MONTGOMERY COUNTY COUNCIL

FY02 INTENSIVE BUDGET REVIEW PROJECT # 2

PERSONAL COMPUTER ASSET MANAGEMENT PRACTICES

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experts recommend that an organization consider user needs, the rate of technology change, the cost to support technology, and agency budget constraints. The TCO reflects an agency's asset management practices and its adopted replacement schedule(s).

Current PC Asset Management Practices

In FY 02, the Council approved $8.6 million to fund asset management programs for Montgomery County Government, Montgomery College and the Montgomery portion of the Maryland National Capital Park and Planning Commission.

This report examines the PC asset management practices of these agencies and the Montgomery County Public Schools (MCPS). Each of these four agencies has conducted a PC asset audit and maintains an inventory of its computers. Each of the agencies is familiar with the TCO concept but has yet to conduct a formal TCO study.

The PC inventory of each agency is unique and each agency follows a its own set of asset management practices. In sum:

- ***MCPS owns 30,000 PCs, or about two-thirds of the PC inventory across the four agencies.*** Over half of its existing computers are at least five years old and have limited functionality. MCPS has yet to establish funding for a PC replacement program. MCPS must purchase an additional 15,000 PCs to achieve its adopted target ratio of one computer for every three students. School System purchase prices are well below list prices because it negotiates directly with vendors and takes advantage of deep educational discounts. MCPS has begun purchasing computers with four-year warranties and uses in-house staff to make post-warranty repairs. MCPS would prefer not to cascade[1] computers but uses this practice because of the age of their computers.

- ***Montgomery College owns 5,739 PCs, including virtually all of the high-end PCs in the combined inventory of the four agencies.*** The College proposes to designate about one-third of its high-end PCs for accelerated replacement because its faculty requests leading edge technology. Like MCPS, the College takes advantages of deep discounts and routinely purchases its desktops well below list price. The College has an automated inventory management system and plans and budgets for the systematic replacement of its inventory. The College uses in-house staff supplemented by contract staff to provide support, administration and maintenance services. The College discourages cascading because of its high labor costs and frequent replacement cycles.

- ***Montgomery County Government's (MCG) inventory of 6,500 PCs is comparable in size to the College and comparable in type to MCPS.*** MCG owns approximately 5,300 mainstream desktop units. MCG is the only agency where individual departments have the authority to request and purchase PCs. In 1998, MCG established a Desktop Computer Modernization (DCM) program to provide for the replacement of PCs on a regular schedule. The Department of Information Systems and Telecommunications (DIST) contracts out for the acquisition, installation, repairs, and help desk support and has effectively used the DCM

[1] Cascading refers to the redeployment of a PC from one user with certain computer needs to another user with different and usually less advanced needs.

program to centralize PC management tasks. MCG does not see cascading as a cost effective or necessary practice because it has replaced all of its desktops within the last three years. MCG has recently piloted paying for hardware repairs on a time and materials basis.

- ***M-NCPPC's inventory of 632 PCs is the smallest of the four agencies.*** Approximately half of the inventory is made up of mainstream standard computers and the other half is divided among high-end computers and mainstream computers recommended for accelerated replacement. M-NCPPC uses in-house staff to support and maintain its computers and encourages cascading. Because of its small size, M-NCPPC can manage redeployments more easily than other agencies.

The ITPCC Report

In response to a request from the MFP Committee, the Interagency Technology Policy and Coordination Committee (ITPCC) developed an interagency set of PC classifications and proposed replacement schedules associated with each classification category. (These are defined in Section V of this report.) Specifically, the ITPCC adopted a:

- 4-year replacement schedule for mainstream desktop PCs,
- 3-year replacement cycle for mainstream accelerated PCs,
- 2-year replacement cycle for high-end PCs, and
- 1.5-year replacement schedule for high-end accelerated PCs.

The ITPCC estimates it will cost $22 million annually to replace the combined inventory of desktop computers for the four agencies according to these guidelines.

Council/OLO Staff Analyses

A Council/OLO staff analysis, using data from the ITPCC report, demonstrates how the specific costs of some asset management practices directly affect TCO. The analysis calculates annual life cycle costs for eight combinations of purchase, maintenance and upgrading practices. The resulting 3-year, 4 year and 5-year annual cycle costs show:

- lower purchase prices and lower maintenance costs produce the lowest life cycle costs, particularly without upgrading;
- higher purchase prices and lower maintenance costs support longer replacement cycles; and
- lower purchase prices and higher maintenance and upgrading costs support shorter replacement cycles.

This analysis supports the industry advice that replacement schedules must be customized to each agency's situation. This analysis also emphasizes how important it is for each agency to implement practices that control costs at each life cycle phase.

A second Council/OLO analysis suggests that cascading may have significant fiscal benefits when the number of mainstream units exceeds the number of high-end units, the

mainstream replacement cycles are a multiple of the high-end replacement cycles and post warranty maintenance costs and redeployment costs are controlled.

A third Council/OLO staff analysis projects the cost to replace and maintain the current inventory of 43,000 computers using data from the DCM program. These data show acquisition costs are less than half of the total direct program costs. This suggest that if the ITPCC estimates it will cost $22 million to replace the combined inventory of desktops, the cost to replace and maintain the combined agency inventory could approach $44 million annually.

Council/OLO Staff Recommendations

As personal computing technology becomes an increasingly indispensable and costly tool for the delivery of government services, County agencies must develop PC asset management programs that address the total costs of ownership and effectively control all PC life cycle costs.

The work completed by the ITPCC, i.e. establishing a classification structure based on user needs and defining an optimal replacement cycle, begins to address the elements that determine the total cost of ownership (TCO). The Council should endorse the use of this classification system and agencies should employ these classifications in their information technology budgeting and planning.

Council and OLO staff propose two sets of recommendations to build on the work of the ITPCC and support the agencies in their development of effective PC asset management programs. The recommendations that follow outline an ongoing Council funding and oversight strategy.

Ongoing Funding and Oversight: Summary of Major Staff Recommendations

1. ***Each agency should review the numbers submitted for the ITPCC report and verify that these reflect its essential baseline user needs.*** When an agency defines and establishes its baseline user needs, it must consider how the size and composition of its PC inventory will affect its overall long-term costs. For example, an agency should consider the trade-off of maintaining a larger inventory with longer replacement cycles versus a smaller inventory with shorter replacement cycles.

2. ***Agencies should review their asset management practices and aggressively pursue strategies to control costs.***

   - Agencies should aggressively pursue ways to maximize volume discounts offered by vendors. Agencies can leverage their combined purchasing power either by forming their own buying alliance or by joining an existing alliance such as the Western States Contracting Alliance.

   - Agencies should aggressively seek vendor-provided educational discounts. For example, the County Government may attempt to secure educational discounts for public use computers such as those available in libraries or recreation centers.

- Agencies should immediately consider purchasing four-year manufacturer's warranties for each new mainstream computer acquired.

- Agencies should ensure that their current inventory practices provide readily available information about the functional computing capabilities of each specific PC and investigate whether an automated inventory system can cut maintenance costs by reducing off-site trip. While the age of the computer currently drives replacement cycles, ultimately the capabilities of a computer, and not the age, may be more important in determining replacement needs.

3. ***The Council's decision on funding levels and replacement schedules should differ depending on whether an agency has established a centralized PC management program.***

   - For MCPS, which has yet to establish a centralized PC management program, the Council should not endorse replacement schedules until MCPS submits a comprehensive asset management program that includes:

     - A justification of the total number of PCs needed;
     - A measurement of the total cost of PC ownership; and,
     - A long term funding strategy to sustain that inventory.

   - For Montgomery County Government, the College and M-NCPPC, which have existing PC management programs, the Council should adopt the following approach:

     - During the Council's upcoming review of FY 03 operating and capital budgets, the Council should require each agency to provide a justification for the number of PCs needed by classification type. Each agency should use the FY 03 budget to establish and justify its baseline needs. If an agency requests an increase in a future budget submission, each agency should explain the factors that necessitated the change from the FY 03 baseline needs to justify its request.

     - The Council should require each agency to develop methods to measure acquisition, maintenance, support, administrative, disposal, and all other costs that contribute to the TCO.

     - Until each agency completes a TCO analysis, the Council should adopt an interim policy of funding four-year replacement cycles for mainstream computers and two-year replacement cycles for high-end computers.

4. ***The Council should be prepared to approve adequate funding for properly justified centralized PC asset management programs.*** Agency budget submissions should measure and report the TCO for their PC inventories and identify management strategies to effectively reduce the TCO while meeting essential agency computing needs.

The table presents questions to shape the Council's FY 03 budget discussions.

FY 03 Budget Questions

County Government	**Montgomery College**
• Could MCG achieve further PC acquisition volume discounts by participating in a buying alliance? • Should MCG begin purchasing four-year manufacturer's warranties to correspond to four-year planned replacement cycles for mainstream PCs?	• Is the College's current inventory of mostly high-end PCs fiscally sustainable over time? • Could the College meet user needs by adopting two-year or four-year replacement cycles for all of its PCs? • Could the College maximize the value of retired two-year old PCs through resale or cascading?
MCPS	**M-NCPPC**
• Is a three-to-one student-to-PC ratio fiscally sustainable over time? Should MCPS adjust its goal to the State target of a five-to-one ratio? Should out-year funding be moved away from increasing the size of the current PC inventory toward funding regular replacement of PCs. • What is the long term relationship between the strategy of buying PCs with four-year warranties and the use of in-house and contractor personnel for PC repairs?	• Could M-NCPPC achieve further PC acquisition volume discounts by participating in a buying alliance? • Should M-NCPPC begin purchasing four-year manufacturer's warranties to correspond to four-year planned replacement cycles for mainstream PCs?

A more detailed list of Staff recommendations appears in Section IX of this report.

I. BACKGROUND

In 1998, the Council approved a County Government request to create a Desktop Computer Modernization (DCM) program. The program provides full life cycle support and management of PCs including the purchase, maintenance, support, and replacement of PCs in order to reduce total personal computer (PC) costs. The program also serves to minimize interdepartmental software and platform interoperability problems.

In FY 02, the Council approved $8.4 million to fund computer management and replacement in three County agencies; slightly more than half of the $15.5 million agency requests. Specifically,

- the County Executive recommended $6.6. million ($2.8 million for PC replacements) for the County Government DCM program and the Council approved $4.2 million ($500,000 for PC replacements);
- the College requested $8.5 million ($3.9 million for PC replacements) and the Council approved $4 million ($2 million for PC replacements); and
- M-NCPPC requested $420,000 and the Council approved $195,000 so that M-NCPPC could initiate a PC replacement program.[2]

The FY 02 budget deliberations highlighted some of the difficult issues associated with the potentially high cost of PC asset management programs. To address these concerns, the Council asked the Interagency Technology Policy and Coordination Committee (ITPCC) to conduct an interagency review of personal computer life cycle costs. The ITPCC started work in July 2001 and presented its report to the MFP Committee in October of that year.

ITPCC Report Highlights: The ITPCC conducted a survey of personal computer ownership in six County agencies: Montgomery County Government (MCG), Montgomery County Public Schools (MCPS), Montgomery College (the College), the Montgomery County portion of the Maryland-National Capital Park and Planning Commission (M-NCPPC), the Washington Suburban Sanitary Commission (WSSC), and the Housing Opportunities Commission (HOC).

The survey revealed a combined inventory of almost 43,000 PCs as of June 30, 2001 for the four agencies discussed in this report: the County Government, MCPS, the College and M-NCPPC.[3] Most of these computers (over 83 percent) are "mainstream" desktops, the type of computer commonly used in an office environment. Approximately 13 percent are the more advanced "high-end" desktops. The remaining inventory consists of laptops – mostly with mainstream configurations.

The ITPCC adopted a set of PC classification categories and replacement cycles and developed estimates of annual replacement cycle costs based on these standards. The ITPCC estimates it will cost over $22 million annually to replace the current inventory of almost 43,000

[2] MCPS had not established a PC asset management program when the FY 02 budget discussions took place.

[3] The Washington Suburban Sanitary Commission and the Housing Opportunities Commission also contributed to the ITPCC report. Their inventories are not included in the combined inventory numbers used in this report.

personal computers. This assumes a four-year replacement cycle for most of the computers. The total cost to replace each of the PCs at least once over the four-year period is $88 million. A copy of the ITPCC PC asset management report appears as Appendix A

IBR Project Scope and Report Organization: The ITPPC report, and the cost estimates in particular, raise significant questions that the Council must address if it wants PCs to remain functional and County workers to be productive. In July 2001, the Council approved a package of "Intensive Budget Review" (IBR) projects including a project to assess replacement programs for desktop computer assets. As approved by the Council, the Office of Legislative Oversight (OLO) and Council Staff would:

1) investigate best practices for management of desktop computer assets;
2) assess variations in user needs; and,
3) identify the relative costs and benefits of alternative desktop computer replacement practices.

The Council has direct budget authority over four County agencies. Together these agencies – the County Government, MCPS, the College, and M-NCPPC – own 94 percent of the inventory identified by the ITPCC. This report examines the practices, assumptions and budget implications of the PC asset management practices in these agencies. This report does not review the practices of the Washington Suburban Sanitary Commission or the Housing Opportunities Commission that were included in the ITPCC report. Similarly, the data in this study reflect only a subset of the data presented in the ITPCC report.

This report focuses primarily on desktop computers. While best management practices for desktops may apply to laptops, neither the literature nor County agency experience provides definitive information regarding life cycle costs for laptops. Moreover, laptops currently constitute less than four percent of the combined inter-agency PC inventory. If the use of laptops or other portable devices becomes more prevalent, County agencies may need to examine whether or not desktop management strategies might be tailored to these devices. This report is organized as follows:

- Section II presents an overview of PC technology trends and requirements.
- Section III identifies the benefits of PC asset management programs.
- Section IV describes best practices for a PC asset management program.
- Section V reviews the status of these practices in Montgomery County.
- Section VI presents a quantitative analysis of replacement cycles and cascading.
- Section VII discusses the significance of the total cost of ownership concept.
- Section VIII presents Council and OLO Staff findings.
- Section IX presents OLO and Council Staff recommendations.

II. PC TECHNOLOGY - TRENDS AND REQUIREMENTS

Thanks to ongoing technology advances, the steady growth of the Internet, and continually declining prices, personal computers have become a ubiquitous and indispensable tool for the delivery of government services. In Montgomery County, agencies rely on personal computers (PCs) to instruct students from grade school to college, to manage court documents and cases, to dispatch emergency response vehicles, to track social service case work, to catalogue library materials, to manage control of public assets, to map public facilities, to monitor refuse collection services and to record tax payments. In many ways, desktop computing technology shapes the very mission of County agencies and the service delivery expectations of their customers.

As PCs have become pervasive and indispensable, the tasks to manage PCs have grown increasingly complex. Council and OLO Staff identified three pre-requisites that must be satisfied to ensure effective PC usage: PCs must be kept current; PCs must be networked; and PC costs must be known and predictable. The following paragraphs briefly address each one of these requirements.

PCs must be kept current. Relying on outdated equipment puts a user at risk that he/she will not be able to complete necessary tasks if the computer cannot perform basic automation functions. A common misperception exists that keeping technology current is a simple task that merely requires replacing hardware equipment or software programs as needed.

In practice, keeping PC technology current is an ongoing task complicated by the dynamic relationships among users and hardware and software manufacturers. For example, users are continually vulnerable to the failure of central business applications when software vendors stop supporting older products, as they routinely do. Similarly, users who decide to replace outdated software often find that their hardware does not support the newer version of the software, even though this hardware may be only a few years old. In competitive business environments particularly, the rapid rate of new software development frequently pushes hardware into technological obsolescence well before a machine is functionally obsolete.

PCs must be networked. Effective PC usage depends on the ability to electronically share information with other PC users. A common misperception exists that merely placing a personal computer on the desktop will automatically deliver significant accessibility and productivity improvements, whether that PC is linked to other computers or not.

In practice, the benefits of improved accessibility and productivity are realized only if strategic planning exists to ensure an interoperable networked system. This means PC technology must be networked to a computer infrastructure capable of performing certain core functions. Intra-organizational computer compatibility (or interoperability) is a basic operating requirement for County agencies.

PC costs must be known and predictable. Effective PC usage requires that an organization purchase, operate, and dispose of personal computer products at a predictable life cycle cost. If an organization does not budget for life cycle costs ahead of time, it will risk purchasing computers without having the resources to properly maintain or repair them.

A common misperception exists that PC technology is inherently affordable, particularly because the cost to purchase a computer has declined steadily over time. In practice, although hardware prices have declined, labor costs have increased. As a result, the combined costs to support, maintain and dispose of a personal computer far surpass the initial acquisition price.

To track and manage this phenomenon, experts have developed a concept referred to as Total Cost of Ownership or TCO. TCO refers to the cost an organization pays for a computer over its life cycle, e.g. from acquisition through disposal. For example, the International Data Corporation (IDC) estimates the TCO to operate a PC at a typical corporate site with 1,000 users is $20,823 over a three-year period or $6,941 annually.[4] Experts caution that TCO costs vary widely and each agency must conduct a study to calculate its own costs. (See Section VII for a more detailed discussion of TCO.)

