



DATA ISSUES RELATING TO CI TECHNOLOGY DATABASE

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**IT Returns Project
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Data Issues Relating to CI Technology Database¹

CRITO researchers have identified several data issues associated with the CI Technology Database. Five variables are involved: PCs, High Performance Workstations, Minicomputers, MIPs, IT stock. The purpose of this report is to inform IBM representatives of these data issues and to serve as a basis of discussion regarding appropriate corrective measures.

The following provides a brief summary of the potential problems associated with each variable and lists for ease of reference their respective exhibit locations within the CRITO report: "Information Technology in Large Corporations: Ten Years of Evolution." Several graphs contrasting the actual variable values with the estimated values are also included to facilitate examination of the data issues. Note that in some cases the actual data may indeed accurately reflect corporate purchasing behavior. However, for completeness we have included all variables for which any uncertainty exists.

Our objective is to better understand the reasons for what we perceive to be anomalies in the CI Technology Database and identify appropriate corrective action. This will benefit the Study on Business Value of Information Technology by enhancing the database and thereby improving the robustness of conclusions. Ultimately, both IS research and practice will benefit from the attention paid to these small but important details.

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1. PCs

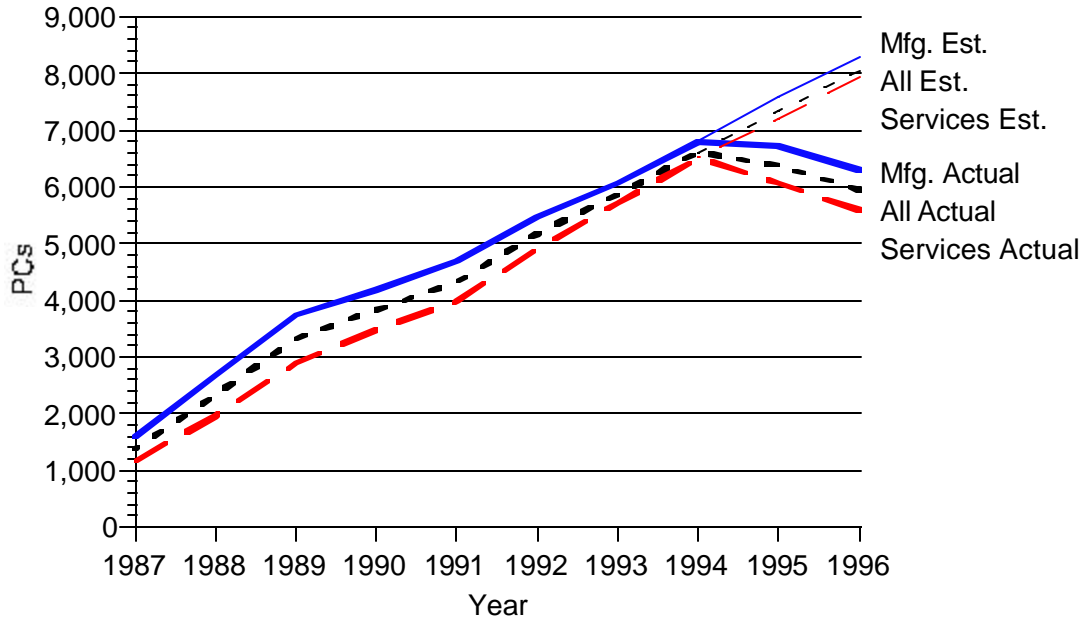
Issue: The number of PCs in 1995 and 1996 exhibits a sharp downward trend, in contrast to the steady upward trend of the first eight years. This downward trend is not concentrated in any particular group of companies. For example, large as well as small companies exhibit this downward trend, as do both manufacturing and services sector firms.

Potential Explanation: In 1991 laptops were added to the PC category, which is a definitional change unlikely to account for the downward trend. In 1994, PC servers were separated from PCs. It is difficult to estimate the impact of this definitional change without examining the PC server variable (which is unavailable to CRITO). While such phenomena as sourcing contracts may underlie a downward trend for some companies, they cannot explain the fairly uniform downward trend beginning in a single year. Finally, a scan of computer magazines reveals no evidence to support sagging numbers of either purchases or stocks of PCs in corporations beginning in 1995.

