

Solutions – Chapter2

Critical Thinking Exercise

Choosing Your Next Computer

Review Questions

1. An Intel Atom will probably best suit your needs. Multiprocessing would be ideal because of the increased processing power.

The x86 processor family dominates in data centers, and it is the world's predominant personal computer CPU processor. The Intel Atom is an ultra-low-voltage CPU that is designed to generate less heat than the x86 chip. As a result, it requires less power and fewer additional components to dissipate the excess heat. ARM processors are used in computers that run Android, iOS, and other operating systems found in mobile devices such as laptops and smartphones. They can execute a small set of simplified instructions more quickly than complex instruction set computers based on the x86 processor and require less power and generate less heat.

2. As memory is always improving, you should select a computer within your budget with the greatest amounts of memory.

Critical Thinking Questions

1. Student responses will vary, but will probably include flash drives and external hard drives.
2. Student responses will vary. Input devices can include a keyboard, mouse and even a digital camera. Output devices might include a display screen and a printer.

Critical Thinking Exercise

Upgrading an Organization's Computers

Review Questions

1. If selecting only one class of mobile computer, laptops are probably the best choice to meet the needs of each person in the organization.

2. Smartphones and tablets are very similar and can usually do the same functions, such as run apps, access the Internet, capture and view photos, listen to music, play games, etc. In addition, smartphones have cell phone capabilities. Laptops are capable of running worker productivity software, playing games, listening to music, watching videos and accessing the Internet. Notebooks and ultrabooks are smaller versions of laptops which have sufficient processing power to run nearly everything a laptop can. Because laptops can match most desktop computers they are usually preferred by workers in organizations.

Critical Thinking Questions

1. Student responses may vary. You might want to select representatives from each department to help define the unique user needs per department. For example, project team could include managers in marketing, sales, human resources, finance, and accounting.
2. Student responses may vary. It's probably a better idea to select different portable computers based on users' needs. The users will probably fall into either a laptop or a notebook/ultrabook category. It might be more cost effective to get the more powerful computer for the only the users who require the extra power or hardware.

Critical Thinking Exercise

Moving to Green Computing

Review Questions

1. Green computing is concerned with the efficient and environmentally responsible design, manufacture, operation, and disposal of IS-related products. As a leader in the development of renewable energy sources, a move to green computing which will help reduce the organization's power need and usage seems to be in line with the organization's core values.
2. Consolidating the three data centers into one will help reduce energy usage and cost, however it is risky from a disaster standpoint. With multiple data centers, there are backup centers when a disaster strikes any one.

Critical Thinking Questions

1. Student responses may vary. The organization might want to replace any old or outdated hardware for new, more energy efficient hardware.

2. Student responses may vary. If replacing old hardware, the organization facing the challenge of safely recycling or disposing of said hardware.

Critical Thinking Exercise

Establishing a Corporate App Store

Review Questions

1. Student responses will vary. Some tasks might include keeping a daily to-do list or tracking time spent on creating the monthly budget.
2. Student responses will vary. Some tasks that would have an impact on the workgroup might include sharing calendars with coworkers or sharing the latest budget spreadsheet (file sharing). Some tasks that would have an impact on the enterprise might include payroll related tasks or managing accounts receivable.

Critical Thinking Questions

1. Student responses will vary. When employees all use different apps there is the real risk of data security, especially if the employee is transmitted sensitive data. This could apply to all three spheres of influence. Another risk could be associated with the compatibility of the data from different apps. Is one app compatible with another coworker's app?
2. Student responses will vary. Providing a corporate app store give employees access to apps that are safe, effective and have been approved by the organization. It helps control software expenses and allows safe sharing and collection of data. On the other hand, when companies have app stores, there is the tendency to avoid new apps. Employees who want to stay current might feel like the company is sluggish in this regard.

Critical Thinking Exercise

Migration to New Operating System

Review Questions

1. Some advantages of migrating all employees to Windows 10 could include:
 - a. Cost savings: The organization needs to license only one OS
 - b. Standardized software: All employees will be working with the same OS and same set of software which will help reduce or eliminate compatibility issues between employees

- c. Standardized support: IT only has to worry about supporting one operating system).
2. Some disadvantages of all employees migrating to the same operating systems might include:
 - a. Employees' resistance to change
 - b. Compatibility issues: Older software applications that some employees depend on may no longer be functional or supported under new OS
 - c. Limiting available software/creativity: Some departments may have better software options with different operating systems. For example, the design department may prefer to work on a Mac.

