Chapter 3: Telecommunications and Network Technologies

Overview

This chapter familiarizes administrative assistants with telecommunications. These technologies are used for both internal and external communication systems in an organization; telephone services, computers, and networks are integrated to provide verbal and data communications to expedite business operations.

Lecture Notes

A. Telecommunications Components and Functions

Communication between computing technologies has become very important. With the deregulation of communication services and improvements in telecommunications equipment, fast, global communication is available.

1. The **Telecommunications Industry** was deregulated in 1984. Then, in 1996, the Telecommunications Deregulation and Reform Act widened deregulation by opening the market for telephone companies, broadcasters, and cable companies. Other countries are starting to make telecommunications services operate in an open, competitive market.

2. **Telecommunications Software** controls the entire transmission process including:

    - Establishing an interface between the sender and receiver
    - Routing messages along the most efficient path
    - Ensuring that the right message is sent to the correct receiver
    - Performing editorial data checks for transmission errors
    - Converting message speeds and formats

Telecommunications Hardware supports the data transmission and reception functions

a. Telecommunications processors are necessary for the communications function.

    - A modem is a device that converts digital data codes to analog signals and vice versa; sender and receiver.
    - A front-end processor is a small, specialized computer that communicates with the main system; manages telecommunications tasks.
    - A multiplexer allows one channel to carry data from multiple sources at the same time; sender and receiver.
    - A bridge connects two similar networks.
    - A gateway connects two dissimilar networks; translates the differences.

b. Network Interface Card (NIC) is an expansion card that connects a computer to a network.

3. **Telecommunications Channels**

Channel	Advantage	Disadvantage
Twisted wire – conventional telephone line, insulated copper wires twisted into pairs, widely used, DSL provides high-capacity digital transmission over existing copper lines, private (tie) lines are available	Inexpensive, easy to install	Slow, low bandwidth, subject to errors, low security
Coaxial cable – thickly insulated copper wire, offers baseband (analog, 1 signal at a time) and broadband (digital, simultaneous transmissions)	Higher bandwidth, less susceptible to interference (compared to twisted wire)	Difficult to install, inflexible, medium security
Fiber optic cable – thousands of glass fibers used to transmit light beams	Very high bandwidth, high transmission accuracy, very good security	Difficult to install
Microwave – wireless, earthbound system that transmits high-speed radio signals between microwave transmission stations	High bandwidth, lower cost than tethered cable	Needs unobstructed transmission line, susceptible to environmental interference
Satellite – wireless, communication systems placed in orbit to accept (uplink) and retransmit (downlink) transmission signals from earth microwave transmission stations	High bandwidth, serves large area	Needs unobstructed transmission line, encryption required (security), transmission time delay
Wireless networks – short distance connections, uses low-frequency radio or infrared technology, infrared ports on many notebook computers	Easy to install	Short-distance transmission, transmission interference, low security
Bluetooth – transmits data around corners and through objects	Not a line-of-sight channel	Security, transmission speed, cost
Cellular radio and mobile computing – radio transmission of voice and data, PDAs	Convenience	Service range, medium security

B. Telephone Communications

The telephone has played an important role in American business and in life since its invention; computer use has expanded its capabilities.

1. Many **Telephone Services** are available.
   a. Basic services are available for a flat rate plus an additional charge for specific extensions used in the organization; long distance charges are in addition to the basic service.
      - Local calls are made within the specific service area.
      - Direct-distance dialing is used when long distance calls are made without operator assistance.
      - Person-to-person calls use the operator's assistance to connect to a specific person at the number you are calling.

- Collect calls use the operator to bill the person receiving a call.
- Card calls use a credit card for billing a specific card.
- Message unit calls utilize a standard base rate to determine the cost of a call.

b. Special services can be helpful when conducting business

- Directory assistance is used to locate telephone numbers; can be accessed by telephone or using the Internet.
- Audio conference calling allows three or more people to talk to one another; large groups require assistance with the connections.
- Emergency 911 calls allow operators to pinpoint the location from which the call is made.
- Text telephones allow people with disabilities to communicate over the telephone.
- Cellular calls can be received anytime and anywhere, making business more mobile; should not interfere with privacy.
- Camera phones are cell phones that have the ability to take pictures; bring up new privacy issues.
- Marine calls are made from a ship at sea; utilize the marine operator.
- International direct-distance dialing and operator assistance allow calls to be placed overseas; many people are using international calling cards.
- WATS line is wide area telephone service that subscribers use when they make a large number of calls to a specific area; paid for a specific time instead of number of calls or minutes used.
- INWATS line is inward wide area telephone service.
- Foreign exchange provides customers with a local number when calling a business in another city; toll charge is billed to the listed number.

2. **Answering Services** are used to answer phones in your absence.

- An independent answering service has an operator to answer calls and take messages; messages can be picked up or e-mailed to the recipient.
- Answering machines use a prerecorded message to answer calls, and a message is recorded; delivery options are available.
- Voice-mail service is available from the local telephone company for an additional charge.

3. **Special Telephone Feature**s

New features are constantly added to make communication easier and more efficient.

a. Call waiting alerts people of incoming calls when they are already on the phone.

b. Call forwarding routes incoming calls to another number.

c. Speed calling allows phone numbers to be programmed into a telephone and then accessed with a code.

d. Caller ID identifies the caller's name or phone number; allows people to know who is calling before they answer the phone.

e. Repeat dialing allows a person to redial the number dialed previously; helpful when calling a number that is busy.

f. Call trace allows a call to be tracked back to where it was made; helpful when receiving prank calls; paid for per use.

g. Taped announcements play recorded information for incoming calls.