Exhibits Affected: Average PCs per Company (Exhibit 10, Page 13), PCs per Thousand Employees (Exhibit 22, Page 25)

PC Graph #1

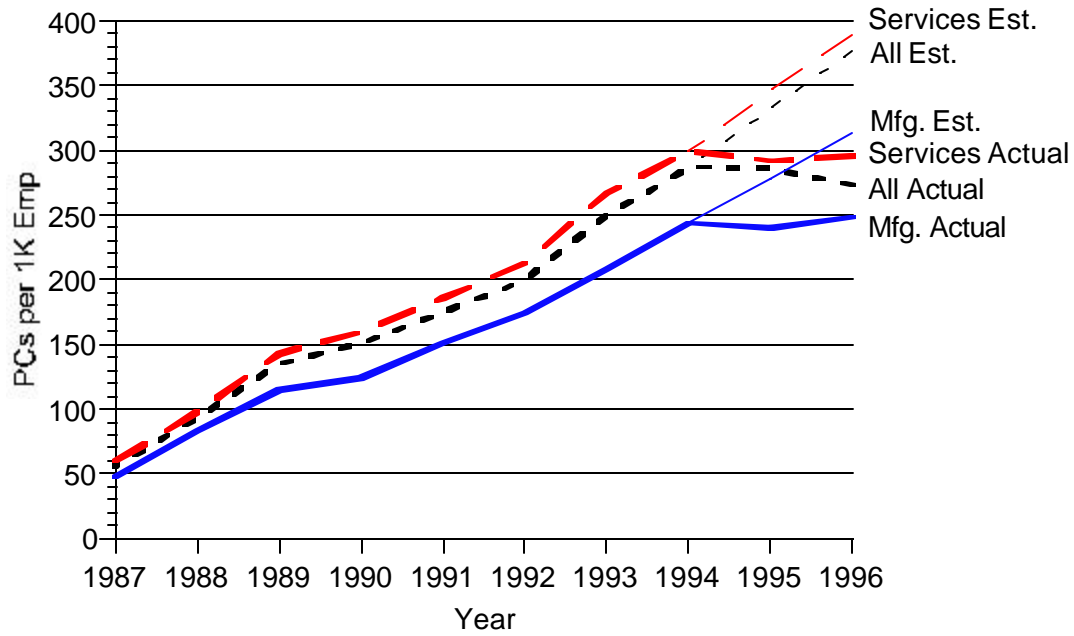
Mean PCs per Company (Exhibit 10, Page 13)



Note: Estimated values (1995 and 1996) are extrapolated based on a regression line of early series values.

PC Graph #2

PCs per Thousand Employees (Exhibit 22, Page 25)



Note: Estimated values (1995 and 1996) are extrapolated based on a regression line of early series values.

2. High Performance Workstations

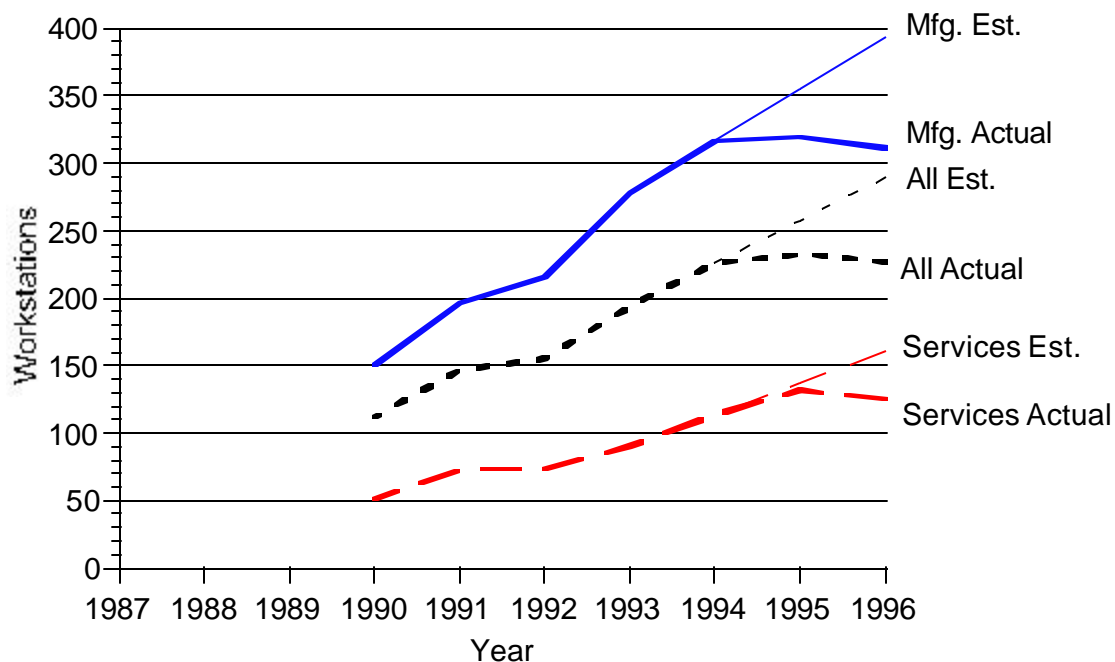
Issue: The number of High Performance Workstations flattens in 1995 and 1996, after growing steadily for the first eight years.