Critical Thinking Questions

1. Student responses may vary. Some negative forces might be the fear of new technology or the resistance to change.
2. Student responses will vary. The IS team could hold workshops to help the employees acquaint themselves with the new OS.

Critical Thinking Exercise

Walmart's VMI System

Review Questions

1. Walmart's VMI systems is proprietary. Proprietary software can give a company a competitive advantage by providing services or solving problems in a unique manner.
2. Insisting on a "one size fits all" approach ensure that all suppliers access the data in the same way and all information will be compatible with each other. It will also help protect against security leaks when suppliers should only have access to limited data. On the other hand, some suppliers may need functionality beyond the basic provided.

Critical Thinking Questions

1. Student responses may vary. The main issue may be security. The system will hold a vast amount of data. Many users will be accessing the system but each user should have access only to a limited amount of data.

2. Student responses will vary. Moving to a public cloud could help with cost savings, accessibility and collaboration. On the other hand, sensitive information could be compromised by unauthorized access by employees or computer hackers. In addition, the company providing the hosting services might not keep its computers and network up and running as consistently as necessary, or a disaster could disable the host's data center.

Critical Thinking Exercise

Organization Weighs Use of Open Source Software

Review Questions

1. Licensed software is software that you purchase a license for. You do not actually own the software but the permission to install and use it. Open-source software is available for free. Users have access to the source code so that it can be studied, changed and improved. Licensed software comes with guarantees and support services while open-source software does not.
2. Many believe that open-source software is often more reliable and secure than commercial software because a program's source code is readily available and users can fix any problems they discover. Also, because the source code for a program is accessible to thousands of people, the chances of a bug being discovered and fixed before it does any damage are much greater than with traditional software packages.

However, using open-source software does have some disadvantages. Although open-source systems can be obtained for next to nothing, the upfront costs are only a small piece of the total cost of ownership that accrues over the years that the system is in place. Some claim that open-source systems contain many hidden costs, particularly for user support or solving problems with the software. Licensed software comes with guarantees and support services while open-source software does not.

Critical Thinking Questions

1. Student responses may vary. As with any new system, there will be resistance to change.
2. Student responses will vary. The IS team and individual department managers need to fully communicate with employees.

Review Questions

1. The four fundamental components of each computer are the CPU, memory, address and data bus and input/output devices.
2. Each processor produces a series of electronic pulses at a predetermined rate, called the clock speed, which governs the speed at which these steps are completed. Clock speed is measured in gigahertz (GHz), which is a unit of frequency that is equal to one billion cycles per second. Many of today's personal computers operate in the 1 to 4 GHz range. The higher the clock speed, the shorter the interval between pulses and the faster instructions can be completed.
3. A multicore processor is a microprocessor that has two or more independent processing units, called cores, which are capable of sequencing and executing instructions.
4. Primary storage, also called main memory or memory, is closely associated with the CPU. Memory holds program instructions and data immediately before or after the registers. Compared with memory, secondary storage offers the advantages of nonvolatility, greater capacity, and greater economy. On a cost-per-megabyte basis, secondary storage is considerably less expensive than primary memory
5. RAM devices are volatile storage devices, whose chips consist of millions of switches that are sensitive to changes in electric current, and they temporarily store data. ROM devices are nonvolatile storage devices, whose combination of circuit states is fixed, and they provide permanent storage of data.
6. A solid state storage device (SSD) stores data in memory chips rather than on hard disk drives or optical media. These memory chips require less power and provide much faster data access than magnetic data storage devices. In addition, SSDs have no moving parts, so they are less fragile than hard disk drives. All these factors make the SSD a preferred choice over hard disk drives for portable computers.
7. Scalability is the ability to increase the processing capability of a computer system so that it can handle more users, more data, or more transactions in a given period. Scalability is increased by adding more, or more powerful, processors. Scaling up adds more powerful processors, and scaling out adds many more equal (or even less powerful) processors to increase the total data-processing capacity.
8. A virtual machine is an emulation of a computer system. Each virtual server is called a virtual machine and includes its own operating system to manage the user interface and control how the virtual machine uses the host server's hardware.

