

**Monday March 27, 1995 Public Hearing on State Budget**

I am here today as both a business owner and a Wisconsin taxpayer. It is my first time at a public hearing, so I may not know all the rules.

It has come to my attention through my customers, electronically from local BBSes, some research on my part, and by talking to many people who work for the State of Wisconsin, that the proposed budget excludes fair market competition, by eliminating the use of Macintosh computer systems.

The area that I am concerned about is the basic idea that Apple Macintosh computers are not computers that can be used in the State of Wisconsin system. What brought this to the attention of many of my customers and then myself, was Section 9144 of the budget. This section along with Executive Order 242, issued by Governor Thompson and other sections of the budget point to replacing the current Macintosh computer network at the State Public Defender's office with one that would use the MS-DOS operating system. I do not want to get too technical at this point, but this move would be a big waste of taxpayer's dollars.

To be brief it seems to me that the Division of Technology Management and the Division of Information Technology Services want to rid the state network of Macintosh computers. As a small business owner of a Macintosh retail store, this concerns me; but as a taxpayer, this makes me very mad.

I have been involved with computers since the late 1960's and working in the field since the early 1970's. I have worked on all types of computers and computer operating systems. In the personal computer area, I have been using both MS-DOS and Macintosh types of computers since the early 1980's. I daily use both types of personal computer systems. Not only I have figured out that the Macintosh computer system is more efficient to use, costs less to purchase, costs less to maintain, and has less training costs, but many small businesses, large corporations, schools, universities, and other governments have determined that the Macintosh system is the better system. When I see my state government want to toss out more efficient, less costly systems and replace them with systems that cost more to maintain, cost more to purchase, and cost more to train the users, it makes me very upset. I thought the time of \$600

hammers and general waste in government was coming to an end, not just switching departments.

Since most of the state legislators probably have not had the time to evaluate both systems, they are not as aware of the benefits of the Macintosh computer system. So I will use a simple analogy. Let's say for comparison, instead of computers, we are talking vehicles, just general cars and trucks.

Let's say for the sake of keeping things simple, there is only Ford and General Motors producing cars and trucks. For this example some division of the State of Wisconsin decided to dictate that everyone in the state government was to only purchase and use General Motors vehicles. This would make things simple for the division, but it would make many taxpayers and business owners upset. Then, let's say, this same state department dictates over the course of a year or two all Ford vehicles would have to be replaced with General Motors vehicles. This move would make many taxpayers upset, by spending taxpayers monies to replace good, operating vehicles. But let's say for this comparison, that the General Motors vehicles cost more to purchase, cost more to maintain, are not as

easy to operate, and get less miles to the gallon when running down the highway. If this would happen, most of the state legislators would call public hearings, press conferences, etc., to protest the waste of taxpayers monies. In this analogy to computer systems, we are not done. General Motors does not make a pickup truck, only Ford does. The division of state government in charge, tells the rest of the state departments, they can use either station wagons or dump trucks to replace the Ford pickup trucks. You know what would happen next.

But because in the case of computers, not many people can relate to the problem, much less the solution, not many people are talking about the large waste of taxpayer's monies and the lack of free and fair market competition that is being proposed in this budget.

Replacing in state department and divisions Macintosh computer systems with MS-DOS systems is a large waste of taxpayers monies. Plain and simple. Not only do the MS-DOS computers generally cost more to purchase than an equivalent Macintosh computer, but us Wisconsin taxpayers have already paid for the Macintosh systems and paid for the training of the staff. Also, the Macintosh computer comes with many

features built in instead of having to add them as extra cost options. Many consultants, magazines, books, and other sources, including MS-DOS sources, admit the MS-DOS computers are not as easy to use as the Macintosh computers. This means less productive state employees and more cost to the taxpayers. This also means more training costs to get new and current employees up to speed with the system or when new software is purchased. The MS-DOS computers are also more costly to maintain. By many studies the Macintosh computer system is up to 30% less costly to maintain than an equivalent MS-DOS computer system. With the number of computer systems in all of the state departments, this would also mean a large amount of taxpayers monies wasted with MS-DOS systems. The MS-DOS systems are more costly and harder to upgrade than Macintosh computer systems and with changing technologies, this is also a very large cost to Wisconsin taxpayers. We have not yet talked about all the headaches, additional time and additional costs involved with switching computer systems. All of this adds up to a very large unneeded use of taxpayers monies.

What happens if a software package is found that could save the State of Wisconsin taxpayers millions of dollars and it only is available on

Macintosh computer systems? Because of the rigid structure I see from researching the budget, the State of Wisconsin would not be able to take advantage of the savings.

When I see someone in business make a decision like this to replace Macintosh computer systems with MS-DOS computer systems, it is usually done with a lack of knowledge about both systems. When this happens in business, the losers are the stockholders or business owners. When this happens in state government, the losers are every taxpayer in the state of Wisconsin.

There are many misconceptions, old wives tales, and general lies about the Macintosh computer that are kept being repeated by people who have not taken the time to research the area for themselves. Many say Macintosh computers are not business computers. This is not true. In many business categories, Macintosh computers are used in over 75% of the businesses. Many businesses are all Macintosh. Some people say the Macintosh computers cannot communicate with other computers. This again is not true. Macintosh computers communicate with many other computer types every day, in business, home and government uses. With

my Macintosh, I daily connect to IBM mainframe, Digital mainframe, and MS-DOS computers. Many businesses use Macintosh computers to communicate to other computers, because they are easier to use, take less time to train staff, and are easier to connect to the other computers. Some people say the Macintosh will not last or is a small company. Apple Computer, the makers of the Macintosh, is a over 10 billion dollar company and has been growing every year. Apple is the largest maker of computers, surpassing in units shipped, IBM, Compac, Dell, and all other MS-DOS computer manufactures. They are a leader in technology. They were the first and still are first in leadership, in many areas of computer development. They are what MS-DOS computers are now trying to emulate with Microsoft Windows.

Another false statement is that Macintosh computers cannot coexist with other computer types. This is very untrue. The Macintosh not only can run all Macintosh software, but can also run MS-DOS software. So you can run both types off software on the Macintosh. Everyone can see what a savings this would be for many State of Wisconsin departments. The MS-DOS computers cannot run Macintosh software, only MS-DOS software, a big limitation in this world today. All current Macintosh computers can

read MS-DOS disks and files right out of the box. The MS-DOS computers cannot read Macintosh disks or files without a lot of work. I could go on with many more examples of other false statements, for the rest of the afternoon, but for the sake of time, I will stop here.