Potential Explanation: No variable changes were made during this period. While the trend is not as marked as that of PCs, the same logic applies regarding the inability of simple factors such as sourcing to be the root cause (see PC comments).

Exhibits Affected: Average High Performance Workstations per Company (Exhibit 11, Page 14), High Performance Workstations per Thousand Employees (Exhibit 23, Page 26)

High Performance Workstation Graph #1

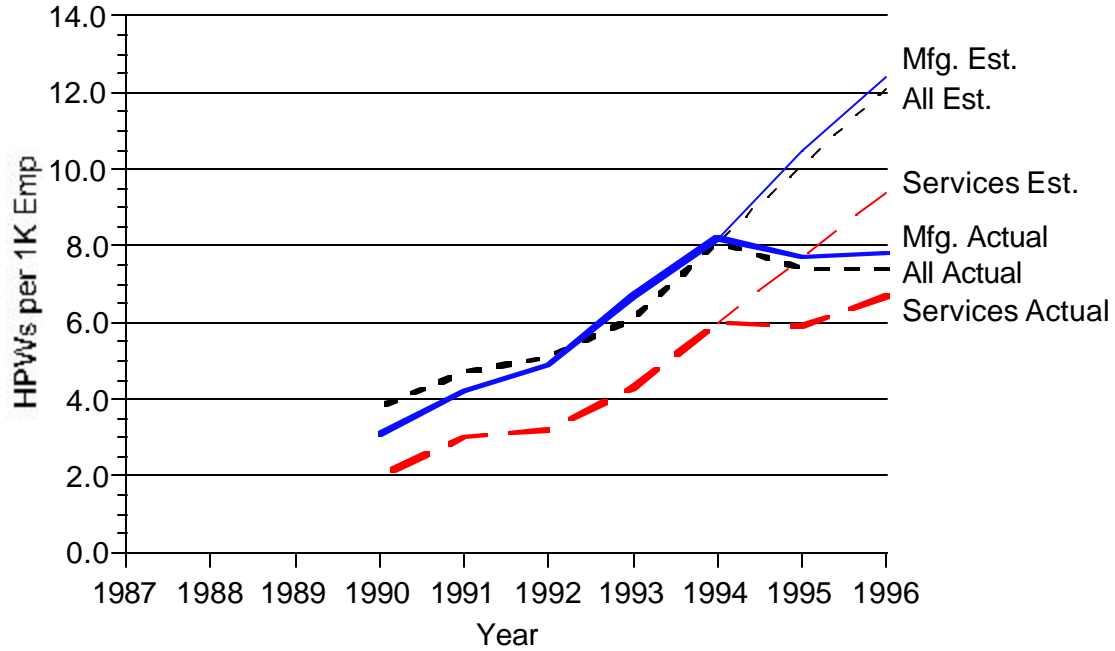
Mean High Performance Workstations per Company (Exhibit 11, Page 14)



Note: Estimated values (1995 and 1996) are extrapolated based on a regression line of early series values.

High Performance Workstation Graph #2

High Performance Workstations per Thousand Employees (Exhibit 23, Page 26)



Note: Estimated values (1995 and 1996) are extrapolated based on a regression line of early series values.

