

Commentary

Linux Desktop TCO: An Overview

With Linux, the client operating system only constitutes a small part of the total cost of ownership. From a TCO perspective, bigger gains can be had from deploying desktop management tools or implementing new processes.

Before an enterprise decides whether a move to Linux on the desktop makes sense, it needs to understand its migration costs (see "Linux Desktop Migration Cost Model") and the total cost of ownership (TCO) savings it hopes to achieve.

The fundamental basis for Gartner's distributed computing TCO model is that TCO represents a holistic view of costs across the enterprise over time. The elements of cost used to achieve this holistic view are grouped into a series of direct and indirect cost elements. Broadly speaking, direct costs comprise the capital and labor costs associated with operating a distributed computing environment, as well as administration and education costs and fees paid for external services. Indirect costs are labor costs associated with end-user operations in a business unit or department, and the downtime involved. Research from Gartner Measurement indicates that, for the average enterprise, the cost of the PC and client operating system (OS) represents a small part of the overall TCO, generally 20 percent to 30 percent.

There is limited cost data available for Linux as a desktop replacement for typical enterprise productivity users today, so we analyze the issues based on past experience and comparisons of Linux to other platforms in the TCO model, and we try to predict how Linux TCO will play out. It is important to remember that TCO costs are steady state, and we do not include migration costs in our TCO model — those costs are covered in other research.

We consider this to be a "stalking horse." Stalking horses are conceptual models used by Gartner analysts to stimulate dialogue with enterprises. Stalking horses do not necessarily reflect the reality of any particular IS organization. We encourage enterprises to perform their own analysis using our models to determine the site-specific impact of a particular change. Differences in end-user proficiency, complexity, installed-base size and implementation strategies can significantly affect an enterprise's TCO. The precision of the numbers should not imply accuracy of the models. These numbers, while arithmetically correct, fall within a broad range of possible numbers. Enterprises should not assume that the numbers in our model reflect their enterprise and should use their own numbers with our framework.

Although all the TCO simulations presented here assume a mix of 1 percent power users, 20 percent knowledge workers, 75 percent structured-task workers and 4 percent data entry workers, we are not judging the suitability of Linux to any of these environments. However, most enterprises will find it significantly more difficult (and more expensive) to migrate and support a user who requires broad access to Web sites or applications. Even some Linux distributions do not believe Linux is suitable for all users today.

In all cases, we are comparing a "fat-client" Linux implementation (client application logic is local) to a fat-client Windows implementation. Results are presented per user for a 2,500-user environment.

TCO Analysis

We have produced two new TCO profiles (see Table 1) to help enterprises examine their alternatives. The first assumes that Windows will continue to be the client OS, but, instead of Microsoft Office, StarOffice will be used. We believe that, too often, enterprises try to link the client-OS decision to the office product decision; we believe these are two separate decisions. The second model assumes Linux as the client OS with StarOffice as the office suite. In this research, we compare both models to two previously existing profiles: Windows 95 and Windows XP. We present an overview of the results here. Assumptions for the various cost categories are detailed in "Linux Desktop TCO: Hardware and Software Details" (hardware and software categories) and "Linux Desktop TCO: Labor Details" (labor categories).

Table 1
TCO Results

Direct Costs (Budgeted)	Win95/MS Office	WinXP/MS Office	WinXP/StarOffice	Linux/StarOffice
Hardware and Software	\$1,423	\$1,423	\$1,348	\$1,311
Operations	\$662	\$626	\$628	\$627
Administration	\$388	\$388	\$388	\$388
Total Direct Costs per User	\$2,472	\$2,437	\$2,364	\$2,326
Indirect Costs (Unbudgeted)				
End-User Operations	\$3,242	\$2,706	\$2,896	\$2,986
Downtime	\$335	\$142	\$142	\$135
Total Indirect Costs per User	\$3,578	\$2,848	\$3,038	\$3,121
Annual Total Cost of Ownership (TCO) per User	\$6,050	\$5,285	\$5,403	\$5,447