9. A laptop computer is a personal computer designed for use by mobile users, being small and light enough to sit comfortably on a user's lap. Laptop computers use a variety of flat-panel technologies to produce lightweight and thin display screens with good resolution.

Numerous portable computers are smaller than the typical laptop and have various names, including the notebook and the even smaller ultrabook. The newest notebook computers come with a natural user interface, including both voice control integration and touch screens.

Tablet computers are portable, lightweight computers that can come with or without a keyboard and allow you to roam the office, home, or factory floor carrying the device like a clipboard. You can enter text with a writing stylus directly on the screen, thanks to built-in handwriting recognition software.

A smartphone combines a cell phone with a handheld computer.

10. Green computing is concerned with the efficient and environmentally responsible design, manufacture, operation, and disposal of IS-related products, including all types of computers, printers, and printer materials, including cartridges and toner. Green computing has three goals: reduce the use of hazardous material, enable companies to lower their power-related costs (including potential cap and trade fees), and enable the safe disposal or recycling of computers and computer-related equipment.
11. The Electronic Product Environmental Assessment Tool (EPEAT) is a system that enables purchasers of electronic products to evaluate, compare, and select products based on a set of environmental criteria. EPEAT was first implemented in 2006 with Computer and Displays (IEEE 1680.1 standard) and has now expanded to Imaging Equipment, under the IEEE 1680.2 standard from January 2013. Products are ranked in EPEAT according to three tiers of environmental performance: bronze, silver, and gold. Individual purchasers as well as corporate purchasers of computers, printers, scanners, and multifunction devices can use the EPEAT Web site (www.epeat.net) to screen manufacturers and models based on environmental attributes.
12. Information systems that operate within the personal sphere of influence serve the needs of individual users. These information systems help users improve their personal effectiveness, increasing the amount and quality of work they can do. Such software is often called personal productivity software.

When two or more people work together to achieve a common goal, they form a workgroup. A workgroup might be a large formal, permanent organizational entity, such as a section or department, or a temporary group formed to complete

a specific project. An information system in the workgroup sphere of influence helps workgroup members attain their common goals.

Information systems that operate within the enterprise sphere of influence support the firm in its interaction with its environment, which includes customers, suppliers, shareholders, competitors, special-interest groups, the financial community, and government agencies.

13. The role of the operating system is to act as an interface between application software and hardware. The OS performs a variety of activities, including the following:
 - Control common computer hardware functions
 - Provide a user interface and manage input/output management
 - Provide a degree of hardware independence
 - Manage system memory
 - Manage processing tasks
 - Provide networking capability
 - Control access to system resources
 - Manage files

14. An application programming interface (API) is a set of programming instructions and standards for one software program to access and use the services of another software program. An API provides a software-to-software interface, not a user interface. The API also provides software developers tools that allow them to build application software without needing to understand the inner workings of the OS and hardware.

15. The kernel, as its name suggests, is the heart of the OS and controls its most critical processes. The kernel ties all of the OS components together and regulates other programs.

16. Operating systems use the following five basic task management techniques to increase the amount of processing that can be accomplished in a given amount of time:
 - Multiuser: Allows two or more users to run programs at the same time on the same computer.
 - Multiprocessing: Supports running a program on more than one CPU.
 - Multitasking: Allows more than one program to run concurrently.
 -
 - Multithreading: Allows different threads of a single program to run concurrently.
 - Real time: Responds to input instantly.

17. Dual booting allows you to set up multiple operating systems on one machine. When booting you can select which platform you want to work with.
18. An embedded system is a computer system (including some sort of processor) that is implanted in and dedicated to the control of another device. Embedded systems control many devices in common use today, including TV cable boxes, cell phones, digital watches, digital cameras, MP3 players, calculators, microwave ovens, washing machines, and traffic lights.
19. Proprietary software is one-of-a-kind software designed for a specific application and owned by the company, organization, or person that uses it. Off-the-shelf software is mass produced by software vendors to address needs that are common across businesses, organizations, or individuals.
20. Middleware is software that allows different systems to communicate and transfer data back and forth.
21. Software as a Service (SaaS) allows organizations to subscribe to Web-delivered application software. In most cases, the company pays a monthly service charge or a per-use fee.
22. Open source software means that the source code is freely available to anyone wishing to use it. It is also available for modification. The biggest stumbling block to its use is the question of support. Although forums exist for problem solving and collaborative upgrades, there are no real guarantees or truly accountable software providers.
23. Software upgrades are an important source of increased revenue for software manufacturers and can provide useful new functionality and improved quality for software users.