3. Minicomputers

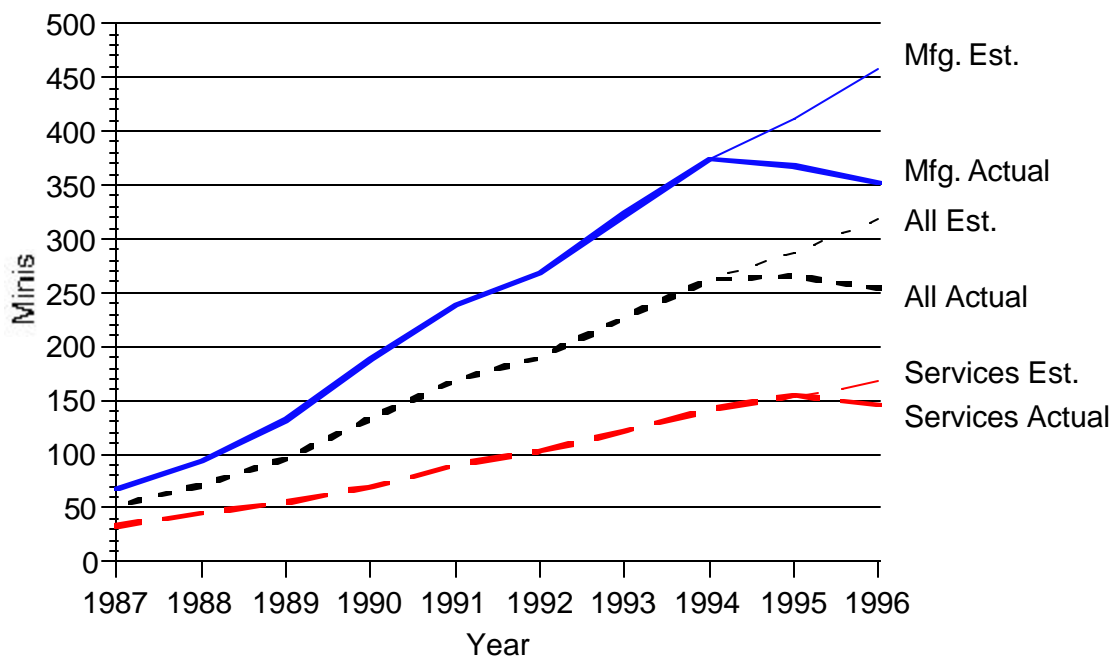
Issue: The number of Minicomputers exhibits a decline in the latter two years similar to that of PCs.

Potential Explanation: As minicomputers is probably the most difficult of all hardware categories to delineate, technical advances and changes in what is defined as a minicomputer may be one potential explanation for the decline in 1995 and 1996. No variable changes were made during this period.

Exhibits Affected: Average Minicomputers per Company (Exhibit 12, Page 15), Minicomputers per Thousand Employees (Exhibit 24, Page 27).

Minicomputer Graph #1

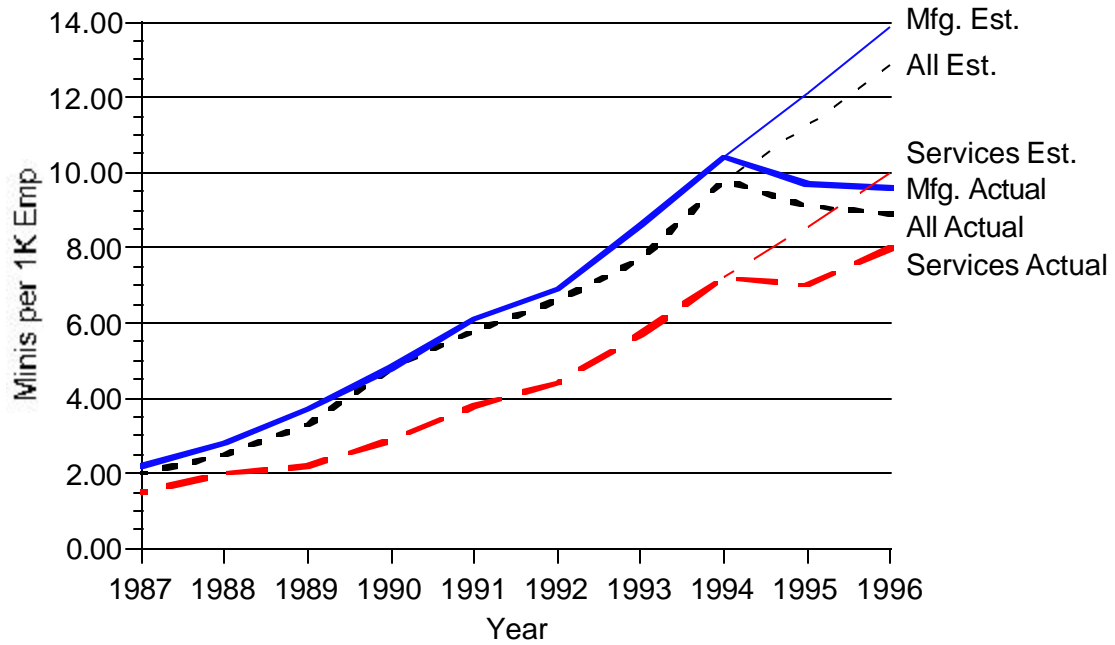
Mean Minicomputers per Company (Exhibit 12, Page 15)



