# The Development of the Telephone Network: Relationship between Telecommunication and Globalization

Yiran Dang*

University of Toronto Scarborough, Canada

*Corresponding author: grace.dang@mail.utoronto.ca

**Abstract.** Globalization is understood as one of the most significant historical trends motivated by technological innovation. The technique of telecommunication is definitely with that innovation. To study the relationship of how telecommunication has an impact on the progress of globalization, this article provides a picture of their development, combined with synthesis by applying the theory of cultural determinism. A factors analysis with social needs is constructed for further researchers who share the same interest in social mobilizations under globalization.

**Keywords:** Neural Network; Prediction Model; Big Data.

## 1. Introduction

Understanding the history of a given technology provides people with an idea of what caused the emergence of this technology and, therefore, can analyze the effects of a given technology. Although the entire social context is involved, this complexity forces people to start narrowing down focuses. Therefore, people can examine cultural factors in how technology changes over time. With the increased demand for technologies influenced by the holistic social, political, economic, and cultural elements, technology development is being accelerated. For example, since most schools and universities are using platforms to do online teaching this year, such as Zoom, and Bb Collaborate, the demand for these technologies increases rapidly, which aids in the development of these online teaching technologies. In mobile telecommunications, significant technological changes are required in the future to keep up with the rapid worldwide development and, therefore, to satisfy people's needs. At this point, globalization is one of the significant factors that accelerate the overall development of the telephone network.

Nevertheless, some factors will inhibit the growth of technology, as well. Some technological innovations will be seen as a threat to the existing cultures or social environment, and therefore these types of innovations will be discouraged. As one of the noticeable innovations of communication technology, the development of the telephone network brought a lot of convenience to the transmission of information and helped boost nations' economies. Still, as technological innovation, the rapid growth of telecommunication technologies had exacerbates inequalities in society, which needs remediation.

## 2. Factors contributed to the development of technologies

Technology emerges within the overall social environment and living conditions at different periods. Simultaneously, the development and use of technologies are highly influenced by human beings in a given society. It is vital to pay attention to the history of a given technology to understand how culture influences technology and make this given technology further developed when it needs to be improved within changed social factors or contexts. The occurrence of technological development happening based on the holistic social environment can be interpreted with the concept of "cultural determinism", in which individuals' behaviors and prevalent social phenomena are contributing to the improvement direction of telecommunication technology.

Cultural determinism illustrates the ideology that technology’s development and innovation are pushed by the prevailing social, political, and economic conditions. Brian Winston points out that economic histories and individuals’ contributions are the two key features that helped to explain the

idea of cultural determinism [1]. According to Winston, when talking about cultural determinism, the role of corporate actors in economic histories, such as international trade, and competition occurred in markets, which contributed to technological development [1]. There is growing evidence indicating that the growing telephony communications technology is having an impact on economics. At this point, the telephone network is not just a communications medium but an enabler of socio-economic development. With the development of telephony communication technology and the emergence of new forms of telecommunication, the proportion of the new telephony industry increased. Information now has its own economic value.

## 3. History of the development of the telephone network

Human beings have a long history of communication. In ancient times, approaches that people used to exchange information were pretty simple: mail delivery by animal, frescoes, etc. After the mid-19th century, with the invention of the telegraph and the telephone, human communication produced a fundamental shift to wireless communication.

At the beginning of the 21st century, cell phones functioning as products of wireless telecommunication entered an era that provides services such as downloading ringtones, taking pictures, sending text messages, playing games, watching movies, etc. These brand new characteristics of telephones are the products made during the development of the telephone network. They are being shaped by globalization's progress since people are representing more interests in international communications as an essential part of their daily lives. However, these newly developed wireless telephones' functions seem to have little connection with the original telephone network. They are all services expanded based on the core function of telecommunication, which is to communicate.

People are using communication technology as communication tools to aid in transmitting information to more distant places. The sense of telecommunication began with Samuel Morse's telegraph invention in 1837, ushering in a new era of using electrical signals to spread information [2]. After the invention of the telegraph, the telephone was invented in 1876 by the American Alexander Graham Bell [3]. Bell’s innovation of the telephone is a remarkable event in the development of the telephone network to a large extent. After more than one hundred years of advancement, the framework of the telephone has become a significant piece of the world’s media communications foundation.