In the case of the State Public Defender's system, not only is there a \$5.9 million dollar cost to switch the current system to the new Division of Technology Management's Bureau of Judicial Information Systems, but additional training costs, increased yearly maintenance costs, the cost of adding additional staff, the cost of being less productive and all the general headaches of switching to an outdated, harder to learn computer system. As a taxpayer, I find this waste of my taxes very upsetting. As a businessman, I also find this move, anti small business, anti free market, and anti fair market competition.

I urge you to look into this waste of taxpayer's monies. I urge you to make sure the State of Wisconsin uses its computer resources in a better more efficient manner. I urge you to let the state departments make the computer decisions that are best for them. I urge you to let the state departments use Macintosh computers, if that is what is best for them,

the state and the Wisconsin taxpayers. I thank you for allowing me to speak today.

Mark Buehl  
3917 Wilnor Drive  
Oregon, WI 53575

# State Directions in Information Technology

Testimony of Richard S. Russell  
Joint Finance Committee • 1995 March 27

## 1. Introduction

- **The obvious things in the budget**

There is a hidden agenda in the governor's budget bill with respect to computer technology. Part of that agenda is the attempt to replace computers running Macintosh and Unix and OS/2 operating systems with computers running DOS or Windows. This is most obviously true in the case of the office of the State Public Defender, where the governor proposes to spend \$5.9 million to replace the existing statewide Macintosh-based system with a new one. Another example is the effort to eliminate the Unix-based graphics workstations used by the University of Wisconsin architectural staff. But the budget document is 2800 pages long, and smaller things of similar nature are undoubtedly tucked away here and there throughout it. We citizens rely on the expertise of the Joint Finance Committee and its staff to be able to ferret them all out.

- **Isn't "standardization" alone a good reason?**

Computer managers will often cite some piece of hardware or software as a "standard" and use that fact alone as all the reason they need for adopting it. You should be aware that there are 2 kinds of standards — those adopted by worldwide bodies and generally agreed to by everyone involved and the so-called "de facto" standards, where one company or product or format or specification has a large share (but not all) of a market. An example of a de-facto standard is the VHS format for videotapes, which has effectively wiped out the competing Betamax format. There are a number of advantages to using standards, but there are plenty of disadvantages, too, and intelligent decision-making requires a sense of proportion. Unfortunately, that sense of balance is missing from the governor's headlong rush to embrace so-called "standards" in computer technology. I'm here to wave a few flags and call your attention to the other side of the story.

## 2. Standards make people fit technology — wrong way!

- **Learning styles**

One of the things we have learned thru educational research is that children mainly use 3 of their 5 senses for learning — vision, hearing, and touch. Now, all of us use all 3 of those senses to some extent, but some people rely much more heavily on some one of them than the others. You've probably experienced this yourself, subconsciously, when you're trying to find out if another person has understood you. If you say "Am I reaching you?", you're probably a tactile learner (or perhaps you think the other person is). If you say "Do you hear me?" or "Are you listening to what I'm saying?", you're appealing to the auditory sense. And, obviously, if you say "Do you see what I mean?", you're using a visual metaphor. A good teacher will use some blend of all 3 of these approaches with a mixed classroom of kids, but will try to use the most effective style for appealing to a child with a dominant learning style.

- **Working styles**

Same thing is true of adults. We all have our best or preferred methods of working. In the area of computers, for example, some people really prefer to use the keyboard, typing all their commands in directly, and having the computer "type" responses back. Other people prefer to press a button to get the desired response. Still other people prefer to see little images on a screen and to point and click at them. When I teach a

computer class, I let people know that modern software allows them to use all of these techniques, and they should pick the one they're most comfortable with.

- **The trend in computing**

From the dawn of the computing age to the present, computing has moved steadily in a single direction — improving technology to adapt to the individual styles and preferences of people. It isn't until we get to the 1995-97 budget proposed by the governor of the State of Wisconsin that we encounter an effort to reverse that trend by forcing people to fit the technology.

- **Where the value lies in computing**

In the packet of materials I'm sending around is a pie chart which shows where the value lies in computing. The chart is based on a study done about 5 years ago for private industry, so if anything it understates the point I'm about to make. You'll notice that it shows that only 15% of the value of computers resides in the hardware, while only 10¢ on the dollar resides in software. Since prices have been steadily dropping, those values are probably even lower today. The rest of the value of computing — that is, the vast bulk of it, at least 75¢ on the dollar — resides in the data. Why? Because that value represents the money you spend on the people who create, collect, edit, manipulate, store, and report the data. If you focus on hardware and software to the exclusion of people, you are being penny wise and pound foolish. Making computing easy for people is the best way to maximize your return on investment. Buying cheap computers will cost you money over the long haul.

### 3. **Standards represent the lowest common denominator.**

- **The "standard" word processor of 1975**

Let's go back 20 years and talk about how the State of Wisconsin created documents. Some people liked to use pens, but everyone could use a pencil. A fair number of people — far from all — could type, but everyone could use a pencil. A small group of people, properly trained, knew how to use the latest, fairly expensive, dedicated word-processing machines, but everyone could use a pencil. And a tiny number of leading-edge "early adopters" were aware that the buttons, levers, and dials on the control panel of a word processor could be imitated by programs fed into these new-fangled "personal computers", but even they could use a pencil. Now, if Tommy Thompson had been in charge in 1975, what would he have picked as the "standard" word processor? You guessed it — the pencil. Would we still be stuck with it today? A more important question is whether state workers will still be stuck with today's decisions 2, 3, 5, or 10 years from now.

- **Playing leapfrog**

Hardware and software vendors constantly leapfrog each other in terms of what their machines and programs can do. Same with the computer technology acquired by state government. Somebody is always trying out a new method of getting the work done. Some jobs require specialized equipment or techniques, and specialists in that field know where the leading edge is heading. Not everyone can keep 100% up to date all the time, but having distributed decision-making means that somewhere in state government, *someone* is up-to-date, and can share that information with others in related occupations.

- **Obsolescence**

The bottom line here is that something doesn't get to be a standard until it's been around long enough to be virtually obsolete. A "generation" in computer terms runs about 18 months. "Standards" are seldom closer to the present than 24. If you want to

lock state workers into obsolete technology, the best thing you can do is force them all to use standard hardware and software.

