Breaking Windows

Estimating the Cost of Breaking up Microsoft Windows

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Table of Contents:

Executive Summary

The Microsoft antitrust trial is far from decided, but the company's critics are already suggesting remedies that break-up the Windows operating system among several competitors. Breaking-up Windows will "balkanize" an operating system standard that has been the overwhelming choice of businesses and consumers for their desktop computers. The effects of this breakup will be felt by many in the information technology (IT) industry--software developers, service firms, resellers, business users and consumers.

The aim of this report is to assess the direct impact on software companies who create, market, and support applications that already run on Windows. Using independent sources for cost information and industry sales forecasts, we determined that even a modest incremental effort to support two new operating systems would have significant economic impact.

- **$30 billion in extra costs over the first three years.** PC software producers would incur nearly $30 billion more in development, marketing, and support costs by adapting their software to two new Windows descendants, just over the first three years.

- **Fragments the customer base.** While the remedy creates new costs to produce software, it does not increase the number of customers who would buy the software. In effect, the court will fragment the market of customers who would have otherwise used Microsoft Windows.

- **Consumers and producers will pay the price**. With no prospect of a greater market, a software company would deal with increased costs in two ways: pass costs along to consumers and business users in the form of higher prices; or elect not to support the new operating systems at all. And since most software producers are small businesses, the effects of reduced margins and fragmented markets will drive some to exit the business altogether. Consumers pay either way--higher prices or fewer choices of software for the new operating systems.

- **No balance of costs and benefits.** The magnitude of these costs and disruptions should be seen in relation to the presumed benefits that consumers would realize from the breaking-up of Windows. We will have to wait for the court's analysis of potential benefits from remedies that balkanize the Windows platform.

I. Introduction

Although the Microsoft antitrust trial is not yet over at the district circuit level, to say nothing of its eventual disposition at the appellate level, much discussion has turned to potential remedies. Among the proposals mentioned, and apparently favored by Microsoft's adversaries, are remedies designed around giving the Windows operating system to several independent companies.[1] One proposed remedy would break Microsoft into three or more "Baby Bills," each with the right to independently modify and market Windows-based operating systems. Another proposed remedy would force Microsoft to license Windows to several other companies, each of whom would then be free to modify and market their own versions of Windows.[2]

These remedies are based on the assumption that they will help consumers by instilling greater competition in the market. Although that premise is itself of dubious merit, our focus here is on a different issue. Ignored in these discussions are the costs of such a breakup, to developers, consumers, and society at large.

Our focus in this report is on the additional costs to software developers of creating, marketing, and supporting their programs to work with competing incarnations of Windows. If antitrust enforcement is supposed to benefit the economy, no examination of remedies can be complete without an examination of both the costs and benefits.

Our research shows that remedies that balkanize Windows as described above will harm both software vendors and software consumers. It will hurt software producers because they will have to incur extra costs in developing and supporting programs to run under competing versions of Windows. It will hurt consumers because they will have to pay the resulting higher prices for this software, suffer under a less predictable software environment, and forgo the benefits of participating in a large network where compatibility could be taken for granted. The most severely hurt are likely to be small software producers who will be less able to cover the additional costs of creating multiple versions of software and who will be forced by higher costs to leave the industry in disproportionate numbers

[1] "CCIA's solution: Break up Microsoft" By Will Rodger, Inter@ctive Week Online March 22, 1999 3:51 PM PT
[2] "Feds, States Ponder the Remedies" REUTERS WASHINGTON, Feb.15

II. What are the Incremental Software Production Costs from a Balkanized Windows?

Software producers incur extra costs in having to create multiple versions of their products to run under different operating systems. This will also be true for various flavors of Windows, particularly as these versions of Windows grow apart. These extra costs include building, testing, selling, and supporting their applications for specific operating systems. A more detailed explanation of these extra costs follows.

A. Research & Development

PC software companies must be selective about which operating systems they support because porting and maintaining their products on a new operating system is costly, and these additional costs have to be justified by the incremental revenues expected from sales of the ported application in the new operating system environment.

