

Introduction to the Role of Computer Networks in Promoting the Development of Human Society

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Abstract: Computer network applications are growing in popularity and coverage as a result of the rapid development of computer network technology, which significantly supports the high-quality growth of human civilization and the ongoing improvement of people's living standards. This paper provides an overview of the history of computer network development and current applications, analyzes the effects of computer networks on human economic, political, and cultural life, and suggests additional application ideas that are optimized in conjunction with future development trends, as well as corresponding improvement countermeasures for adverse effects.

1. Introduction

Computers power the information era of the twenty-first century. The network has inserted its tentacles into several spheres of human social life through the transmission medium. The old methods of production and way of life have been dramatically altered by the ongoing growth of computer networks. Computer networks have fueled the growth of several sectors to previously unheard-of levels. While people appreciate the convenience that computer networks bring, there are drawbacks, such as the possibility of privacy breaches and juvenile Internet addiction. To better utilize the application value of computer network technology, which is of practical value to advance human society, it is crucial to fully comprehend the impact of computer networks on human life, adopt corresponding improvement measures for the negative effects, and further optimize the network application technology and functions by combining the future development trend.

2. Computer Network Technology and Its Development History

2.1 Analysis of Concepts Related to Computer Network Technology

Computer network technology is a product of the combination of communication technology and computer technology. A computer network is an arrangement of dispersed, autonomous computers connected using network protocols. Computer and network are both components of a computer

network. Among them, the computer is an electronic computer, commonly known as a computer, which is a modern intelligent electronic device that can run according to a pre-stored program and process massive amounts of data automatically and at high speed. Computers come in various configurations, including desktops, laptops, mainframes, etc. In addition to the conventional varieties, new varieties of computers, including biological, photonic, and quantum ones, have been developed recently. On the other hand, the network utilizes physical links to connect separate, isolated workstations or mainframes to establish a data link, so attaining the goals of resource sharing and communication. A computer network is a system that interconnects multiple computer systems with different geographical locations and their external networks via communication media. It achieves resource sharing and information transfer through the management and coordination of network operating systems and network management software and communication protocols.

2.2 Computer Network Development History

Throughout their development, computer networks have been through four distinct period.

The first period was the mid-1950s when computer networks were in their infancy. The first generation of the computer network in this period was a remote online system centered on a single computer, which constituted a terminal-oriented computer network. Its typical application was the United States-developed airline reservation system, which consisted of a single computer and more than 2,000 terminals throughout the country. As more remote terminals were connected, a Front End Processor (FEP) was installed between the communication line and the central computer to reduce the load on the central computer responsible for data processing. This clarified the division of labor between data processing and communication control and improved the central computer's data processing capacity.

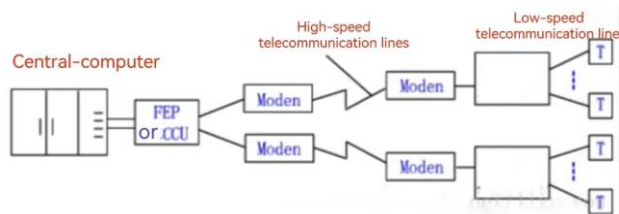


Figure 1: Schematic diagram of front-end processor (FEP) operation

The second period was the mid-to-late 1960s when multiple independent main computers were interconnected by lines to form a computer network. In the late 1960s, the U.S. Department of Defense Advanced Research Projects Agency designed and developed the ARPANET network, which interconnected four mainframe computers from four universities in Los Angeles - the University of California at Los Angeles, the University of California at Santa Barbara, Stanford University, and the University of Utah - using packet-switching technology, through a specialized interface signal processor (IMP) and specialized communication lines for the second generation computer network.

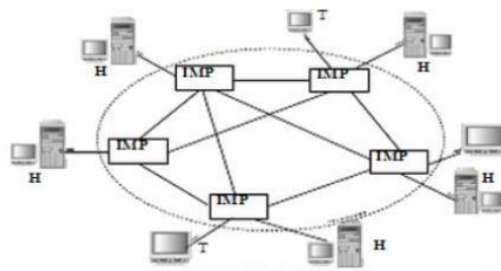


Figure 2: APPA network structure diagram

From the 1970s through the mid-1980s, the third period, research on networking technologies, methodologies, and ideas reached a higher level of maturity. Xerox created Ethernet, a baseband LAN technology that used coaxial cable as the network media, a carrier sense multiple access and conflict detection (CSMA/CD) mechanism, and data transfer rates up to 10MBPS. Numerous significant corporations released their Internet standards, and at that time, a diversity of network standards evolved. The International Organization for Standardization (ISO) created the OSI standard for network connectivity to harmonize the standards. The network created via the standardization of network design, often known as the third generation of computer networks, has grown fast.

In the fourth period, from the mid-1990s to the present, computer networks have evolved in the direction of high-speed and integration, with the emergence of Fast Ethernet, Fiber Distributed Digital Interface (FDDI), Fast Packet Switching Technology (including Frame Relay and ATM), Gigabit Ethernet, B-ISDN, and several other new network technologies; the fourth generation of computer networks is a gigabit-based transmission rate. The computer network of the fourth generation is an intelligent multimedia network with a gigabit transfer rate.