Note: Estimated values (1995 and 1996) are extrapolated based on a regression line of early series values.

Minicomputer Graph #2

Minicomputers per Thousand Employees (Exhibit 24, Page 27)



Note: Estimated values (1995 and 1996) are extrapolated based on a regression line of early series values.

4. MIPs

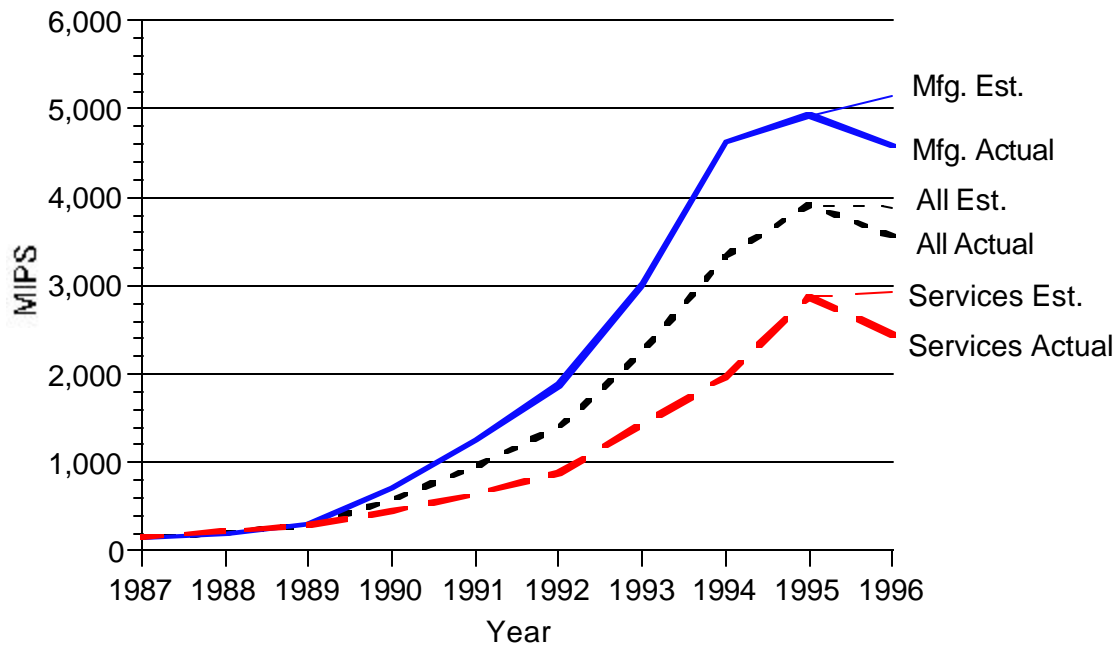
Issue: The number of MIPs drops sharply in the latter two years, similar to the drop in PCs.

Potential Explanation: As MIPs is measured on both mainframes and minicomputers, the drop in MIPs may correspond to the drop in minicomputers. However, increasing MIPs per machine with time could counteract this possibility. Comments related to sourcing in the PC section also apply here. No variable changes were made during this period.

Exhibits Affected: Average MIPs per Company (Exhibit 14, Page 17), Minicomputers per Thousand Employees (Exhibit 26, Page 29).