One famous instance of increased R&D costs associated with porting applications was Lotus' attempt to upgrade its 1-2-3 spreadsheet from DOS to a graphical version that could run first under DOS and then later be ported to OS/2 and Windows. To enhance portability Lotus converted the code for 1-2-3 into to a high level programming language only to find that the converted program no longer fit within the memory confines of DOS. Lotus finally had to pay an outside firm to help them get the product to work, with an attendant delay of almost a year in the DOS version.[3]

Although many PC software companies have some experience in dealing with the incremental costs and revenues from porting their programs to additional operating systems, these decisions are full of guesswork--questions about the compatibility of the new operating systems to their well-known ancestors, about complexities of learning and handling new features that differentiate the operating systems, and performance characteristics under varying loads to determine "minimum" and "recommended" hardware configurations. There are numerous cases where firms made serious

[3] “PC Spreadsheet Software” IDC 1991. From page 9: “The production of Lotus’s upgrade to 1-2-3 Release 2.1 proved to be a difficult undertaking for the company.….Release 3.0’s production schedule stretched out as Lotus attempted to fit the product within reasonable memory restraints….Finally, Lotus went to an outside source, Rational Systems, and purchased DOS extender technology.”

business errors in the decisions to port products. For example, we were told the following story in our interviews with software executives:

> "It took nine man-months to port just the time-entry module the Macintosh platform. That was greater than our effort to code the original module for Windows. We did lots of trial-and-error performance tuning. In hindsight, we wouldn't do it again, because the Mac market did not grow like we expected."[4]

Once a software company decides to support a new operating system, they invest in design decisions about how to manage the conversion and maintain the products on multiple platforms. Source code that works on Windows today may have to be altered to find the lowest common denominator among the Windows variations. Much of the rest of the code ends up in "duplicate code trees" which increases the long-term complexity and cost of software maintenance.

After design decisions are made, development begins, and significant incremental costs arise. An incomplete list of some of these costs would include:

- Adding programmers and educating new and old programmers about application programming interfaces to the new operating system.
- Acquiring, equipping, and maintaining extra development computers for the new operating systems.
- Adding testing personnel with knowledge of the new operating system, and equipping them with testing computers running the new operating systems.
- Creating test plans to ensure that software users on multiple operating systems can co-exist and share data on the same network. This "inter-operability" testing increases in complexity with every new version supported.
- Creating, printing, and maintaining new on-line help and user documentation.
- Creating and maintaining system documentation.

B. Incremental Sales & Marketing

We assume that the total number of software customers will not be increased as a result of having multiple versions of Windows. Instead, customers who would have purchased application software that ran under the old unified Microsoft Windows operating system would now have to choose between several versions of the program, each designed to run on one of the competing versions of Windows.

[4] Rene Adam, Ad Systems, Inc.

We assume that each version attracts the complete set of programs, although it is likely that different versions will have a different number of programs written for them as the fortunes of the various Windows versions rise and fall.

Some selling expenses will increase as the number of operating systems supported. When the new versions are first announced, a public relations campaign is usually undertaken. And when the software is released, a high-profile "launch" campaign is typically unveiled, including advertising, public relations, conference booths and sponsorships at events catering to users and developer communities supporting the new operating system. New versions of software are often created to take advantage of new versions of operating systems, so that these costs are likely to multiply with different versions of Windows.

For software that is distributed by a salesforce, there will be incremental spending on educating the salesforce about features, options, prices, and configurations supported. In addition, the salesforce would need to acquire and maintain incremental equipment to demonstrate their software on each operating system supported.

Finally, marketing costs may increase if the different flavors of Windows lead to different features, options, prices and configurations for each version of the program. Software companies will need to create new brochures, web pages, fact sheets, etc. without adding new customers.

C. Incremental Support Costs

We assume once again that the total number of customers will not be increased as a result of having multiple vendors and versions based upon Windows. It might seem to follow that support costs might be the same as if Microsoft made the only version of Windows. Technical support desks, however, strive to please their customers by staffing with the quality and quantity to meet predicted call volumes and call handling times for each version of a product.

Adding new versions of operating systems will require additional training for current support staff, and increase the training and ramp-up time for new and replacement staff. Call handling times are increased by any complexity that makes it harder for support staff to understand and replicate a caller's problem. Support staff, if they are to do their jobs properly, need to be able to replicate the same screens, features, and "bugs" as the callers. If callers are using multiple operating systems, support reps will be forced to use the same multiple operating systems where problems can be replicated faithfully.

This will likely require additional staff and computers, and/or additional training so the support staff can switch between operating systems to match the calls coming in.

D. Evidence of these Costs

The cost of porting programs is readily apparent from many diverse pieces of evidence, as well as direct examination. For example, much of the excitement surrounding Java was due to its purported reduction in porting costs, captured in the phrase: "write once, run anywhere". If a program was written in Java, it was supposed to be able to run directly on any machine and operating system, avoiding the R&D costs of porting applications to other operating systems.

