# Module 12

# Information Technology Requirements Planning

# 12.1 OBJECTIVES

Students will be able to:

- Understand Moore's Law
- Understand Information Technology Lifecycle concepts
- Applying a general lifecycle model to selecting various hardware and software components

# 12.2 OVERVIEW

In this module, we introduce the concept of lifecycle management for desktop personal computers. We will discuss Moore's Law and its effect on our work environment. We will apply Moore's Law to upgrade and lifecycle issues and discuss how to apply lifecycle management concepts to the Air Force work place.

# 12.3 MOORE'S LAW

Dr. Gordon E. Moore is Chairman Emeritus of Intel Corporation. He co-founded Intel in 1968, serving initially as Executive Vice President. He became President and Chief Executive Officer in 1975 and held that post until being elected Chairman and Chief Executive Officer in 1979. He remained CEO until 1987 and served as Chairman until being named Chairman Emeritus in 1997. Dr. Gordon Moore made his famous observation in 1965. The press called it "Moore's Law" and the name has stuck. Moore predicted that the number of transistors per integrated circuit would double every 18 months. He predicted that this trend would continue through 1975. Through Intel's technology, Moore's Law has been maintained for far longer, and still holds true as we enter the new century. The mission of Intel and Advanced Micro Devices (AMD) technology development teams has been to continue to break down barriers to Moore's Law.

Two basic factors govern the performance of a microprocessor: architectural design and manufacturing technology (also know as replication). A chip's architectural design is akin to a high performance car engine - it's defined by the number of cylinders, the bore and stroke of the pistons, the configuration of the valves, and so on. Anyone can design a monster engine, but will it work? The design is worthless if the manufacturing technology can't meet the challenge. A design that exceeds manufacturing constraints will overheat and fail. The same is true of microprocessors. The ability of a computer processor is defined by three major factors, heat, the distance that energy has to move from one transistor to another and the number of solder points between transistors, the number of transistors being the pistons of the engine and the solder points being the valves. Within microprocessors, Moore's Law is defined by on the number of pistons.

Manufacturing technology drives architectural design. Manufacturing determines how many transports will fit on a chip, how fast transistors switch on and off, and how far the electrical signals must travel from one point of the chip to another. In this area, smaller is better. Smaller transistors can switch faster, burn less energy, and shorter wires can carry signals to their destinations more quickly. The by product is increased efficiency and speed.

The illustration below shows the vast increase in the number of transistors within microprocessors and the subsequent increase in microprocessor capabilities and speed.

