Hardware and Software

**What is the meaning and significance of Moore’s Law?**

Moore’s Law predicts that the number of transistors fitting on a computer chip will double every one and a half to two years. This prediction about density also captures advances in processing speed, storage capabilities, cost, and other component features. Processing power and speed and storage capabilities have increased exponentially as the cost of computing devices has decreased.

What are the major computer hardware, data storage, input, and output technologies used in business?

List and describe the various types of computers available to businesses today.

* **Personal computers**: generally used when working alone or with a few other people in a small business.
* **Workstations**: desktop computers with more powerful mathematical and graphics-processing capabilities than a PC. Used primarily for advanced design or engineering work requiring powerful graphics or computational capabilities.
* **Servers:** specifically optimized to support a computer network, enabling users to share files, software, peripheral devices, or other network resources.
* **Mainframes:** large-capacity, high performance computers that process vast amounts of data very rapidly.
* **Supercomputers:** specially designed and more sophisticated computers used for tasks requiring extremely rapid and complex calculations with thousands of variables, millions of measurements, and thousands of equations.
* **Grid computing:** geographically remote computers connected into a single network to create a “virtual supercomputer” by combining the computational power of all computers on the grid.

Define the client/server model of computing.

Client/server computing splits processing between “clients” and “servers”. Both are on the network but each machine is assigned functions it is best suited to perform. The client is the user point of entry for the required function and is normally a desktop computer, workstation, or laptop computer. The user generally interacts directly only with the client portion of the application, often to input data or retrieve data for further analysis. The server provides the client with services. Servers store and process shared data and also perform back-end functions not visible to users, such as managing network activities.

**What are the most important contemporary hardware and software trends?**

Define and describe the mobile digital platform, nanotechnology, grid computing, autonomic computing, virtualization.

**Mobile digital platform:** More and more business computing is moving from PCs and desktop machines to mobile devices like cell phones and smartphones. Data transmissions, Web surfing, email and instant messaging, digital content displays, and data exchanges with internal corporate systems are all available through a mobile digital platform. Netbooks, small low-cost lightweight subnotebooks that are optimized for wireless communication and Internet access, are included.

**Nanotechnology** uses individual atoms and molecules to create computer chips and other devices that are thousands of times smaller than current technologies permit. Nanotechnology shrinks the size of transistors down to the width of several atoms.

**Grid computing** connects geographically remote computers into a single network to create a “virtual supercomputer” by combining the computational power of all computers on the grid.

**Autonomic computing** is an industry-wide effort to develop systems that can configure themselves, optimize and tune themselves, heal themselves when broken, and protect themselves from outside intruders and self-destruction.

**Virtualization** is the process of presenting a set of computing resources (such as computing power or data storage) so that it can be accessed in ways that are not restricted by physical configuration or geographic location. Server virtualization enables companies to run more than one operating system at the same time on a single machine.

**Define and describe cloud computing**

**Cloud computing** is a model of computing where firms and individuals obtain computing power and software applications over the Internet, rather than purchasing their own hardware and software. Data are stored on powerful servers in massive data centers, and can be accessed by anyone with an Internet connection and standard Web browser. Cloud computing consists of three types of services:

* Cloud **infrastructure as a service**: customers use processing, storage, networking, and other computing resources from cloud service providers to run their information systems.
* Cloud **platform as a service**: customers use infrastructure and programming tools hosted by the service provider to develop their own applications.
* Cloud **software as a service**: customers use software hosted by the vendor.

A business can rent software from another firm and avoid the expense and difficulty of installing, operating, and maintaining the hardware and software on its own. A business must carefully assess the costs and benefits of the service, weighing all people, organizational, and technology issues. It must ensure it can integrate the software with its existing systems and deliver a level of service and performance that is acceptable for the business.

Small and medium-sized businesses may find it more advantageous to use cloud computing services because of the minimal overhead and upfront costs. Large businesses will have to factor in whether cloud computing capabilities are sufficiently secure or reliable for their most critical systems. These firms may choose to handle their average processing loads in-house and pay for only as much additional computing power as the market demands. This arrangement enables firms to have a more flexible infrastructure, some of it owned by the firm, and some of it rented from giant computer centers run by technology specialists.

