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Data Communications and Computer Networks: Research and Impact

Sinek Mehuli Br Perangin-angin
Institut Teknologi Dan Bisnis Indonesia, Indonesia
E-mail: sinekmehulibrperanginangin@itbi.ac.id

Abstract

Science and technology have brought society to an advanced level. The use of human labor, which is becoming increasingly scarce, often results in people losing their jobs because their tasks have been replaced by equipment or machines. As a means of providing information and communication, computers can be used as a means of the Internet. Through the Internet, people can search for various information and communicate. Obtaining information for personal life, such as information about health, hobbies, recreation, and spirituality, is the role that this application of information technology can play. In addition to the benefits, it turns out that information and communication technology devices also have negative effects on their users. As a result of inappropriate or irresponsible use by users, these negative effects occur. Some of these negative effects are 1). Kids spend more time watching TV than doing other things (such as studying and playing sports), 2). Children lose the ability to mingle with society and tend to be comfortable with online life, 3) Copyright infringement, 4). Cybercrime, 5). Spread of computer viruses, and 6). Pornography, gambling, fraud, violence. The ways to overcome these negative effects are: 1). Build relationships with people you already know, 2). Find a positive community that often meets in the real world, 3). The need for law enforcement, which involves the establishment of Internet police, 4). Avoid the use of cell phones with sophisticated features by minors and supervise the use of cell phones, 5). Reading more books that are educational and faith-based as well as computer applications that are educational in nature, and 6). The need for time management in front of the computer or television.

Keywords: *data, communication, computer, networks*

1. Introduction

Initially, a computer could only be used by itself (stand-alone), but the development of digital technology has allowed a computer to communicate with other computers. In simple terms, using a cable and a communication port, two or more computers can be connected and work together. When two computers (A and B) are connected to each other, some of the things that can be done include Computer A can have access to files on computer B, computer A can have access to computer B's disk drive, computer A can send data to computer B, and so on. Computer networking has the word computer in it. This is because the core component of a computer network is a computer. Therefore, you must first recognize what is meant by a computer before you enter a computer network. It's really changed from one dedicated disk for corporate use to an all-purpose device that allows you to communicate and stream in real time. Data communication between computers allows users to send and receive data to and from other computers. It can also be used by a company to communicate data both to other companies as external information users and to employees as internal users. The principles and methods of communicating data are discussed in the next chapter of this paper. The rise of the Internet can no longer be blocked due to the rise of globalization in Indonesia.

So far, scientific development has brought society to a new stage, a stage using tools that are the result of technology. These tools can not only directly assist us in carrying out

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our activities, but can also provide us with information and entertainment. With the existence of these tools, we begin to be burdened so that our body movements become more and more passive. The use of human labor is becoming smaller and smaller.

The diminishing use of human labor often results in people losing their jobs because their tasks have been replaced by devices or machines. This phenomenon will become more and more prevalent as the creation of devices that replace humans increases. In fact, in developed countries such as Japan, China, America, Germany, and developed countries in continental Europe, the creation of such equipment is unstoppable. Indonesia is an easy target for these developed countries to market their products. One such device is the computer.

Computers have now penetrated all aspects of life. In companies, offices, both private and public, computers have been used to simplify and speed up their work. Nowadays, computers can also be a means of entertainment for its users. Through computers, people can listen to songs, watch movies, and play games. The most popular use of computers today is as a means of providing information and communication. As a means of providing information and communication, computers can be used as a means of the Internet. And there are negative and positive impacts produced by today's technological developments related to people's lives.

2. Reseach Methodology

Descriptive qualitative research methods using a case study approach were used in the research conducted by the author. In this research, the criteria of its effectiveness are measured after revealing only the facts found about the object of study. According to Moleong (2012), qualitative research is a research that aims to understand the phenomenon of what the object of study is experiencing, including how it behaves, perceives, motivates, and acts, in a holistic way and through descriptions in the form of words and speech, in a special natural setting, and through the use of various natural ways. The case study approach was used to research the marketing function of the company.