MIPs Graph #1

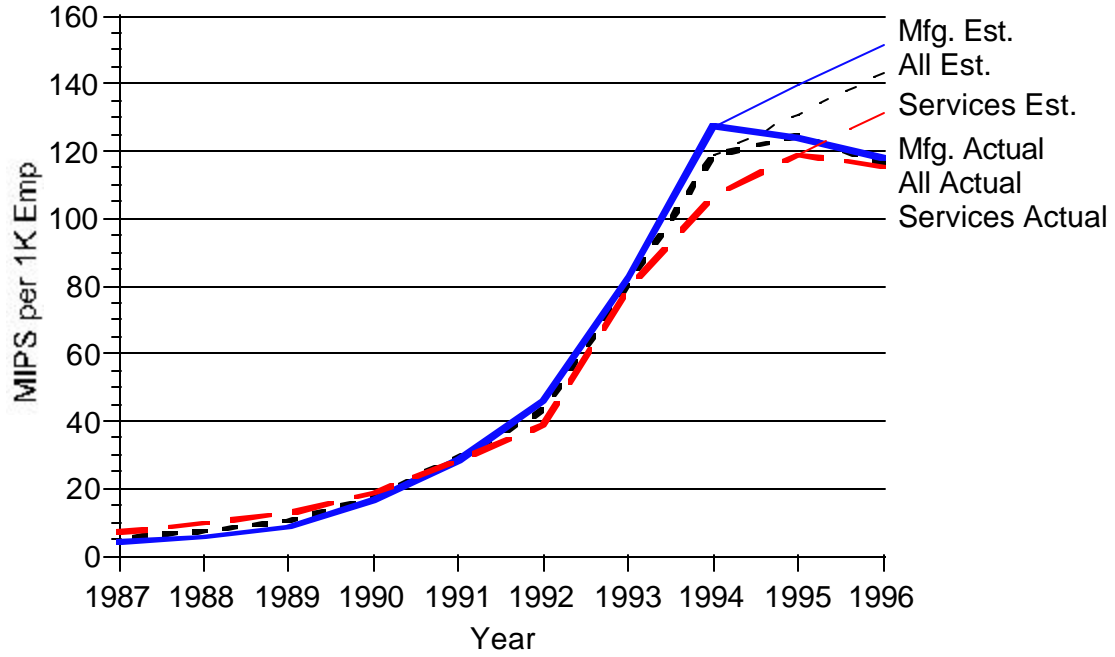
Exhibit 14: Mean MIPS per Company (Exhibit 14, Page 17)



Note: Estimated values (1996) are extrapolated based on a regression line of early series values.

MIPs Graph #2

Total MIPs per Thousand Employees (Exhibit 26, Page 29)



Note: Estimated values (1995 and 1996) are extrapolated based on a regression line of early series values.

5. IT Stock

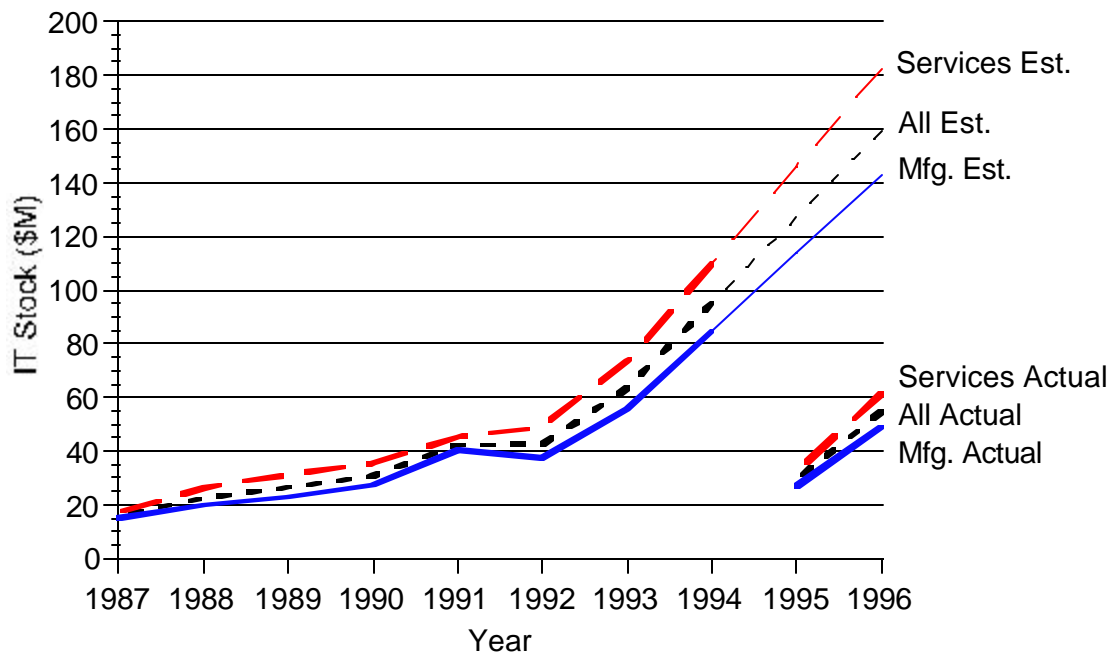
Issue: IT stock lowers in magnitude by more than 50% in the latter two years.