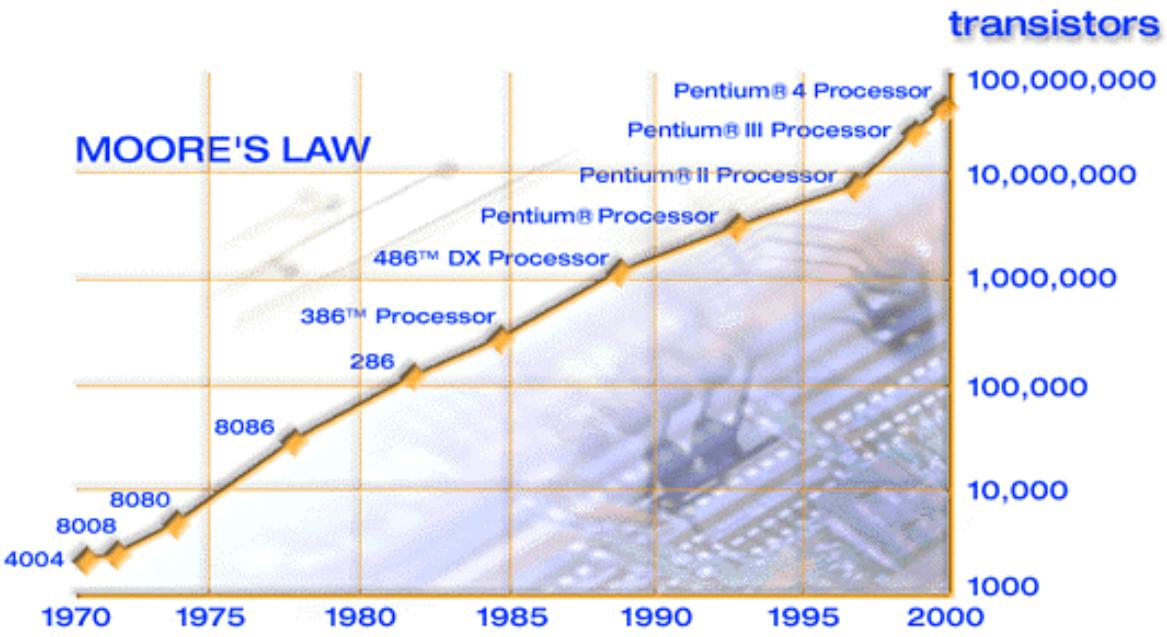



**Figure 12-1.** Moore's Law

**PUBLICATIONS:**

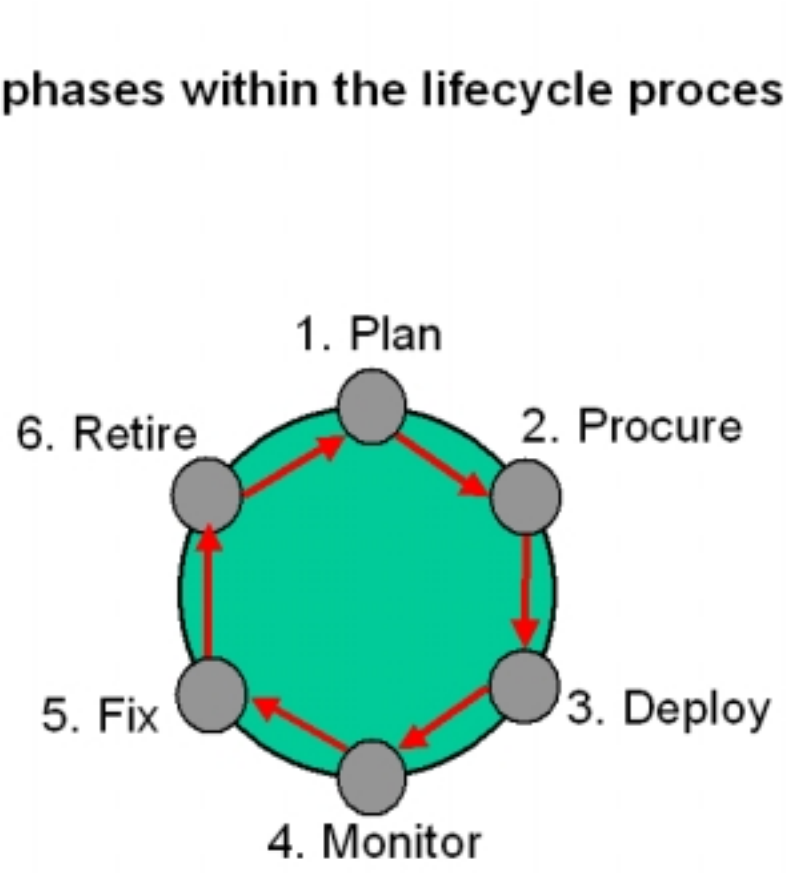
"Cramming More Components Onto Integrated Circuits" (Acrobat PDF file, 167 KB)
Author: Gordon E. Moore
Publication: Electronics, April 19, 1965

"Microprocessors Circa 1300" (Acrobat PDF file, 543 KB)
Authors: Patrick Gelsinger, Paolo Gargini, Gerhard Parker, Albert Yu
Publication: IEEE Spectrum, October 1989

Why is Moore's Law important? Upgrade decisions are based on requirements. Moore's Law provides a timeline for how long a processor will remain viable based on productivity and software requirements.

# 12.4 LIFECYCLE CONCEPTS

In this section, we will discuss lifecycle concepts and how to make decisions on how to define and apply a lifecycle model. There are six phases within the lifecycle process: Plan, Procure, Deploy, Monitor, Fix, and Retire. The lifecycle process is never ending. When you reach the Retirement phase, the process begins again at the planning phase in a circular fashion. We will discuss all of these concepts some in detail.




**(Figure 12-2. Six phase lifecycle model)**

## 12.4.1 PLANNING

We all deal with situations where computers fail and applications will not work on the PCs within our office space. Some of these problems arise due to old equipment or incompatible software. If you have not encountered a situation where you need to upgrade from one operating system or application to another and your PC cannot support the new software requirements, be assured you will. The question is not "should you upgrade," but when and how. *Per Air Force Instruction 33-115, Volume 1, Workgroup Managers are responsible for the "First 400-Feet" of the enterprise network.*
Workgroup managers are responsible for ensuring PCs are stable, sustainable and up to the task at all times. To that end we must plan for PC replacement and upgrade, like other parts of the network. The keys to an effective plan are research and clear objectives.