3. Result and Discussion

Computer networks are important. A network makes it easier to communicate and share information by allowing more than one computer to talk to each other. From games to the Internet. Computer networking has the word computer in it. This is because the core component of a computer network is a computer. Therefore, we must first recognize what a computer is. Computers were originally computing tools (computer = to calculate). But computers have now evolved into an integral component for communication, entertainment, and educational tools.

Understand Computer Networks According to several experts such as Sandhykara, Computer Networks are the relationship of two or more separate computer systems, through communication media to communicate data with one another to share resources. According to Jafar Noor Yudianto (2007), a computer network is a system of computers sharing resources (printers, CPUs), communicating (email, instant messaging) and accessing information (web browsers). The purpose of a computer network is that any part of the computer network can request and provide services to achieve its goals.

Meanwhile, according to Umi Proboyekti, a computer network is a group of many computers that are separate but interconnected in performing their tasks. For example, two computers are said to be connected if they can exchange information with each other. The form of connection can be through: copper wire, optical fiber, microwave, communication satellite.

The purpose of computer networks :1). Networks allow for more efficient resource management: For example, multiple users can share a single high-quality printer instead

of having a low-quality printer at each desk. In addition, network software licenses can be less expensive than separate standalone licenses for the same number of users, and CPU, memory, and disk usage can be shared; 2). Networks help keep information reliable and up-to-date: A well-managed centralized data storage system allows multiple users to access data from different locations and restricts access to data while it is being processed; 3). Networks help speed the process of sharing data. Data transfer on a network is always faster than other non-network means of data sharing; 4) Networks allow workgroups to communicate more efficiently. Electronic mail and messaging are at the heart of most networked systems, along with scheduling systems, project monitoring, online conferencing, and groupware, all of which help teams work more productively; 5)

Networking helps companies serve their customers more effectively. Remote access to centralized data allows employees to serve customers in the field, and customers to communicate directly with suppliers.

To accomplish the same goal, each part of the computer network requests and provides services. The party requesting the service is called the client, and the party providing the service is called the server. This architecture is called a client-server system and is used in almost all computer network applications.

There are several types of computer networks based on the range or area consisting of: 1). LAN (Local Area Network): LAN is a computer network that is often used to connect personal computers and workstations in a company's office to share resources (such as printers) and exchange information that is still in one area. This network usually consists of computers, printers, and other devices; 2). MAN (Metropolitan Area Network): Almost the same as LAN, which is a larger version of LAN and usually uses the same technology as LAN. MANs can cover nearby corporate offices or even a city and can be used for private or public purposes. MANs are capable of supporting power and voice, and can even connect to cable television networks. MANs are typically used in an urban area, not just one location. The area that can be covered is up to 50 KM. This MAN is a series of LANs that are larger in size and distance; 3). WAN (Wide Area Network): This type of network provides a wider service than MAN, which can connect an area and even countries and continents. WAN is basically a collection of multiple LANs in multiple locations, so a device is needed to connect them, and we call this device a router. It can be said that the WAN network is the Internet network as we know it today; 4). W.Lan (Wireless Local Area Network): Wireless network is a solution for communication that cannot be done with a wired network. The existence of a wireless network makes it easier for users to access the desired data in places that are not covered by cable networks, for example, when mobile / traveling; 5). PAN (Personal Area Network): Is a network between two or more computer systems that are not too far apart. Typically, this type of network is only 1 to 5 meters away. We use this type of network very often, for example, when we connect a computer to a cell phone, handset, or other similar device.

The definition of computer network topology is a way or concept to connect several or many computers at once into an interconnected network. And each type of computer network topology will be different in terms of data transmission speed, manufacturing costs, and ease of maintenance. And also each type of computer network topology has its own advantages and disadvantages. there are many kinds of topologies such as ring, star, bus, mesh, and tree topologies which will be discussed in this computer learning article.

BUS topology is the earliest topology used to connect computers. The transmission media used in this topology only uses one long cable equipped with several terminals, and at the end of the cable must be terminated by a terminator. Coaxial cable is the transmission medium in this topology. Even though it looks simple, bus topology is very rarely used in building network systems.