* **Although vendors describe the cloud as a cost-effective solution to increase IT capabilities, critics describe it as marketing hype. The implementation of cloud computing to replace in-house computing generally requires:**
	+ **Leasing IT resources**
	+ **Depending on a third party to store data**
	+ **Depending on a third party to provide services**

**What are the advantages and disadvantages of the cloud computing model?**

**Advantages:**

* Eliminates need for large up-front capital investments in systems
* Eliminates lengthy implementations on corporate computers
* Low cost subscriptions; no expensive licensing and maintenance fees
* No hardware for subscribers to purchase, scale, and maintain
* No operating systems, database servers or applications servers to install
* No consultants and staff
* Accessible via standard Web browser with behind-the-scene software updates
* Better scalability, eliminate cost and complexity of managing multiple layers of hardware and software

**Disadvantages:**

* Audience for the App Exchange application platform may not be large enough to deliver the level of growth Salesforce wants
* May not be attractive to larger companies for their application needs
* Responsibility of data storage and control is in the hands of the provider
* Security risks may increase and open vulnerabilities to data maintenance
* System reliability issues
* Users dependency on the cloud computing provider

**What are the principal issues in managing hardware and software technology?**

Explain why managers need to pay attention to capacity planning and scalability of technology resources.

The principle issues in managing hardware and software assets include capacity planning and scability. Capacity planning is the process of predicting when a computer hardware system becomes saturated. It considers factors such as the maximum number of users that the system can accommodate at one time; the impact of existing and future software applications; and performance measures, such as minimum response time for processing business transactions. Capacity planning ensures that the firm has enough computing power for its current and future needs.

Scability refers to the ability of a computer, product, or system to expand to serve a large number of users without breaking down. Organizations must ensure they have sufficient computer processing, storage, and network resources to handle surging volumes of digital transactions and to make such data immediately available online.

Describe the cost components used to calculate the total cost of ownership (TCO) of technology assets.

When calculating the total cost of ownership of technology assets, a business must include the original cost of the hardware and software, installation costs, ongoing administration costs for hardware and software upgrades, maintenance, technical support, training, downtime, and even utility and real estate costs for running and housing the technology.

“Hidden costs” for support staff, downtime, and additional network management can make distributed client/server architectures—especially those incorporating handheld computers and wireless devices—more expensive than centralized mainframe architectures.

**What are the two major types of software and how do they differ? Give an example of each.**

Application software supports business processes, personal productivity, and entertainment. An Oracle or Access database is an example of application software. System software controls basic operations such as file management, disk storage, hardware interfaces and integration with application software. Software in this category includes operating system software utilities. Windows 7 is an example of operating system software, and Disk Defragmenter is an example of utility software.

**What are the different strategies for creating and deploying software?**

 **Commercial off-the-shelf** software solutions are ready-made and available for licensing or sale to the general public**. Custom software development** describes how an organization develops and builds software tailored specifically to its needs. **Outsourcing** is paying another company to run or develop your company’s software system

Off-the-shelf software systems that cannot be modified to meet the specific needs of a particular organization are sometimes called turn-key systems or software

Identify the benefits and challenges of using outsourcing.

In the past, most companies ran their own computer facilities and developed their own software. Today, more and more companies are obtaining their hardware and software technology from external service vendors.

**Outsourcing**: The most important benefit of outsourcing technology management is that it allows a business to concentrate on its core competencies rather than focusing on technology issues. Instead of purchasing all the necessary hardware and software for hosting a Web site, a business can use a Web hosting service that maintains a large Web server, or a series of servers, and provides fee-paying subsribers with space to maintain their Web sites.

Outsourcing custom software development or maintenance to outside firms benefits a company because it won’t have to hire programmers, analysts, and managers with the necessary skills. An outsourcer often has the technical and management skills to do the job better, faster, and more efficiently. Even though it’s often cheaper to outsource the maintenance of an IT infrastructure and the development of new systems to external vendors, a business must weight the pros and cons carefully. **Service level agreements** are formal contracts between customers and service providers that define the specific responsibilities of the service provider and the level of service expected by the customer.

**What is Total Cost of Ownership?**

**Total Cost of Ownership (TCO):** The total cost of acquiring, installing, maintaining, changing, and getting rid of something across an extended period of time

TCO is a life cycle estimate

TCO supports decision making when it is likely that all options come with the same benefits and the only differences are on the cost side.

TCO analysis shows what an acquisition implies for future spending or budgetary planning

Five year TCO for computing equipment can be 3 – 10 times the original purchase price

**What are the components of TCO for a IT system?**

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| --- | --- |
| **Hardware acquisition** | Purchase price of hardware including computers, terminals, storage and printers |
| **Software acquisition** | Purchase or license of software for each user |
| **Installation** | Cost to install hardware and software |
| **Training** | Cost to train IT staff and end-users |
| **Support** | Cost to provide ongoing technical support; help desks, documentation etc |
| **Infrastructure** | Cost to acquire, maintain and support related infrastructure such as networks and specialized equipment (including storage and backup units) |
| **Downtime** | Lost productivity if hardware or software failures cause the system to unavailable for processing user tasks |
| **Space and energy** | Real estate and utility costs for hosing and providing power for the technology |