World War II contributed to the development of telephony communications. Before and after the Second World War, a large number of analog communication devices were put into use, and it was the military needs that greatly stimulated the development of radar and microwave communication systems, which are both basic techniques of telephony. After the war, this type of communication technology was applied to daily life. In the beginning, due to some fundamental technical problems and high costs of telephones, there were only a small number of people using telephony technology. Nevertheless, with the application of innovative technologies in telephony, telecommunication has decreased power consumption volume with increased functionality. The reduced equipment and maintenance costs have led to the widespread use of various communication devices.

It is people's insatiable desire for communications and interactions that push the innovation of the telephone network. The development of society is inseparable from the communication and cooperation between people. The occurrence of communication inevitably has to be made with the help of communication technology. Therefore, the development of telecommunication technology is closely related to the progress of society and globalization.

## 4. Positive influences of telecommunication technologies

Telephone communication affects social development and environments by accelerating the spread of information and ideas, expanding interpersonal networks, interacting with information across social and cultural boundaries, and increasing transparency as well as efficiency. As Headrick mentioned in

his book, the telephone network has five crucial qualities; they are “speed, coverage, reliability, cost and security” [4]. While the first four influence the technical and economic level, the last one is related to politics [4].

Innovations in telecommunication technologies have revolutionized the previous way that information, and scientific research were obtained and then led to globalization. Modern communication methods and platforms, such as mobile telecommunication tools, have made the exchange of theoretical and technical information faster and easier. It has dramatically reduced the time consumed outside of research work, thus accelerating the development of more advanced technology. The telephone network enables the spreadability of "real-time" information in a short period, which represents the efficiency of the telephone network [4]. This resulted in an increasing number of participants in telecommunication.

The telegraph altered the way people used to transport messages in the past and eliminated the geographical restrictions in communications. The appearance of the telegraph enabled interactions between individuals to happen without limitations on time and space. Most importantly, the emergence of the telegraph has separated the two terms "transportation" and "communication," which are contaminated terms in previous message transporting systems [5]. The telegraph enhanced the effectiveness of communication by allowing the happening of independent transportation when transporting messages. Physical movement is no longer a necessary condition during communications under the function of the telegraph. People can connect with others even though they are not staying in the same place or in the same time zone. This phenomenon is the representation of the increasing globalized communication, and therefore to further promotes the process of globalization.

The diverse culture brought by modern telecommunications has influenced people's values and understandings to a great extent. While accepting traditional culture, the telephone network provides people with more opportunities to participate in other cultures. People have the right to choose the type of culture which they are eager to engage with. In the long term, these modern telephone networks will enhance the education level among individuals since people can easily access professional knowledge and information through the function of telecommunication.

Initially, in the beginning, telephony services encountered lots of problems, and the dominant ones should be the low service quality and the high costs. These phenomena lacked the acceptance of the telephone network by the public at some point [6]. Nevertheless, with the reduced cost of telecommunication, telephony is not merely related to wealthy people. People with other social identities can purchase a telephone or other telecommunication tools to communicate. When the price of cell phones dropped to the point where most people could afford them, the number of users increased dramatically. In 2007, there were more than two billion cell phone users worldwide, and even in some cities, more people are using wireless telephones than the total urban population of the city [6]. This phenomenon helped promote the business industry of the telephone network. For example, innovations in communication products, applications, and other communication tools developed based on the new form of telephony have brought lots of profits to the telecommunication industry, especially companies making telecommunication products.

The development of the telegraph helped boost the performance of the international business industry by originating new structures of social relationships. As discussed by Carey, "Before the telegraph, business relations were personal" [5]. During that time, trades merely happened based on connections among individuals, and it is required to have face-to-face relations to do business. The structure of social relations before the invention of the telegraph was highly restricted by the previous communication model, which led to fewer opportunities in multinational commercials. Nevertheless, with the characteristics of the telegraph, impersonal relationships became available when doing business. At this point, people can start the "buyers and sellers" business relations with people they do not know before, and therefore expand their business market [5]. Based on the effectiveness of telegraph communication, both the quantity and the speed of trades are increased. Since face-to-face relations are no longer the required element in commercial trades, more and more people can join the business market and make profits.

The rapid development of the telecommunication industry has also impacted traditional industries and has played a significant role in promoting the development of traditional industries. This competition can be seen as an encouragement to make business people start putting more effort into the telephony industry, which will benefit the market itself and the innovation of communication technologies. Above all, business people can use the telegraph to make international trades and therefore have an opportunity to expand their business. The emergence of the telephone network provided a new possibility for people to make more profits by using communication tools to open opportunities for international trade. As a result, with the function of the telegraph, the expanded international business market will impact the economic aspects in the process of globalization as well as make contributions to boosting the holistic global economy.