This may be due to several shortcomings, including the possibility of data flow collisions, and also if one of the devices has a fault, the network is immediately down. the

bus topology uses a single cable or central cable where all workstations and servers are connected. Each computer uses BNC plugs to connect to this cable, and each end of this cable needs termination.

Token RING topology in which all workstations and servers are connected so that a circle or ring pattern is formed. Each workstation or server will receive and pass information from one computer to another, if the addresses in question match then the information is received and if not the information will be passed. So if one computer will send data or messages to another computer, it must pass through the computers on the workstation line.

This makes the hub/switch the center of the network and controls traffic, so if computer 1 wants to send data to computer 4, the data will be sent to the switch and sent directly to the destination computer without passing through other computers. This computer network topology is the most widely used now because it has more advantages.

This MESH topology each computer is connected to each other. In other words, each computer can directly communicate with other computers. As a result, to implement this topology, each computer must have many interfaces so that it can connect to other computers. Tree topology is also referred to as a merger of star topology and BUS topology. This topology is also commonly referred to as a multilevel topology, and is very suitable for implementation in multi-storey offices. This Tree type computer network topology is most ideally used in computer network systems. In a Tree network, there are several levels of nodes or nodes. The center or higher level node can control the nodes below its level. This topology combination supports future upgrades of computer networks, much better than bus or star.

Using a transmission medium such as a wire or cable, data communication is the process of exchanging data between two devices. For data communication to occur, the devices must communicate as part of a communication system, which is a combination of hardware (physical equipment) and software (programs Four fundamental properties - delivery, accuracy, timeliness and jitter - determine the effectiveness of a data communications system. It is a combination of two different techniques, namely a combination of communication techniques and data processing. There are several types of data communication, namely 1). Terrestrial infrastructure: Access through wired and wireless media. To build this terrestrial infrastructure requires high cost, limited bandwidth capacity, high cost because using cables is not affected by weather factors so the signal used is quite strong; 2). Via satellite: Access using a satellite. The area covered by satellite access is wider, so it can reach a location that cannot be reached. However, using terrestrial infrastructure, it takes a long time for the communication process to take place. Due to interference caused by solar wave radiation (solar eclipse), which occurs at its worst every 11 years.

There are several basic characteristics of data communication which consist of 1). Delivery: The system must send data to the appropriate destination. Data must be received by the intended equipment/user, and only by the intended equipment/user; 2). Accuracy: The system must deliver accurate data. Data that has been altered in transmission and leaves the source, uncorrected data cannot be used; 3). Timeliness: The system must transmit data at the right time. Late data transmission is useless. In the case of video and audio, timely delivery means delivering the data as it was produced or as it originally appeared, in the same order in which it was created, and without significant delay. This type of delivery is called real-time transmission; 4). Jitter. The term jitter refers to the variation in the time of arrival of packets. Audio or video packets are delivered with an uneven delay.. For example, suppose video packets are sent every 3D ms. If some of the packets arrive with a delay of 3D ms and others with a delay of 4D ms, this will result in uneven video quality.

A data communication system has five components consisting of: 1). Message: Messages are information (data) to be communicated. Popular forms of information include text, numbers, images, audio, and video; 2). Sender is the device sending the message. This may include a PC, work station, phone, videocamera, etc. 3) Receiver: This is where you can send and receive messages. This may include a computer, work station, phone handset, TV, etc. 4). Transmission medium: Transmission media is a physical means by which information is transmitted from sender to recipient. Some examples of transmission media include twisted-pair cable, coaxial cable, fiber optic cable, and radio waves; 5). Protocol: Protocol refers to the rules that govern data transmission.. It is an agreement between devices that communicate with each other. Without protocols, two devices may be connected but unable to communicate, a person who speaks French cannot be understood by a person who speaks Japanese.

