



Role of Telecommunications in Economic Growth: A Theoretical aspect

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Abstract

Technological innovation and development are two closely intertwined processes that shape and support each other. Although both originate from economics, they have been separated for most of the 20th century. Classic economic thinkers such as Ricardo recognized the role of technology, albeit he saw diminishing returns to agriculture and capital formation as more important and Marx's theory placed technological innovation as one of the prime movers in capitalist development. Apart from that the notable exception to the previous work was Schumpeter (1939) who saw innovations as essential forces for driving growth rates in a capitalist system. The increasing information intensity of economic activity, coupled with the globalization of capital flows, trade, manufacturing and other activities, resulted in strong demand for better, more varied, and less costly communication and information services. Demand growth has been intertwined with rapid changes in telecommunications technology fuelled by advances in microelectronics, software and optics. Technological innovation and development are two closely intertwined processes that shape and support each other. Although both originate from economics, they have been separated for most of the 20th century. Classic economic thinkers such as Ricardo recognized the role of technology, albeit he saw diminishing returns to agriculture and capital formation as more important and Marx's theory placed technological innovation as one of the prime movers in capitalist development. Apart from that the notable exception to the previous work was Schumpeter (1939) who saw innovations as essential forces for driving growth rates in a capitalist system.

Introduction

The world is rapidly moving towards an economic system based on the continuous and ubiquitous availability of information. Recent advances in telecommunications technology have been an important vehicle in permitting information exchange to develop as a valuable commodity. Countries and sectors equipped with the requisite telecommunications systems have been rapidly moving into post-industrial, information-based economy growth. For the developing world, a modern telecommunications infrastructure is not only essential for domestic economic growth, but a prerequisite for participation in increasingly competitive world markets and for attracting new investments. Thus, in the recent past technological



advance in telecommunication has made possible the fast and widespread use of information which is a vital need for the operation of most producer services. (Alleman:2004)

With the world going through the process of communication, telecommunication has come to occupy a place of extreme importance as the 'link' connecting a whole gamut of communication channels like T.V, computers, satellites etc. Since the 1980s, the telecommunication sector in many countries has been expanding rapidly. The fast-paced growth of telecommunications services can be explained by a number of factors, such as advancements in technology, market liberalization, and privatization. The output of the world's economy has also been growing at a faster rate during the period. In particular, many developing countries and transition economies have experienced rapid growth. Development in telecommunication is considered to be one of the driving forces behind globalization and the rapid growth of the world's economy (Shiu and Lam: 2008). "Telecoms are the 'electronic highways' of the future which will influence the geography of economic opportunities in emerging 'Information Economy' as much did railways in the earlier periods of profound structural change in the industrial economy" observes J.B Goddard (Goddard and Gillespie: 1986).

There is a significant relationship between telephones and associated interactive communication technologies and development. "The cause of recent optimism about development communication is the realization that communication technologies can become something more than a just delivery system for development messages. They also represent ,at least potentially, a new type of industry, one that some enthusiastic observers claim can allow a third world nation to leapfrogging the industrial era and become a information society .so microelectronics can provide jobs and create taxable wealth and thus contribute to investment"(Singhal:1989).

Telecommunication and Economic Growth: Theoretical Aspect

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was Schumpeter (1928, 1939) who saw innovations as essential forces for driving growth rates in a capitalist system (Zook: 1997).

Kondratiev (1935) was the first scholar to identify regularly occurring structural cycles although he did not implicitly identify technology as the cause. It was Schumpeter (1939) who first argued that a cycle of technological creative destruction was responsible for cyclical trends in capitalism. He also identified three waves based respectively on 1) textiles 2) railroads and steel, and 3) the electrical and automotive industries (Zook: 1997).

Schumpeter (1939), attempted to explain growth largely in terms of technical innovation. He suggested that the first long cycle of economic development was based on the diffusion of the steam engine and textile innovations in the latter part of the 18th century; the second, largely on the railways and the associates changes in the mechanical engineering and iron and steel industries; and the third on electric power, the internal combustion engine and the chemical industry.