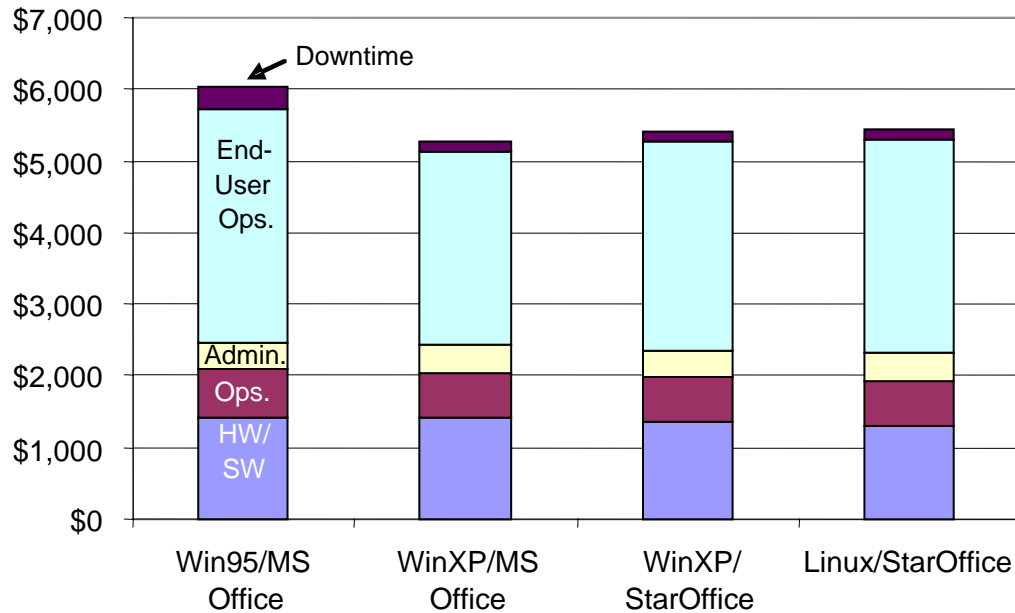
Source: Gartner Research (June 2003)

All our base TCO profiles assume a hardware life cycle of three years. The base case assumes a manually managed, unlocked (everyone has administrator/root access) environment. The numbers are expressed in U.S. dollars/user/year. Future research will address longer life cycles.

Figure 1 shows desktop TCO results.

Figure 1
Desktop TCO Results

Cost per User



HW = hardware
MS = Microsoft
SW = software

Source: Gartner Research (June 2003)

The Office Suite Option: Previous Gartner research examined the costs and benefits of moving from Microsoft Office to StarOffice for certain users (see "The Costs and Benefits of Moving to Sun's StarOffice 6.0"). Enterprises should use their own numbers with our StarOffice Migration Cost Model to understand their migration costs and more accurately explore their productivity costs.

When we compare the base Windows XP (which would include Microsoft Office) cost profile with the Windows XP/StarOffice cost profile (see Table 2), we expect a 5.2 percent decrease in the annual cost of hardware and software (because of lower license costs for StarOffice), a small increase in operations (primarily due to additional support for users that have trouble with office product document exchange) and a 7.0 percent increase in end-user operations costs (also because of document exchange issues). The result is a net additional cost of \$118 per user per year because of StarOffice. The breakdown is an \$72 decrease in direct costs and a \$190 increase in hidden costs. Managers should decide the relative importance of direct vs. indirect costs in their enterprise. Migration costs must also be factored in to understand the break-even of any migration.

Table 2
Comparative TCO: Windows XP With Microsoft Office vs. StarOffice

Direct Costs (Budgeted)	WinXP/MS Office	WinXP/StarOffice	Difference	Difference % From WinXP/MS Office
Hardware and Software	\$1,423	\$1,348	-\$74	-5.2%
Operations	\$626	\$628	\$2	0.3%
Administration	\$388	\$388	\$0	0.0%
Total Direct Costs per User	\$2,437	\$2,364	-\$72	-3.0%
Indirect Costs (Unbudgeted)				
End-User Operations	\$2,706	\$2,896	\$190	7.0%
Downtime	\$142	\$142	\$0	0.0%
Total Indirect Costs per User	\$2,848	\$3,038	\$190	6.7%
Annual Total Cost of Ownership (TCO) per User	\$5,285	\$5,403	\$118	2.2%

Source: Gartner Research (June 2003)

Which Windows? Once enterprises separately examine the office product decision, the next step is to compare Windows to Linux. The difference in TCO between Windows and Linux has a lot to do with which version of Windows is being discussed. The TCO of Windows 95 is relatively high, and it is increasing as support from Microsoft has been eliminated and support from independent software vendors and other third parties continues to wane. Therefore, users running Windows 95 are likely to see more benefits by a move to Linux than will Windows 2000 or Windows XP users. Windows 2000 and Windows XP include more modern technology than Windows 95 and are generally more stable and incur lower costs.