4. **Telephone Systems** are used by an organization to provide the internal and external communication service.

a. Private Branch Exchange (PBX) is a special-purpose computer originally designed for handling business calls. Today the switching system accepts and transmits voice and data using regular telephone lines. The system is handled by commercial vendors. No special wiring is required, but the low bandwidth prevents interactive video and high-resolution photos from being transmitted. The system can include automated telephone features.

b. Computerized Branch Exchange (CBX) is a computer-based system for automated telephone switching and management; however, it only serves telephone requirements (not data). The system can include automated telephone features.

c. Central Exchange System (CENTREX) is a system leased from the regional telephone company. In this system, each extension is assigned a 7-digit number for outside access, and direct incoming and outgoing calls are available at each extension phone. The system can include automated telephone features.

5. **Telephone Equipment**

Some equipment is necessary to take advantage of the special features of the system.

a. Key (or button) telephone is one phone connected to multiple lines with a button identifying the line that is currently being used.

b. Touch-tone telephone is a phone that has buttons for all 10 digits and the # and *. These phones are required for the computerized phone systems discussed.

c. Speakerphone is a phone with a microphone and speaker; it is useful when the call involves more than one person at a single location.

d. Call director is a desktop unit used to manage up to 100 lines; it can be connected to a switchboard or intercom system.

e. Pager is a device that signals the carrier of an incoming call; the number calling is displayed so the call can be returned.

f. Paging system is an in-house system used to signal people in the office when they are needed.

g. Headset is worn for extended time on the phone; it includes the microphone and ear piece without having to hold it in your hand.

C. Communication Networks

Communication in a computer environment transmits documents, graphics, images, or files. Communication includes the sender, receiver, and a communication channel for delivery. Data need to be converted into bits (digitized). Transmission requires adequate bandwidth.

1. **Computing Models** for processing and transmitting data/information:
   a. Centralized computing was not a true network in the 1970s because there was no sharing of information or resources. Today used in conjunction with one of the other models.
   b. Distributed computing required networks so information and services could be shared.
      - Peer-to-peer computing puts all processing power on user's desktop PC; computer assigned through operating system; utilizes unused disk space and processing power.
      - Client/server computing uses a computer as a server with clients (PCs); tasks shared between client and server.
   c. Collaborative computing emerged in 1990s; networked to accomplish integrated operations and link common processing tasks.
2. **Network Categories** are based on the size of the network.
   a. Local area network (LAN) is a private network, supports communications within an office building or within a few miles; it links devices so data can be shared with greater speeds.
   b. Wide area network (WAN) can use public or private lines; microwave or satellite transmission for long-distance communication. There are five categories.
      - An enterprise network connects distributed networks of a single organization into a single network.
      - A metropolitan area network is used to connect LANs with fiber optic cable for high-speed data transmission.
      - A global network is an international network of networks; the Internet is the world's largest.
      - A virtual private network is used by many organizations for intranet and extranet security; firewalls are used.
      - A value-added network is shared by many organizations who pay a subscription fee plus an additional charge for data that is transmitted. It is a private, multimedia, multipath, third-party managed, medium-speed WAN.
3. **Network Topologies** describe the structure of the network.

a. In a bus network, a communications channel attaches all peripheral devices at any point on a single circuit of limited length. Signals can be sent from either direction; performance is reduced during periods of high traffic.

b. A star network uses a central computer (node) to process all tasks before being routed to the appropriate network device. If the central CPU is down, all shared processing stops.

c. A ring network eliminates the reliance on a central decision point for WANs; a unidirectional transmission line forms a closed path linking CPUs at remote locations. If a CPU or peripheral is down, a bypass relay is a solution to network reliability.

Additional Resources for Students

Recommended readings (no texts should be more than two years old):

- Fuller, Floyd and William Manning. *Computers and Information Processing*.
- Groneman, N. and J. Meroney. *Information Systems Applications, Evaluation, and Selection*. South-Western Publishing Co.
- Long, Larry and Nancy Long. *Introduction to Computers and Information Systems*. Prentice-Hall, Inc.
- Meyer, Marilyn and Roberta Baber. *Computers in Your Future*.
- Norton, Peter. *Introduction to Computers*.
- O'Leary, Timothy J. and Linda L. O'Leary. *Computing Essentials*. McGraw-Hill.
- Regan, Elizabeth A. and Bridget N. O'Connor. *Automating the Office – Office Systems and End-User Computing*. Macmillan City.
- Ricks, B., A. Swafford, and K. Gow. *Information and Image Management*. South-Western Publishing Co.
- Robek, Brown, and Stephens. *Information and Records Management*.
- Shelly, Gary and Thomas Cashman. *Learning to Use: Microcomputer Applications*. Boyd and Fraser Publishing Co.
- Silver, G. A. and M. L. Silver. *Data Communications for Business*.
- Tilton, R., J. Jackson, and S. Rigby. *The Electronic Office: Procedures and Administration*. South-Western Publishing Co.

Current issues of periodicals or business publications are also an excellent resource. Some of the following periodicals have an accompanying Web site.

Current Periodical	***Web Address***
Gregg Reference Manual	

IAAP Complete Office Handbook	http://www.iaap-hq.org/products/handbook.htm
Modern Office Technology	
Network Computing	http://www.networkcomputing.com/
Networking Management	
OfficePro	http://www.iaap-hq.org/officepro/toc.htm
PC Computing	