Scheme of Long Waves (Schumpeter and Kondratiev)

Period	Prosperity years	Innovations and technologies
First Industrial revolution	1787-1843	Textile Industry specially cotton technologies, mechanical machinery tools, iron replaces wood
Rail road and Steam engine era	1842-1897	Railways track and steam engines. Shipping, machinery, petroleum and chemical industry
Age of steel and electricity	1897-1939	Steel and aluminum, internal combustion engines, electrification, electric motors
War and post-war boom	1939-1982	Green revolution,
Post industrial Era: Information technology	1982-.....	Mobile and wireless technology, telecommunication infrastructure, internet, personal computers

Samihula contributed fifth wave of technological innovation which was started with introduction of computers, TV satellite, internet in 1980s. These technical changes paved the way of financial markets and globalization. Information and telecommunications technological innovation was more adequately described from the perspective of Kondratiev’s waves. Therefore, Samihula developed a modern framework of long economic waves by using the “theory of Kondrateiv cycles”. During the modern age, Samihula elaborated six long waves and each new wave is shorter than previous one due to acceleration of scientific and technological progress.

**Modern framework of six long waves by Samihula**

Technological revolution	Period of revolution	Length	Leading sector
Financial-Agricultural revolution	1600-1740	180 years	Finance, agriculture, trade
Industrial revolution	1780-1840	100 years	Textile, iron, coal, railways, channels
Technical revolution	1880-1920	60 years	Chemistry electro technical industry, machinery
Scientific technical revolution	1940-1970	45 years	Air-industry, nuclear industry, astronautics synthetic materials, oil industry
Information and telecommunication revolution	1985-2000	30 years	Telecommunications cybernetics informatics internet
Post-information and technological revolution	2015-2020	20 or more years	Biotechnical and bio-medical sciences, nanotechnology, biogas fuel, industrial robotics

Source: www.kondratieffwavecycle.com/kondratieff-wave

Much in line with endogenous growth theory by Paul Romer and Robert E. Lucas (1980), cell phones impact economic development and growth primarily through their function as a medium of communication. Cell phones improve information sharing, which is crucial to the diffusion of ideas that endogenous growth theory emphasizes. Information and communication technologies decouple information from a “physical repository,” enabling the spread of information, ideas, and knowledge that is so critical during the development process. The easier exchange of ideas can reduce the knowledge gap among developed and developing nations, between different industrial organizations enabling developing countries to increase their standards of living. Information technologies, such as cell phones, can increase efficiencies within a country by enabling the exchange of information among its inhabitants and lowering the cost of acquiring information. Mobile phones are especially important in developing nations where the needs of separate groups within the population may differ substantially (Lum: 2011). For example, the poorest individuals in marginalized communities need information about sources of food and shelter immediately. Producers and consumers which constitutes the majority of population, would instead need information about employment opportunities, prices of goods, education, health, acceptable norms of behavior, and elections. So, with cell phones, distinct groups can receive the specialized information they need. The use of mobile phones also implies a two-way communication. After individuals receive the information they need, they can communicate their other needs to governing bodies. In this manner, cell phones increase the flow of information, as well as its overall availability.



Role of Telecommunications in Economic Development

There is very significant relationship between telecommunication and economic growth in an economy. Telecommunication services can substitute for other forms of communication (mainly postal service and personal travel) and are often more effective and more efficient than other forms of information in terms of time, energy, materials, and quality of environment. Further, there is some evidence that with reliable telecommunication system new communication is generated and stronger, more complex and more productive communication patterns build up, partly through direct and indirect interaction with numerous production and distribution functions. Apart from that with accessible and reliable telecom services, some of the physical constraints on organizational communication are removed in various sectors of economy, permitting increased productivity through better management in both the public and private sectors. Technology has made it possible to adopt different structures and locations, and aiding the evolution of increasingly complex organizations. Also the efficiency of household operations rises as telecommunication allows improves access to goods and services and forms of work are supported that require some integration of work place and residence (Saunders.et.al:1983).