#### 4. **Standards are anti-competitive.**

Suppose you ran a small business and had a new, improved product which was of higher quality and lower cost than a similar product offered by your competitor. Would you be eager to bring this message to the purchasing agents of state government? Today, the answer would be "yes", because today those purchasing agents can consider what you have to offer on the basis of its merits alone. Under the governor's proposal, the answer will be "no", because the state will already have locked itself in to a single way of doing business — using "standard" technology — and no matter how good your stuff is, or how low its price, you're out of luck. The standardization plan is hostile to small business, even ignoring the fact that the proposed Information Technology Fund gets its money from those very same businesses via a form of extortion.

#### 5. **Standards use bad management theory.**

I'm sure you've all heard of the management theories of W. Edwards Deming, who was largely responsible for the way Japanese companies do business. He said that the best organizations have clear goals, but that the best way to achieve those goals is to ask 2 groups of people how to go about it. Those 2 groups of people are the workers and the customers. The role of top management should be to articulate the goals, put the infrastructure in place, and get out of the way. Successful companies all across America have adopted these techniques. Lee Iacocca turned Chrysler around using this approach. GM's Saturn uses it. Wisconsin's Johnsonville Sausage is highly successful because of its application of the Deming Method. We teach this approach at the UW Business School. This is what John Benson has been trying to do at the Department of Public Instruction. Tommy Thompson, on the other hand, wants to have centralized, rather than distributed, decision making. He wants to operate on the basis of a top-down, hierarchical structure, rather than flattening out the org chart, building many different lines of communication, and operating from the bottom up. He wants the State of Wisconsin to operate like a business, all right. The business he had in mind was turning out Model Ts.

#### 6. **Macintoshes**

- **Competitive on cost**

As you will see in the packet of materials I've handed out, Macintoshes are dollar-for-dollar comparable to Intel-based machines running DOS and Windows.

- **More efficient and accurate**

You will also see a study that shows that the average user of the Macintosh operating system is faster at a wide range of common computer tasks than the average Windows user. Plus which Mac users are more accurate. Over the 5-year lifespan of the average computer have a decided cost advantage.

- **More "compatible"**

Macintoshes can read DOS disks. DOS-based machines can't read Mac disks. Macintoshes can understand DOS file names (maximum length = 8 characters). DOS-based machines can't understand Mac file names (maximum length = 31 characters).

- **An analogy**

I've talked about computers to enough non-technical audiences to know that many people's eyes glaze over at the subject. So let me bottom-line this for you with an analogy that I think we can all relate to. The State Public Defender's office is currently driving Cadillacs. The governor wants to replace them with Chevrolets. But wait, there's more. We know the Cadillacs run; we aren't sure about the Chevies. But wait, there's more. You get to pay nearly \$6 million for the privilege of finding out. There may be even more, but I'm relying on your staff to dig it out.

- **Should we have all Macs?**

I use a Macintosh at work. I've had one at home since 1987. It is a dandy machine. But I wouldn't recommend it for everyone. Even though the Mac is a better machine for the average user, the main point I'm trying to drive home here is that the people in state government are not all average. Some of them are better off with Windows — or, in specialized cases like the aforementioned UW architects, with Unix or OS/2-based machines. The decision about what computer is best should be left to either the individual worker or to small groups of workers. The role of the Department of Administration should be to facilitate that process by making objective information available.

## 7. **What's really going on here?**

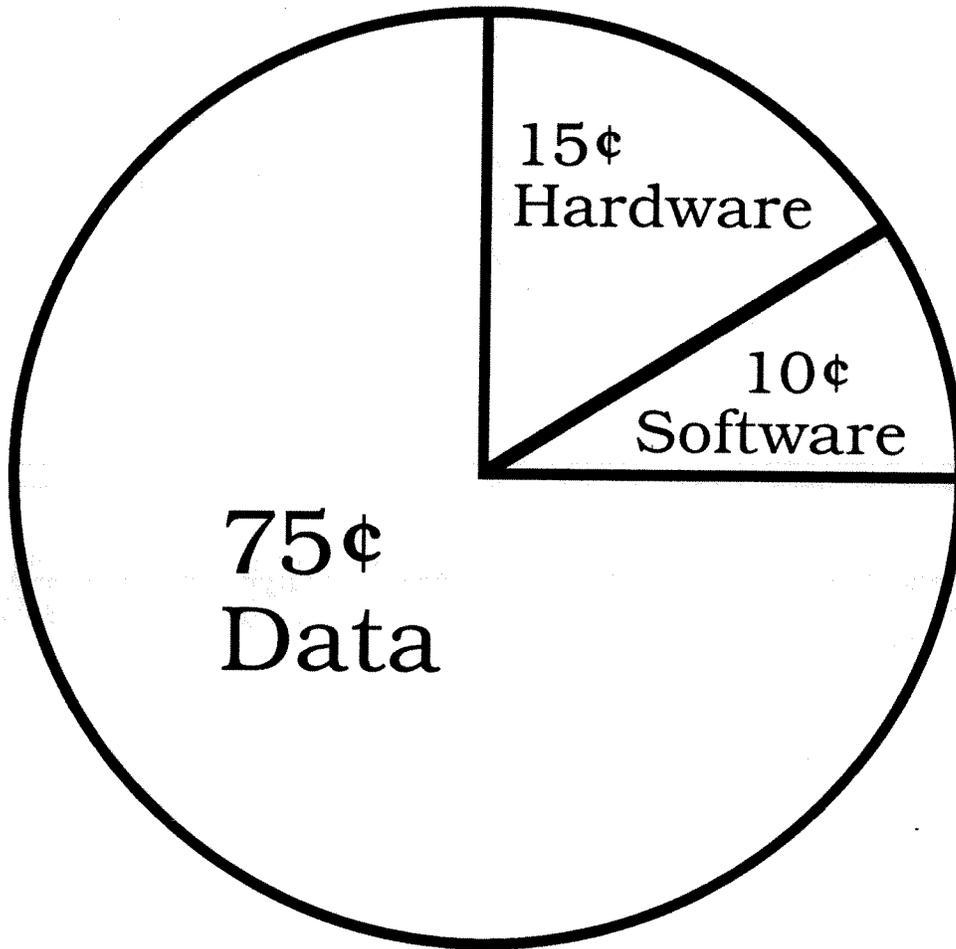
- **Control of information**

Let me be blunt. In the Information Age, information represents power. The governor wants to control all the information. The last thing he wants is for the Legislature or the public to have access to an independent source of information on things like distribution of school aids or whether Learnfare is working. He proposes to achieve that control of information under the guise of "standardization" by consolidating all decision-making power about computers in the hands of the Department of Administration, the state agency which he controls most closely.