However, enterprises running Windows 95 should not simply compare its TCO with that of Linux. Enterprises with older versions of Windows should estimate the costs and benefits for both a project to upgrade their current environment to Windows XP and a project to move to Linux, and compare the return on investment of the two alternatives before choosing their next platform (see "Linux Desktop Migration: Finding the Break-Even Point").

If we compare Windows XP/StarOffice with Linux/StarOffice (see Table 3), we see a small decrease in direct cost for Linux hardware and software. Some operations benefits of Linux over Windows are offset by issues of document compatibility with other users running Microsoft Office. Although we tried to keep all migration and learning-curve costs in the migration cost model, we do expect some lingering long-term increase in end-user operations reflected in our analysis. Downtime should be slightly less with Linux. Overall, we would expect a slight increase in TCO, with increases in hidden costs outweighing savings in direct-cost categories.

Table 3
Windows vs. Linux Desktop With StarOffice

Direct Costs (Budgeted)	WinXP/StarOffice	Linux/StarOffice	Difference	Difference % From WinXP/ StarOffice
Hardware and Software	\$1,348	\$1,311	-\$38	-2.8%
Operations	\$628	\$627	-\$1	-0.1%
Administration	\$388	\$388	-\$0	0.0%
Total Direct Costs per User	\$2,364	\$2,326	-\$38	-1.6%
Indirect Costs (Unbudgeted)				
End-User Operations	\$2,896	\$2,986	\$90	3.1%
Downtime	\$142	\$135	-\$8	-5.4%
Total Indirect Costs per User	\$3,038	\$3,121	\$83	2.7%
Annual Total Cost of Ownership (TCO) per User	\$5,403	\$5,447	\$44	0.8%

Source: Gartner Research (June 2003)

When Windows XP with Microsoft Office is compared with Linux with StarOffice (see Table 4), we see a 7.9 percent decrease in hardware and software costs, but a 10.4 percent increase in the hidden-cost categories. In total, we would expect a 3.1 percent increase, due to the magnitude of indirect costs in the model.

Table 4
Windows XP/Microsoft Office vs. Linux/StarOffice

Direct Costs (Budgeted)	WinXP/MS Office	Linux/StarOffice	Difference	Difference % From WinXP/ MS Office
Hardware and Software	\$1,423	\$1,311	-\$112	-7.9%
Operations	\$626	\$627	\$1	0.2%
Administration	\$388	\$388	\$0	0.0%
Total Direct Costs per User	\$2,437	\$2,326	-\$111	-4.5%
Indirect Costs (Unbudgeted)				
End-User Operations	\$2,706	\$2,986	\$280	10.4%
Downtime	\$142	\$135	-\$8	-5.4%
Total Indirect Costs per User	\$2,848	\$3,121	\$273	9.6%
Annual Total Cost of Ownership (TCO) per User	\$5,285	\$5,447	\$162	3.1%

Source: Gartner Research (June 2003)

Comparing Windows 95/Microsoft Office and Linux with StarOffice (see Table 5), presents a much better case for enterprises considering a move to Linux. In this case, we see a 7.9 percent decrease in hardware and software categories, a 5.2 percent reduction in operations (technical and support labor), a 7.9 percent decrease in end-user operations, a nearly 60 percent drop in downtime, and a 10 percent drop overall.

Table 5
Windows 95/Microsoft Office vs. Linux/StarOffice

Direct Costs (Budgeted)	Win95/MS Office	Linux/StarOffice	Difference	Difference % From Win95
Hardware and Software	\$1,423	\$1,311	-\$112	-7.9%
Operations	\$662	\$627	-\$35	-5.2%
Administration	\$388	\$388	\$0	0.0%
Total Direct Costs per User	\$2,472	\$2,326	-\$146	-5.9%
Indirect Costs (Unbudgeted)				
End-User Operations	\$3,242	\$2,986	-\$256	-7.9%
Downtime	\$335	\$135	-\$201	-59.8%
Total Indirect Costs per User	\$3,578	\$3,121	-\$457	-12.8%
Annual Total Cost of Ownership (TCO) per User	\$6,050	\$5,447	-\$603	-10.0%

Source: Gartner Research (June 2003)

How to Use this Model: The important part of TCO is not the numbers that appear in various models from time to time. The important part is the framework that is built around the numbers and the methodology for enterprises to measure their own TCO. The numbers in the models represent specific examples. TCO data is created from analysis and predictions based on actual data from the Gartner Measurement database, which shows a broad range of costs. Enterprises should not assume that our numbers are theirs, but should examine our models, understand our assumptions, and adjust our numbers to match their own assumptions.