[4] International Data Corporation (IDC), *Asset Management Practices for Reducing PC Cost of Ownership: An IDC White Paper*, Framingham, MA, ND, p.1.

III. BENEFITS OF PC ASSET MANAGEMENT/REPLACEMENT PROGRAMS

Information technology consultants recommend that an organization establish a personal computer asset management program to control the proliferation of computers and, more importantly, to manage costs. A PC asset management program keeps track of what equipment is on site, where it is, what department it is being billed to, and whether or not it is sitting in storage. These tasks give an agency control over the use of its PCs and establish a system to get rid of surplus equipment in order to save space and money. In sum, an effective PC asset management program implements a set of management practices to:

- optimize the use of an organization's PC assets,
- lower operating costs,
- manage risks,
- improve investment decisions, and
- make workers more productive.

The private sector has employed computer asset management and replacement programs for several years to achieve cost efficiencies, organizational improvements and technology benefits. From a cost perspective, computer asset management/replacement programs centralize and coordinate all of the tasks associated with PCs in order to reduce the total cost of ownership. Centralized PC asset management achieves organizational efficiencies and benefits, including:

- improving management of software and hardware assets through better knowledge and control over PC inventory;
- maintaining useful IT information for budgeting;
- assuring software license compliance;
- preparing for enterprise-wide upgrades;
- reducing computer down time; and,
- improving productivity of help desk support.

Centralized PC asset management programs also produce corollary technology benefits by simplifying IT management and allowing more efficient use of IT resources. These benefits include:

- standardizing IT operating platforms and software across departments which minimizes inter-departmental incompatibilities;
- developing standard requirements to implement enterprise-wide technology (such as electronic mail);
- improving IT support and help desk functions; and,
- freeing up decentralized IT support staff to concentrate on department specific needs.

IV. BEST PRACTICES FOR PC ASSET MANAGEMENT

A PC asset management program consists of a collection of practices that are used to track and manage assets and capture related operational and financial information. Based on a review of current literature, OLO and Council Staff have identified ten practices that serve as the building blocks for a successful PC asset management program. Effective PC management requires consideration of the following:

1. Computing Environment Standards and PC Classifications
2. PC Inventories and Inventorying Practices
3. PC Replacement Cycles
4. Budgeting, Pricing and Acquisition Practices
5. Leasing and Seat Management Practices
6. Centralized Support and Administration Services
7. Maintenance Practices
8. Upgrading Versus Replacement
9. Cascading Practices
10. PC Disposal Practices

Each of these ten items is described in further detail in the paragraphs below.

1. Computing Environment Standards and PC Classifications

An effective PC asset management program will adopt standards to simplify program administration, address interoperability problems, and reduce costs. The literature recommends that an organization standardize both hardware and software applications. An IT organization can choose to implement uniform standards at many different levels in the technology environment. For example, an organization can standardize:

- a single hardware platform or a mix of similar hardware platforms;
- core software applications[5] (as well as other applications supported by the organization's IT department); and,
- workstation configurations.

Standardization reduces support costs and management time. Specifically, standardization:

- reduces costs and complexity in procurement, installation and user support;
- facilitates software distribution and software version control; and,
- improves the responsiveness and effectiveness of PC support.

By supporting fewer models and configurations, standardization improves service levels and helps make IT staff more productive. A study by the META group estimates standardization

[5] A core application is an operating system or software application that is used throughout the organization.

can save as much as $650 per seat per year.[6] According to Giga Information Group, standardized PC desktop environments are 15-20 percent less costly than non-standardized environments.[7]

2. PC Inventories and Inventorying Practices

A fundamental PC management practice is to create an inventory of computer hardware and software. The Gartner Group[8] recommends that one of the first tasks in developing an effective asset management program should be an audit of the hardware and software inventories. An inventory should capture detailed information about all of the organization's personal computers, including items such as the vendor name, product name, model number, purchase or leasing price and terms, specific hardware components, software loaded, terms of software licenses, name and department of first users, how it is used and any outsourcing contracts associated with the hardware and software.

The literature suggests an audit may be more difficult in practice than in theory, particularly in those organizations that have a decentralized technology framework. However, there are several uses for the data collected from a PC audit. They include:

- budgeting and forecasting;
- hardware and software procurement;
- asset disposal;
- help desk activities; and,
- maintenance.

Several software programs exist to automate the inventory process. These programs package different sets of features but typically include real-time inventory, software distribution and electronic licensing tools. The literature suggests that an organization must understand itself as well as the products on the market to achieve the promised benefits. In addition to the typical cautions to check references, compatibility, and prices, the literature notes that packages can be challenging to deploy. Many organizations may not have staff who are sufficiently trained to do the job properly. Also, an organization that does not have standard configurations will not be able to take full advantage of these projects. Finally, the literature cautions that the best inventory tools only capture what they find on the network. They cannot find assets that are warehoused, not in use, or not connected to the network.[9]

3. PC Replacement Cycles

A life cycle defines how long a computer will serve an organization based on the needs of the end users, the rate of technology change, and the cost to support the technology. An organization must estimate how long it intends to keep, maintain, and support a computer in order to estimate the total cost of ownership (TCO) and budget for computer replacement cycles.

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[6] www.expressmetrix.com/main/wp_asset_mgmt.asp, Getting the Most from Your IT Infrastructure Using IT Asset Management, p. 6.

[7] COTS Seat Management Workgroup, Seat Management for the Commonwealth of Virginia, Sept. 1999.

[8] The Gartner Group is a highly recognized independent consulting firm specializing in research and analysis on computer hardware, software, communications and other information technologies.

[9] Brain Bertin, Mike Lanier, Sean Burress and Ryan Haman, *From the trenches*, eWEEK, April 21, 1999.

A replacement cycle is the amount of time that an organization owns a PC before it is replaced. An organization typically adopts policies to establish a life cycle and a replacement cycle as part of its PC asset management program. Although the terms life cycle and replacement cycle are often used interchangeably, the length of a life cycle and a replacement cycle may or may not be the same.

In a recent research note, the Gartner Group modified its recommendation regarding the optimal life cycle for mainstream PCs. After several years of recommending a three-year life cycle, Gartner, in August 2001, amended its guidance to advocate a four-year replacement standard for most organizations. Gartner believes the slowing software development cycles justify extending the functional life of a mainstream PC. Gartner forecasts that three-quarters of organizations will adopt a four-year replacement standard for most of their mainstream PCs within three years.

The State of Texas Department of Information Resources (Texas DIR) states that the industry standard for PC life cycles is often used as a "rule of thumb" to justify purchases of desktop and laptop computers.[10] However, the Texas DIR believes there are no absolute life cycle numbers and industry standard life cycles may or may not be a good fit for all agencies. Instead, the Texas DIR proposes that each organization decide for itself how long a PC is useful and cost effective and suggests this determination be made with a complete understanding of agency needs and processes. The Texas DIR recommends a formal process to identify weaknesses in PC management procedures, develop user profiles for equipment and consider technological advances to establish a PC life cycle that best suits the needs of a particular agency.

The optimal length of a computer replacement cycle balances many related factors. In planning for regular and systematic replacement of PCs, an organization must consider:

- how frequently it must replace operating system software and core applications;
- the warranty period associated with operating systems software and software applications;
- whether or how to provide hardware maintenance beyond the term of the warranty;
- whether to upgrade or replace PCs that need more memory or speed; and,
- whether to extend the life of more powerful machines by passing them on to users with lesser needs.

Each of these factors is addressed later in this report.

4. Budgeting, Pricing and Acquisition Practices

An effective PC asset management program establishes budgeting mechanisms and centralized purchasing practices for an organization. A comprehensive budgeting framework helps an agency sequence and coordinate its PC technology assets. An organization that prepares its budget based on a TCO concept will also establish a decision structure that allows a department to appropriately weigh perceived technology needs, benefits, and costs. Finally, a

[10] State of Texas Department of Information Resources, *PC Life Cycles: Guidelines for Establishing Life Cycles for Personal Computers,* January 2000, p.2.

comprehensive budgeting approach will even out the spending peaks and valleys that may have characterized past PC investments.

Centralized purchasing also has several advantages. First, it gives an organization a tool to control the unchecked proliferation of PCs and the costs associated with their maintenance and support. Second, centralized or coordinated purchasing allows an organization to take advantage of volume discounts and improves a buyer's negotiating position. Finally, centralized procurement can reduce redundant purchases.

5. Leasing and Seat Management Practices

While purchasing is the predominant method of securing use of PCs, an organization may wish to evaluate other options including leasing and "seat management."

Lease vs. Purchase: In light of the rapid rate of change in information technology and the rapidly increasing costs, some IT managers are re-examining whether to own or lease PC assets and also whether to outsource IT management functions. The most common acquisition options are:

- Outright purchase – an agency purchases equipment purchases using general revenues or other dedicated funds, such as grants;

- Lease purchase – an agency finances the purchase of equipment and obtains title to the equipment at the end of the purchase period; and

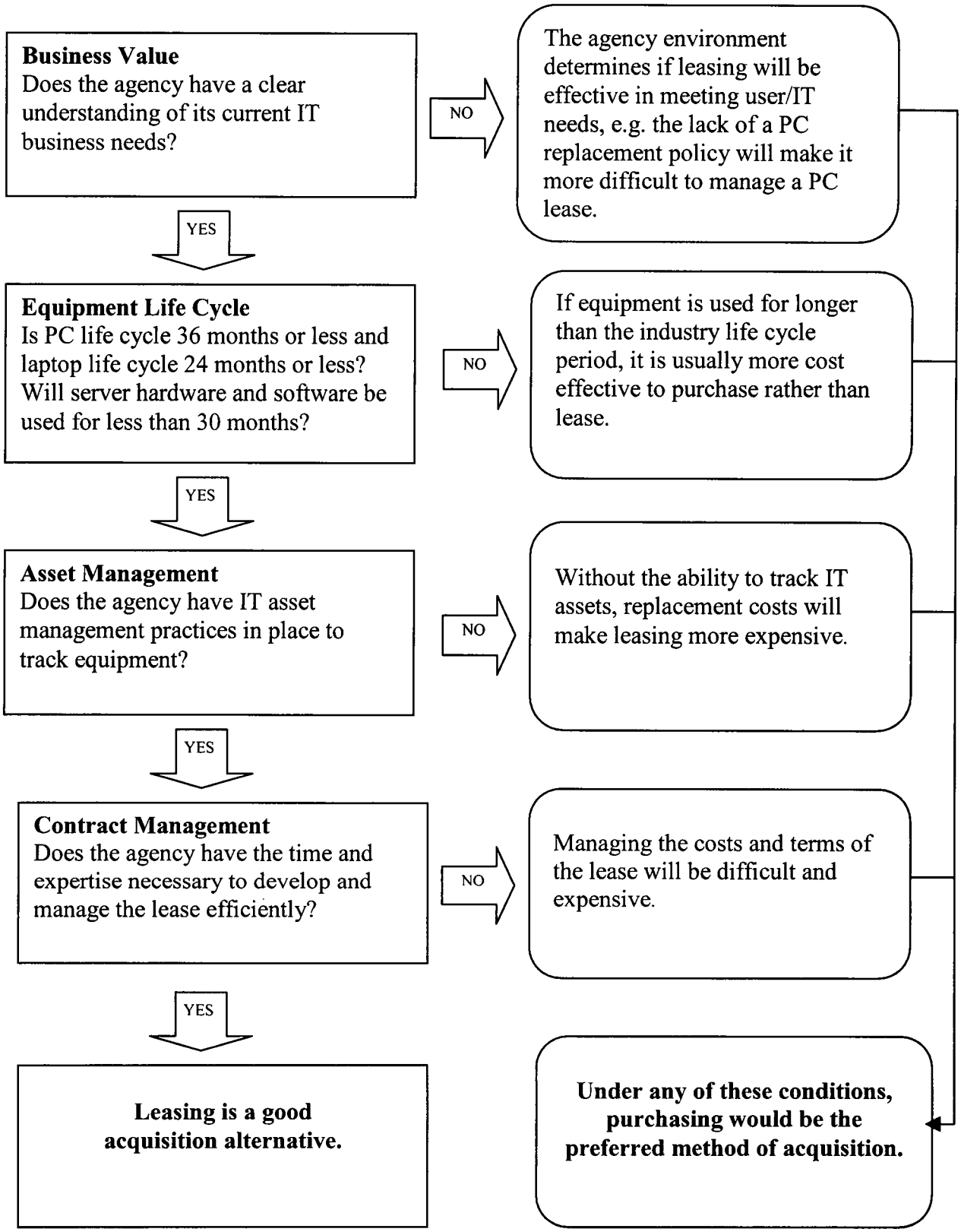
- Leasing or an operating lease – an agency makes ongoing payments to obtain use of the technology for a specific amount of time but does not own the equipment at the end of the lease term.

In May 1998, the Texas DIR published guidelines to help state agencies decide whether to lease or purchase IT equipment. The Texas DIR recommended that the decision to lease or purchase requires a thorough understanding of life cycle costs and management issues. Appendix B reproduces a table taken from the Texas DIR study that identifies the management issues and costs that occur at each life cycle step.

The Texas DIR also developed a decision tree of the specific issues an agency must address to determine whether to pursue leasing or purchasing. The exhibit on the following page suggests that an agency must pass several hurdles before leasing could be considered a good acquisition alternative. Specifically, an agency must have:

- a clear understanding of its current IT business needs;
- PC life cycles of 36 months or less for desktops and 24 months or less for laptops;
- IT asset management practices in place to track equipment, and
- time and expertise to develop and manage a lease efficiently.

Lease versus Purchase Decision Tree



Source: Department of Information Resources, State of Texas, Lease vs. Purchase: Guidelines for Lease versus Purchase of IT, Austin TX, May 1998.

Lease vs. Purchase vs. Seat Management: The term "seat management" refers to the practice of outsourcing desktop computers and their related software, hardware, maintenance, and help desk support. It is a form of performance-based contracting which holds a vendor responsible for the management of an agency's PC assets. An agency determines the level of desktop computing service and support it requires and then contracts for these services for a fixed price per month, per seat.

The decision to replace the traditional practice of purchasing and in-house management with leasing and/or seat management depends on the cost implications of each approach and a certain level of organizational readiness. Two tables in the appendices compare the management approaches or purchasing, leasing or seat management. Appendix C addresses how each approach assigns direct and indirect PC management costs. Appendix D compares how the management responsibilities differ under each approach.

6. Centralized Support and Administration Services

A comprehensive computer management program encompasses more than the centralized purchase and periodic replacement of standard units. As noted in Section III above, some of the justification for a PC asset management program derives from cost efficiencies achieved when maintenance and support functions are centralized. Effective PC management programs centralize administration of the following services:

- **Installation, Moves, and Changes**: installing new desktop units including connections to a local area network, and testing; removing and deleting files from the hard drive of retired PCs; moving PCs from one desktop to another; and, upgrading and modifying the configurations of existing desktop PCs.

- **Help Desk**: providing a single point of contact for a user to call to resolve operating problems, requesting repair services, or asking questions regarding operating systems and common applications.

- **Compatibility Testing**: testing the compatibility of new software or software upgrades with current operating systems and hardware configurations.

- **New and Upgraded Software**: installing new software; upgrading existing software; installing software patches.

- **System and Network Management**: evaluating system support costs and employing network management tools to allow for efficient monitoring, testing, repair, and upgrade of PCs; and, ensuring that PC management services are performed with minimal disruption to users' work. Similar to the inventory practices mentioned above, the computer industry has developed tools that automate the desktop management functions. The capabilities of these tools vary. The chart on the following page, prepared by College IT Staff, summarizes the capabilities of some of the desktop management tools that are currently available.

Examples of Desktop Management Systems

	Description	Benefit
Push Technology	Network software to automate sending applications from central server to individual workstations	Removes the need for technicians to physically visit the workstation to accomplish the software installation job
Self-Healing Applications	Network software to "watch" workstation applications and restore lost or corrupted files automatically	Removes the need for technicians to physically visit the workstation to accomplish the repair job
Automated Backup	Automated storage of data and applications and "personality" settings to save storage	Removes the need for technicians to physically visit the workstation to accomplish the conversion job
Automated Inventory	Network software to poll the individual workstations for their hardware and software configuration	Removes the need for technicians to physically visit the workstation to accomplish the inventory job

7. Maintenance Practices

New PCs typically are purchased with a manufacturer's warranty that covers service and repair costs for failing hardware. Generally, manufacturers' warranties last for three years beyond the purchase date. Manufacturers may offer extended warranties beyond three years. Standard warranties provide on-site repairs performed within one business day.

For computers beyond the manufacturer's warranty period, agencies have several options regarding continued hardware maintenance.

- Purchase Extended Coverage: An agency may choose to purchase a third party (non-manufacturer) extended warranty for its entire inventory of post-warranty computers. This option serves as an "insurance policy" and assures the contractor will repair any hardware failures within a specified time.

- Pay for Repairs on a Time & Materials Basis: An agency may contract with a third party to perform repairs as needed. The agency compensates the contractor based on hourly labor rates and the cost of supplies for the repair. Response times for this approach may be slower than the response times under the extended warranty approach.

- Perform Repairs Using In-House Personnel: An agency may use in-house personnel to repair PCs. Salaried employees perform maintenance work as needed.