3. Application of Computer Network Technology under Different Fields

After four periods of development, computer networks have grown progressively sophisticated. Combining computer technology with communication technology makes people's lives faster and more efficient and drastically alters their usual production and lifestyle routines.

In education, for instance, the old form of instruction has changed into a new mode of multimedia-assisted instruction and online classroom. In medical care, new types of online consultation and online registration and reservation have evolved in recent years, saving people's time while seeing doctors and giving convenient services to patients. In transportation, based on the online and offline, end-to-end identity recognition integration system, according to the passenger's journey movement accurate service recommendation technology, efficient digital passenger service links, to provide passengers with personalized, convenient travel services. In shopping, people through Taobao, Jingdong, and other online shopping platforms can widely collect the information they need about goods and services, utilizing the network to direct their purchases; In payment methods, people generally used cash transactions in the past, but with the rise of the Internet, there are various payment methods such as online banking, Alipay, WeChat payment, etc. In social methods, with the support of computer networks, an increasing number of people are using social software such as QQ, WeChat, Weibo, Tiktok, and other virtual platforms to make friends and socialize. Because online communication is not limited by geography, time, or space, it can be more effective than traditional methods. Because network communication is not limited by geography, time, or place, people may make more friends and find more people with similar interests, which subtly affects interpersonal relationships and pulls people closer together[1].

4. The Impact of Computer Networks on the Development of Human Society

4.1 Positive Impact

4.1.1 Promoting Economic Development

The fast growth of computer network technology in the twenty-first century has accelerated the growth of corporate e-commerce. Compared with traditional commerce, e-commerce has computer network applications such as advertising, commodity purchase, payment, and logistics [2]. Using advertising as an example, the network has evolved into a new media platform for the public to

receive new products and messages. With the outstanding advantages of unrestricted communication time and space, cost savings, strong influence, strong interactivity, rich content, and various forms, major corporations are paying increasing attention to the network as a medium for advertising, which has produced outstanding publicity effects. In terms of purchasing and paying for goods, the development of internet shopping has altered people's consumption patterns. Modern people's lives are hectic; thus, the ease and effectiveness of internet purchasing are ideal for their demands. Moreover, people may locate the things they wish to purchase online in a few minutes, and there is a vast range of similar goods available online, saving them time and effort. And the reduced operating expenses of online retailers, so the price of items is frequently less than offline brick-and-mortar stores, has become the primary reason consumers choose to buy online. Take Alibaba's Tmall Double 11 campaign as an example: the firm started its first Double 11 campaign in 2009, and on that day, the company's revenue hit half a billion yuan; in 2010, the company's revenue surpassed one billion yuan, reaching 936 million yuan. By 2021, overall revenue reached 540.3 billion yuan, a 10,000-fold increase from 2009's 0.5 billion yuan.

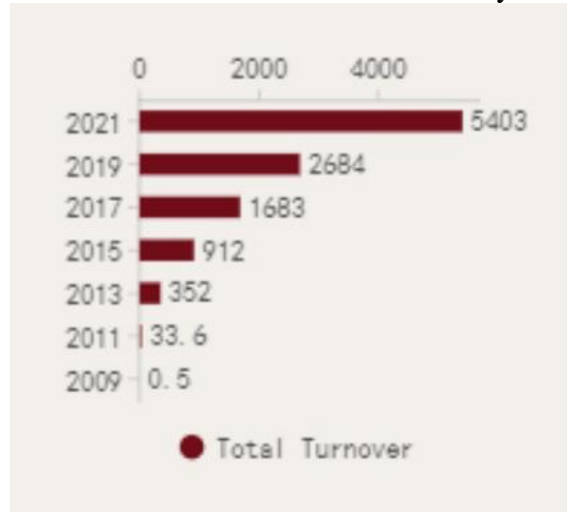


Figure 3: Tmall Double 11 2009-2021 Total Turnover Comparison Figure

At the same time, the rise of online shopping in the development of the logistics industry has played a great role in driving. The development of e-commerce needs the support of an intelligent logistics system. After people buy goods through the Internet, they hope goods can arrive intact and as soon as possible. Especially in the period of large promotional activities such as Tmall Double 11, orders soared, putting forward higher requirements for logistics. For this reason, logistics companies are actively changing to expand service coverage and improve logistics speed to meet e-commerce needs. As can be seen, thanks to the expansion of the network's efficient, convenient and diversified functions, e-commerce has formed a closed loop with sustainable and benign development, thus promoting the development of the economy.

4.1.2 Promoting Political Life

Numerous government external service agencies have built their websites to disseminate pertinent information to the public, achieving the goal of open government affairs and playing a beneficial role in boosting government transparency and embracing public oversight. In addition, the public can connect with functional departments via the Internet, increasing work efficiency.

Many government departments, such as traffic management and city management, have established online service systems, i.e., e-government, which allow citizens to conduct some of their business through the Internet without having to wait in line on-site, greatly facilitating people's lives.