Cost of Labor: Enterprises should adjust the salaries we used in our model (see Table 6 — we added 33 percent to come up with the fully burdened numbers below) to reflect their geography and industry. Users with the Gartner Decision Engine for Costs Management (DECM) (formerly known as TCO Manager and TCO Analyst) tool can change the salaries and the burden rate used in the software. Users who only have access to the published research should apply the general percentage that the salaries we used differ from their own. Enterprises in geographies or industries with vastly different labor-to-capital cost ratios may find very different results when migration costs are factored in.

Table 6
Salary Assumptions

Title	Annual Base Salary	Annual Burdened Salary
Administrative Assistant	\$25,797	\$34,310
Business Service Analyst	\$57,480	\$76,448
Computer Operations Manager	\$66,876	\$88,945
Computer Operations Supervisor	\$55,910	\$74,360
Computer Operator	\$34,874	\$46,382
Data Security Administrator/Analyst	\$61,215	\$81,416
Database Manager	\$69,479	\$92,407
Director, IS Operations	\$94,242	\$125,342
Director, Networks	\$92,699	\$123,290
End-User Microcomputer Manager	\$47,863	\$63,658
End User — Data Entry	\$23,348	\$31,053
End User — High Performance	\$67,327	\$89,545
End User — Knowledge	\$39,864	\$53,019
End User — Structured Task	\$35,033	\$46,594
Weighted Average End-User Burdened Salary Rate	\$29,986	\$39,882
Lead Computer Operator	\$56,981	\$75,785
Network Administrator	\$59,491	\$79,123
PC Technical-Support Specialist	\$51,181	\$68,071
Purchasing	\$47,852	\$63,643
Technical Specialist (Training/Auditing)	\$56,262	\$74,828
Technical Support	\$44,337	\$58,968

Source: Gartner Research (June 2003)

The Management Factor: For enterprises with unmanaged Windows environments, adding desktop management to their Windows environment may be a good way to reduce costs without having to migrate all their applications to Linux. There are many tools on the market for managing Windows PCs — for example, software distribution (SD), inventory, policy, healing and remote control — and many are mature and proven in large enterprises. Many of these tools do not have versions for Linux desktops yet, and it will take time for them to match their Windows counterparts in maturity when they do.

Some compare a well-managed Linux desktop to an unmanaged Windows environment. We believe this could be an invalid comparison. Management and lockdown are largely political and cultural issues. If an enterprise cannot lock down a Windows workstation for political or cultural reasons, there is a good chance it will not be able to lock down a Linux desktop, either.

However, a "wild card" in the argument is the technical aspect of lockdown. Many applications do not work properly if a Windows user is not at least a power user. Some have problems if the user is not an administrator. The problem is legacy applications that write to parts of the registry or disk to which a standard user has no access. Power users can install most software and administrators can install anything. Although Microsoft provides some tools to help, many enterprises have not been able to lock down their desktops because of lingering application incompatibilities. This means that users cannot be prevented from installing software. In many cases, users installing unsupported software have been a major source of help desk calls, downtime and increased cost.

If an enterprise is able to give users everything they need to do their jobs without the user having the root password, Linux could have an edge over a Windows environment that cannot be locked for technical reasons. There may still be political issues that make it necessary for the enterprise to give users root privileges, and then Linux would lose its advantage. Furthermore, enterprise SD tools are more mature in a Windows environment and may be used to implement software without giving users administrator

access. Table 7 and Table 8 show the cost comparison of an open Windows XP/Microsoft Office environment to a locked, but unmanaged (for example, no asset management or SD tools) Linux/StarOffice environment.

Table 7
Windows XP/Microsoft Office Unlocked vs. Locked-Down Linux

Direct Costs (Budgeted)	WinXP/MS Office	Linux/StarOffice Locked	Difference	Difference % From WinXP
Hardware and Software	\$1,423	\$1,296	-\$127	-8.9%
Operations	\$626	\$546	-\$80	-12.8%
Administration	\$388	\$383	-\$5	-1.2%
Total Direct Costs per User	\$2,437	\$2,225	-\$212	-8.7%
Indirect Costs (Unbudgeted)				
End-User Operations	\$2,706	\$2,205	-\$501	-18.5%
Downtime	\$142	\$92	-\$51	-35.5%
Total Indirect Costs per User	\$2,848	\$2,296	-\$552	-19.4%
Annual Total Cost of Ownership (TCO) per User	\$5,285	\$4,522	-\$764	-14.4%