- Forgo Maintenance on Post-Warranty PCs: An agency may choose to forgo maintenance of post-warranty computers entirely. In some cases, the additional useful life gained by

repairing the unit does not justify the cost of the repair. Under this approach, the agency would use each post-warranty PC until it breaks or until it is replaced. Failing post-warranty PCs would be replaced.

To choose an optimal hardware maintenance strategy, an agency must evaluate both costs as well as acceptable service levels. Certain mission-critical agency functions, which may be seriously impaired by extended down time for even a single computer, may warrant relatively high-cost coverage. Other users may be able to weather extended down time. For example, an employee working in an office environment may use the PC of a colleague who is on leave while awaiting repair of his/her computer.

8. Upgrading Versus Replacement

Replacement is not the only means of retaining current functionality for an inventory of PCs. An organization may choose to upgrade existing computers as a means of extending the duration of replacement cycles. Limited hardware improvements may render a PC capable of continued used as necessary to meet the user's business requirements. While mid-replacement cycle upgrades forestall the need to replace a computer, parts and labor must be factored into an assessment of cost effectiveness. Moreover, PCs with extended lives may incur increased maintenance costs as the machine remains in use after the manufacturer's warranty period expires.

9. Cascading Practices

"Cascading" refers to the redeployment of a PC from one internal user with certain computing needs to another user with different (and usually less advanced) automation needs. For example, , an organization with users who require leading edge technology may redeploy a high-end unit after a relatively short time (for example, two years). . When a high-end user receives a new unit, the agency would redeploy the retired high-end PC to the desktop of a user to replace his/her retired mainstream PC.

Successful and cost effective cascading requires careful planning and inventory management. Redeploying a computer incurs measurable labor costs to move and install units. Poorly implemented redeployments of PCs may result in high costs and may result in protracted down time. However, as demonstrated in Section VI of this report, under certain conditions cascading of PCs may yield meaningful cost savings.

10. PC Disposal Practices

Cascading temporarily delays the need to dispose of some computer hardware. Ultimately, however, when a PC reaches the end of its useful life, an organization must have a program to remove retired computers. Retired computers may be resold, reused, or recycled. Prior to relinquishing ownership of a PC, organizations need to "clean" the computer, deleting all data and files from the hard drive as well as removing all licensed applications.

The ability to resell or reuse a PC is a direct function of the unit's age and functionality. Limited resale opportunities exist for PCs older than two years. Similarly, redistribution of bulk

quantities of older hardware to secondary external users becomes increasingly difficult for computers older than three or four years. Older computers may be of value to some individual users (particularly non-profit organizations) especially when the new users have limited need to operate in a network environment or to interface with external computer users. Organizations which receive computers as a donation must also pay the disposal costs associated with these gifts.

V. PC ASSET MANAGEMENT PRACTICES IN MONTGOMERY COUNTY

This section of the report presents Council and OLO Staff observations and comments about PC asset management practices in four County agencies: Montgomery County Government, MCPS, the College, and M-NCPPC. The information is based on the ITPCC report on PC asset management and follow-up interviews and discussions with agency staff.

1. Computing Environment Standards and PC Classifications

Standards: All four of the County agencies have instituted core software application standards. For example, the County Government has established standardized imaging for the operating systems and applications installed on a new PC. Automated installation of the standardized image decreases the amount of labor needed to set up a PC, reduces user down time, and reduces the amount of errors in computer installation. With standardized PC images, DIST takes approximately 30 minutes to rollout a new desktop PC compared to three to four hours before images were standardized.

The County Government, the College, and M-NCPPC have completed their standardization processes. MCPS is moving toward the establishment of a single WINTEL platform across the agency. Established standards are not permanent; rather, agencies periodically review and update the standards based on technology advances, the introduction of new applications, and user needs.

ITPCC Classification System: Through the work of the ITPCC, each of the agencies adopted standard specifications and replacement cycles for different classifications of PCs based on user needs. After detailed review of the uses of PCs in County agencies, the ITPCC established a PC classification method shown in the tables below. It consists of five desktop PC categories and three laptop PC categories.

ITPCC PC Classifications

Desktops

	PC Category	Examples of Users/Applications
D1	**Mainstream Single Use** Single Purpose/ Application	Internet/Intranet access – single purpose stations
D2	**Mainstream Standard** Standard Office Automation	Office workers, K-12 classrooms, faculty, multi-purpose stations
D3	**Mainstream Accelerated** Application with Accelerated Life cycle	Power Users, faculty, Banner, GIS, CAD, CLASS
D4	**High-end Specialized** Specialized/Multiple Applications	Lab computers (MCG & MC), GIS, CAD, Graphics, Web Developers
D5	**High-end Accelerated** Applications with Accelerated Life cycle	Video editing, Specialized Instruction, Faculty

Laptops

	PC Category	Examples of Users/Applications
L1	**Mainstream Standard** Standard Office Automation	Workers with mobile computing requirements
L2	**High-end Specialized**	GIS, Graphics, Web Developers
L3	**High-end Accelerated**	Specialized Instruction, Faculty, Wireless Applications

The ITPCC classification system provides a basis for PC asset management planning and budgeting. This system is predicated on the following definitions:

Mainstream Single Use PCs are computers configured appropriately to provide a single function such as Internet access.

Mainstream Standard PCs are those intended for common office functions including word processing, spreadsheets, simple data base management, electronic messaging, Internet access and some specialized applications.

PCs slated for Accelerated replacement are those that an agency chooses to replace on an accelerated schedule so that select users can stay current with ongoing software releases.

High-end Specialized PCs rely on leading edge technology including high level processing speeds, memory, and data storage necessary to operate advanced software applications.

OLO and Council Staff find the ITPCC classification system a very helpful tool in assessing computer replacement requirements. To provide a more meaningful assessment of replacement needs by category, Staff asked each ITPCC agency for examples of the types of users associated with each desktop PC category. The tables below list some of the agency uses for each type of desktop PC.

Common Uses of PCs by Category
Montgomery County Government

D1 – Mainstream Single Use	Library patron use (future)
D2 – Mainstream Standard	Office work, library patron use
D3 – Mainstream Accelerated Replacement	Computer aided design, geographic information systems
D4 – High-end Specialized	Web site development, computer aided design, geographic information systems
D5 – High-end Specialized Accelerated Replacement	Not applicable

Common Uses of PCs by Category
Montgomery County Public Schools

D1 – Mainstream Single Use	Not applicable
D2 – Mainstream Standard	Classroom use, computer labs, office work
D3 – Mainstream Accelerated Replacement	Not applicable
D4 – High-end Specialized	Computer aided design, geographic information systems, network engineering
D5 – High-end Specialized Accelerated Replacement	Not applicable

Common Uses of PCs by Category
Montgomery College

D1 – Mainstream Single Use	Student research
D2 – Mainstream Standard	Office work, faculty use
D3 – Mainstream Accelerated Replacement	High-end application office work, faculty use
D4 – High-end Specialized	High-end application classroom and computer lab use
D5 – High-end Specialized Accelerated Replacement	High-end application classroom and computer lab use, graphics, faculty use

Common Uses of PCs by Category
Maryland National Capital Park and Planning Commission

D1 – Mainstream Single Use	Not applicable
D2 – Mainstream Standard	Office work
D3 – Mainstream Accelerated Replacement	High-end application office work
D4 – High-end Specialized	Use of high–end applications, programming
D5 – High-end Specialized Accelerated Replacement	Not applicable

2. Agency PC Inventories and Inventory Practices

Baseline Inventories: During the summer of 2001, the ITPCC Asset Management Work Team surveyed member agencies to determine how many PCs each agency owned in each category. As displayed in the table below, the survey revealed that the County Government, MCPS, the College, and M-NCPPC had a combined PC inventory of almost 43,000 units.

Agency PC Inventories by Category
Summer 2001

		MCG	MCPS	College	MNCPPC	Totals
Desktop	D1 - Mainstream Single Use	--	--	300	--	300
	D2 - Mainstream Standard	5,300	29,500	545	300	35,645
	D3 - Mainstream Accelerated Replacement	100	--	850	250	1,200
	D4 - High End Specialized	500	50	2,347	50	2,947
	D5 - High End Specialized Accelerated Replacement	--	--	1,130	--	1,130
Laptop	L1 - Mainstream Standard	500	500	362	22	1,384
	L2 - High End Specialized	100	--	105	10	215
	L3 - High End Specialized Accelerated Replacement	--	--	100	--	100
		6,500	30,050	5,739	632	42,921

This combined interagency PC inventory data reveals the following findings:

- 83 percent of the inventory are standard mainstream desktop computers.
- Laptops constitute less than four percent of the inventory.
- The County Government owns 15 percent of the inventory and almost 82 percent of its PCs are standard mainstream desktop units.
- MCPS owns 70 percent of the combined interagency PC inventory and almost all of MCPS PCs are standard mainstream desktop units. However, as many as 15,000 of these are five years of age or older and have limited functionality.
- The College owns 13 percent of the inventory and nearly four out of every five its PC's are either high-end units or units designated for accelerated replacement.
- M-NCPPC owns under one-and-a-half percent of the inventory and its PCs are divided almost equally between mainstream and high-end/accelerated replacement units.

Criteria/Methods for Determining Inventory Requirements: The most important variables in the cost of a PC management program are the size and composition of the PC

inventory. PC management costs are highly dependent on the number and types of PCs owned. An assessment of how many PCs an agency requires must begin with an initial determination of who requires use of a PC, whether the PC is dedicated to a single user or shared among multiple users, and what minimum functions are required by the user(s).

Various factors contribute to the size of an agency's PC inventory. For example, prevalent business practice assumes that almost every employee working in an office environment requires access to a dedicated PC. Moreover, employees who work predominantly outside an office environment are becoming increasing dependent on automation. Field workers often use portable (laptop) PCs or have access to a computer shared by multiple users in the organizational unit. Thus, the size of the PC inventory is related to the size of the work force. Growth or contraction of an agency's work force directly affects the size of its PC inventory.

In many cases, PC users are not agency employees but rather agency customers. Generally, PCs used by non-employees are work stations available for individual use for a limited amount of time. For example, the County Government provides multiple computers at each public library for patrons to search the materials catalogue and to access the Internet. The MCPS Global Access Technology program is installing PCs in classrooms. In addition, many public schools have computer labs used at different times of the day for instruction, student homework, or adult education. An increasing number of the College's classrooms are equipped to provide networked PCs for use by the instructor and each student in the room. In each of these examples, the agency's desire and ability to meet customer demands determine the number of computers made available.

MCPS, which owns the most PCs by far among County agencies, uses a formula to derive the number of PCs it requires. MCPS applies a desired ratio of students per computer to calculate how many student PCs it needs. The Maryland State Department of Education has established a target ratio of one current mainstream (D2) computer for every five students. The MCPS Strategic Technology Plan (September 2001) sets a goal of one computer for every three students.

Comparison of Current Inventory and Future Needs. All agencies, with the exception of MCPS, report that their existing PC inventories currently meet their needs. Future changes in PC requirements for these agencies primarily will come as a result of changes in the work force, changes in enrollment, or the addition of new programs or services.

MCPS reports that it has not fully implemented the Global Access Technology program and has not installed enough computers to meet its goal of one computer for every three students. At present, MCPS has achieved a ratio of one computer for every five students. However, as many as 15,000 of these computers are five years or older and have limited functionality. In addition to replacing these older machines, MCPS would need 15,000 more mainstream PCs to achieve its target of one computer for every three students. For the time being, MCPS has pushed back plans to achieve a three-to-one ratio. Current fiscal constraints have compelled MCPS to defer significant spending on PC acquisition. In the memorandum transmitting the Board of Education's requested FY 03 – 08 Capital Improvements Program, Board President Nancy J. King describes the current state of affairs for technology budgeting:

Although we need to substantially increase funding for instructional technology, the Board's request does not include what is necessary to meet the strategic technology goals of MCPS. Although the primary goal in the capital budget is to provide funding for seats to accommodate enrollment growth, a new project, Technology Modernization, which will create a replacement schedule for existing computers, increase the number of computers in our schools, and enable MCPS to implement the Instructional Management System that is part of the System of Shared Accountability, is included in the request. However, funds requested for this project are being delayed until FY 2004, and even this investment will not meet the significant technology needs of our schools. However, it is vital that the school system begins to address this longstanding issue.

Once MCPS achieves a particular student-to-computer ratio, it would need to purchase additional computers to sustain that ratio, as enrollment continues to grow.

Inventory Practices: Each of the agencies has conducted a PC asset audit and maintains an inventory of its computers. MCG maintains a comprehensive centralized inventory of PCs that is collected and maintained through both automated and manual processes. The DCM program office uses subsets of the inventory for day-to-day management (e.g., a detailed spreadsheet that track the details of computers covered under the seat management contract.[11]) An ongoing physical inventory of PCs is part of the DCM seat management contract.

MCPS conducts an inventory of its PC assets annually as part of a Technology Inventory compiled by the Maryland State Department of Education.[12] MCPS also conducts a physical inventory of non-school based computers annually.

The College has maintained an automated inventory management system for at least three years. This system shows each desktop with full configurations, size, location, assignment and dates of purchase and installation.

M-NCPPC uses a spreadsheet to track its inventory.

PC inventory databases containing detailed configuration and software information may be of great importance for use in strategic PC management decision-making. Staff notes that the practice of routine PC replacement is predicated on the assumption that the age of a computer serves as a proxy for the functionality of a computer. While this premise appears reasonable given recent trends in PC technology, in the future it is possible that agencies may achieve efficiencies by replacing computers based on their compatibility with current software and user needs instead of their age. A database that readily identifies the operational capabilities of each unit could serve as a valuable tool in future PC inventory management.

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[11] This spreadsheet tracks items such as the person and location of the computer, the computer's make model, speed, and memory, the operating system, the date the computer was shipped, the ISP address and the computer's age.

[12] The inventory reports measures such as: Student to computer ratios, the number and percent of high capacity, mid capacity and low capacity computers by location; the percent of classrooms with at least one computer for student use, one computer for teacher use or at least five computers

3. ITPCC Recommended Replacement Cycles

The ITPCC report defines an optimal replacement cycle for each PC classification category. The ITPCC recommends replacement cycles ranging from 1.5 years for specialized high-end systems to 4-plus years for single purpose machines. Based on the advice provided by the Gartner Group, the ITPCC adopted guidelines recommending a four-year replacement cycle for mainstream PCs, the most common type of PC in the interagency PC inventory.

ITPCC PC Recommended Optimal Replacement Cycles

	PC Category	Replacement Cycle
D1	**Mainstream Single Use** Single Purpose/ Application	4+ years
D2	**Mainstream Standard** Standard Office Automation	4 years
D3	**Mainstream Accelerated** Application with Accelerated Life cycle	3 years
D4	**High-end Specialized** Specialized/Multiple Applications	2 years
D5	**High-end Accelerated** Applications with Accelerated Life cycle	1.5 years

The ITPCC took into account several competing factors in developing these recommended replacement cycles. These factors are:

- advice from the Gartner Group;
- an ITPCC review of agency business/user requirements;
- an assessment of the rate of technological change that must be supported by PCs within each agency; and,
- consideration of budget constraints.

Advice from the Gartner Group: The ITPCC work group asked Gartner analysts to comment on the relative risks and benefits of three-, four-, and five-year PC replacement cycles. The Gartner analysts responded:

> There are no absolute rules and it depends on the business use that must be supported. Mainstream business environments are currently using an average of three to four year replacement cycles. A five-year cycle is not an acceptable business standard. Technology this old is not robust enough to support operating system and software requirements needed to operate. The asset management model must be based on the applications used on the hardware through the years it is deployed.

User requirements: Achieving an optimal frequency of PC replacement cycles also depends on user requirements. The ITPCC report concludes, "the primary variable driving hardware replacement cycles is applications software requirements." The ITPCC also recommends shorter replacement cycles for users with mission-specific automation needs including specialized applications requiring advanced hardware configurations. High-end and accelerated replacement PCs constitute about 13 percent of the combined interagency PC inventory.

Rate of Technological Change: The Gartner Group analysts noted that office automation software development cycles appear to be slowing which would reduce the pressure for frequent hardware replacements. The ITPCC report notes that the work group's analysis indicates that a three-year replacement cycle may minimize total life cycle cost of ownership for mainstream PCs. The report states that software development cycles should be closely monitored to determine if a three-year replacement cycle is warranted in the future.

Budget Constraints. Budget constraints have a very real impact on the actual rate of PC replacement. While the ITPCC adopted the interagency work group's recommended replacement cycle recommendations as the optimal practice, some ITPCC members stated the that their agencies may not be capable of fully funding recommended PC replacements during periods of limited resources.

4. Budgeting, Pricing and Acquisition practices

Budgeting: In the County Government, when a PC is added to the inventory, a department must pay the hardware and software acquisition plus the initial warranty costs. When the PC rolls over into the replacement program, DIST assumes purchasing responsibilities and the costs are assigned to the DCM non-departmental account. MCPS and the College both have centralized budgeting frameworks. At the College, the IT department reviews the departments' budget requests for consistency with the College's Information Technology Strategic Plan. M-NCPPC has developed an operating budget impact factor that it uses to represent the support costs associated with the acquisition of a new computer. M-NCPPC uses this factor when a budget is developed to ensure that PC operating costs are funded beyond the initial acquisition phase.