- **Separation of powers**

The people who founded the United States were justifiably wary of consolidating too much power in any one place. That's why they provided several methods of power balancing. One was the division of power between the central, federal government and the decentralized state governments. Another was the checks and balances inherent in having 3 branches: the legislative, executive, and judicial. In the past, you could detect an unbalancing or shift of power by following the money. Today, you also have to follow the shift in information control. I encourage you to be highly suspicious of the governor's information-technology initiatives.

# Where the Value Resides in Computing



# The Ingram Performance Study

## EXECUTIVE SUMMARY

This document summarizes the results of the benchmark test program completed in August 1994 by Ingram Laboratories, a leading independent tester of personal computers whose clients include Apple, Epson, Hewlett-Packard, Texas Instruments, Intel, and NEC.

The test program was conducted at the Santa Ana Test Facility of Ingram Laboratories. The program was designed to compare—quantitatively—the performance of Apple Power Macintosh computers and Intel processor-based computers.

The study showed that the PowerPC processor-based Power Macintosh computers from Apple generally outperformed comparable Intel Pentium and 80486 processor-based personal computers running Microsoft Windows 3.1. Details are as follows:

- The Power Macintosh 8100/80, with its 80-megahertz PowerPC 601 processor, and the Power Macintosh 7100/66, with its 66-megahertz PowerPC 601 processor, outperformed comparably equipped computers based on 90- and 100-megahertz Intel Pentium processors.
- The Power Macintosh 8100/80 was 21 percent faster overall than a computer based on the 100-megahertz Pentium processor.
- The Power Macintosh 7100/66 was 15 percent faster overall than a computer based on the 90-megahertz Pentium processor.
- The Power Macintosh 6100/60, with its 60-megahertz PowerPC 601 processor, outperformed a comparable computer based on a 60-megahertz Intel Pentium processor by an average of 24 percent. It also outperformed a computer based on a 66-megahertz Pentium processor.

# RANK

- |                                  |                                |
|----------------------------------|--------------------------------|
| 1 .Apple Power Macintosh 8100/80 | 7 .Compaq Deskpro XE 5/60      |
| 2 .Apple Power Macintosh 7100/66 | 8 .AST Bravo LC 4/100t         |
| 3 .Dell PowerEdge SP 5100        | 9 .Digital DECpc 466d2 MTE     |
| 4 .Dell Dimension XPS P90        | 10 .Apple Macintosh Quadra 610 |
| 5 .Apple Power Macintosh 6100/60 | 11 .Compaq Presario 425        |
- Apple Benchmarks Index Score Ratings** 6 .Compaq Deskpro 5/66M

Computer	Performance Index
Power Macintosh 8100/80 (80-MHz PowerPC 601)	6.77
Power Macintosh 7100/66 (66-MHz PowerPC 601)	6.06
Dell PowerEdge SP 5100 (100-MHz Pentium)	5.58
Dell Dimension XPS P90 (90-MHz Pentium)	5.26
Power Macintosh 6100/60 (60-MHz PowerPC 601)	4.61
Compaq Deskpro 5/66M (66-MHz Pentium)	4.39
Compaq Deskpro XE 5/60 (60-MHz Pentium)	3.73
AST Bravo LC 4/100t (100-MHz 80486DX4)	3.44
DECpc 466d2 MTE (66-MHz 80486DX2)	2.53
Macintosh Quadra 610 (25-MHz 68040)	2.17
Compaq Presario 425 (25-MHz 80486SX)	1.00

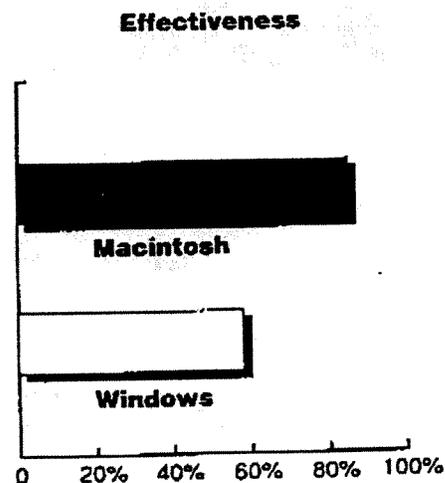
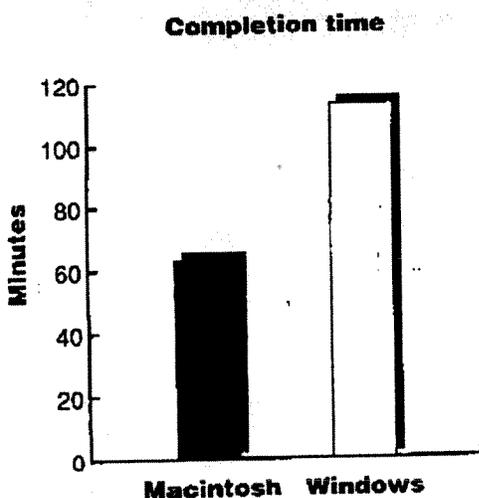
## SUMMARY

# The Arthur D. Little Efficiency Study

This report summarizes the results of a productivity study, *A Comparative Study of Productivity: Macintosh vs. Windows*, completed in January 1994 by Arthur D. Little, Inc., a leading international consulting firm. The study compared the productivity of people using Apple Macintosh computers to that of people using Intel-based personal computers running Microsoft Windows.

**Macintosh exhibited a significant advantage over Windows.** The study's overall finding is that "...today's Macintosh represents a fundamentally more productive platform/environment than does a comparable Windows machine for a broad range of typical business computing activities." Arthur D. Little tested Macintosh and Windows users of comparable skill levels working on an identical set of business computing tasks. Productivity was defined along two dimensions: completion time, how long it took to complete the tasks; and effectiveness, whether the tasks were completed correctly. The key findings from the study are as follows:

- **Completion time.** Macintosh users completed the tasks in an average of 63 minutes. Windows users required 113 minutes to finish. This means that Macintosh users needed 44 percent less time than the Windows users.
- **Effectiveness.** Macintosh users weren't only faster, they were also more accurate. The average Macintosh user completed 85 percent of the tasks correctly. The average Windows user completed only 58 percent of the tasks correctly. Overall, Macintosh users completed 43 percent more of the tasks correctly than did Windows users.