Discussion Questions

1. Organizations that do not make wise hardware investments are often stuck with outdated equipment that is unreliable and that cannot take advantage of the latest software advances. Such obsolete hardware can place an organization at a competitive disadvantage. Managers, no matter what their career field and educational background, are expected to help define the business needs that the hardware must support. In addition, managers must be able to ask good questions and evaluate options when considering hardware investments for their areas of the business. This need is especially true in small organizations, which might not have information system specialists.

2. Parallel computing is the simultaneous execution of the same task on multiple processors to obtain results more quickly. Massively parallel processing involves linking many processors to work together to solve complex problems. Grid computing is the use of a collection of computers, often owned by multiple individuals or organizations, that work in a coordinated manner to solve a common problem.
3. Generally, multiprocessing involves the simultaneous execution of two or more instructions at the same time. Parallel computing is the simultaneous execution of the same task on multiple processors to obtain results faster. Systems with thousands of such processors are known as massively parallel processing systems, a form of multiprocessing that speeds processing by linking hundreds or thousands of processors to operate at the same time, or in parallel, with each processor having its own bus, memory, disks, copy of the operating system, and applications.
4. With grid computing the grid can include dozens, hundreds, or even thousands of computers that run collectively to solve extremely large processing problems. The key to the success is a central server that acts as the grid leader and traffic monitor. This controlling server divides the computing task into subtasks and assigns the work to computers on the grid that have (at least temporarily) surplus processing power. The central server also monitors the processing, and if a member of the grid fails to complete a subtask, the server restarts or reassigns the task. When all the subtasks are completed, the controlling server combines the results and advances to the next task until the whole job is completed. Large projects, such as the World Computing Grid, require a significant number of computers or computing centers with significant surplus processing power. Projects like this are dependent on a lot of different parts working together.
5. 3D printing technology takes a three dimensional model of an object stored on your computer and sends it to a 3D printer to create the object using strands of a plastic filament or synthetic powder. The filament comes in spools of various colors and is fed through a heated extruder that moves in several directions to place layer upon layer on top of each other until the object is created.

3D printing is commonly used by aerospace firms, auto manufacturers, and other design-intensive companies.

6. Solid state storage devices (SSDs) store data in memory chips rather than magnetic or optical media. These memory chips require less power and provide faster data access than magnetic data storage devices. In addition, SSDs have few moving parts, so they are less fragile than hard disk drives. All these factors make the SSD a preferred choice for portable computers. Two current disadvantages of

SSD are their high cost per GB of data storage and lower capacity compared to current hard drives.

7. Organizations are consolidating their data centers from many locations to a few locations. The goal of consolidation is to lower ongoing operating costs—less spending on utilities, property taxes, and labor. General Motors recently consolidated from 23 data center locations to just two. This has reduced both its operating costs and energy usage.

A smaller number of data centers might affect an organization's ability to absorb the impact of a disaster.

8. Microsoft is hoping for Windows 10 to run on more than a billion devices across the globe. The idea being that this will enable universal software applications to run across all devices. While the idea of one platform across all devices is interesting, it may stifle competition and innovation.
9. This discussion question is structured to help students better understand programming languages. Currently, many languages are being used. Demand is high for SQL, Java, JavaScript, C#, and C++. Students will realize programmers can benefit from a working knowledge of multiple languages. This gives them mobility in the job market and provides them with a wider range of tools to apply to software development efforts. Because of rapid change, the programmer needs to remain current on popular languages. "Learning how to learn" new languages is as important as knowledge of a specific language.
10. Student responses will vary. Important operating system features could be an attractive, easy to use user interface, file protection, system restore capabilities, security features, such as a security center and Firewall, and troubleshooters.
11. The student might recommend a sight interface, which uses a camera on the computer to determine where a person is looking on the screen and performs the appropriate command or operation.
12. Student responses will vary. I would access the support area of the manufacturer's Web site for patches and install the latest software updates. In order to confirm that it is a bug, I would repeat my steps, making a note of what I expected to see and what I saw instead. After re-creating the error, I would call the manufacturer's tech support line.
13. SaaS can reduce expenses by sharing its running applications among many businesses. Note that providing one high-quality SaaS application to thousands of businesses is much more cost-effective than custom designing software for each business.