Potential Explanation: Variable definition was changed in 1995 from total purchase value of all systems (including peripherals) to total value of CPU only. Also in this year, PCs were excluded. This narrowing in scope is likely the cause for the dramatic decline in IT stock.

Exhibits Affected: Average IT Stock per Company (Exhibit 15, Page 18), IT stock per Employee (Exhibit 29, Page 32), Average IT Stock per \$M Corporate Revenue (Exhibit 32, Page 35), Percentage IT Stock of Total Capital (Exhibit 36, Page 39).

IT Stock Graph #1

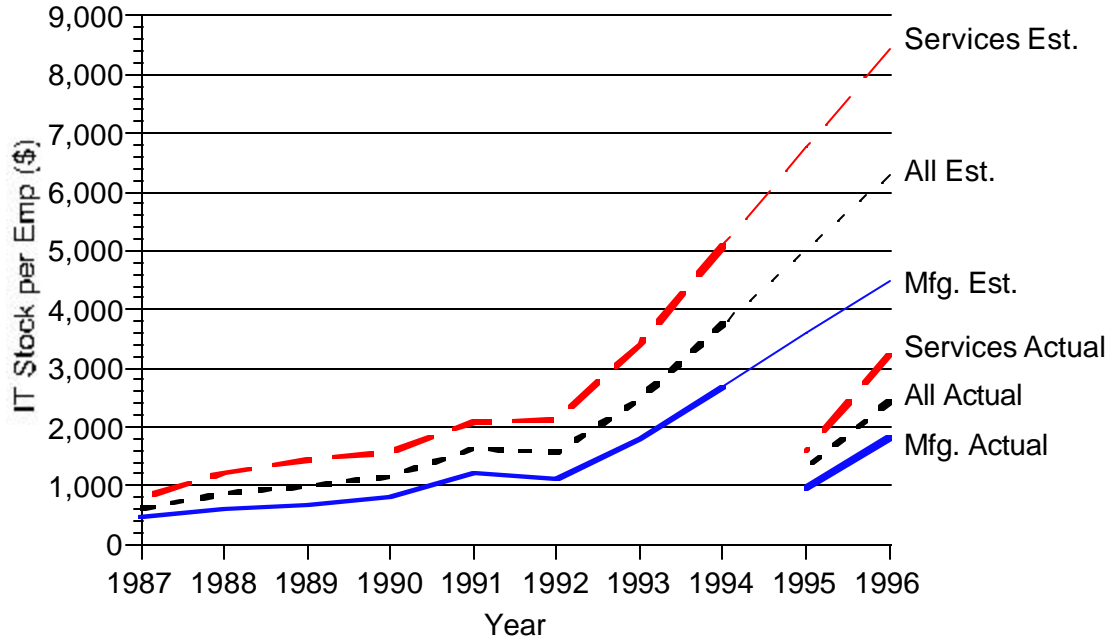
Exhibit 18: Mean IT Stock per Company (Exhibit 18, Page 21)



Note: Estimated values (1995 and 1996) are extrapolated based on a regression line of early series values.

IT Stock Graph #2

IT Stock per Employee (Exhibit 29, Page 32)



Note: Estimated values (1995 and 1996) are extrapolated based on a regression line of early series values.