**Inherent productivity advantages.** The study clearly shows that the Macintosh has inherent productivity advantages over Windows. For the range of tasks tested, users on the Macintosh platform consistently outperformed users on Windows, in terms of both completion time and effectiveness. This performance edge was true not only for the test as a whole, but also for every component/segment of the test.

## **OBJECTIVE AND METHODOLOGY**

The objective of this study was to compare the productivity of people using Apple Macintosh computers to that of people using Intel-based personal computers running Microsoft Windows, across a variety of business computing tasks. The test was designed to keep the research focused, at the purest level possible, on the fundamental productivity differences between the two environments.

The test included 24 tasks, which were further grouped into 11 major categories. The completion time scores and the effectiveness scores were based on these 11 categories:

- Managing Files
- Checking System Resources
- Printing Across the Network
- Editing a Compound Document
- Exchanging Files on the Network
- Installing an Application
- Installing a Peripheral
- Checking for an Application
- Sharing Files
- Recovering Files
- Installing the Operating Environment

The majority of tasks were developed with the criterion that they should reflect typical business computing tasks. However, the overall test objective wasn't merely to simulate a typical day in the office. It was also important to test whether the process of accomplishing less frequently done tasks—such as installing an application or checking system resources—showed any differences between the two platforms.

The test environments for both groups were designed to be equivalent to every extent possible. The computers used were comparably equipped Intel-based PCs running MS-DOS 5.0 and Microsoft Windows 3.1 and Macintosh systems running System 7.1. Each computer was connected to a local-area network with the most common network software found in today's business environment, and equipped with the same mainstream word processing and spreadsheet applications. Network servers were similarly matched, and printing resources were identical on each side.

Macintosh and Windows users were tested in separate rooms and were not aware that the goal of the test was to compare productivity differences between the two platforms. Participants on both sides were given the same time limits and tasks to complete.

## OVERALL RESULTS

**Completion time.** Study participants were timed to see how long it took them to complete each task grouping. The overall findings for completion time show that Windows users took significantly more time to finish their tasks than the Macintosh users. Macintosh users consistently outpaced their Windows peers on each of the 11 task groupings, demonstrating a greater than 50 percent speed advantage in 5 of these 11.

### Macintosh users spent 44 percent less time than Windows users

Task Grouping	Macintosh Users (minutes)	Windows Users (minutes)	Macintosh Advantage*
Managing Files	6.5	20.3	68%
Checking System Resources	4.5	11.3	60%
Printing Across the Network	3.2	7.5	57%
Recovering Files	2.0	4.6	57%
Exchanging Files on the Network	3.8	7.9	52%
Installing an Application	8.7	15.3	43%
Checking for an Application	4.0	6.4	38%
Sharing Files	6.2	9.8	37%
Editing a Compound Document	6.3	9.4	33%
Installing the Operating Environment	8.0	10.0	20%
Installing Peripherals**	9.5	10.8	12%
Total	62.7	113.3	44%

\* Indicates how much less time (on a percentage basis) it took Macintosh users to complete each grouping of tasks than it took Windows users to complete the same tasks.

\*\*In "Installing Peripherals," Windows users were not required to open their computer to install any interface cards.

**Effectiveness.** The tasks that study participants completed were also measured for accuracy. Under real job conditions, incorrectly completed work must be redone, which significantly affects productivity.

Overall, for the 11 categories completed, Macintosh users significantly outperformed Windows users in terms of effectiveness. In addition, Macintosh users outperformed Windows users for each of the 24 individual tasks.

**Macintosh users completed 43 percent more tasks correctly**

Task Grouping	Number of Tasks	Macintosh Users	Windows Users	Macintosh Advantage*
Recovering Files	1	0.5	0.1	400%
Printing Across the Network	2	1.8	0.6	200%
Editing a Compound Document	2	1.4	0.5	180%
Installing Peripherals**	1	0.8	0.5	60%
Installing an Application	1	0.9	0.6	52%
Managing Files	5	4.8	3.5	37%
Checking System Resources	3	2.7	2.0	35%
Installing the Operating Environment	1	0.9	0.7	29%
Sharing Files	2	1.5	1.2	25%
Checking for an Application	2	1.6	1.3	23%
Exchanging Files on the Network	4	3.6	3.3	9%
Total	24	20.5	14.3	43%

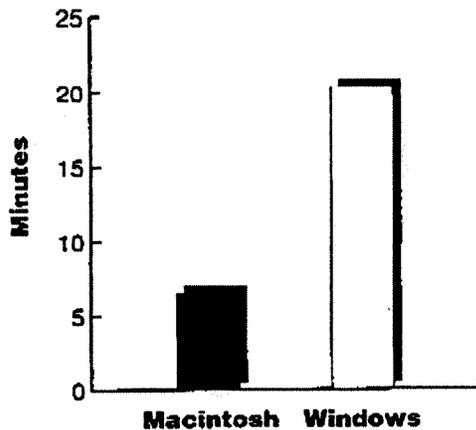
\* Indicates for each grouping, how many more tasks (on a percentage basis) were completed correctly by the Macintosh users than by the Windows users.  
 \*\*In "Installing Peripherals," Windows users were not required to open their computer to install any interface cards.

## SPECIFIC FINDINGS

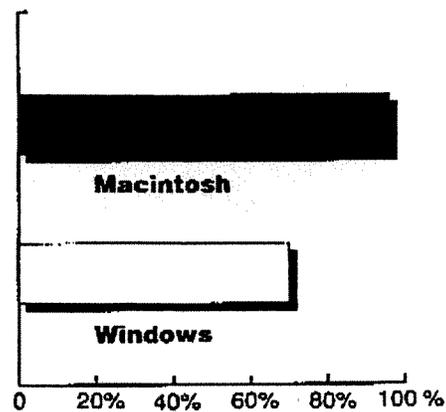
### Managing Files

Users were asked to perform a number of basic file management tasks, such as creating a new folder/directory, locating a file, copying files, duplicating and renaming files, and deleting files.