The utility of telecommunication services is also apparent for commerce and industry. Industrial development requires coordination of various activities: acquisition of supplies, recruitment and coordination of labor, control of stocks, processing of materials, billing, record keeping, delivery of goods to buyers, and general market search activities. Commerce, however, is inherently an information processing activity. Effective buying, selling, brokerage and transport require a continuous supply of up to date information on the availability and prices of numerous goods and services. In the absence of accessible and reliable telecommunication service such activities suffer a variety of inefficiencies, including the creation of markets in which a few information-rich individuals are able to gain significant advantage over the majority of those who are information poor (A Parthasarthi :1988)

The core impact which information technology can make on development is a use of integrated computer-cum-telecommunication systems to convert data into information and use/manipulate/control such information for planning and decision making, efficiently managing large economic assets, enhancing productivity and safety and in improving the availability, quality and access to new services in areas like telecommunication itself, education and health (A Parthasarthi: 1988)



Further, a telecom service has a very significant role to play in social development. Connectivity fosters social development, including improved education, health and increased citizen participation in civil society. Telecommunication helps provide access to health care and allied services. It helps combat epidemics such as HIV/AIDS and malaria by supplying information on treatment and control, generating awareness, improving access to and connectivity with health centers, and establishing the mobile testing of diseases. The current synergy between health reform initiatives and advantages in technologies has resulted in the proliferation of e-medicine projects. This represents an innovative approach in providing quality health care whenever and wherever needed. Telemedicine can be useful for rural and underserved areas, where there are fewer specialists. Telemedicine provides the opportunity for clinicians to provide consultation directly to other physicians or to patients in remote areas using a wide range of technologies, including telephone, e-mail and video-conferencing (Nair: 2007).

Apart from that e-governance that helps in exploiting the power of information and communication technology to transform accessibility, quality and the cost-effectiveness of public services has been made possible by the telecom revolution. Since the advent of IT and communication technology, Indian ministries and government departments are working to computerize their operations to make them simpler and increasingly accessible for Indian citizens. Most relevant information about these entities is now available on their websites, making it easily accessible and increasing transparency. Significant progress has been made in the computerization of railway bookings, allocation of the Permanent Account Number (PAN) to income tax payers, processing of passport application, conduct of public examination and customs clearance etc (Earnest & Young and FICCI:2011).

Besides being one of the largest revenue generators, telecom is also a major creator of jobs. The telecom sector has led to the growth of a range of communication technology-enabled activities and services. Operations such as data entry, revenue accounting, processing of insurance claims, human resource services, call center operations, customer support centers, software, development, systems engineering and systems design and integration are popular examples. Further, the spread of telecom and information services to rural areas is enabling the setup of rural business process outsourcing (BPO)