A large part of the reason for the creation of classes stems from unequal access to information. Due to the development of information technology, the time of access to information has been shortened or even disappeared so that people have reached an equal status of access to social information, which also directly leads to the loss of effectiveness of the traditional pyramidal structure of the ruling class. This has increased the transparency of politics and vigorously promoted the process of political democratization [7]. A well-developed telephone network allows people to stay informed about a country's policies and also provides adequate feedback to the governments about people's thoughts on current policies. Nevertheless, at the security level, since politics became mostly transparent with characteristics of the developed telephone network, sometimes the political decisions made by a nation's government will be vulnerable.

Despite the fact that the use of the telephone network might have privacy disclosure and then make personal or national information less secured, telecommunication tools will make people feel much safer and provide individuals with a great sense of security when they are staying in unsafe environments. For instance, in disaster movies, people are always looking for communication tools that can be used to keep in touch with their family or stay connected with the outside world to gain a sense of security. Most importantly, to use telecommunication technologies to save themselves from danger. The telecommunication networks have the ability to connect "all levels of information flow and unify different communication channels into various electronic communications networks" [7]. With this two-way communication technology, people can participate in multiple information channels and interact with others to not only receive information but also gain a sense of belonging.

As a means of exchange, connection, communication, and coordination, the telephone network has become the technological basis for accelerating the world's economic, social, cultural, technical, and other developments. With the function of telecommunication, people can make a connection with the world and get in touch with global events more straightforwardly. The development of telephony reduced the time consumption for people when accessing information and eliminated space requirements when connecting with others. It is not merely about the changing of time and space, but also the increased total amount of information that people can gather within the holistic context. At the same time unit, as the total amount of information exchange expands dramatically, the scale of economic, social, cultural, scientific, and technological development expands exponentially as well. The development of the telephone network is constantly increasing the scale of communication, the speed of contact, the quality of communication, and the level of coordination between all parts of the world. As a result, globalization begins, and countries are becoming globalized. Telecommunication can be considered a determining factor in the building of relationships between nations.

## 5. Positive impacts on the news industry

The telegraph created a new model and a new form for people when receiving knowledge or information about the public, which then altered the network relations in contemporary society. In other words, the development of the telegraph itself is marking the change in forms of media mediation, which help accelerate the globalization process. With the availability of wire services established by the telegraph, forms and news content received by people are undergoing significant changes [5].

The telegraph is influencing the news industry mainly in three ways. Firstly, the telegraph stimulated the sense of competition among journalists by making more information obtainable and available, which further led to enhanced professionality in the news industry. Secondly, the characteristics of the telegraph are contributing to the quality of news content. As a new convenient mediation to convey messages and news to the public, the telegraph shortened the length of news content and made the descriptions more concise. As a result, news published under the telegraph is in a new form in which information itself is more prominent in the contents. Last but not least, the telegraph alternated the types of news information in public. Before the existence of the telegraph, a dominant part of the information that appeared in newspapers was about politics. Nevertheless, after the application of the telegraph, more types of news emerged and allowed people to interact with this information and knowledge in a new way based on their understanding. At this time, the telegraph makes journalism become an expression of democracy.

## 6. Negative influences of telecommunication technologies

In the developing process of the telephone network, telecommunication has become one of the convenient tools to fulfill the needs of global communication among countries and individuals. The developed and advanced telephone network enables people to be able to connect with others on a larger scale. Like globalization, the telephone network will have both positive and negative impacts on human society's progress. From one perspective, individuals can easily access telephone network communication and then make a connection or cooperation with various portions of individuals. The telephone network helped boost interaction and participation among individuals in society, which contributed to the progress of globalization.

Although the development of telephony has had positive influences on individuals, society, and the world as a whole, there are still some problems associated with the telephone network that is mainly caused by globalization. For example, the telephone network brought the issue of electronic colonialism and made the difference between the core and the periphery countries more dominant [7]. Public mobile communications continue to grow but with uneven development around the world. On the one hand, new subscribers are decreasing in developed countries such as North America and Europe, while the number of new subscribers is growing rapidly in developing countries in regions such as Asia and Africa. The problem that occurs in this situation is that the Average Revenue Per User (ARPU) generated by telecommunication subscribers in developed countries is much higher than that in developing countries. This means that the telecommunication industry will make less revenue since the number of users from developed countries is decreasing. As a result, with less revenue gained from users, further technological development in telecommunication technology will be influenced negatively.