**Macintosh users spent 68 percent less time than Windows users**



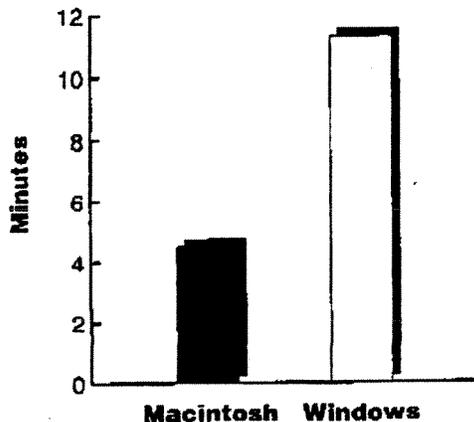
**Macintosh users completed 96 percent of tasks correctly vs. 70 percent for Windows users**



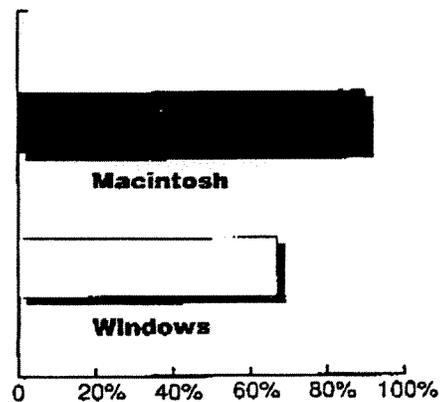
### Checking System Resources

Users were asked to move an application from one hard disk drive to another to free up disk space, check available space on their hard disk drive, and check the amount of RAM installed in their computer.

**Macintosh users spent 60 percent less time than Windows users**



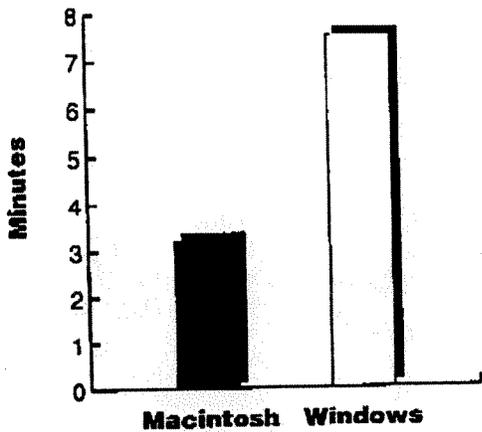
**Macintosh users completed 90 percent of tasks correctly vs. 67 percent for Windows users**



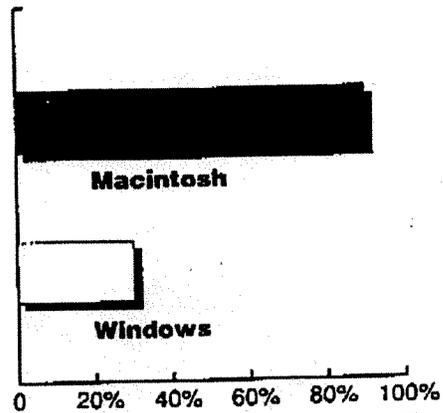
### Printing Across the Network

Users were asked to select two different network printers and to print a document on each of these two printers.

**Macintosh users spent 57 percent less time than Windows users**



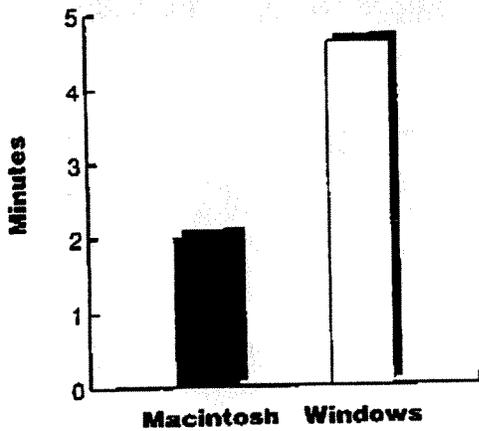
**Macintosh users completed 90 percent of tasks correctly vs. 30 percent for Windows users**



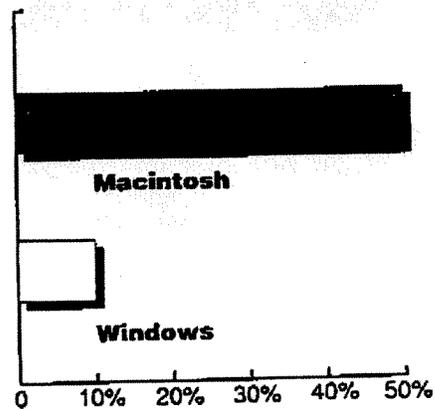
### Recovering Files

Users were asked to recover a file that they had been asked to delete earlier in the test.

**Macintosh users spent 57 percent less time than Windows users**



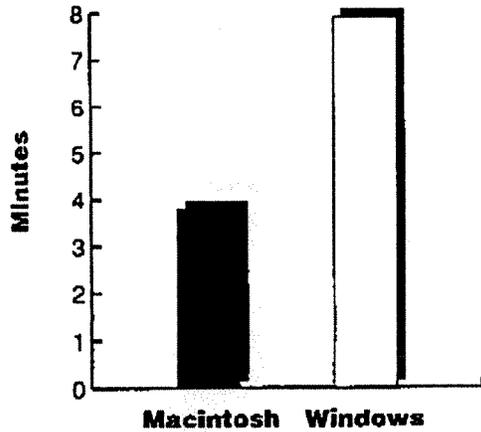
**Macintosh users completed 50 percent of tasks correctly vs. 10 percent for Windows users**



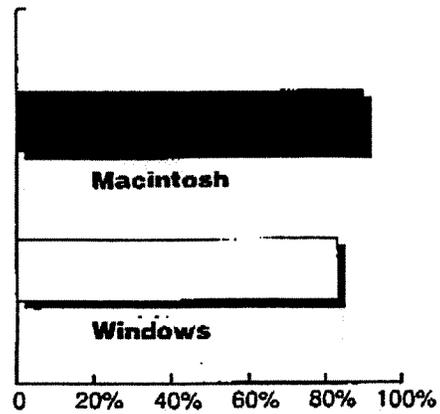
## Exchanging Files on the Network

Users were asked to retrieve files from the server and to back up files onto the server.