Initial Purchasing: The County Government operates a de facto centralized purchasing program through the DCM program. Individual departments have the authority to request PCs through their departmental budgets and purchase them either independently or through the DCM program. In over 95 percent of the cases, a department will purchase through the DCM program because DIST will handle maintenance, repair and support issues.

Montgomery College, MCPS and M-NCPPC also operate centralized purchasing programs for the initial acquisition of PCs.

Analysis of PC Pricing: Multiple factors contribute to the purchase price paid by County agencies for new PCs. As technology advances have produced increasingly more powerful computers at lower costs, mainstream PC prices have dropped steadily in recent years. As

illustrated in the table below, the price of the County Government's mainstream PC has decline between 6.5 and 13.7 percent in each of the past four years.

Average Annual Change in Mainstream PC Purchase Prices
Montgomery County Government

	Percent Change from Prev. Year
FY 99	-9.8%
FY 00	-6.5%
FY 01	-13.7%
FY 02 (to date)	-7.5%

These declines may not be sustainable in the future. As the national economy has slowed and demand for new PCs has declined, vendors have reduced profit margins to attract more business. With low profit margins, future price reductions would only come as a result of technological advances that lower the cost of production.

Recent price reductions reflect more than general market conditions. Agency purchasing practices also influence the prices of new PCs. All County agencies have contract vehicles that provide the ability to negotiate the price for new PC purchases. Agencies generally start negotiations with published vendor "list" prices or with prices negotiated by the Maryland State Office of Procurement and Contracting. Agencies generally are able to leverage their high volume of purchases to achieve actual pricing below both list and State published prices. Agencies achieve volume discounts by issuing bulk purchase orders for PCs with standardized hardware and software configurations. In addition, MCPS and the College take advantage of deep discounts that some vendors offer to educational institutions.

The table below illustrates the price differentials among different customers. Staff searched for December 2001 prices by customer category for the type of mainstream computer currently provided through the County Government's Desktop Computer Modernization program.

Pricing for Dell OptiPlex GX150 Small Desktop
with Pentium III Processor, 256MB Memory, 20GB Hard Drive, and 17 in. Monitor

	Price (Dec. 2001)	Percent Off List
List Published Price	$1,316	--
State Published Price	$1,241	5.7%
MCG Negotiated Price	$1,200	8.8%
Educational Discount Price	$930	29.3%

All County agencies routinely negotiate directly with vendors rather than buying from published price lists. MCPS and the College have the advantage of beginning negotiations with an assumed significant educational discount. IT managers in County agencies and other

jurisdictions report that the size and timing of PC purchases are the most significant factors that determine the actual purchase price.

Staff discovered three Maryland counties (Anne Arundel, Baltimore, and Howard) have entered into agreements with the Western States Contracting Alliance (WSCA), a multi-state bargaining alliance designed to pool purchases from numerous state and local governments to achieve greater volume discounts in computer purchasing. Contacts in the participating Maryland counties report that WSCA prices compare favorably to those published by the State Office of Procurement and Contracting. IT managers in these three counties have found participating in WSCA particularly advantageous when negotiating pricing for both large and small volume purchases.

Staff contacted the Dell account manager responsible for local governmental accounts to discuss WSCA pricing. The Dell account manager described WSCA pricing as "far and away the best pricing available to local governments" and indicated that County agency participation in WSCA would almost assuredly reduce contract costs. A recent article in Civic.com detailed the volume discounting achieved through WSCA (See Appendix E). A comparison of WSCA and US Communities (sponsored by the National Association of Counties) purchasing arrangements also appears in Appendix E.

Agency participation in purchasing alliances must conform to agency procurement policies and practices. Agencies may have to consider competitive bidding, minority participation, and other policies when evaluating the feasibility of joining a purchasing alliance.

5. Purchase versus Leasing versus Seat Management

The most common agency practices for acquiring PCs distinguish between hardware equipment and related services. Three options exist for equipment acquisition: outright purchase, lease/purchase, or an operating lease. Three options also exist for procuring IT support and administration services: using in-house staff, contracting out, or using a combination of the two. Seat management, which refers to the practice of outsourcing desktop computers and their related software, hardware, maintenance and help desk support, combines the options for equipment and services into one overall lease.

For equipment, all of the agencies currently follow the traditional practice of purchasing and owning their PCs. MCPS has begun to finance the purchase of school based computers over a four year term. The ITPCC workgroup discussed the issue of leasing with a consultant from the Gartner Group and concluded that it is not a viable approach for ITPCC agencies. The Gartner Group advised that the economic life cycles of PCs are too short to justify leasing in most cases because operational leases typically require a ten percent residual value at the end of the lease period, which, in turn, requires leased PCs to be replaced every 24 or 30 months.

The ITPCC report also noted that the effective management of a leasing contract requires a detailed inventory system as well as careful asset tracking to ensure that equipment is returned on time. The ITPCC noted that most of its agencies do not currently maintain a sophisticated database, which suggests they are not be ready to manage a leasing contract effectively.

6. Centralized Support and Administration Services

The practices for providing support and administration services for PCs vary among the four agencies. The County government has implemented a hybrid seat management approach through the DCM program. Under this approach, the County government continues to purchase PCs but DIST manages a contract that provides support and administration services for PCs after their initial purchase. The services include acquisition of replacement computers, installation, repairs, moves/adds and changes, and help desk support.

At the College, the Office of Information Technology manages its support services through a "Customer Care Initiative." Two groups within the Office of Information Technology have major responsibility for support and administration services. Each group consists of in-house staff supplemented by contract staff. The Computer Service group takes care of the desktop environment. The in-house staff is responsible for purchasing and installation and some repairs. The contract staff performs triage at the help desk and field technicians to troubleshoot minor problems. The Network Engineering group, which is supplemented by some high level contract technicians, is responsible for system and network management.

MCPS relies on both in-house and contractual support staff. In house staff coordinates procurement and installations and performs help desk services, networking, software setup and minor repairs.

M-NCPPC provides its centralized support and administration programs using in-house staff. M-NCPPC asked the Gartner Group to study the feasibility of seat management and the Gartner Group advised M-NCPPC that it was too small to make seat management cost effective.

Help desk support is the most commonly recognized support function for PC users. Help desks serve as a single point of contact for users to call to resolve operating problems, request repair services, or ask questions regarding operating systems and common applications. County agencies report substantial usage of help desk services. The College's help desk logged over 19,000 PC inquiries in Calendar Year 2001, an average of over three calls per user station per year. The County Government's help desk logged over 14,000 PC inquiries in the same year, an average of over two calls per user station per year.

7. Maintenance Practices

As mentioned above, new PCs may be purchased with a manufacturer's warranty for repair of failing hardware. Standard warranties provide on-site repairs performed within one business day. Most typically, manufacturers' warranties extend for three years after purchase.

Manufacturers may offer extended warranties beyond three years. For example, MCPS recently has begun purchasing computers with a four-year manufacturer's warranty. Vendor representatives have informed Staff that buying a fourth year of warranty should increase the purchase price of a new mainstream desktop PC by $90 to $120.

County agencies employ a variety of strategies to provide for the repair of post-warranty PC hardware. Agencies have several options regarding continued hardware maintenance. Until

recently, the County Government purchased third-party (non-manufacturer) coverage for its entire inventory of post-warranty computers. A contractor would perform repairs of hardware failures within a specified response time on any covered PC. The County Government employed this approach until earlier this year, paying $252 per computer for fourth-year coverage.

The County Government recently has piloted paying for PC hardware repairs using a time and materials basis. The County Government has a contractual arrangement with a vendor that performs repairs as needed and charges based on hourly labor rates plus the cost of supplies used in the repair. Very preliminary information from the County Government indicates that this approach has yielded an average cost of approximately $150 per unit repaired.

MCPS relies on school system personnel to perform PC hardware repairs. MCPS has provided training for several employees to become vendor certified technicians to repair post-warranty computers. MCPS has begun an effort to quantify the in-house costs spent on PC repair.

Agencies may choose to use multiple hardware maintenance strategies. For example, the College relies on a combination of in-house and contractor personnel for post-warranty hardware maintenance.

As described above, agencies may choose to forgo maintenance altogether on post-warranty PCs. At times, the additional useful life that would be gained by repairing a PC does not justify the cost of the repair. Agencies could use each post-warranty PC until it breaks or until it is replaced. Failing post-warranty PCs would be replaced. Agency IT departments have experimented with this approach and are evaluating its worth as an-on-going strategy.

Development of hardware maintenance strategies is an essential component of comprehensive PC management program. As will be illustrated in Section VI of this report, hardware maintenance costs are an important factor in determining both the total cost of ownership (TCO) as well as the optimal replacement cycle for PCs. To assess the relative merits of maintenance strategies, agencies must consider both costs and how alternative service levels and response times affect PC users' ability to perform their essential responsibilities.

8. Upgrading Versus Replacement

No County agency routinely upgrades computers in its inventory as a strategy to extend the duration of PC replacement cycles. Rather, each of the agencies reports that it selectively upgrades some of its PCs when required to accommodate a new application. While hardware upgrades may extend the useful life of a PC, mid-replacement cycle upgrades may also result in increased maintenance costs as the unit's life outlasts the warranty period.

MCG has found in its current roll-out of MS Office XP that four year old PCs require operating system upgrades to work with the new software and three to four year old PCs are requiring memory upgrades to attain acceptable performance. These are specific examples of the common experiences in managing PC assets. The operating system or application requires minimum hardware. Within three to four years the operating system or application is no longer

supported and needs to be replaced, but the old hardware (sometimes even with upgrades) does not support the software.

The Gartner Group recently compared current mainstream PC configurations with the current and projected rate of software development. Gartner concluded that a PC purchased today should meet most common office automation needs for a period of four years. This analysis implies that mid-cycle upgrades would not be justified for PCs with a planned life of up to four years. Mid-cycle upgrading appears may become a viable option for PCs planned for lives of five or more years. As will be illustrated in Section VI of this report, the cost-effectiveness of upgrading PCs in a five-year replacement program depends on the cost of the upgrade, the cost of new computers, and the cost of post-warranty PC maintenance.

9. Cascading Practices

Cascading practices vary significantly among County agencies. The County Government generally discourages cascading and does not incorporate cascading as a routine element of its Desktop Computer Modernization (DCM) program. DIST believes that the administrative, labor, and maintenance costs of PC redeployment renders cascading difficult to justify. As of the end of FY 01, the DCM program had completed one full three-year cycle of PC replacements. With an inventory consisting entirely of PCs under three years of age, cascading is not viewed as an attractive or cost effective option.

The College also discourages cascading. A limited number of the College's retired computers are redeployed for use in computer repair classes. As with the County Government, the College believes the administrative, labor, and maintenance costs are too high to justify cascading in an environment where most PC are replaced every two to three years.

Due to the resources required, MCPS would prefer not to cascade computers. However, the MCPS practice is significantly shaped by the age of its PC inventory. With thousands of active PCs over five years of age, MCPS routinely works to find a new home for any computer replaced after three or four years of use.

M-NCPPC encourages cascading of its PCs. As a relatively small agency with a correspondingly small inventory of PCs, M-NCPPC may administer PC redeployments more easily than the other agencies.

The ITPCC report estimates that cascading may reduce PC acquisition costs by up to ten percent but that these savings may be offset by redeployment costs. The ITPCC recommends that agencies evaluate the feasibility of cascading PCs with short life cycles:

> Agencies should consider cascading and redeploying the high-end systems with short life cycles of two years or less (e.g. the category D4 and D5 PCs). ... The cost of redeploying and cascading high-end equipment should be evaluated by each agency to understand the impact on TCO.

OLO and Council Staff analysis of the economics of cascading appears in the Section VI of this report.

10. PC Disposal Practices

County agencies rely on several methods to dispose of a retired PC once its useful life ends. The College donates many of its used PCs to non-profit organizations. For several years, the County Government has donated some of its retired PCs to MCPS, an agency with a much older inventory of computers. This practice amounts to a type of inter-agency cascading.

As described above, agencies often have difficulty finding other organizations to take their used PCs. Units that cannot be donated must be sold or recycled.

The ability to resell or reuse a PC is a direct function of the unit's age and functionality. Limited resale opportunities exist for PCs older than two years. Once most computers reach an age of four years, recycling becomes the only viable disposition option. Agencies often have to pay for the removal, recycling and/or disposal of older PCs. For example, the County Government currently pays $42 per unit to the DCM contractor to dispose of retired PCs if they cannot be cascaded to MCPS or resold. MCPS includes old PCs in its annual auction of surplused inventory.

VI. QUANTITATIVE ANALYSIS: REPLACMENT CYCLES AND CASCADING

OLO and Council Staff conducted an analysis of PC life cycle cost factors as they pertain to replacement cycles and cascading.

1. Quantitative Analysis of Replacement Cycles

An understanding of the factors that contribute to the total lifetime cost of ownership of a computer is necessary to determine the optimal replacement cycle for mainstream PCs. (Agencies justify replacement schedules for non-mainstream PCs based on user needs rather than on total cost of ownership). As discussed above in the "PC Support and Administration" section of this report, numerous factors contribute to the cost of computer asset management and the calculation of the total cost of ownership over the life of a PC. Staff sought to compare the total life cycle costs of three-year, four-year, and five-year replacement cycles. To facilitate a quantitative comparison of alternative replacement cycles, Staff performed an analysis using the three most quantifiable mainstream PC life cycle cost factors:

1. Purchase Price: the cost of acquiring a new computer with current configurations and functionality. The analysis assumes that purchase prices currently range from $925 to $1,250 per mainstream PC. The analysis also assumes that PC prices will decline by five percent per year.

2. Desktop Maintenance: the cost of providing repairs or resolving operating problems for desktop PCs. The analysis assumes that fourth year maintenance costs currently range from $100 to $250 per PC with fifth year maintenance costs assumed to be 25 percent higher than fourth year costs.

3. Mid-Cycle Upgrading: the cost of upgrading PC hardware or software in the middle of the replacement cycle to extend the functional life of the unit. The analysis assumes that mid-cycle upgrades might only be employed during a five-year replacement cycle and that an upgrade would cost $300 per PC.

The table below shows the variations in purchase price, maintenance costs and upgrading assumptions for each of eight comparative scenarios.

	Purchase Price	Maintenance Costs	Mid-Cycle Upgrade
Comparison #1	Highest in Range	Highest in Range	In Middle of 5-Year Cycle
Comparison #2	Highest in Range	Lowest in Range	In Middle of 5-Year Cycle
Comparison #3	Lowest in Range	Highest in Range	In Middle of 5-Year Cycle
Comparison #4	Lowest in Range	Lowest in Range	In Middle of 5-Year Cycle
Comparison #5	Highest in Range	Highest in Range	No Mid-Cycle Upgrade
Comparison #6	Highest in Range	Lowest in Range	No Mid-Cycle Upgrade
Comparison #7	Lowest in Range	Highest in Range	No Mid-Cycle Upgrade
Comparison #8	Lowest in Range	Lowest in Range	No Mid-Cycle Upgrade

The table below summarizes the results of the analysis. It shows 3-year, 4-year and 5-year life cycle costs for each combination. The life cycle cost comparisons reveal that different

cost assumptions support different replacement cycles. In summary, the analysis reveals following:

- The determination of an optimal replacement cycle for mainstream PCs is dependent on multiple factors and the introduction of other cost of ownership factors (such as PC support and administration costs) may affect the determination of agency replacement cycles.

- Lower purchase prices and lower maintenance costs produce the lowest annual life cycle costs, particularly without upgrading.

- Higher purchase prices and lower maintenance and upgrading costs tend to support longer replacement cycles.

- Lower purchase prices and higher maintenance and upgrading costs tend to support shorter replacement cycles.