Source: Gartner Research (June 2003)

Table 8
Windows 95 Unlocked Compared to Locked Linux

Direct Costs (Budgeted)	Win95/MS Office	Linux/StarOffice Locked	Difference	Difference % From Win95
Hardware and Software	\$1,423	\$1,296	-\$127	-8.9%
Operations	\$662	\$546	-\$116	-17.5%
Administration	\$388	\$383	-\$5	-1.2%
Total Direct Costs per User	\$2,472	\$2,225	-\$247	-10.0%
Indirect Costs (Unbudgeted)				
End-User Operations	\$3,242	\$2,205	-\$1,038	-32.0%
Downtime	\$335	\$92	-\$243	-72.6%
Total Indirect Costs per User	\$3,578	\$2,296	-\$1,281	-35.8%
Annual Total Cost of Ownership (TCO) per User	\$6,050	\$4,522	-\$1,528	-25.3%

Source: Gartner Research (June 2003)

Compared with Windows XP, if Linux is locked and Windows isn't, we see that there can be a savings of 14.4 percent overall, or \$764 per PC annually, including an 8.7 percent or \$212 decline in direct costs. Compared with Windows 95, the savings reach 25 percent, including over 17 percent savings in operations and 35.8 percent savings in indirect costs.

We have applied various levels of best practices against the various models to predict the effect of best practices on cost using our DECM software. We applied two levels of best practices — one we refer to as

the "typical" level of management and the other as the "well managed" scenario. The level of each best practice is shown in Table 9. Of course, enterprises should apply their own level of best practices to understand the effect they might see in their environment, but this should give enterprises an idea of the range of savings best practices can provide.

Table 9
Best-Practice Levels for Typical Managed and Well-Managed Environments

	Best-Practice Level Assumed	
	Typical	Well-Managed
Change Management		
Deployment (Installs, Adds, Changes)	3.6	7.8
Retirement and Moves	1.5	6.5
Change Management Technology	1.7	4.5
Change Management Process	4.8	7.1
Operational Management		
Virus Protection	6.8	9.2
Data Management	0.3	2.1
Performance Monitoring and Event Management	0.0	0.8
Security	2.3	4.8
Standards Compliance	0.0	8.9
Repair and Maintenance	1.4	4.6
Asset Administration		
Hardware Inventory Management	1.8	6.2
Software Inventory Management	0.6	6.9
Life Cycle Management	0.6	3.2
Procurement Process	3.9	6.5
Vendor Management	2.7	7.8
Customer Service		
Service Desk Technology	2.0	8.4
Service Desk Process	2.3	7.4
Marketing and Relationship Management	0.6	4.7
Training		
End-User Training	0.8	5.4
IS Training	2.0	7.3
Technology Planning and Process Management		
Technology Planning and Process Management	3.0	5.9

Source: Gartner Research (June 2003)

Table 10 and Figure 2 show the resulting costs. In the typical and well-managed best-practice models, a range of tools, people and processes is assumed to be used. In the "Linux locked" simulation, the only best practice applied is "locked user environment" — other management tools are not assumed. Enterprises should assess the tools that are used in the Windows and Linux environments to understand the relative capabilities.