**Macintosh users spent 52 percent less time than Windows users**



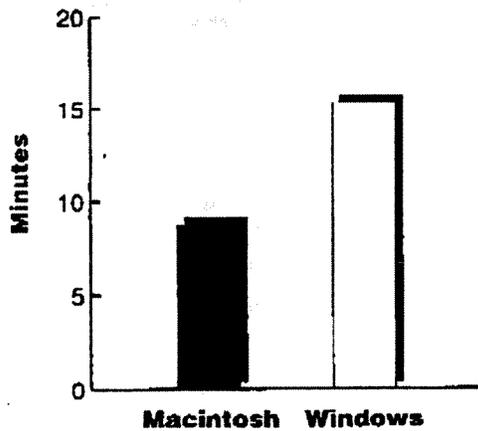
**Macintosh users completed 90 percent of tasks correctly vs. 83 percent for Windows users**



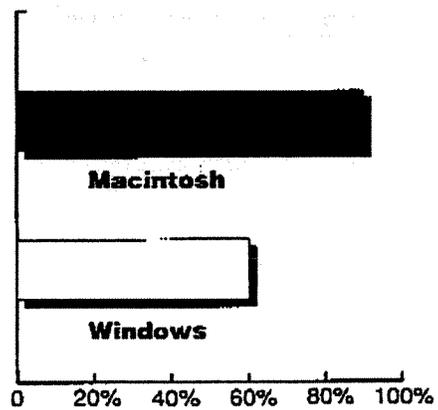
## Installing an Application

Users were asked to install a leading word processing application.

**Macintosh users spent 43 percent less time than Windows users**



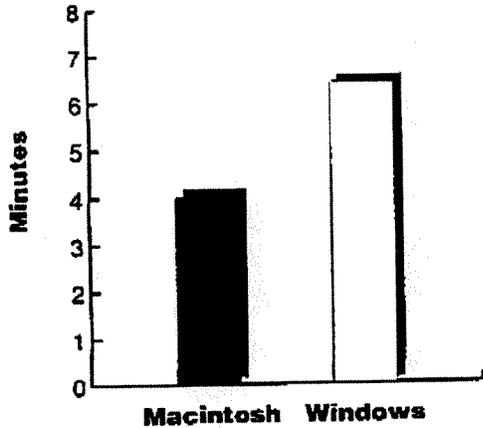
**Macintosh users completed 90 percent of tasks correctly vs. 60 percent for Windows users**



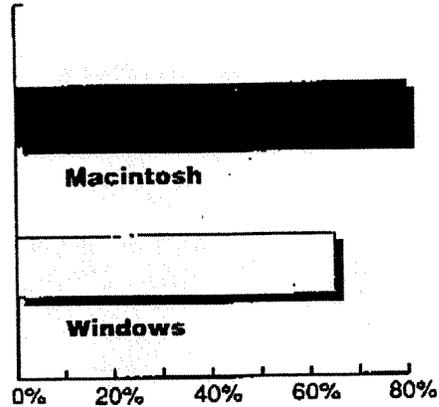
### Checking for an Application and Fonts

Users were asked to determine whether an application was installed and, if it was, to write down the version number. They were also asked to determine whether certain fonts were loaded and, if they weren't, to load them.

**Macintosh users spent 38 percent less time than Windows users**



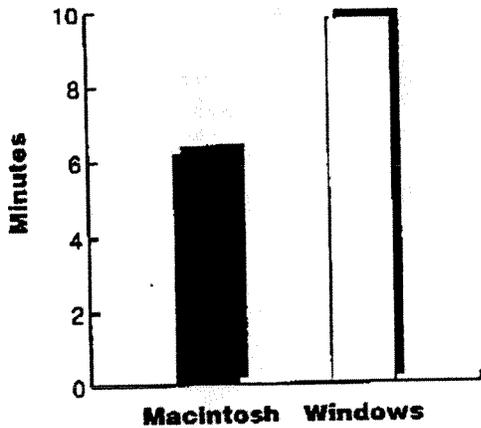
**Macintosh users completed 80 percent of tasks correctly vs. 65 percent for Windows users**



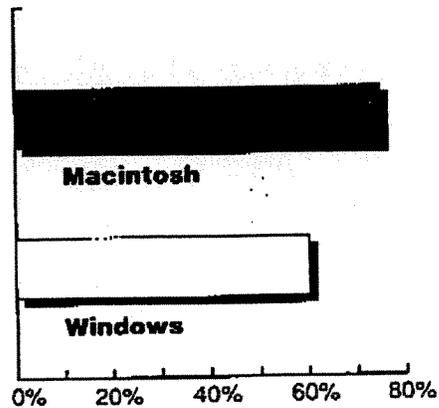
### Sharing Files

Users were asked to retrieve files from a coworker's computer and from a server.

**Macintosh users spent 37 percent less time than Windows users**



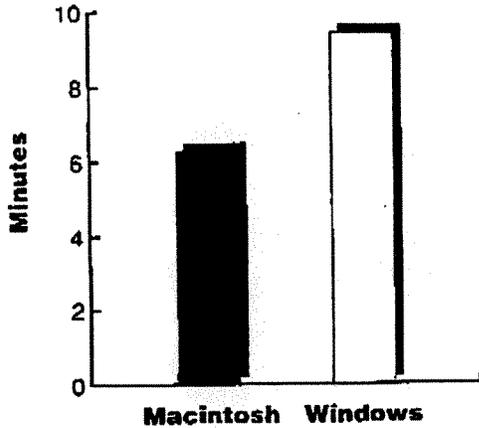
**Macintosh users completed 75 percent of tasks correctly vs. 60 percent for Windows users**



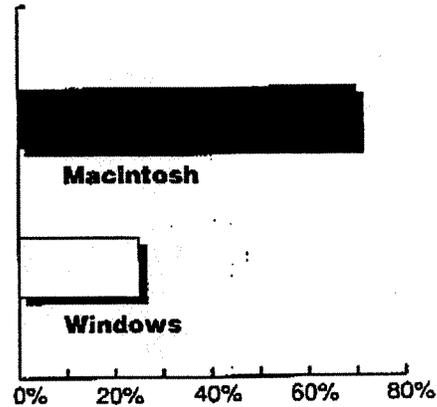
### Editing a Compound Document

Users were asked to locate an existing document, remove a graphic and chart, and replace them with a different graphic and chart. The graphic was located on the server and the chart was stored locally on the computer.