Comp. #	Purchase Price	Price of Maint.	5 Year Upgrade?	Simplified Annual Life Cycle Cost		
				3-year Life Cycle	4-year Life Cycle	5-year Life Cycle
#1	High	High	Yes	$336	$321	$392
#2	High	Low	Yes	$336	$283	$326
#3	Low	High	Yes	$248	$254	$334
#4	Low	Low	Yes	$248	$216	$268
#5	High	High	No	$336	$321	$332
#6	High	Low	No	$336	$283	$266
#7	Low	High	No	$248	$254	$274
#8	Low	Low	No	$248	$216	$208

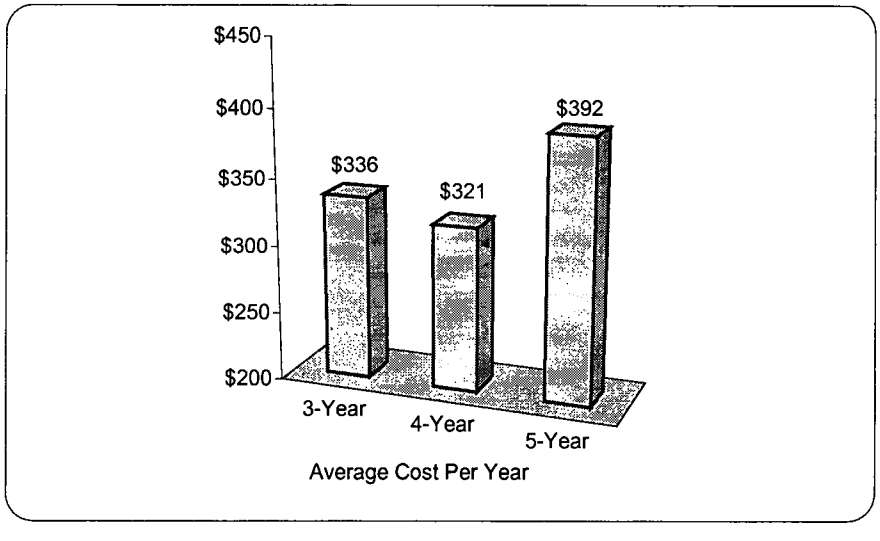
The eight life cycle cost comparisons take into account three variables. The introduction of other cost of ownership factors (such as PC support and administration costs) may affect the determination of agency replacement cycles and affects TCO

LIFE CYCLE COST COMPARISON #1

Purchase Price: ***High*** **Maintenance:** ***High*** **Mid 5-Year Upgrade:** ***Yes***

PC Purchase Price	$1,250
Avg. Annual Price Decline	5%
Post-Warranty Maintenance (4th Yr.)	$250
Post-Warranty Maintenance (5th Yr.)	$300
Mid-Cycle Upgrade	$300

	3-Year	4-Year		5-Year		
Year	Purchase Price	Purchase Price	Post-Warr. Maintenance	Purchase Price	Post-Warr. Maintenance	Mid-Cycle Upgrade
1	$1,250	$1,250	$0	$1,250	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$300
4	$1,072	$0	$250	$0	$250	$0
5	$0	$1,018	$0	$0	$300	$0
6	$0	$0	$0	$967	$0	$0
7	$919	$0	$0	$0	$0	$0
8	$0	$0	$250	$0	$0	$300
9	$0	$829	$0	$0	$250	$0
10	$788	$0	$0	$0	$300	$0
11	$0	$0	$0			
12	$0	$0	$250			
Totals	$4,028	$3,097	$750	$2,217	$1,100	$600
Avg. $/Yr.	**$336**	**$321**		**$392**		

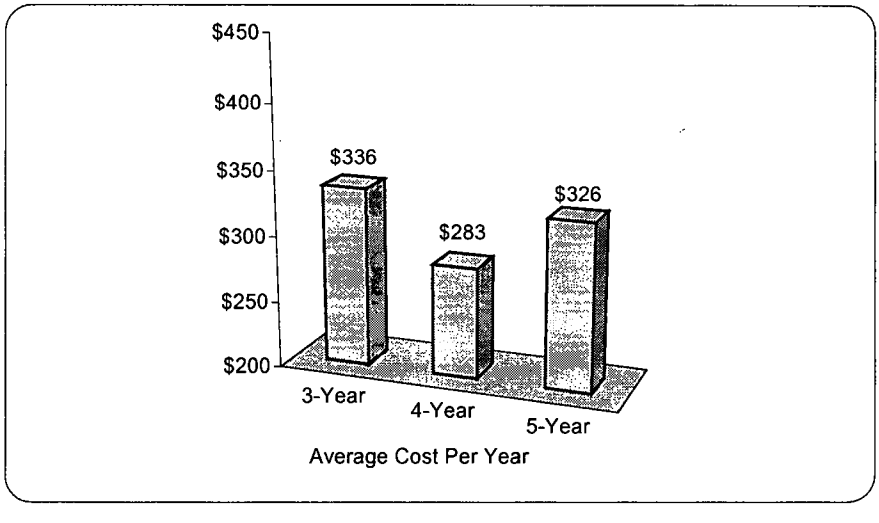


LIFE CYCLE COST COMPARISON #2

Purchase Price: ***High*** **Maintenance:** ***Low*** **Mid 5-Year Upgrade:** ***Yes***

PC Purchase Price	$1,250
Avg. Annual Price Decline	5%
Post-Warranty Maintenance (4th Yr.)	$100
Post-Warranty Maintenance (5th Yr.)	$120
Mid-Cycle Upgrade	$300

	3-Year	4-Year		5-Year		
Year	Purchase Price	Purchase Price	Post-Warr. Maintenance	Purchase Price	Post-Warr. Maintenance	Mid-Cycle Upgrade
1	$1,250	$1,250	$0	$1,250	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$300
4	$1,072	$0	$100	$0	$100	$0
5	$0	$1,018	$0	$0	$120	$0
6	$0	$0	$0	$967	$0	$0
7	$919	$0	$0	$0	$0	$0
8	$0	$0	$100	$0	$0	$300
9	$0	$829	$0	$0	$100	$0
10	$788	$0	$0	$0	$120	$0
11	$0	$0	$0			
12	$0	$0	$100			
Totals	$4,028	$3,097	$300	$2,217	$440	$600
Avg. $/Yr.	**$336**	**$283**		**$326**		

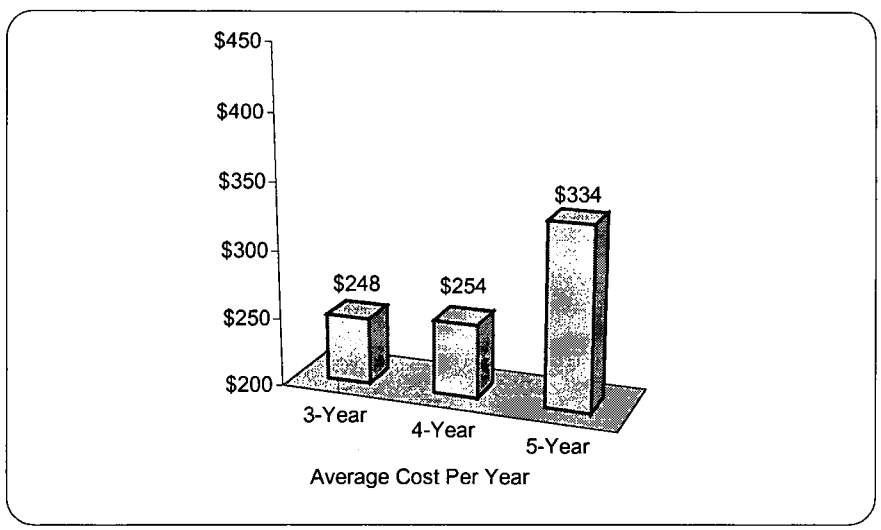


LIFE CYCLE COST COMPARISON #3

Purchase Price: ***Low*** **Maintenance:** ***High*** **Mid 5-Year Upgrade:** ***Yes***

PC Purchase Price	$925
Avg. Annual Price Decline	5%
Post-Warranty Maintenance (4th Yr.)	$250
Post-Warranty Maintenance (5th Yr.)	$300
Mid-Cycle Upgrade	$300

	3-Year	4-Year		5-Year		
Year	Purchase Price	Purchase Price	Post-Warr. Maintenance	Purchase Price	Post-Warr. Maintenance	Mid-Cycle Upgrade
1	$925	$925	$0	$925	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$300
4	$793	$0	$250	$0	$250	$0
5	$0	$753	$0	$0	$300	$0
6	$0	$0	$0	$716	$0	$0
7	$680	$0	$0	$0	$0	$0
8	$0	$0	$250	$0	$0	$300
9	$0	$614	$0	$0	$250	$0
10	$583	$0	$0	$0	$300	$0
11	$0	$0	$0			
12	$0	$0	$250			
Totals	$2,981	$2,292	$750	$1,641	$1,100	$600
Avg. $/Yr.	**$248**	**$254**		**$334**		

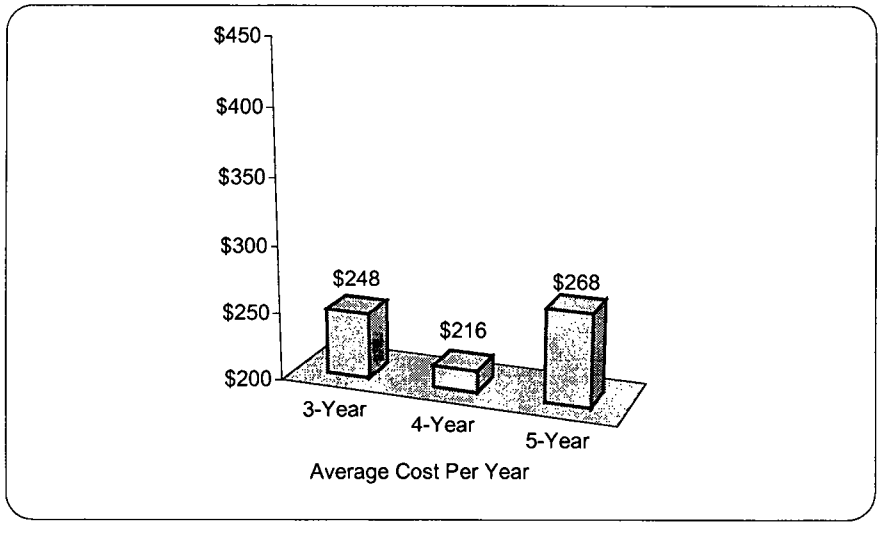


LIFE CYCLE COST COMPARISON #4

Purchase Price: ***Low*** **Maintenance:** ***Low*** **Mid 5-Year Upgrade:** ***Yes***

PC Purchase Price	$925
Avg. Annual Price Decline	5%
Post-Warranty Maintenance (4th Yr.)	$100
Post-Warranty Maintenance (5th Yr.)	$120
Mid-Cycle Upgrade	$300

	3-Year	4-Year		5-Year		
Year	Purchase Price	Purchase Price	Post-Warr. Maintenance	Purchase Price	Post-Warr. Maintenance	Mid-Cycle Upgrade
1	$925	$925	$0	$925	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$300
4	$793	$0	$100	$0	$100	$0
5	$0	$753	$0	$0	$120	$0
6	$0	$0	$0	$716	$0	$0
7	$680	$0	$0	$0	$0	$0
8	$0	$0	$100	$0	$0	$300
9	$0	$614	$0	$0	$100	$0
10	$583	$0	$0	$0	$120	$0
11	$0	$0	$0			
12	$0	$0	$100			
Totals	$2,981	$2,292	$300	$1,641	$440	$600
Avg. $/Yr.	**$248**	**$216**		**$268**		

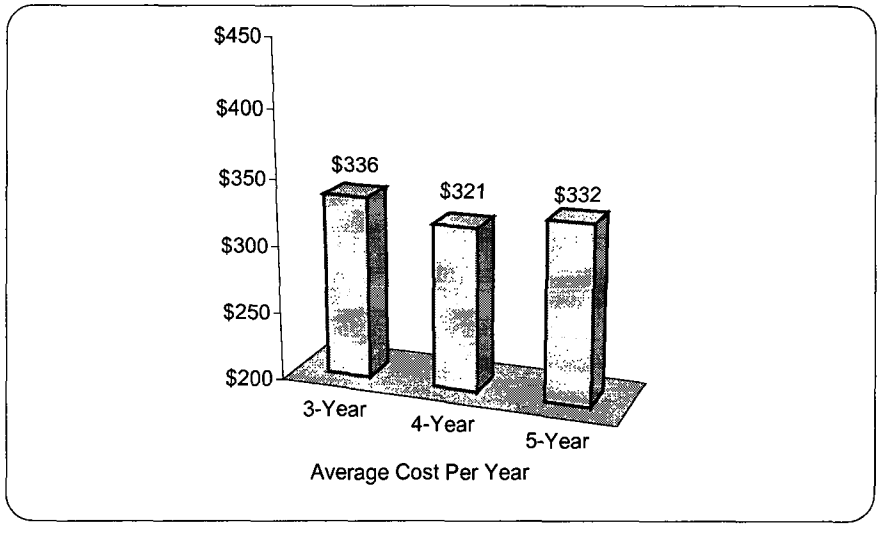


LIFE CYCLE COST COMPARISON #5

Purchase Price: ***High*** **Maintenance:** ***High*** **Mid 5-Year Upgrade:** ***No***

PC Purchase Price	$1,250
Avg. Annual Price Decline	5%
Post-Warranty Maintenance (4th Yr.)	$250
Post-Warranty Maintenance (5th Yr.)	$300
Mid-Cycle Upgrade	N/A

	3-Year	4-Year		5-Year		
Year	Purchase Price	Purchase Price	Post-Warr. Maintenance	Purchase Price	Post-Warr. Maintenance	Mid-Cycle Upgrade
1	$1,250	$1,250	$0	$1,250	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$0
4	$1,072	$0	$250	$0	$250	$0
5	$0	$1,018	$0	$0	$300	$0
6	$0	$0	$0	$967	$0	$0
7	$919	$0	$0	$0	$0	$0
8	$0	$0	$250	$0	$0	$0
9	$0	$829	$0	$0	$250	$0
10	$788	$0	$0	$0	$300	$0
11	$0	$0	$0			
12	$0	$0	$250			
Totals	$4,028	$3,097	$750	$2,217	$1,100	$0
Avg. $/Yr.	**$336**	**$321**		**$332**		

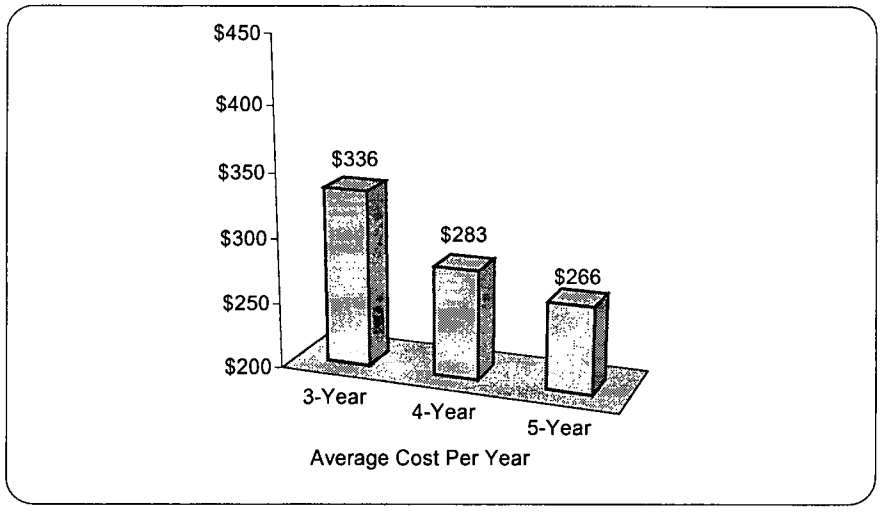


LIFE CYCLE COST COMPARISON #6

Purchase Price: ***High*** **Maintenance:** ***Low*** **Mid 5-Year Upgrade:** ***No***

PC Purchase Price	$1,250
Avg. Annual Price Decline	5%
Post-Warranty Maintenance (4th Yr.)	$100
Post-Warranty Maintenance (5th Yr.)	$120
Mid-Cycle Upgrade	N/A

	3-Year	4-Year		5-Year		
Year	Purchase Price	Purchase Price	Post-Warr. Maintenance	Purchase Price	Post-Warr. Maintenance	Mid-Cycle Upgrade
1	$1,250	$1,250	$0	$1,250	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$0
4	$1,072	$0	$100	$0	$100	$0
5	$0	$1,018	$0	$0	$120	$0
6	$0	$0	$0	$967	$0	$0
7	$919	$0	$0	$0	$0	$0
8	$0	$0	$100	$0	$0	$0
9	$0	$829	$0	$0	$100	$0
10	$788	$0	$0	$0	$120	$0
11	$0	$0	$0			
12	$0	$0	$100			
Totals	$4,028	$3,097	$300	$2,217	$440	$0
Avg. $/Yr.	**$336**	**$283**		**$266**		

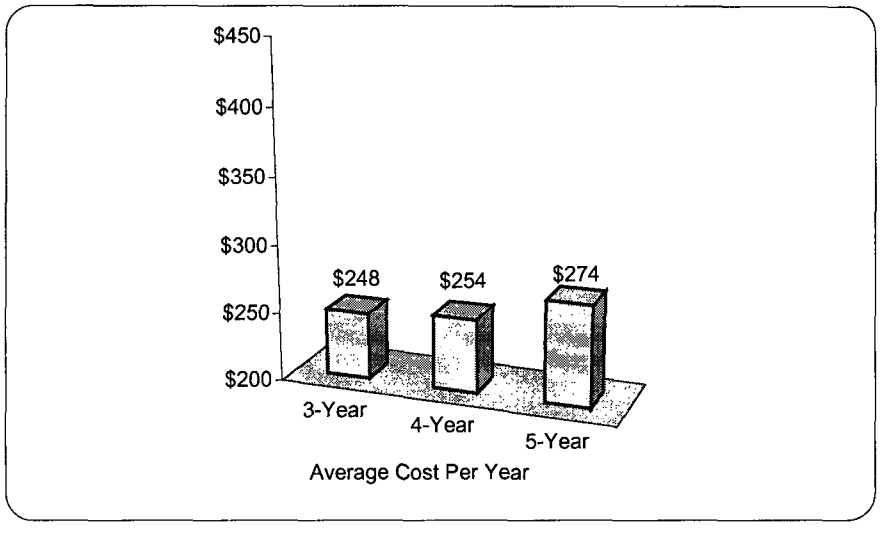


LIFE CYCLE COST COMPARISON #7

Purchase Price: ***Low*** **Maintenance:** ***High*** **Mid 5-Year Upgrade:** ***No***