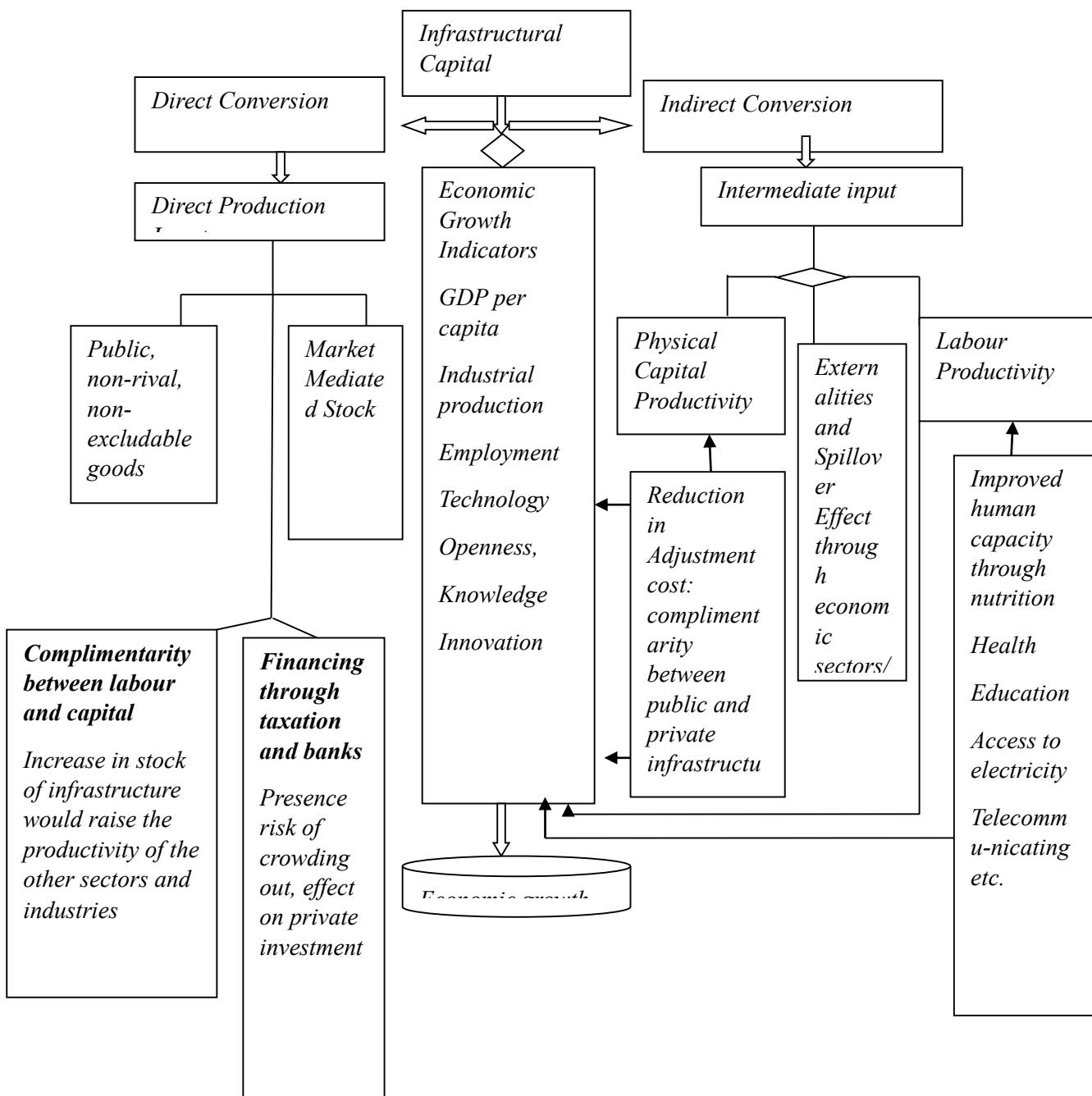
So telecommunication is important not only for faster commercial, industrial and other economic activities thereby facilitating the overall economic development of a country but also



contributes to the development of shared communication environment reaching the country's most remote areas , thereby promoting political, cultural, social and economic integration of the country (Saunders.et.al:1983).

Conceptual Framework of Relationship between Economic Growth and Telecommunication

The conceptual framework of the theoretical linkage between telecommunications infrastructural investment and economic growth is presented in Fig. below the various channels of transmission are illustrated in the diagram





The effect of infrastructure is transmitted directly and indirectly to economic growth. This effect is manifested only through the economic growth indicators which include real GDP, industrial production, employment, price stability, education, technology, openness, knowledge, innovation. The nature of transmission is determined by the role of infrastructure capital in the production function i.e. whether it is a direct or intermediate input. As a direct input, it can either be in its pure public good form or provided by the private investors, guided by market forces. The transmission channel in this case is said to be direct channels. Where infrastructure capital is an intermediate input in the production function, the consequential indirect transmission channel through which infrastructure affects growth is determined by three factors. These are productivity of physical capital which is in turn determined by reduction in adjustment costs and maintenance of existing infrastructure also derived from the facilitation of reallocation of capital. The second variable is higher labour productivity obtained from improved human capacity development. The transmission impact through human development can be realized through improving health better nutrition, education, better Roads, access to electricity, telecommuting, etc. The third factor is the externalities which transmit key technological innovations to other sectors leading to involve lower costs, and spill-over effects on other firms and therefore, on the economy as a whole (Tella.et.al:2012)

Traditionally telecommunications sector was regarded as a relatively straightforward public policy. Economies of scale, political and military sensitivities, and large externalities made telecommunications a typical public service believed to be a natural monopoly. In this environment, telecommunications development focused mainly on extending standard service, building basic networks and improving performance of the operating entities. The main issues were technological and management of telecommunications enterprises was largely oriented toward engineering (Nulty E.Timthy:1989).

