other incumbents like COMSATS or Brain in the middle of 90's whereas PTCL entered into the era of Internet services and IP based business later than the smaller and newer companies and missed the opportunity of pioneering this field even being a big crown corporation with all the resources and it happened due to poor TF.

After entering into the competitive market of cell phone industry, when question of offering advance value added services such as online banking, bill payments and money transfer through cell phones was there, then also newer companies like Telenor took an edge and offered such services ahead of the subsidiary of PTCL (Ufone).

Prepaid phone cards are another example where newer and smaller companies like Worldcall etc. envisioned the opportunity and got license from PTCL family of companies and enjoyed a big market share. Whereas, PTCL never forecasted this opportunity and was not able to enter prepaid phone card market way later than the competition and become a trend follower and missed the opportunity of being a trend setter.

We see similar trend on the international level, for example in North America, the companies like At and T and Bell, who were leading in research and conventional value added services such as land lines and cell phones were lagging behind other smaller companies for providing modern services like IPTV, Web TV, VOIP services.

If we analyze this behavior of these companies based on the technology management model shown in Figure 2, this attitude shows the lack of confidence in the last three steps of technology management that are commercial potential, innovation potential and strategic planning. When a company does not evaluate an upcoming opportunity in future, then this opportunity does not get any attention because the commercial potential of the opportunity is overlooked. That's why many big companies instead of having financial and technological abilities do not recognized the commercial scope of the opportunity as was done by PTCL and its subsidiaries.

Neglecting commercial potential limits the innovation potential. When a company is unable to see any economical viability in an opportunity of adding a member to its product mix then the innovation potential is not realized. The opportunity goes under shadow and the management does not see any innovation potential and the idea goes wasted.

CONCLUSIONS

With the help of a case study of the business innovations in telecommunication sector, this paper examined the technology management aspects such as road mapping, forecasting and modernization. It was presented that the major telecommunication companies of the world entered late in businesses such as cellular phones, Voice over Internet Protocol (VoIP) and cable/broadband TV due to the poor technological road mapping and forecasting. The newer and smaller companies got the business advantages such as initial high rate of return and market share and led the major telecommunication companies due to aggressive technological forecasting. The technology forecasting and management efforts of companies such as PTCL were evaluated against a popular technology-forecasting model.

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