PC Purchase Price	$925
Avg. Annual Price Decline	5%
Post-Warranty Maintenance (4th Yr.)	$250
Post-Warranty Maintenance (5th Yr.)	$300
Mid-Cycle Upgrade	N/A

	3-Year	4-Year		5-Year		
Year	Purchase Price	Purchase Price	Post-Warr. Maintenance	Purchase Price	Post-Warr. Maintenance	Mid-Cycle Upgrade
1	$925	$925	$0	$925	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$0
4	$793	$0	$250	$0	$250	$0
5	$0	$753	$0	$0	$300	$0
6	$0	$0	$0	$716	$0	$0
7	$680	$0	$0	$0	$0	$0
8	$0	$0	$250	$0	$0	$0
9	$0	$614	$0	$0	$250	$0
10	$583	$0	$0	$0	$300	$0
11	$0	$0	$0			
12	$0	$0	$250			
Totals	$2,981	$2,292	$750	$1,641	$1,100	$0
Avg. $/Yr.	**$248**	**$254**		**$274**		

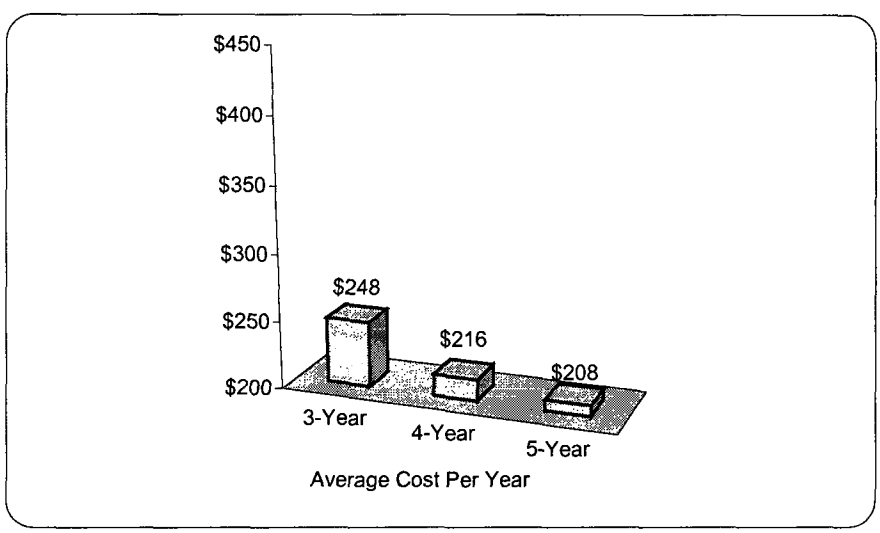


LIFE CYCLE COST COMPARISON #8

Purchase Price: ***Low*** **Maintenance:** ***Low*** **Mid 5-Year Upgrade:** ***No***

PC Purchase Price	$925
Avg. Annual Price Decline	5%
Post-Warranty Maintenance (4th Yr.)	$100
Post-Warranty Maintenance (5th Yr.)	$120
Mid-Cycle Upgrade	N/A

	3-Year	4-Year		5-Year		
Year	Purchase Price	Purchase Price	Post-Warr. Maintenance	Purchase Price	Post-Warr. Maintenance	Mid-Cycle Upgrade
1	$925	$925	$0	$925	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$0
4	$793	$0	$100	$0	$100	$0
5	$0	$753	$0	$0	$120	$0
6	$0	$0	$0	$716	$0	$0
7	$680	$0	$0	$0	$0	$0
8	$0	$0	$100	$0	$0	$0
9	$0	$614	$0	$0	$100	$0
10	$583	$0	$0	$0	$120	$0
11	$0	$0	$0			
12	$0	$0	$100			
Totals	$2,981	$2,292	$300	$1,641	$440	$0
Avg. $/Yr.	**$248**	**$216**		**$208**		



2. Quantitative Analysis of Cascading Costs and Benefits

Staff conducted a quantitative analysis to evaluate the possible fiscal advantages of integrating cascading of PCs as part of a computer inventory management program. Staff evaluated costs for a hypothetical organization that had an inventory of 1,000 PCs consisting of 750 mainstream units and 250 high-end units. Staff assumed a four-year life for mainstream units and a two-year life for high-end units. Staff further assumed purchase prices and post-warranty costs in the middle of the ranges described in the previous section of this memorandum.

Implementing a cascading policy requires staff or contract support to move the computer from original user's desktop and to reinstall the unit at the new user's desktop. The analysis below assumes a cascading (PC move and reinstallation) costs of $80 per unit. The example assumes that retired high-end units are redeployed to mainstream PC users for an additional two years of use.

Replacement and Maintenance Cost Comparison
With and Without Cascading of Retired High-end PCs

Mainstream Unit Purchase Price	$1,100
High End Unit Purchase Price	$2,000
Number of Mainstream PCs	750
Number of High End PCs	250
Average Annual Price Decline	5%
Post-Warranty Maintenance (per PC)	$175
Cascading Cost (per move)	$80

	NO CASCADING			CASCADING OF HIGH END PCs			
	Mainstream		High End	Mainstream			High End
Year	Purchase Price	Post-Warr. Maintenance	Purchase Price	Purchase Price	Post-Warr. Maintenance	Cascading Costs	Purchase Price
1	$825,000	$0	$500,000	$550,000	$0	$20,000	$500,000
2	$0	$0	$0	$0	$43,750	$0	$0
3	$0	$0	$451,250	$0	$0	$20,000	$451,250
4	$0	$131,250	$0	$0	$175,000	$0	$0
5	$671,968	$0	$407,253	$447,978	$0	$20,000	$407,253
6	$0	$0	$0	$0	$43,750	$0	$0
7	$0	$0	$367,546	$0	$0	$20,000	$367,546
8	$0	$131,250	$0	$0	$175,000	$0	$0
	$1,496,968	$262,500	$1,726,049	$997,978	$437,500	$80,000	$1,726,049
		Total Cost	$3,485,517			**Total Cost**	$3,241,528
		Avg. Cost/Mainstream PC/Year	$293			**Avg. Cost/Mainstream PC/Year**	$253

This example illustrates a case in which cascading raises overall maintenance costs (including PC moves and re-installations) but reduces PC acquisition costs by an even greater amount. In this case the average cost per year of keeping a mainstream computer with cascading was 13 percent lower than the alternative without cascading. Staff believes that this analysis indicates that cascading may be of significant benefit under certain conditions. Cascading may be of most benefit to County agencies when:

- the number of mainstream units exceeds the number of high-end units;
- mainstream replacement cycles are an exact multiple of high-end replacement cycles (as in the example when the mainstream cycle was exactly twice as long as the high-end cycle); and,
- post-warranty maintenance and move/reinstallation costs do not grow significantly.

VII. SIGNIFICANCE OF THE TOTAL COST OF OWNERSHIP CONCEPT

Total Cost of Ownership (TCO) refers to the collective costs of purchasing, maintaining and disposing of a PC over the life of the computer. Industry experts recommend that an agency establish a tracking system to manage a personal computer throughout its life cycle, i.e., from acquisition, deployment, and maintenance to disposal and that an agency establish an accounting system to capture the costs associated with these life cycle phases. The TCO usually includes the purchasing costs of the hardware, software and software licenses, training, plus the costs of ongoing support, maintenance and disposal of these assets.

TCO Cost Models. To understand the factors that contribute to TCO, experts have developed models to track and capture all ownership costs. While a model will vary from one agency to the next, typically a TCO model captures direct and indirect costs. Direct costs include acquisition, operations and management costs. Indirect costs usually include end user operations and downtime.

The Gartner Group has developed the most well-known TCO cost model. The table below provides a brief summary of each cost component. A more detailed explanation is found in Appendix F.

DIRECT (BUDGETED) COSTS	
Acquisition –	Includes costs of hardware and core software.
Operations –	Includes costs to deliver technical support and infrastructure operations for users.
Administration	Includes direct labor staffing, activity costs and outsourced fees in support of operations including supervisory managers, finance, procurement and training
INDIRECT (UNBUDGETED) COSTS	
End User Operations –	Includes cost of end users supporting themselves instead of relying on formal support channels
Downtime –	Represents lost productivity due to planned and unplanned network, system and application unavailability

Based on an analysis of the data, industry experts report that the costs to purchase hardware and software represent only a fraction of the TCO whereas labor-related items such as maintenance account for the bulk of total cost. For example, research by IDC estimates operating and staffing costs make up 75 percent of the life cycle costs and hardware and software expenditures comprise 25 percent of these costs. (IDC estimates that 16 percent of life cycle costs are for hardware acquisition and 9 percent are for software.)[13]

[13] International Data Corporation (IDC), *Asset Management Practices for Reducing PC Cost of Ownership: An IDC White Paper*, Framingham, MA, nd, p.1.

TCO cost studies and data in Montgomery County agencies. Staff at each of the agencies are familiar with the TCO concept but have not conducted any formal TCO studies. Staff at Montgomery College have received TCO training from the Gartner Group and intend to conduct a TCO study in the coming year. MCPS has looked at some TCO elements including warranties, maintenance and user support costs and has researched experience in other jurisdictions. MCPS does not currently have a TCO program. M-NCPPC has not conducted a TCO study.

The County has not conducted a formal TCO study; however the County government provided information during the FY 02 budget worksessions that corresponds to the direct costs of a TCO model. The table below presents the County government data. These data show that the $3.4 million acquisition costs for the DCM program are less than half of the total direct costs of the program. If other costs, including indirect costs were added to the direct costs, the acquisition costs might be as little as one-third of total program costs.

DIRECT (BUDGETED) COSTS		
Acquisitions[14]	$3,401,119	47.5%
Operations[15]	2,982,798	41.7%
Administration[16]	772,583	10.8%
SUBTOTAL		$7,156,500
INDIRECT (UNBUDGETED) COSTS		
End User Operations	Not Available	
Downtime	Not Available	
SUBTOTAL	Not Available	

Implications of the TCO concept for the PC inventory database. OLO and Council Staff applied the budget data from the County DCM program to develop a conservative estimate of the TCO for the PC inventory developed by the ITPCC. Specifically, since acquisition costs for the DCM program were approximately half the direct costs, Council and OLO Staff believe its reasonable to assume the costs to *replace and maintain* the PCs in the inventory would be twice the acquisition estimate.

In other words, if ITPCC estimates that it will cost over $22 million to replace the current inventory of almost 43,000 PCs, it would cost $44 million annually in direct costs to replace and maintain this inventory. Similarly, if it will cost almost $26 million to replace a future inventory of 58,000 PCs (reflecting the addition of 15,000 new units identified by MCPS), it is reasonable to assume the cost for replacement and maintenance would be twice that or approximately $51 million. These cost estimates are intended to provide a general estimate of the on-going actual costs of PC management for County agencies. Actual costs will be dependent on the inter-relationships among PC acquisition, maintenance, support, and disposal practices and costs.

[14] Includes $2,793,569 for hardware acquisition and $607,550 for software acquisition.
[15] Reflects $2,982,798 in DIST salaries and subcontractor fees.
[16] Includes $239,963 for contract support, $361,720 for DIST personnel and $170,900 in OHR budget for training.

These estimates are conservative because they do not include any indirect costs for end user operations or user downtime and productivity loss. They are also understated because the ITPCC acquisition estimate was based on hardware costs only; it did not include other acquisition costs to purchase the software or software licenses.

VIII. SUMMARY OF IBR REPORT FINDINGS

The bullets below summarize the major findings of this report.

PC Technology - Trends and Requirements

- Personal computers have become a ubiquitous and indispensable tool for the delivery of services by County agencies. In many ways, desktop computing technology shapes the very mission of County agencies and the service delivery expectations of their customers.

- Relying on outdated equipment raises a real risk that PC users will not be able to complete essential tasks.

- Effective PC usage depends on the ability to electronically share information with other PC users both within and outside of the organization.

- Effective PC usage requires that an organization purchase, operate and dispose of personal computer products at a predictable life cycle cost. If an organization does not budget for life cycle costs ahead of time, it will risk purchasing computers without having the resources to properly maintain them.

Benefits of PC Asset Management Programs

- The private sector has employed computer asset management and replacement programs for several years because these programs yield cost efficiencies as well as organizational improvements.

- PC management programs allow an organization to control the costs associated with growth in PC usage. Effective PC management programs optimize the use of assets, lower operating costs, manage risks, improve investment decisions, and make workers more productive.

Best Management Practices

A PC asset management program consists of a collection of practices that are used to track and manage assets and capture related operational and financial information. Based on a review of current literature, OLO and Council Staff have identified ten practices that serve as the building blocks for a successful PC asset management program. Effective PC management requires consideration of the following:

1. Computing Environment Standards and PC Classifications
2. PC Inventories and Inventorying Practices
3. PC Replacement Cycles
4. Budgeting, Pricing and Acquisition Practices
5. Leasing and Seat Management Practices
6. Centralized Support and Administration Services
7. Maintenance Practices

8. Upgrading Versus Replacement
9. Cascading Practices
10. PC Disposal Practices

PC Asset Management Practices in Montgomery County

- The County Government, MCPS, the College, and M-NCPPC have each begun to institute core software application standards.

- The ITPCC established a PC classification method consisting of five desktop PC categories and three laptop PC categories. OLO and Council Staff find the ITPCC classification system a very helpful tool in assessing computer replacement requirements.

- The County Government, MCPS, the College, and M-NCPPC had a combined PC inventory of almost 43,000 units as of the Summer of 2001. Approximately 83 percent of the combined interagency PC inventory are standard mainstream desktop computers.

- MCPS owns 70 percent of the combined interagency PC inventory and almost all of MCPS PCs are standard mainstream desktop units. However, as many as 15,000 of these are five years of age or older and have limited functionality.

- The County Government owns 15 percent of the interagency inventory and almost 82 percent of County Government's PCs are standard mainstream desktop units.

- The College owns 13 percent of the interagency inventory and nearly four out of every five of the College's PC's inventory are either high end units or units designated for accelerated replacement.

- M-NCPPC owns under one-and-a-half percent of the interagency inventory. The M-NCPPC inventory is divided almost equally between mainstream and high end/accelerated replacement units.

- Growth or contraction of an agency's work force would have a direct affect on the size of an agency's PC inventory.

- An increasing number of the College's classrooms are equipped to provide network PCs for use by the instructor and each student in the room.

- All agencies, with the exception of MCPS, report that their current PC inventories meet their current needs.

- The Maryland State Department of Education has established a target ratio of one computer for every five students. The MCPS Strategic Technology Plan sets a goal of one computer for every three students. MCPS has deployed sufficient PCs in schools to attain a ratio of five students per computer. However, as many as 15,000 of these computers are at least five years old and have limited functionality. MCPS would need to add 15,000 more mainstream PCs to its current inventory to achieve a three-to-one ratio.

- Each of the agencies has conducted a PC asset audit and maintains an inventory of its computers. OLO and Council Staff find that each agency would benefit by developing a more refined inventory database with detailed configuration and software information for use in strategic PC management decision-making.

- The ITPCC recommends a four-year replacement cycle for mainstream PCs, the most common type of PC in the interagency PC inventory.

- As technology advances produce increasingly more powerful computers at lower costs, mainstream PC prices have dropped steadily in recent years. However, recent PC price declines may not be sustainable in the future.

- All County agencies have contract vehicles that provide the ability to negotiate the price for new PC purchases. Agencies generally are able to leverage their high volume of purchases to achieve actual pricing below both list and State published prices.

- MCPS and the College take advantage of deep discounts offered by some PC vendors to educational institutions.

- Three Maryland counties (Anne Arundel, Baltimore, and Howard) have entered into agreements with the Western States Contracting Alliance (WSCA), a multi-state alliance designed to pool the purchases from numerous state and local governments to achieve greater volume discounts in computer purchasing. County agency participation in WSCA would almost assuredly reduce contract costs.

- All four agencies purchase rather than lease their PCs. MCPS has begun to finance the purchase of school based computers over a four year term. The ITPCC concluded that leasing is not a viable approach for County agencies. The Gartner Group advised that the economic life cycles of PCs are too short to justify leasing in most cases.

- New PCs may be purchased with a manufacturer's warranty for repair of failing hardware. Most typically, manufacturers' warranties extend for three years after purchase. MCPS recently has begun purchasing computers with a four-year manufacturer's warranty.

- County agencies have employed a variety of strategies to provide for the repair of post-warranty PC hardware. The strategies include buying third-party coverage for all computers, paying for repairs a time and materials basis, and performing repairs with in-house personnel.

- No County agency routinely upgrades computers in its inventory as a strategy to extend the duration of PC replacement cycles.

- Cascading practices vary significantly among County agencies. The County Government and the College discourage cascading while MCPS and M-NCPPC generally encourage cascading.

- The College and the County Government have donated retired PCs to other agencies and to non-profit organizations. Agencies often have difficulty finding organizations willing to accept used PCs. Units that cannot be donated must be sold or recycled. Limited resale opportunities exist for PCs older than two years. Once most computers reach an age of four years, recycling or disposal becomes the only viable option. Agencies often have to pay for the removal and recycling of older PCs.