The increasing information intensity of economic activity, coupled with the globalization of capital flows, trade, manufacturing and other activities, resulted in strong demand for better, more varied, and less costly communication and information services. Demand growth has been intertwined with rapid changes in telecommunications technology fuelled by advances in microelectronics, software and optics. These changes have greatly reduced the cost of information transmission and processing, changed the cost of structures of telecommunications and many other industries which has made possible new ways of meeting a wider range of communication needs at lower cost. In this contest, telecommunication is now widely considered a strategic investment to maintain and develop competitive advantage at all



levels- national, regional, firm. Telecommunications facilitate market entry, improve customer service, reduce costs and improve productivity. They are an integral part of financial services, commodities market, media, transportation, travel industry and provide vital links among manufacturers, wholesalers and retailers. Moreover, industrial and commercial competitive advantage is now not only influenced by availability of

Convergence of Technologies

The telecom sector has witnessed rapid changes since the commercialization and privatization of telecom services. There have been far reaching developments in Information Technology (IT), consumer electronics and media industries across the globe. The Government of India has recognized that provision of world-class telecommunications infrastructure and information is the key to rapid economic and social development of the country. This will not only help in the development of the IT industry, but will also provide for widespread spillover benefits to other sectors of the economy.

Convergence of Information technology, telecommunications and broadcasting is marked in the developed economies by growing number of alliances, partnerships and mergers in the three industries. The barriers between information products and other industries are disappearing and new competition and new alliances are appearing in developed systems. At the user level, Internet telephony and e-mail are challenging traditional telecom business models. The impact is felt both in offices and at home. While in offices, desktop and portable PCs pack the power of yesterday's mainframe computers, web television, smart phones and low price computing devices denote the future digital networked home (Singh:2009).

Private Sector participation in the Indian telecom sector will provide a fillip to technology up gradation and help bridge the gap in adoption of new technology. There have been far reaching developments in the recent past in telecom, information technology, consumer electronics and media industries. According to NTP 1999 convergence of both markets and technology is a reality that is forcing realignment of the telecom industry. On the one hand, telephone and broadcasting industries are entering each other's markets, while technology is blurring the difference between conduit systems such as wireless and wire line. These rapid changes in technology have largely diluted the monopoly characteristic of telecom service provision, thereby opening up avenues for improved efficiency (Earnest and Young & FICCI: 2011).



Competition is now viable in a range of services, including long distance transmission of voice and data. The basic driving force of growing competition which was once thought to be a natural monopoly is the increasing versatility, with which services can be provided, based on the digitisation of all signal transfer technology. As the manner in which signals are transferred from one location to another becomes common, it is possible for a service provider in one segment of telecommunication, say network television services, to perform the functions of another, say, the local phone company. Efforts to maintain barriers across such segments will eventually be overwhelmed by technology. Regulation will follow convergence rather than the other way around. Additionally, traditional methods of distinguishing between telecommunications and broadcasting are becoming less clear as a result of technology developments in both industries. The nature of telecommunications and broadcasting transactions, the technology used, and the methods of funding the infrastructure are becoming more and more similar. Some of these diversification activities are on account of technical convergence of the medium (the fibre optic cable) used to distribute services. The high and versatile data carrying capacity of fibre-optic networks means that they will also be ideal network resources to be re-sold to multiple service providers. These could be cable operators, broadcasters, telephone operators, internet service providers, or any other company that needs to send digital signals into the connected units. In several developed systems, broadcasting is increasingly exploiting the traditional telecommunication medium of cables rather than radio waves, and vice versa. Conversely, entertainment and advertising are among the areas turning to the ordinary telephone network. The use of telecommunications infrastructure for entertainment provision will make it possible to deliver a potentially unlimited number of TV channels, and the need to limit the number of channels to preserve radio frequencies will disappear (<http://www.siteresources.worldbank.org>).

Conclusion

Technological innovation and development are two closely intertwined processes that shape and support each other. Although both originate from economics, they have been separated for most of the 20th century. Classic economic thinkers such as Ricardo recognized the role of technology, albeit he saw diminishing returns to agriculture and capital formation as more important and Marx's theory placed technological innovation as one of the prime movers in capitalist development. Apart from that the notable exception to the previous work was Schumpeter (1939) who saw innovations as essential forces for driving growth rates in a capitalist system.



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