Planning includes accessing what systems you currently have and defining what will be needed to support future productivity. It is easy to say, "Sir, we need new computers," your challenge is to define why. The Air Force standardizes on Microsoft based operating systems at the desktop. Today you will see Windows 1300 Professional or Windows XP Professional as the standard operating system on most desktop computers. All operating systems have minimum processor, random access memory (RAM) and hard drive space requirements**.** If your PCs cannot support these minimums, it is impossible to upgrade from older operating systems to new ones. Generally, Microsoft Corporation deploys new operating system and desktop applications every 2.5 years. Operating system upgrades are just one consideration within your plan. Systems also age making them less effective and reliable over time. These facts alone make upgrading not only desirable but also necessary.

Within your plan, you need to define clear objectives. Here are a few to consider:

- Set an annual quota on how many systems to replace, using a set timeframe to 100% technical refresh
- Determine a balance between cost and performance
- Replace your systems from oldest to newest - only make exceptions for operational requirements (i.e. mission required equipment or software that can not easily be replaced or upgraded)
- Set your requirements one level higher than processing requirements (this helps with contingency requirements and ensures your systems can meet unforeseen requirements)
- Review your plan annually to align requirements with products and equipment
- Evaluate infrastructure interoperability potential and determine legacy software compatibility when planning operating system and hardware upgrades (All the "bells and whistles" included with the latest and greatest operating system are worthless when the upgrade cannot support current operational needs)

Workgroup managers must remain abreast of current and new processor, operating system and application advances. The users we support have operational requirements for applications and software needed to perform their mission. By understanding new and old technology, workgroup managers are able to make decisions on how to meet user requirements. Furthermore, Air Force networks have structured architectural standards. Workgroup managers need to apply standards and rigor to the desktop PC. For example: the Air Force does not allow shareware, games or personal single point communications applications like America Online on our networks. These applications cause vulnerabilities to our networks that could allow our adversaries to gain strategic or operational information on our activities and cost American lives. Workgroup managers must balance user requirements and architectural standards to provide solutions that enhance mission accomplishment.

In the previous section, we looked at how processor technology doubles itself every 18 months. Let's add cost to the mix and consider acceptable standards for upgrades. For example: the current Intel processor is the Pentium 4. This processor comes in speeds from 1.3 Gigahertz (GHz) at $127.00 to a 2.0 Gigahertz at $432.00. You can see the vast difference in price and in processing capability. If you select the least expensive chip, consider yourself already 18 months behind current technology at the time of purchase. If you select the most expensive, based simply on cost alone, you would not be able to purchase as many PCs. They would cost between $1,130.00 and $1,600.00 each. Selecting a middle of the road solution, say the Pentium 4 1.7 or 1.8 Gigahertz at $210.00 to $213.00, you are able to strike an equitable balance between processor capability, viability and cost.

## 12.4.2 PROCUREMENT

In order to execute the plan, you need support and funding from leadership. Money is only part of the procurement concept. You also need to consider vendor issues. Seek out and build relationships with vendors to ensure you get much needed support and robust systems. Most vendors will allow potential customers to review their systems under operational conditions. Once you have leadership support, spend your funding wisely. Avoid buying unnecessary equipment and products. Use sound judgment and mission requirements to make procurement decisions. Try to purchase your systems in bulk, some vendors will provide price breaks based on the number of systems purchased. There are some contractual issues to be avoided. Don't offer or promise business to vendors. Working with quotes for systems is not a problem. However, once it comes time to execute funds and your base contracting office is involved, leave this part of the procurement process to the procurement professionals in contracting.

## 12.4.3 DEPLOYMENT

Deploying systems is fairly straightforward; this includes planning for where the new systems will be placed, when they will arrive and the status of old system. It is important to replace the oldest to the newest. You will find individuals that don't want a new system, they're happy with their current PC. You need to ensure that deployment is smooth and beneficial to your user community. But, you also need to ensure that there are no exceptions to replacing aging systems unless there are operational requirements that can't be met with a new system.

## 12.4.4 MONITOR

Monitoring includes ensuring your systems meet user requirements and providing nominal review, preventive maintenance and security updates on your systems. You need to be responsive to new user and network requirements outside of replacing systems. Know your systems, their capabilities and local network security requirements. Ensure you keep abreast of user requirements.