SaaS does involve some risks. For example, sensitive information could be compromised in a number of ways, including unauthorized access by employees or computer hackers; the host might not be able to keep its computers and network up and running as consistently as necessary; or a disaster could disable the host's data center, temporarily putting an organization out of business. It can also be difficult to integrate the SaaS approach with existing software.

- Many believe that open-source software is often more reliable and secure than commercial software. How can this be? First, because a program's source code is readily available, users can fix any problems they discover. A fix is often available within hours of the problem's discovery. Second, because the source code for a program is accessible to thousands of people, the chances of a bug being discovered and fixed before it does any damage are much greater than with traditional software packages.

However, using open-source software does have some disadvantages. Although open-source systems can be obtained for next to nothing, the upfront costs are only a small piece of the total cost of ownership that accrues over the years that the system is in place. Some claim that open-source systems contain many hidden costs, particularly for user support or solving problems with the software. Licensed software comes with guarantees and support services while open-source software does not.

- Server virtualization software allows a server to run more than one operating system at the same time. For example, you could run four different virtual servers simultaneously on one physical server. Virtual server technology also lets people use server resources more fully, which saves expense.

Problem-Solving Exercises

- Responses may include the following information (table shows number of units in millions):

	2015	2014	2013	2012	2011
HDD	481.33	557	552.06	577.1	626.2
SSD	102.57	59	57	39	NA

- Students should develop a spreadsheet that compares the features, initial purchase price, and a two-year estimate of operating costs (paper, cartridges, and toner) for three color laser printers and three inkjet printers. Students should write a memo explaining which printers he selected and why and which of the printers he would ultimately buy.

3. Student response will vary. Student will use a spreadsheet and presentation software to detail which version of Office is best for him. Some points that may be mentioned:

Office 2016

- One-time purchase
- No upgrade option

Office 365

- Subscription service
- Includes most recent version
- On-going support
- Extra online storage

Team Activities

1. Students should do Web research on three large grid computing projects of interest to the team.
2. Students should visit three different retail stores in search of their ideal smart watch.
3. Student response will vary but may include:
 - Use line graphs to display unusual results
 - Organize your workbook by function
 - Use simple formulas

Web Exercises

1. Moore's Law is a hypothesis that states that the transistor densities on a single chip will double every 18 months. To date, physicists see no reason why this trend will not continue for several more years. However, since the density of the transistors is already so high, increasing them is becoming more difficult.
2. Bioprinting is the three-dimensional printing of biological tissue and organs through the layering of living cells. Students should research current and future applications.
3. Students should use the Internet to search for information on real-time operating systems.

Career Exercises

1. Students responses may vary. Computer engineers typically design not only the hardware, but also much of the software in computer-based systems. Students should research potential career prospects.
2. Student responses will vary based on his current or future career field.
3. Students should identify three specific smartphone applications that would greatly help them in their current or next job.

Case Studies

Case One: Vivobarefoot Upgrades Technology Infrastructure

Critical Thinking Questions

1. Student responses will vary. By updating its infrastructure, Vivobarefoot was able host file servers and business-critical applications, such as accounting software and stock management systems.
2. Student responses will vary. Office 365 applications can be used offline. Microsoft installs the desktop versions of the latest Office apps on your computer when you first activate Office 365, just as if you had purchased the programs off the shelf. You will, however, need to go online every 30 days to maintain your subscription and prevent the apps from de-activating.
3. Student responses may vary. The risks of running unsupported operating systems include security risks due to no available patches or updates (for an organization this could put customer data at risk), third party software no longer supports system, and loss of functionality.

Case Two: Société de transport de Montréal (STM) Implements Innovative Mobile App

Critical Thinking Questions

1. Student answers will vary. Over the six-month pilot program, examples of success criteria might include:
 - Less than 5% rider attrition
 - Increased monthly pass sales
 - 50 event and commercial partner participation agreements
 - App use by 65% of riders

2. Splitting the data could be a safeguard, but you will have to consider the cost to performance. Also, splitting the data may double the risk of downtime.
3. Student answers will vary.