Data transmission is the process of sending data from a data source to a data receiver using a computer/electronic media. To find out more about data transmission along with the process and work steps. Data Transmission Media is useful for transmitting data, a medium is needed, this media itself has several types such as buses, cables commonly found on internal computer devices, while for external computers in data transmission can use external cables (Wired) and Wi-Fi (Wireless / Wireless).

This cable / wired is commonly used to carry out the data transmission process, there are several types, including 1) Stranded cable: UTP Wired or commonly known as Unshielded Twisted Pair, this cable is commonly used to transmit through computer networks such as in offices / internet cafes. Apart from UTP, STP (Shielded Twisted Pair) in which there are several wires in one bundle can also be used to transmit data; 2) Coaxial (coaxial cable): This cable consists of two kinds of conductors separated by using insulators; 3) Optical fiber: This cable is commonly referred to as (fiber optic), which is a cable that can transmit information by conducting information / data using light waves.

While Wireless or known as Wi-fi is a unguided transmission media, which can only transmit data and is not used as a guide. Data transmission contained in this network is usually carried out using a tool known as an antenna or transceiver such as Radio, Microwave, Infrared.

Transmission line is a tool that is able to send information using other equipment. This data transmission path is divided into 3 types, namely 1) Multicast Is a communication process that occurs through one tool with another tool. In this process each connected device / media can communicate using the device that contacts it; 2) Broadcast Is a process in sending data or information from one tool to other tools. In this process, the device receiving the information cannot respond back to the device sending the data / information; 3) Unicast is an information contact that occurs on a device with one other device.

Before using data transmission (data transmission), one of the important factors to consider is the Configuration of the Data Transmission Path, in this case the configuration is divided into several types, namely 1) Point to point: In this configuration the media or equipment is connected between one equipment and another without being divided. Multiple computer devices, such as printers, connected directly to the PC/computer are typically used in point-to-point configurations; 2) Point to multipoint: In the process also called access multipoint, where one device / media can be connected to several other devices. Examples of data transmission processes that use this configuration are television broadcasting, radio broadcasting where one radio / television transmitter can be accessed / connected to several radios / televisions.

The transmission channel in this data transmission process can also be interpreted as a pipe that connects two units of equipment to send their data. Where the two connected channels make it possible to transfer data in the channel or path. To determine the direction of transmission in the channel, it is grouped into 3 parts, namely: 1)

Simplex: This transmission direction is also said to be one way transmission, in the direction of the Simplex transmission channel can only communicate / transmit in one direction only as found in television transmitters or radio transmitters. This transmission direction allows the reception of data / information to be passive and cannot provide a response back to the sender of information / data; 2) Half Duplex: Bidirectional communication is the term commonly used for bi-directional data transfer. (Half Duplex) must take turns; 3) Full Duplex: This transmission direction is also called both way transmission. Where both connected devices can transmit data simultaneously. When communication is happening, each unit can send and receive data at the same time.

This transmission mode is data sent from a medium or device and received by another medium / device. This transmission is also one of the important concepts in computer systems, with this transmission mode allowing a device to be connected to communicate with other devices. This serial transmission has several transmission methods, namely 1) Synchronous Transmission, this data transmission mode is also known as synchronous transfer mode (STM). In the data transmission process is arranged in such a way as to have the same settings, so that when the data is sent and received properly by the device; 2) Asynchronous Transmission, this mode is usually referred to as Asynchronous Transfer Mode (ATM). This mode is usually often used by someone to send and receive data between two devices. In this mode, the clock is used by both devices, not working in sync with each other.

Basically, data transmission has 3 parts consisting of 1) Transmitter Transmitter or transmitter is a signal sending device, which is usually an analog signal sent to a receiver or receiver that will receive the signal and convert it into a digital signal; 2) Receiver is an electronic device that captures electromagnetic waves or radio waves usually with an antenna. The receiver also functions as a modulator converting from radio waves to a machine-readable format; 3) Media. Transmission media is a medium that connects the sender and receiver of information (data), because of the long distance, the data is first converted into codes / signals, and these signals will be manipulated in various ways to be converted back into data.