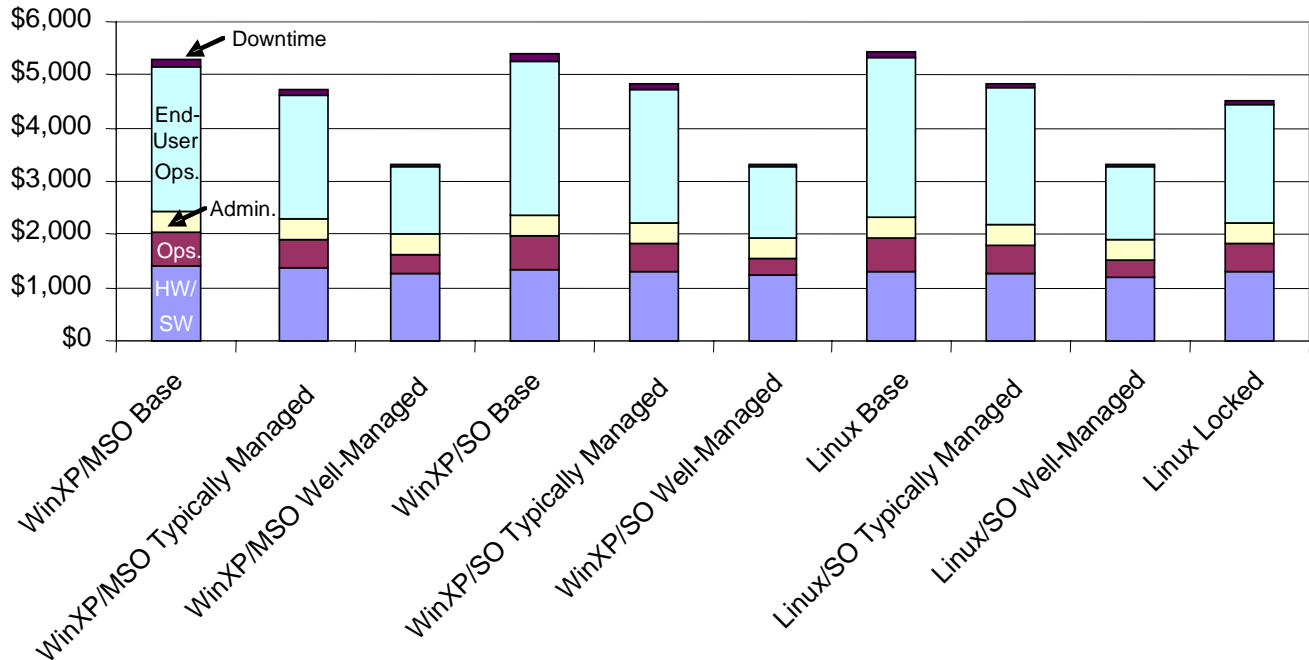
Table 10
TCO in Managed Scenarios

Direct Costs (Budgeted)	WinXP/MS Office Base	WinXP/MS Office Typically Managed	WinXP/MS Office Well- Managed	WinXP/ StarOffice Base	WinXP/ StarOffice Typically Managed	WinXP/ StarOffice Well- Managed	Linux Base	Linux/ StarOffice Typically Managed	Linux/ StarOffice Well- Managed	Linux Locked
Hardware and Software	\$1,423	\$1,384	\$1,280	\$1,348	\$1,314	\$1,221	\$1,311	\$1,276	\$1,185	\$1,296
Operations	\$626	\$538	\$349	\$628	\$539	\$349	\$627	\$539	\$349	\$546
Administration	\$388	\$382	\$374	\$388	\$383	\$375	\$388	\$382	\$375	\$383
Total Direct Costs per User	\$2,437	\$2,304	\$2,003	\$2,364	\$2,235	\$1,945	\$2,326	\$2,197	\$1,909	\$2,225
Indirect Costs (Unbudgeted)										
End-User Operations	\$2,706	\$2,320	\$1,282	\$2,896	\$2,480	\$1,346	\$2,986	\$2,551	\$1,368	\$2,205
Downtime	\$142	\$103	\$33	\$142	\$103	\$33	\$135	\$98	\$31	\$92
Total Indirect Costs per User	\$2,848	\$2,423	\$1,314	\$3,038	\$2,583	\$1,379	\$3,121	\$2,648	\$1,399	\$2,296
Annual Total Cost of Ownership (TCO) per User	\$5,285	\$4,727	\$3,317	\$5,403	\$4,818	\$3,324	\$5,447	\$4,846	\$3,308	\$4,522

Source: Gartner Research (June 2003)

Figure 2
TCO in Managed Scenarios

**Cost per User
per Year**



HW = hardware
MSO = Microsoft Office
SO = StarOffice
SW = software

Source: Gartner Research (June 2003)

Linux and Managed Diversity: We are often asked whether Linux can be included on some desktops in a strategy that embraces managed diversity. For similar users or if similar applications would be required on both the Windows and Linux desktops, this would clearly fall outside our definition of a "managed diverse" environment and would lean toward unmanaged diversity. However, for very different sets of users with different sets of applications, Linux may be able to be integrated into the infrastructure.

Bottom Line: Enterprises should examine the expected total cost of ownership gains Linux promises alongside the migration cost to get there. TCO savings on the client operating system may turn out to be minimal for many enterprises, and savings in direct-cost categories can easily be erased by lost productivity caused by learning curves and compatibility costs. Enterprises should be careful when assuming that they will be able to lock down or manage Linux PCs more effectively than Windows PCs — enterprises that have failed to manage Windows because of cultural or political issues will encounter similar problems as they try to lock down and manage Linux PCs. If culture and politics are not issues, enterprises should see whether Linux can overcome technical hurdles in lockdown.