Another problem that adheres ought is the unequal telephone network development among countries. Due to the policy tilt of the U.S. government, the telephone and telegraph company almost monopolized the telephone communication business in the U.S. with the emergence of telecommunication. It controlled 80% of the local telegraph lines, and the rest of the market was shared and divided by many small companies [6]. As for the long-distance telephone service, the percentage controlled by the U.S. was even more prominent. This monopoly that the American Telephone and Telegraph Company established on the telephone communication system in the world, led to the difference in the communication network qualities between American companies and companies in other countries. The fact is that telecommunication services outside of the United States usually run with lower quality [8]. Above all, the differences in the telephone network qualities caused by unequal development processes will further lead to information asymmetries among nations [8]. Then led to the concept of the "digital divide" in the different levels of engagement with media technologies.

In the very beginning, the term "digital divide" was used to describe the communicability of communication technologies among different social classes on a global scale [9]. For now, the digital divide is a concept that refers to the diverse and unequal accessibility to modern communication

technologies among regions and countries. This difference is having a close relationship with the overall network development history, and it is the continuation of the "digital divide" generated in the past.

The uneven development process of the network itself can be considered an essential factor that causes inequalities in the global network society. More and more resources needed for technology innovations and productions are generated in top cities instead of other growing cities. This phenomenon further caused the non-negligible digital gap among regions. The problem adheres is that although some lower-ranked cities have more significant growth rates compared to top cities, the status of those privileged cities in global connectivity is still in a stable and leading position [10].

One of the reasons that led to the gap in global connectivity ought to be the different policies applied in nations. Specifically, the rooted concept involved in the development of the network is merely available for specific countries, especially for developed countries. For instance, as Gagliardone mentioned in his article, the Internet that people are familiar with is designed with a background based on a mix of "Big Science, military research and a culture of freedom" [9]. Fundamentally, all these required elements in network development are mere can be found under policies on the American West Coast. These already decided factors are basics in the network development process and play a significant role in making these communication technologies. Once a country can meet this standard, this country will put much effort and a considerable amount of investment into the invention of new communication technologies [9]. As was foreseeable, regions outside of the American West Coast will not be able to develop the same type of advanced network and keep up with the network development process since they cannot meet the "standard" when developing networks according to their own policies and national conditions. Additionally, the function of the Geographic Information Systems demonstrates a phenomenon in which the network businesses are placed in particular areas instead of being evenly distributed in different regions. In the United Kingdom, telegraph stations in the year 1868 are mostly concentrated in London, the UK's capital city [10]. This distribution was determined by the number of critical businesses and the demand for message exchanging in the 19th century to a large extent. Since there are more business requirements in the city and areas around, it is considered "normal" to make less network access in other regions with lower participation in communication. The uneven distribution in local connectivity within countries had become a common phenomenon and continued until now.

On a larger scale, the digital divide has negative impacts on countries themselves and influences people's social life in various aspects, which will impact the process of contemporary globalization to some extent. Within the idea of globalization, global connectivity is an essential and significant part of contributing to the process of globalization. Nevertheless, the emergence of the digital divide is cutting off the possibility of local or global connectivity by lacking network accessibility in some regions. Besides, looking through the impact of the digital divide on social lives, there will be inequalities that occur in people's fundamental rights. Some groups will not have the ability to access essential network services or advanced communication technologies due to the lack of network access caused by the digital divide. The differences between each group of people will be more prominent, and therefore cause a situation in which some people are disconnected from the global network society with a lack of engagement in public information. Overall, the process of globalization might be negatively influenced by the situation of the digital divide with inequalities happening in communication. Without efficient global communications in today's network society, the process of contemporary globalization will be slowed down on a large scale.

## 7. Conclusions

The development of the telegraph is not only influencing the process of globalization but also providing new forms of relations in the contemporary network society. With the separation of transportation and communication, the telegraph enabled a new modern communication network culture, new ways for people to interact with the information they received, as well as new relations

in business models. Based on these improvements made by the telegraph in communication, the social, cultural, and economic aspects of globalization will be positively influenced. Meanwhile, the problem caused by the development of the telephone network that occurred among countries ought to be resolved before or in future developments since the development of telecommunication is having a closer relationship with globalization. If the gap between developed and developing countries becomes larger due to telecommunication, the progress of globalization will be negatively influenced or standstill.

The direction of social development determines the development trend of communication technology, and the speed of social progress also depends mainly on the development of communication technology. With the continuous improvement of society, the requirements for communication technology, especially in the field of telecommunication, are bound to be higher. As a result, the development of communication technology will be related to the whole process of globalization. To further promote globalization, it is necessary to have more fixed innovative communication technologies appear in life.

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