There are several positive impacts of the presence of computer data in the technology sector such as Various hardware devices such as hard drives, printers, CD-ROMs, drives, and modems can be used by a number of computers without the need to remove and reinstall them. Easy access to information Computer networks enable access to information. A person can travel anywhere and still be able to access the data contained on the server when needed. Speeding up the flow of information The flow of information is currently very fast, even tends to be uncontrolled until now. However, this is one of the positive impacts, because it can provide information about an event quickly, even though it is sometimes inaccurate and imprecise. Facilitate communication with other individuals who are far away Communication is one of the most important things that must be established by humans, as social beings. With the existence of data communication so that information and communication technology is also growing, it is now much easier to communicate with other people. Support the speed of communication With the support of computer networks, communication can be done faster. Pre-computer users can easily send electronic mail and can even chat directly through writing (chatting) or teleconferencing.

In addition to providing benefits, it turns out that information and communication technology equipment also has a negative impact on its users. The negative impact arises as a result of the wrong or irresponsible use of the user. Recently, people are more comfortable gathering friends in cyberspace rather than being active in real organizational activities that can provide the quality of friendship relationships that are more concrete and intents.

The negative impact of the development of information and communication technology is that children spend more time watching TV than doing other things (such as studying and sports). With busy parents who do not have enough time to pay attention, accompany & supervise children. Children spend more time watching TV. In a week children watch TV for about 170 hours. What do they learn during that time? They will learn that violence solves problems. They also learn to sit at home and watch instead of playing outside and exercising. This takes them away from important life lessons, such as how to interact with peers, learning how to compromise and share in a world full of other people.

Children then lose the ability to blend into society and tend to be comfortable with online life. Many people have hundreds or even thousands of friends on Facebook but in the real world, they only have a few close friends who accompany their daily lives. . Even though if something crucial happens to our lives, those who can help us are not the people we know in the real world. We are not the people we know in the virtual world but the people who live around us.

Another negative impact is Copyright Infringement, Intellectual Property Rights (IPR) which is an exclusive right granted by a regulation to a person or group of people for their creative work. IPR includes two categories, namely Copyright and Industrial Property Rights. Copyright is an exclusive right for creators and recipients to publish or reproduce their creations or give permission for it without reducing restrictions according to applicable laws and regulations. Meanwhile, Industrial Property Rights include patents, trademarks, industrial designs, integrated circuit layout designs, trade secrets and plant varieties. The law governing Copyright is Law No. 19 of 2002 which describes several forms of protected creation consisting of various fields such as science, art and literature. In copyright regulations there are some rights obtained by someone or some people who have legally become copyright holders, namely exclusive rights, economic rights and moral rights. Penalties or sanctions given for violators of copyright, is a criminal prosecution or civil suit.

Crime on the Internet. This crime does not recognize national and territorial boundaries, anytime and anywhere can appear. The acts committed are illegal or unethical, using equipment related to computers and the internet, and the losses caused are far greater than ordinary crimes. Usually, the perpetrators are people who have a good understanding of the internet, computers and their various applications. Types of internet crimes: Unauthorized Access, Cyber Sabotage and Extortion, Cyber Espionage, Data Forgery, Illegal Contents, Infringements of Privacy, Phishing, Spamming, Offense Against Intellectual Property, and Carding.

The spread of computer viruses is one of the impacts that can be accepted. A computer virus is a program that is relatively small and parasitic in nature that is able to live and duplicate itself like a file or folder and is very disturbing to infected computer users. Computer viruses spread through various media including the internet and file storage such as CD-ROM, Diskette, Flash Disk, Hard Disk, and Memory Card.

Pornography, gambling, fraud, violence also have a negative impact. Various ICT equipment such as TV, internet, broadcasts and shows many acts of pornography, gambling, fraud, and violent shows that are quickly imitated by the audience.

4. Conclusion

Living in this modern era, we cannot escape the influence of the development of information and communication technology. In education, business, other communication and entertainment, the development of information and communication technology has brought us many benefits. In addition to these positive benefits, the development of technology and information also has negative effects. In order not to eliminate the positive effects, these negative effects should be wisely minimized.

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