Therefore, it can be stated that the use of computer networks in the political sphere may efficiently monitor the activity of important functional departments, increase the link between citizens and government functional departments, and foster a positive social environment.

4.1.3 Promoting Cultural Development

As a result of the widespread use of computer networks, network culture has emerged as a significant component of contemporary social culture. The Internet facilitates the expression and transmission of network culture. Due to the expansive and accessible nature of the network, individuals from all nations, ethnicities, and professions can freely express themselves on platforms like Tiktok and Weibo, fostering the growth of a network culture that enhances the content and form of social culture.

4.2 Negative Effects

4.2.1 The Negative Impact of Network Information Security

Numerous e-commerce operations require the usage of user information. However, the present defensive mechanisms and transmission protocols have flaws and vulnerabilities that result in frequent network security issues. For instance, hackers steal user information to commit telecommunications fraud; hackers target websites to render them inoperable and engage in nasty competition; etc. The growth of a healthy market economy has been hindered by network information security issues, which have caused a surge in public crises.

4.2.2 Negative Effects on the Development of Young Minds

The accessibility of the Internet facilitates the spread of dangerous information. Many types of information are available on the Internet, including beneficial material, but there is also an abundance of pornographic, violent, and useless information. The abovementioned negative information has a corrosive impact on the brains of adolescents, who are in the process of creating their viewpoint on life, values, and worldview. Numerous adolescents are enticed by false material on the Internet to engage in illicit drug use, blackness, and pornography. The inability of teenagers to effectively comprehend and utilize the Internet will have a detrimental effect on their healthy development.

5. Methods to Maximize the Utility of Computer Network Applications

5.1 Response Tactics to Lessen Adverse Effects

5.1.1 Various Steps to Improve Network Information Security

According to pertinent data, practically every Internet user nowadays, when computer networks are widely used, has experienced the phenomenon of being attacked by viruses and Trojan horses or having their accounts and passwords stolen. It is clear that the extremely effective information dissemination network conceals a significant amount of stolen links, spam, unwanted content, etc., which continuously endangers people's lives and property safety. It may be urgent to strengthen network information security.

First, it is important to raise people's awareness of the importance of network security awareness, the state of network security in China, the country's security initiatives, common network attacks, and network security traps. Second, we should improve people's screening and prevention skills for

bad information and trap websites. Second, intensify technical research and development of fundamental computer network technologies, work toward localizing key pieces of equipment, and design a mechanism for ensuring network and information security that is protected by independent intellectual property rights[3]. Third, strengthen the legal basis for network information security by clarifying the rights and responsibilities of regulators, operators, and users and improving the system of rules and regulations pertaining to computer networks.

5.1.2 Increasing Young People's Access to Ideological Education

In order to combat the issue of young people being exposed to harmful websites that poison their minds, we should first intensify our efforts to clean up the Internet, crack down on websites that promote gambling, drug use, and pornography, and promote the development of high-quality websites that disseminate a variety of wholesome, positive, and accurate information. Second, through promoting our superb traditional culture and opposing the intrusion of unfavorable material at their level, we should strengthen propaganda and education to improve young people's moral character.

5.2 Suggestions for Improving Computer Networks' Practical Applications

People's material and cultural lives are getting richer and richer along with the economy and information network technology, and as a result, there will be an ever-increasing need for computer networks' convenience, security, diversity, and experience. The market is determined by demand, and computer network technology will advance in the direction of satisfying these needs. First, future computer network technology will combine more humanized components, pay more attention to services and experiences, and fully realize the value of intelligent living. This is in line with people's individualized demands. Second, as smartphones, tablets, and other mobile terminals gain popularity, computer networks and mobile communication technologies will be more thoroughly integrated, giving users access to more sophisticated application services. Third, there will be a wider range of applications for computer network technology. Currently, computer networks are used in a variety of industries, including enterprise production, scientific research, and the communications industry. Computer networks will eventually permeate every aspect of people's lives, advancing civilizational advancement and social and economic development.

6. Conclusions and Recommendations

Taken together, the above analysis shows that the development of computer networks has both advantages and disadvantages for the development of human society. On the whole, the benefits of computer networks far outweigh the disadvantages. However, at present, there are still negative effects of computer networks, and it is necessary to further reduce or eliminate the negative effects of computer networks on the progress of human society by taking measures such as "improving network security, increasing efforts to clean the network, and increasing efforts to educate young people's minds"; increasing research and development efforts in application technology and service experience, and optimizing functions to make the computer network play a greater application value.

References

- [1] Zhang Guanggen, Chen Yun. (2020). *The application of computer and network to human life [J]. Science and Technology Wind* (12):89-90;
- [2] Bian Chengmin, Chen Zixi. (2022). *Exploration of the impact of computer network technology on regional*

economic development [J]. Economist (07):129-130;

[3] *Zhong Xibao, Ruan Limei, et al. (2022). Discussion and application of computer network security technology [J]. Digital Communication World (06):141-143.*