Replacement Cycles

- Higher purchase prices and lower maintenance and upgrading costs tend to support longer replacement cycles. Lower purchase prices and higher maintenance and upgrading costs tend to support shorter replacement cycles.

Cascading Costs and Benefit

- Cascading may be of most benefit to County agencies when the number of mainstream units exceeds the number of high-end units; mainstream replacement cycles are an exact multiple of high-end replacement cycles; and, post-warranty maintenance and move/reinstallation costs do not grow significantly.

Total Cost of Ownership

- Industry experts recommend that organizations establish an accounting system to capture all life cycle costs which include purchasing hardware and software, software licensing, on-going support and administration, maintenance and disposal.

- Total cost of ownership (TCO) modeling typically captures direct costs such as acquisition, operations and management costs and indirect costs such as end user operations and downtime.

- Based on an analysis of TCO data, industry experts report that the costs to purchase hardware and software represent only a fraction of the TCO whereas labor-related items such as maintenance account for the bulk of total cost. Operating and staffing costs may constitute up to 75 percent of the life cycle costs while hardware and software acquisition expenditures may comprise as little as 25 percent of these costs.

- County Government, MCPS, the College, and M-NCPPC IT departments are familiar with the TCO concept but have not yet conducted any formal comprehensive TCO studies.

- The ITPCC estimates that it will cost over $22 million annually to fund regular replacement of the current inter-agency inventory of almost 43,000 PCs. Assuming that direct PC management costs (other than acquisition) are at least equal to that of PC acquisition, it would cost a minimum of $44 million annually to fund and support agency PC inventories. With the addition of 15,000 new MCPS computers, total inter-agency PC management costs would at a minimum exceed $51 million.

IX. OLO/COUNCIL STAFF RECOMMENDATIONS

Desktop computing technology often shapes the very mission of County agencies and the service delivery expectations of their customers. PC technology has become an indispensable tool for the delivery of County services and the County agencies must develop effective PC asset management programs to ensure their commitment to this technology can be sustained. OLO and Council Staff propose the following recommendations to support the County agencies in their development of effective PC asset management programs.

General

1. As personal computing technology becomes an increasingly indispensable and costly tool for the delivery of government services, all County agencies must develop PC asset management programs that meet changing user needs while effectively control all PC life cycle costs, i.e. acquisition, maintenance, support, administrative, and disposal costs.

2. When an agency defines and establishes its baseline user needs, it must consider how the size and composition of its PC inventory will affect its overall long-term costs. For example, an agency should consider the trade-off of maintaining a larger inventory with longer replacement cycles versus a smaller inventory with shorter replacement cycles.

3. When an agency develops an asset management program, it must address all of the elements that drive the total costs of ownership (TCO). The work completed by the ITPCC, i.e. establishing a classification structure based on user needs and defining an optimal replacement cycle, begins to address the elements that determine the total cost of ownership (TCO). To build on the work of the ITPCC, each agency must identify how alternative PC acquisition, maintenance, support, administrative, and disposal practices affect the TCO.

4. The Council should endorse the use of the PC classification system developed by the ITPCC. Agencies should employ these classifications in information technology budgeting and planning.

5. The Council should be prepared to approve adequate funding for properly justified centralized PC asset management programs. Agency budget submissions should measure the TCO for PC inventories and identify management strategies to effectively reduce the TCO while meeting essential agency computing needs.

6. The Council's decision on funding levels and replacement schedules should differ depending on whether an agency has established a centralized PC management program.

   6A. For MCPS, which has yet to establish a centralized PC management program, the Council should not endorse replacement schedules until MCPS submits a comprehensive asset management program that includes:

   - A justification of the total number of PCs needed
   - A measurement of the total cost of PC ownership, and
   - A long term funding strategy to sustain that inventory

6B. For Montgomery County Government, the College and M-NCPPC, which have existing PC management programs, the Council should adopt the following approach:

- During the Council's upcoming review of FY 03 operating and capital budgets, the Council should require each agency to provide a justification for the amount of PCs (by classification type) needed. Each agency should use the FY 03 budget to establish and justify its baseline needs. If an agency requests an increase in a future budget submission, each agency should explain the factors that necessitated the change from the FY 03 baseline needs to justify its request.

- The Council should require each agency to develop methods to measure acquisition, maintenance, support, administrative, disposal, and all other costs that contribute to the TCO.

- Until each agency completes a TCO analysis, the Council should adopt an interim policy of funding four-year replacement cycles for mainstream computers and two-year replacement cycles for high-end computers.

Inventory Practices

7. Agencies should ensure that their current inventory practices provide readily available information about the functional computing capabilities of each specific PC. While the age of the computer currently drives replacement cycles, ultimately the capabilities of a computer, and not the age, may be more important in determining replacement needs.

Acquisition Practices

8. Agencies should aggressively pursue ways to maximize volume discounts offered by vendors. Agencies can leverage their combined purchasing power either by forming their own buying alliance or by joining an existing alliance such as the Western States Contracting Alliance.

9. Agencies should aggressively seek vendor-provided educational discounts. For example, the County Government may attempt to secure educational discounts for public use computers such as those available in libraries or recreation centers.

Budgeting Strategies

10. Agencies' operating budgets should account for the annual costs of maintaining a PC inventory. Operating budgets should recognize all PC-related costs associated with the creation of new positions and programs.

11. Agencies should examine budgeting practices that assure steady and sustainable funding for upkeep of their PC inventories. For example, County agencies may consider making user departments responsible for the on-going costs of PC ownership (possibly through implementation of system of chargebacks).

Leasing and Seat Management

12. Agencies should periodically review alternative PC management strategies including leasing and seat management options. Refined calculations of TCO will assist in the comparison of alternative management strategies.

Maintenance Practices

13. Agencies should evaluate (and periodically reassess) alternative strategies for repairing failing hardware. Staff suggests that all agencies immediately consider purchasing four-year manufacturer's warranties for each new mainstream computer acquired.

14. Agencies should assess service level and response time needs by user categories to identify hardware maintenance strategies that are both affordable and sufficient to meet essential user needs.

PC Support and Administration Services

15. Agencies should work toward defining and quantifying all PC support and administration costs.

16. Agencies should assess how support and administrative costs affect the total cost of PC ownership and how these costs might influence strategies for PC purchasing, maintenance, and upgrading.

Upgrading vs. Replacement

17. Agencies should periodically review PC upgrading strategies including mid-replacement cycle upgrading. Refined calculations of TCO will assist in the evaluation of decisions whether to plan for mid-cycle upgrades as a strategy to extend the functional life of PCs.

Cascading

18. Agencies must consider whether high-end and mainstream replacement cycles might be aligned to promote cascading and reduce TCO.

Disposal Practices

19. Agencies must determine to what degree alternative PC disposition options influence TCO and replacement cycle decisions.

FY 03 Budget Issues

The recommendations above address budget issues that will recur annually. Most immediately, however, Staff has identified the following questions for consideration during review of the FY 03 agency capital and operating budget requests.

County Government	**Montgomery College**
• Might MCG achieve further PC acquisition volume discounts by participating in a buying alliance? • Should MCG begin purchasing four-year manufacturer's warranties to correspond to four-year planned replacement cycles for mainstream PCs?	• Is the College's current inventory of mostly high-end PCs fiscally sustainable over time? • Might the College be able to meet user needs by adopting two-year or four-year replacement cycles for all of its PCs? • Might the College maximum the value of retired two-year old PCs through resale or cascading?
MCPS	**M-NCPPC**
• Is a three-to-one student-to-PC ratio fiscally sustainable over time? Should MCPS adjust its goal to the State target of a five-to-one ratio? Should out-year funding be moved away from increasing the size of the current PC inventory toward funding regular replacement of PCs. • What is the long term relationship between the strategy of buying PCs with four-year warranties and the use of in-house and contractor personnel for PC repairs?	• Might M-NCPPC achieve further PC acquisition volume discounts by participating in a buying alliance? • Should M-NCPPC begin purchasing four-year manufacturer's warranties to correspond to four-year planned replacement cycles for mainstream PCs?

IT Asset Management Guidelines for PC Systems

Background

IT Asset Management is a high priority for the FY02 Interagency Technology Policy and Coordination Committee (ITPCC) workplan. At the conclusion of the FY02 budget process, the Montgomery County Council requested that the ITPCC examine the IT asset management practices of the agencies and develop a common set of guidelines for replacing IT assets in the agencies. The Council was especially interested in the basis of replacement cycles for desktop computer systems. The Council requested that ITPCC guidelines for replacement of desktop computer systems be available by the FY03 budget cycle.

The IT Asset Management Workgroup was created and tasked with development of coordinated guidelines for replacement of IT assets. The workgroup, consisting of staff designated by CIOs of each ITPCC agency, convened July 2, 2001. A workplan was developed and subsequently approved by the CIO Staff Subcommittee on July 10, 2001. The current workplan for the IT Asset Management Workgroup is listed in Appendix A.

These guidelines are derived from meetings and discussions between technology representatives from all ITPCC agencies, review of documented practices from entities outside Montgomery County, review of Gartner Group reports, and an audio conference with Gartner Group representatives. These guidelines represent a consensus among the ITPCC agencies and achieve the overall objective of defining a common interagency guideline for replacement of PC systems.

Scope and Objectives

Phase I focuses on PC asset management; Phase II will focus on servers, network equipment, peripheral equipment, and specialized devices such as Instructional Workstations used in higher education environments; and Phase III will focus on large system asset requirements. A multiyear-phased approach is recommended due to the scope of the project.

In Phase I, ITPCC agency PC asset management practices were reviewed, a best practices literature review was conducted, and an audio conference with the Gartner Group was completed. Representatives from each of the agencies compiled PC inventories, grouped PCs according to business use, and collectively discussed appropriate PC replacement cycles. Guidelines reflecting the results of the research and collaborative analysis for the ITPCC agencies were drafted. The Phase I objectives include the following:

- Derive a common lexicon and descriptive vocabulary;
- Specify common classifications for desktop and laptop PCs;
- Develop interagency guidelines for replacement cycles by PC classification
- Compile PC asset summaries by agency;
- Examine lease vs. buy options;
- Provide a basis for a multiyear PC Asset Management Model

Findings

The ITPCC agencies have agreed to 8 categories for PC classification consisting of 5 desktop categories, and 3 laptop categories (see Figure 1). This classification schema and replacement cycle guideline considers the business requirements and the rate of technological change that must be supported by desktop PCs within each agency. Recommended replacement cycles range from

1.5 years for specialized high-end systems in higher education environments to 4 years for low-end single purpose machines.

The following table summarizes the recommended PC lifecycle replacement guidelines.

Figure 1

ITPCC PC Lifecycle Model

Desktops

	PC Category	Examples of Users/Applications	Replacement cycle
D1	**Desktop Mainstream Single** Single Purpose/ Application	Internet/Intranet access -single purpose stations	4+ years
D2	**Desktop Mainstream Standard** Standard Office Automation	Office workers Office workers, K-12 classrooms, faculty – multi-purpose stations	4 years
D3	**Desktop Mainstream Accelerated** Application with Accelerated Lifecycle[1]	Power Users, faculty, Banner, GIS, CAD, CLASS	3 years
D4	**Desktop High End Specialized** Specialized/Multiple Applications	Lab computers (MCG & MC), GIS, CAD, Graphics, Web Developers	2 years
D5	**Desktop High End Accelerated** Applications with Accelerated Lifecycle	Video editing, Specialized Instruction, Faculty	1.5 years

Laptops

	PC Category	Examples of Users/Applications	Replacement cycle
L1	**Laptop Mainstream Standard** Standard Office Automation	Workers with mobile computing requirements	3 years
L2	**Laptop High End Specialized**	GIS, Graphics, Web Developers	2 years
L3	**Laptop High End Accelerated**	Specialized Instruction, Faculty, Wireless Applications	1.5 years

(Note: See Appendix B for additional details about PC inventory, annual replacements, etc.)

The ITPCC agencies adopt technology at different rates in response to the mission and service delivery requirements. The higher education environment is extremely dynamic and must constantly provide leading edge technology for the students and instructors or risk loss of enrollment. Single purpose or less complex business processes such as public access to the Internet offered in public libraries are less dynamic and therefore do not require rapid replacement.

The primary variable driving hardware replacement cycles is applications software requirements. Software supports core business processes essential to delivery of customer services. Hardware must accommodate requirements of software specifications or the software will fail to support the business functions properly. The rapid rate of change for critical software applications created pressure for frequent hardware upgrades and replacements until recently. According to the Gartner Group, the cycle of rapid software change is slowing slightly for office automation applications, which lessens the pressure for frequent hardware replacements. However, specialized software applications often require higher end hardware configurations at the start and may be upgraded or changed more frequently than mainstream applications, which creates pressure for early hardware replacement. Mainstream business environments are currently using 3 to 4 year PC replacement

[1] Note: A "normal" software lifecycle is 18 months; however, because the County opts to skip one generation of core OA software, the "normal" County core OA software lifecycle is 3 years. An "accelerated" software lifecycle is considered by the County to be 12-18 months.

cycles. A 5-year replacement cycle is not an acceptable business practice according to the Gartner Group because it will not support operating system and standard software requirements over this interval of time. (See Appendix C).

Less frequent replacement means longer lifecycles that carry some risks. Vendors will stop supporting older software products at some point, which could result in critical business processes relying on unsupported software. Hardware may not support software written to take advantage of newer technology. Software upgrades or replacements cannot always be planned or predicted (e.g. the State of Maryland new elections software requirements). Increasing the capacity of older hardware to extend the lifecycle adds costs and eventually fails to meet business requirements. Some organizations address this risk by reserving funds for unplanned upgrades or replacements.

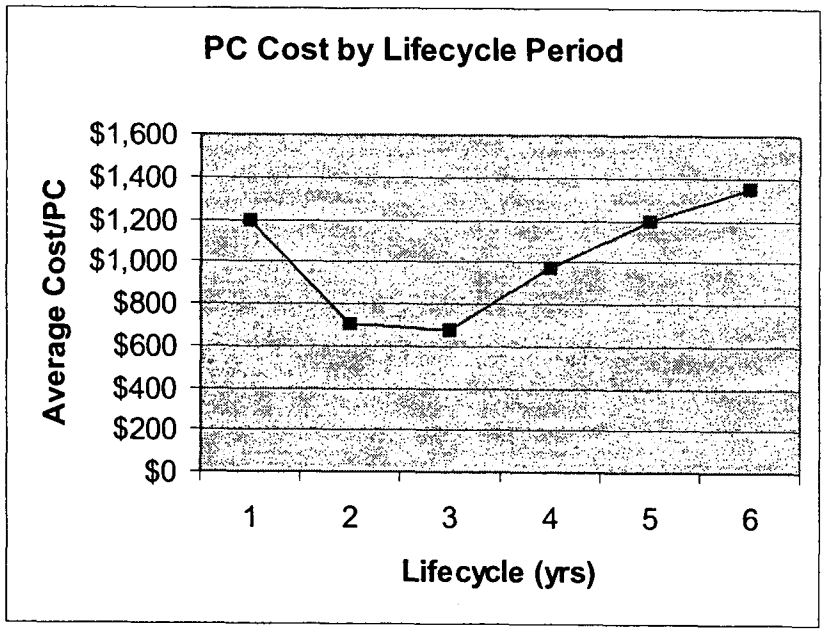
Work processes within all agencies depend on technical infrastructure that enables communication and interoperation between the oldest hardware and software components and the newest. Information is created, communicated, and managed across the enterprise by staff using networked PC desktop systems. If this technology infrastructure is allowed to deteriorate to a point where this communication and interoperation is impeded, the ability of agencies to achieve mission objectives will be compromised. The opportunity to derive benefits from new technologies across the enterprise, such as enterprise email systems or software that enables collaborative and interactive work sessions over a networked environment requires a certain basic level of technology to even be possible. Scheduled asset replacement will protect the investment in IT infrastructure that supports the critical business processes of the ITPCC agencies.

The IT Asset Management Workgroup analysis indicates that the cost of maintaining desktop systems beyond 3 years increases the cost of ownership especially when individual machines must be upgraded to meet business requirements and maintenance contracts for additional years are purchased. The 3-year replacement cycle appears as the most cost beneficial replacement point. During FY02, some agencies will use time and materials for maintenance of machines over three years old. Data collected from this practice will be evaluated to assess the fiscal impact on the model when actual costs are known.

Based on the Gartner Group assessment that a 4-year replacement cycle of mainstream systems is currently possible due to slowing software development cycles, the IT Asset Management Workgroup recommends a 4-year cycle for category D2 systems for FY03. The cycle of software development must be closely monitored to determine if a shorter replacement cycle may be needed in the future. This PC model will be reviewed by the ITPCC after data resulting from agency from use of time and materials for PC repairs is analyzed, and the impact of software development cycles on agency business processes is evaluated at the end of FY03. (See Appendix D for assumptions used in this model).

Agencies should consider cascading and redeploying the high-end systems with short lifecycles of two years or less (e.g. the category D4 and D5 PCs). A single new installation can trigger multiple moves of equipment within the organization, require extensive planning, and associated staff time and expense. Unmanaged redeployments are very labor intensive and may result in unsatisfactory matches between users and PCs that fail to support the business objectives of the agency. The cost of redeploying and cascading high-end equipment should be evaluated by each agency to understand the impact on total cost of ownership.