**Macintosh users spent 33 percent less time than Windows users**



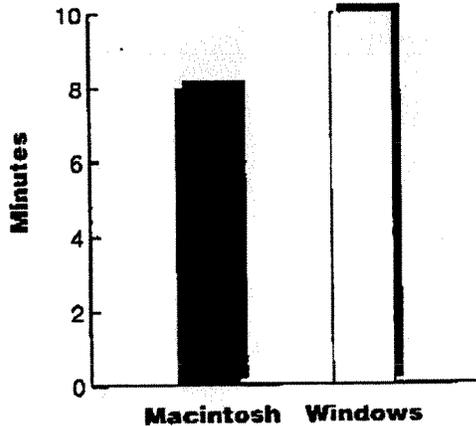
**Macintosh users completed 70 percent of tasks correctly vs. 25 percent for Windows users**



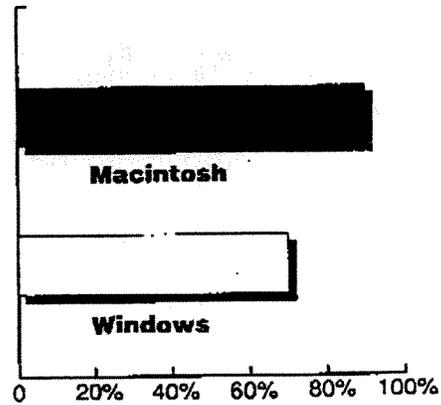
### Installing the Operating Environment

Users were asked to install the operating environment on their computer (Windows 3.1 on the PC and System 7.1 on the Macintosh).

**Macintosh users spent 20 percent less time than Windows users**



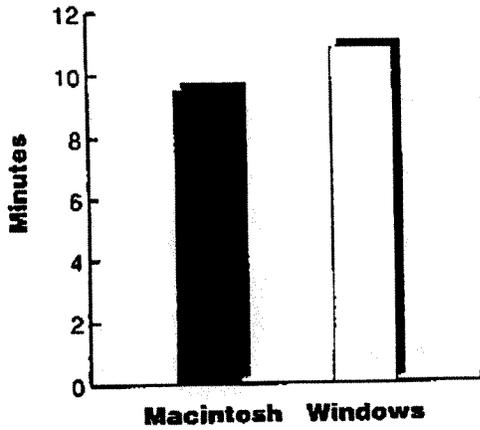
**Macintosh users completed 90 percent of tasks correctly vs. 70 percent for Windows users**



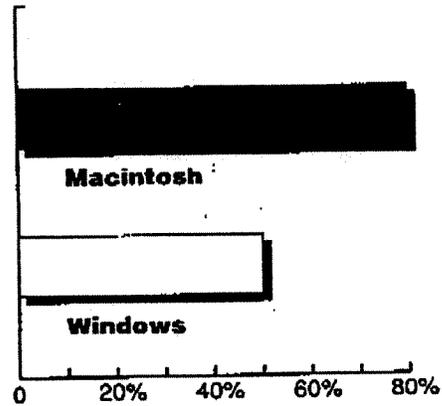
## Installing Peripherals

Users were asked to attach a CD-ROM drive to their computer and install the accompanying software. (The PCs had the CD-ROM interface card preinstalled, so this portion of a typical PC peripheral installation was completed for the users.)

**Macintosh users spent 12 percent less time than Windows users**



**Macintosh users completed 80 percent of tasks correctly vs. 50 percent for Windows users**



## FOCUS GROUP RESULTS

In addition to the quantitative findings from the tests, participants in the study were also asked for qualitative information about their experiences with the Macintosh or Windows platform. Findings showed an overall contrast between how Macintosh and Windows participants characterized their feelings about the test. Windows users showed higher levels of frustration and reported some trouble with the time limits associated with the tasks. Macintosh users generally completed the tasks within the time limits and without frustration.

**When participants were asked about platform preferences, here is what some of them said:**

### **Windows Participants (some with Macintosh experience)**

*"I've had Windows for four years, and I still have a lot of trouble. I am not a stupid person, and I don't feel comfortable with it still after four years."*

*"I'm now a Windows user because the firm I work for has Windows, and I don't have a choice. It's a lot better than DOS, I wouldn't even take a job (if it were DOS), they would have to double my salary. But to compare it to a Mac? I would always rather have a Mac, always..To me, Windows compared to Mac, Mac's a little slower, but to me Windows is cumbersome."*

*"Mac is totally better."*

*"I can say I'm more comfortable with the Macintosh and I feel more efficient because of all of the many different things you can do on the Mac vs. IBM, and because I'm more comfortable with it."*

*"There's something about the aesthetics on the Mac, because I use them both a lot, and I remember what it was like to try and remember some of the DOS-based or Windows-based programs from Microsoft when I first started and what it was like when you first see a Mac... There's something that's kind of indescribable about the way a Mac drives you to want to use a Mac."*

### **Macintosh Participants (some with Windows experience)**

*"I said the Mac was better because it was a more visually oriented platform...For some reason, with Windows... the way the letters are, the way everything looks,—it's just not as aesthetic. It looks like it's not as clean to interpret and understand and see files. That's my own personal bias. I'm more Mac."*

*"I never had to use DOS ever. So when I started working I was in Windows, a new Windows environment. I'm also at the top of the line PC equipment...I still like my Mac better."*

*"The PCs are faster, but when it comes to getting work done during the day, a Mac's more productive."*

*"The Macs are so easy and it's so simple to do something that you don't think you know how to do. That increases your productivity because you don't have to run around asking lots of questions—you can just get more work done."*

## **CONCLUSIONS**

The study concludes that the Macintosh platform offers inherent productivity advantages over the Windows platform. Arthur D. Little found this to be true for common day-to-day tasks as well as for less frequently done tasks.

- The Macintosh computer provides a more productive environment, both for accomplishing common day-to-day tasks and for accomplishing tasks that are done less frequently, than an Intel-based personal computer running Windows.
- For the range of tasks tested, users on the Macintosh platform consistently outperformed users on Windows, in terms of both completion time and effectiveness. This performance edge was true not only for the test as a whole but for every part of the test.
- Although some participants believed that Windows had an advantage in a few areas such as processor speed, there were no productivity results that showed that these perceived Windows advantages had any bearing on productivity.