## 12.4.5 FIX AND RETIRE

The last two concepts are Fix and Retire. Simply put fix and/or upgrade systems where possible and when cost effective. Some systems can be effectively upgraded to a level that meets or exceeds current technology. Upgrades are always a consideration, however as a general rule if an upgrade is more than half the cost of a new system the new system would be more economical. Consider how long the upgrade must last. Of course retire systems that are no longer useful. Normally these systems are turned into the base Equipment Control Officer.

## 12.4.6 APPLYING LIFECYCLE CONCEPTS

Now you need to build a replacement plan. Determine what PCs need to be replaced and when to execute your plan. Computer processors will only support requirements for so long and it is inevitable that software and requirements will force an upgrade. Processors double themselves every 18 months and new operating systems deploy every 2.5 years. Similar to automobiles where you replace your oil every 3 to 4 months; you need a formal plan to upgrade your PCs, based on annual or fiscal considerations. Diagram 12-1 gives us some insight into what processors may be in use today; based on when they were manufactured and purchased. For example: if you have Pentium 130 Megahertz (MHz) PCs in your office it was likely purchased in 1995-96. Further, when you consider software requirements you could

use Windows NT or Window 1300 on this platform, but it would run very slowly. Now let's take the information from the previous sections and define a lifecycle plan.

***Example:***
You are the workgroup manager for 30 desktop computers ranging from 133 MHz Pentiums to 500 MHz Pentium III. Your base is migrating to Windows 1300 and the PC requirements for the upgrade are: Pentium II 400 MHz, 128 Megabytes of RAM, and a 6.4 Gigabyte (GB) hard drive with 1 GB of free space.

First thing to consider is a replacement timeline, keeping Moore's Law in mind. Based on a 3-year replacement timeline and 30 computers, you would upgrade or replace 10 computers each year. Based on a 5-year replacement timeline and 30 computers, you could upgrade or replace 6 computers each year. Based on Moore's Law, technology doubles itself every 18 months. With this in mind, if you select the 3-year model; your oldest will be 4 to 6 levels behind current technology when it is replaced. If you select the 5-year model, our oldest computers will be 6 to 8 levels behind current technology. Using September 1301 as present day, your oldest system under a 3-year plan would be at least a Pentium II processor (1999), well within the Windows 1300 Professional hardware requirements. However, if you use a 5-year plan your oldest PCs would be second-generation Pentiums processors that max out at 233 MHz, outside of the scope for upgrade to Windows 1300 on your base. This leads credence to the 3-year replacement timeline.

**Below is a diagram of potential outcomes with 3 and 5-year replacement plans:**

| ***3-year Replacement Plan*** | | ***5-year Replacement Plan*** | |
|---|---|---|---|
| **Number of Machines** | **Process Speed** | **Number of Machines** | **Process Speed** |
| 10 | Pentium III 800MHz | 6 | Pentium III 800 MHz |
| 10 | Pentium III 500 or 450MHz | 6 | Pentium III 500 or 450MHz |
| 10 | Pentium II 400MHz | 6 | Pentium II 400MHz |
| 10 | | 6 | Pentium Pro 130MHz |
| 10 | | 6 | Pentium 233MHz |

**(Figure 12-3.)**

Review current technology to find the balance between requirements and cost. You now need to procure and deploy your systems. You need to reduce the affect of the deployment on your users. Plan and know who will receive the new systems. Access what software these users need and are using. Replacing your old systems should be a pleasure to your users, if you plan appropriately. Monitor the performance and compatibility of your new and old systems to stopgap new problems. Fix problems that arise and retire the old systems.

A properly defined and executed lifecycle process can greatly enhance network and user productivity, save you a great deal of time and your organization up to 50% of their total cost for information technology.

# 12.5 REVIEW QUESTIONS

1. What is Moore's Law?

2. What are the factors governing the performance of a microprocessor?

3. How many phases are there to the lifecycle process?

4. Microsoft Corporation deploys new operating system and desktop applications every _____.

5. What issues may make it impossible to upgrade your users PCs to a new operating system?

6. What issues make upgrading not only desirable but also necessary?

7. Within your plan, you need to define clear objectives. Outline at least two objectives to consider:

8. Who is responsibility is it to remain abreast of current and new processor, operating system and application advances?