Figure 2.



According to Gartner, economic lifecycles of PCs are too short to justify leasing in most cases. Operational leases rely on a 10% residual value at the end of the lease period, requiring leased PC replacement cycles in the 24 to 30 month range. Leasing also requires highly accurate asset management, tracking both contractual and technical attributes of each PC, and the ability to return all equipment on time. Failure to achieve this drastically increases the cost of leasing beyond that of purchasing the equipment. The workgroup concludes that leasing is not a viable approach for the ITPCC agencies (Appendix E).

The quantities of annual PC replacements are based on the recommended PC life cycles and do not include any "catch-up" replacements of PCs that are currently older than the recommended lifecycle. The quantities of PCs and associated costs in the model are based on current agency inventories as of June 30, 2001 and also includes application of agency based standards such as those reflected in agency strategic plans. A projection of the estimated impact of redeployment or cascading of high-end systems is included for reference. The replacement costs in this model include PC hardware only and do not include other costs that comprise the Total Cost of Ownership (e.g., software, maintenance, support, provisioning, etc.). Educational discounts for the agencies that qualify are included. The educational discount for PC hardware is much less than the educational discount available for PC software.

Recommendations

The IT Asset Management Workgroup recommends the following:

1. Every agency should implement a PC replacement plan.
2. Adoption of the ITPCC PC Lifecycle Model for the ITPCC agency desktop and laptop systems is recommended.
3. Update the base numbers annually, and re-evaluate assumptions regarding replacement cycle frequency to determine if application software developments require a change in the asset management model.
4. Agencies should evaluate the fiscal impact of using a time and materials contract in lieu of additional years of maintenance contract support after the third year.

5. Agencies should perform an assessment of risks to business processes when considering extended lifecycles and use of time and materials maintenance approaches.
6. Cascading cost and potential savings should be evaluated to determine the most efficient use of resources.
7. Agencies should consider cascading and redeployment of high end PCs lifecycles at the time of scheduled replacement as follows:
   - Category D4, and D5 desktop systems with lifecycles of 2 years or less to category D2 desktop system uses with lifecycle of 4 years;
   - Do not cascade category D3 PCs with a 3 year lifecycle
8. Agencies should consider leasing desktop PCs only for equipment with lifecycles of less than 30 months.
9. Agencies should consider reserving funds for unplanned upgrades or replacements.

Leasing does not appear to be a viable approach due the short economic life of PC systems and the requirements for strict inventory management systems. This level of inventory management does not currently exist for all ITPCC agencies. Direct purchase, or financing may provide alternative solutions for acquisition.

Conclusion

An enterprise that fails to maintain information processing technology that keeps pace with innovation will not be able to achieve business objectives and meet customer requirements over the long term. IT asset replacement cycles that maintain information processing infrastructures directly impact the ability of organizations to achieve mission objectives. Software applications must operate on hardware that is capable of supporting these applications for the duration of the hardware lifecycle. When computer hardware is unable to support software requirements, the inability of staff to work collaboratively, exchange information efficiently, and manage information assets results in customer dissatisfaction and missed opportunities. The ITPCC PC Lifecycle Model should be adopted as an interagency guideline for replacement of desktop systems.

When the ITPCC PC Lifecycle Model is applied to the installed PC base of 45,155 systems (as of June 30, 2001), it predicts an annual replacement requirement for 12,901 PCs at an annual PC replacement cost of $23,422,393, based on the current price model.

When the PC baseline numbers are adjusted in the model to include certain agency-based standards as reflected in agency strategic plans, the annual PC replacement requirement is 20,401 PCs at an annual PC replacement cost of $30,509,893, based on the current price model.

The following Appendices accompany this report and support the findings:

Appendix A-IT Asset Management Workgroup Workplan
Appendix B-Montgomery County Agencies PC Inventory Status as of 6/30/01
Appendix C-Gartner Group Teleconference 8-15-2001, Replies to ITPCC Questions
Appendix D-PC Lifecycle Cost Analysis Model
Appendix E-Gartner Group, **PC Life Cycle: How Long Should I Keep My PCs**? Research Note, DF-10-3178, March 14, 2000.
Appendix F- PC Lifecycles, **Guidelines for Establishing Life Cycles for Personal Computers, Department of Information Resources**, Austin Texas, January 2000, http://www.dir.state.tx.us/eod/pc/pc-cycle.html
Appendix G-Summary Table -- Federal Agency PC Replacement Practices (July 2001)
Appendix H-ITPCC PC Asset Management Inventory Matrix

APPENDIX B

Life Cycle Step	Asset Management Issues	TCO Costs
Acquisition	Standards Budget Constraints Life cycle	Staff time for selecting technology, writing and processing the purchase orders and submitting order to the vendor. Actual purchase cost of hardware or software considered here.
Installation	Inventory	Costs for receiving and installing the new equipment. Cost and time for disposal of currently owned equipment.
IT Staff Training	NA	Any IT staff training represents a cost to the organization. These costs will be similar regardless of whether technology is leased or purchased.
IT Staff costs for maintenance	Asset tracking Life cycle tracking	Staff time spent maintaining and upgrading new hardware or software. Possible that acquiring more advanced technology initially could be less expensive to an agency than buying cheaper, less advanced technology if equipment life cycle is considered. Incremental upgrades and maintenance costs will affect this decision.
Removal	Inventory update Physical disposal EPA restrictions Software licensing Data removal	Staff time and resources spent to prepare items for surplus, showing potential takers available surplus and arranging for disposal if surplus equipment is not taken.

Source: State of Texas Department of Information Resources, *Lease vs. Purchase: Guidelines for Lease versus Purchase of IT*, Austin TX, May 1998.

APPENDIX C

Purchasing, Leasing, and Seat Management Assignment of Responsibilities and Costs

	Purchasing	Leasing	Seat Management
TCO Direct Costs – Hardware	Agency is responsible for procurement, configuration and disposal. Agency pays one lump sum for equipment.	Agency is responsible for procurement and configuration but not disposal (unless it is lease purchase contract.)	Vendor is responsible for ordering, configuration, disposal and much more.
TCO Direct Costs - Management Hours	Agency handles all staffing and is responsible for planning and project management.	Agency handles all staffing and outsources and is responsible for planning and project management	Vendor staffs PC support personnel and does planning and project management. Agency staffs development and other functions not associated with seat management.
TCO Direct Costs - Support Hours	Agency is responsible for administrative assistance, executive management, procurement, support, maintenance, travel, training, outsourcing, etc	Agency is responsible for administrative assistance, executive management, procurement, support, maintenance, travel, training, outsourcing, etc	Vendor handles desktop procurement, maintenance, support, user training PLUS travel and training for its own staff to do their job. Agency handles admin. Assistance and exec. Management.
TCO Direct Costs – Development	Agency is responsible for all development.	Agency is responsible for all development.	Agency is responsible for all development.
TCO Direct Costs - Communications	Agency is responsible for all communications lines, etc.	Agency is responsible for all communications lines, etc.	Communications CAN be incorporated into seat management program.
TCO Indirect Costs – End User IS/IT	Agency picks up the productivity loss for end users teaching themselves or asking peers for help when they are reluctant to call the help desk.	Agency picks up the productivity loss for end users teaching themselves or asking peers for help when they are reluctant to call the help desk.	Vendor must conform to established service level agreements to get the job done within reasonable time period. This inspires confidence from users.
TCO Indirect Costs – Downtime	Agency's service level agreements may not be met because agency doesn't have staff to solve problems or perform upgrades and maintenance in reasonable amount of time.	Agency's service level agreements may not be met because agency doesn't have staff to solve problems or perform upgrades and maintenance in reasonable amount of time.	Vendor must comply with service level agreements for repair, maintenance and upgrades

Source: Seat Management for the Commonwealth of Virginia, COTS Seat Management Workgroup, September 1999.

APPENDIX D

Purchasing, Leasing, and Seat Management Agency Management Responsibilities

	Purchasing	Leasing	Seat Management
Budget and Payment	Agency pays a lump sum for PCs when they have available funds. This creates irregular budgeting with peaks and valleys. Agency pays outsourcers separately.	Agency pays a monthly rate for equipment and refresh, leveling the procurement budget. Agency still pays outsourcers separately.	Agency pays a single monthly rate for PCs, refresh, and services together creating a level PC budget for procurement of goods and services.
Technology refreshment	Agency pays a large lump sum and can only refresh technology when the money is available; therefore refreshment is not on a schedule and equipment can easily become out of date.	Refresh costs are included in the monthly fee so agency pays for refresh over the term of the contract.	Refresh costs are included in the monthly fee so agency pays for refresh over the term of the contract.
Platform Compatibility	This depends on whether the agency orders PCs and peripherals centrally or locally.	Leasing contracts are centralized so the vendor has a standard set of items to choose from.	Seat management contracts are centralized so the vendor has a standard set of items to choose from.
Upgrades/Latest Software Versions	Agency is responsible for upgrades of software.	Agency is responsible for upgrades of software.	Agency has the option of giving the vendor responsibility for maintaining the latest version of software.
Installation, Maintenance, Support	Agency provides installation, maintenance, support, testing, etc.	Either provided by agency or rolled into costs of lease price when provided by vendor.	Vendor performs all installation, configuration, maintenance, support, testing, etc.
Asset Management	Agency is responsible for documenting incoming/outgoing inventory and moves, add changes.	Agency is responsible for documenting incoming/outgoing inventory and moves, add changes.	Vendor handles all asset management and reporting for its own equipment and can manage existing agency assets as well.
Disposal	Agency disposes of assets.	Vendor disposes of assets. May not have to comply with same rules as agency.	Vendor disposes of assets. May not have to comply with same rules as agency.
Use of Internal IT Staff	Agency needs a large IT staff for development, networking, security and help desk/PC support.	Agency needs a large IT staff for development, networking, security and help desk/PC support.	Agency can trim IT staff by eliminating need for internal PC support. Current staff can be moved into higher level functions or may be employed by vendor in support.

Source: Seat Management for the Commonwealth of Virginia, COTS Seat Management Workgroup, September 1999.

civic.com

Power in numbers

BY Patrick J. Walsh
March 5, 2001

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Sometimes the most innovative contracting begins with a simple premise. In the case of the Western States Contracting Alliance (WSCA), the proposition was: Volume purchasing of computers for education, state and local governments should lead to discounted prices.

The alliance's first computer contracts went into effect in October 1999 with New Mexico, the lead state for the contracts, managing procurement and administration. A year later, the WSCA computer buying program had purchased a total of $295 million in computers and peripherals, enabling contract participants to reap the benefit of six permanent price reductions from involved vendors, which include Gateway Inc., Dell Computer Corp., IBM Corp., Compaq Computer Corp. and CompUSA Inc.

As additional state and local purchasing authorities begin using the contracts, the volume is expected to pass $500 million this year and top the $1 billion mark in 2002, according to Terry Davenport, WSCA national computer contracts administrator.

Twenty states participate in the program on a statewide basis, and the agreements are also used by cities, counties, public schools and universities in an additional 10 states, he said. The program's users currently include the states in the alliance, Vermont and Rhode Island, and local governments in Connecticut and Maryland.

Underlying the obvious advantage of earning price discounts for large scale cooperative purchases, the program is structured to make it easy for additional state and local entities — large and small — to participate, and to ensure that the benefits of big volume buying are realized by buyers and sellers alike.

"One of the things that makes this program work is the way that the contract is structured — in two pieces. In addition to the basic contract, there's a participating addendum that allows an individual jurisdiction to tweak the terms and conditions for its unique requirements," Davenport said.

Barriers to participating in the agreement generally lie not in the contract

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model but in the regulatory climate of the government's own statehouse. In North Dakota, for instance, an opinion from the state's attorney general forbids the use of cooperative purchasing contracts, while Nebraska is currently seeking clarification from its legislature to ensure that it can participate, Davenport said. California's participation in the WSCA contracts also required the passage of special legislation, he said.

"To some extent, we've accomplished two things in that some states have found that they need to make a special provision in their statutes to allow them to use these kinds of contracts. By doing so, we're encouraging participation, but we're also breaking down the barriers to large scale cooperative purchasing, because we think that's really the future of government buying," Davenport said.

For vendors, the agreement adds volume while streamlining the selling process. Eliminating the need to compete for and administer contracts with hundreds of individual state and local government customers, the WSCA program enables PC makers to cut their administrative costs and pass along their per-transaction savings to a larger pool of buyers, without the loss of margin they would incur with groups of smaller sales.

"The big state agencies and big cities have always received good prices, and they still do under the terms of the contract. The difference is, those purchases are now counted in the cumulative volume discount pool, and when we hit a preset volume level, the baseline price drops for everybody," Davenport said.

The streamlined buying process also works on the buyers' side, as purchasing officials avoid the time- consuming tasks of formulating and issuing a request for proposals, evaluating vendors, negotiating contracts and responding to protests.

For all its intricacy, however, the program's bottom line still fulfills its original mandate of making volume discounts available to smaller buyers, with real world results for its constituents.

"Most of the states in the West and the Midwest suffer from digital divide issues. There's a lot more technology and a lot more money on both coasts than there is in the middle of the country. By combining our purchasing power with state and local governments and with universities and other users, we've been able to drive down prices and put more and better equipment in our public schools," Davenport said.

"In one of our school districts locally, for the same exact amount of money they spent on their previous contract, their new WSCA contract put computers in 17 additional classrooms. Smaller users are seeing prices like they've never seen before."

NATIONAL COMPUTER EQUIPMENT CONTRACTS FOR EDUCATION, STATE AND LOCAL GOVERNMENT

Sponsored By:

Western States Contracting Alliance

WSCA vs USC

Two cooperative purchasing organizations have sponsored national computer equipment contracts for use by education, state and local governments. The first to do so is the Western State States Contracting Alliance (WSCA) formed by 15 state purchasing directors under the umbrella of the National Association of Procurement Officials (NASPO). That effort was followed by the US Communities (USC) procurement conducted jointly by representatives from the National Association of Counties (NACo) and the United States Conference of Mayors (USCM).

The intent of this document is to highlight the primary differences between the two offerings.

The purpose of the WSCA computer contracts is to combine the cumulative purchasing power of the larger state and local governmental purchasers to obtain lower prices for public schools and local governments alike. The contracts feature low initial prices for the small purchasers, per transaction cumulative volume discounts for the larger purchasers and cumulative volume discounts that lower the prices for everyone. The WSCA competitive source selection procurement was focused on a limited number of manufacturers in order to obtain the lowest possible direct pricing available. The result is lower WSCA prices.

USC's primary goal is to provide a broad selection of products and services to local public bodies and other governmental entities via a series of cooperative purchasing contracts. The USC computer and software procurement included both manufacturers and resellers resulting in broader selection for products than the WSCA contracts but at somewhat higher prices. USC also offers office products to the local public bodies.

The Results

The WSCA contracts include the complete product lines plus software and peripherals from five computer manufacturers -- Compaq, Gateway, Dell, IBM and CompUSA. The USC contracts include four manufacturers -- Gateway, Dell, IBM and MicronPC plus three resellers -- CompUSA, Comark and Software Spectrum. The USC contracts offer a broader selection of products and peripherals. The WSCA contracts offer lower prices.

http://www.state.nm.us/spd/WSCAmain.html

APPENDIX F

Summary of Gartner Group TCO Model Cost Elements

Direct costs - Measures direct expenditures on IS by an organization. Includes capital, labor and fees.	
Hardware and Software • Hardware • Software • IS Hardware • IS Software	• Capital Expenditures for hardware and software. Covers initial acquisition and upgrades, software costs bundled with the original equipment acquisition, expenditures for consumable supplies such as diskettes, toner cartridges and other supplies. • Software category includes operating systems, utilities, business applications, email, groupware, communications and connectivity. Includes all or portion of maintenance and support agreements. • Lease fees for hardware related to distributed computing assets including servers, client computers, peripherals, and network components.
Operations (management) • Technical services – clients • Database management and administration • Service Desk	• Direct labor staffing, activity costs and outsourced fees to deliver technical support and infrastructure operations for users. Includes both in house staff, contractors and outsourced management and support contracts. Includes technical services for Tier II and III problem resolution, labor and contract costs for performance tuning, user administration, operating system support, maintenance labor, software deployment, hardware configuration, hardware deployment, disk and file management, storage capacity planning, backup and archiving
Administration (support) • Finance and Administration • IS Training • End user training	• Direct labor staffing, activity costs and outsourced fees in support of operations including supervisory managers, finance, procurement and training
Indirect costs - Measures the efficiency of IS capital expenditures and labor as they impact end users, measured as lost productivity due to end user operations and downtime impact.	
End User Operations • Peer support • Casual learning • Formal learning • File management • Application development • Futz factor • End user metrics	• Cost of end users supporting themselves and each other instead of relying on formal support channels. Costs include peer and self-support, end user formal training, casual learning, self-development, local file maintenance and futz factor (optional).
Downtime	• Lost productivity due to planned and unplanned network, system and application unavailability

Source: OLO/Council staff from information found at http://www.seatmanagement.state.va.us/ducuments/TCOGuidance.html pp. 5-6.