Probably the most famous recent instance of the importance of porting costs was Intuit's very public hesitation about continuing to support Quicken for the Macintosh. At the time, the Macintosh version generated approximately 10% of the revenues of the Windows version, indicating that the incremental costs of continuing to upgrade and supporting a Macintosh version must have been in the vicinity of 10% of total revenues.[5]

This 10% value can not be taken as typical, however. There are two factors that might lead us to conclude that it is too low, and one factor that might lead us to conclude that it is too high. On the biased downward side, note that Quicken had already been produced for the Macintosh for may years, so the porting costs should have been considerably less than if Intuit needed to create a brand new port for which it had no experience. Quicken also has a much larger output base upon which to amortize the fixed costs of porting, compared to most other software programs. On the biased upward side, the difference between the Macintosh and Windows will undoubtedly be greater than the differences between the various flavors of Windows, overstating the porting costs.

We can also look to some of today's computer stories for confirmation of the importance of these costs.

- "Sandra Potter, an analyst at Aberdeen Group Inc. said that although many vendor executives know how much damage proprietary implementations did to the Unix market by killing

5 An article with some of the details, although it prematurely reported the death of the Macintosh version is: "Sales drop killed Quicken for Macintosh: Intuit to discontinue finance product for the Macintosh," Sean Silverthorne, ZDNN, April 20, 1998. The article states that sales for Windows were 1.5 million versus 133,000 for the Macintosh (8.9%).

compatibility among various flavors of Unix, they may still have trouble preventing the same from happening to Linux." [6]

- "VA Research Inc., which sells computers with a choice of four distributions, may have to drop one because testing four is too burdensome, said CEO Larry Augustin." [7]
- In an article about the future viability of Linux, the difficulties of producing software for more than a single implementation of the operating system was highlighted: "[Caldera CEO Ransom] Love said he's talked to software developers who are reluctant to jump to Linux because they fear it will fragment... Jeff Carr, the founder of Linux PPC, called the Linux standards base — a move to provide common standards for Linux distributions — a crucial and critical movement." [8]

All this evidence is consistent with the conclusion that the economic costs of porting programs from one operating system to another, even for closely related operating systems, can be and often are significant. In many cases these costs are significant enough to deter porting, causing the software developer to forego additional revenues and restricting consumer choice.

Finally, we have some estimates from actual software vendors that we have interviewed. [9]

- Network Associates, a large producer of utility software approaching a billion dollars in yearly sales including the well-known McAfee antivirus software, provided this quote after researching the question of incremental costs: "As a leading developer of network security and management products across heterogeneous operating environments, Network Associates is confident that the costs of two competing Windows operating systems could range from zero after the initial split to up to as much as 200% over time as the operating systems diverged." [10]
- Dr. Eric B. Allely, President, Tekamah, Inc., a firm involved with producing software for distance learning stated: "Based on the level of work to debug and maintain multiple versions, I would estimate our lab's overhead expenses to increase by 70 to 100%. That would translate into a 30 to 50% increase in product costs and more importantly an extension in the time it takes us to deliver a product."[11]

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6 From "Linux-For-All Faces Obstacles" by David Orenstein, ComputerWorld Online News, 3/15/99 http://www.computerworld.com/home/print.nsf/all/990315960E.

7 "Choice, Not Standards, Drives Linux Users", by David Orenstein, ComputerWorld Online News, Mar 8, 1999 full story at http://www.computerworld.com/home/print.nsf/all/9903089576

8 "Hamstrung by lack of standards? Linux bigwigs talk up desktop and embedded systems — and flag the need to promote standards for the OS," Lisa M. Bowman, ZDNN, CHICAGO, April 20 1999.

9 These interviews were conducted by Steve DelBianco, who assisted in this project. Steve is a Director with CIBER, a national IT consulting firm

10 Richard Greene, Network Associates, via email 4/27/99

11 Email response on 4/23/99.

- Charles Crystle, Founder and CEO of Chili!Soft states: "Maintaining software for different operating systems is very costly and is a serious drag on our business. To begin with it takes about 6 months for a team of 12 people to port to a new operating system. The additional cost for each new OS is about 80% of the original work. Two additional operating systems will cost us a great deal, both in real costs as well as in opportunity costs--instead of improving our software for our consumers we'll be busy moving it to a new OS." [12]

Of the eleven companies that responded to our requests for estimates of incremental costs, the average estimate was that R&D would increase by 78% for each new Windows platform, with a range of 15% to 100%. The average estimate for increases in support was 47%, although only five respondents quantified support costs. Only two companies quantified selling cost increases, with both in the 5-10% range.

We should note that there is little question that the new competing versions of Windows will have to diverge over time. If the various versions of Windows truly compete with one another, as the DoJ hopes, they will have separate R&D efforts and will be making different improvements to the OS as they each try to increase market share. DoJ oversight will prevent them from colluding or coordinating their behavior, and the products will grow in different directions. Moreover, this differentiation would come in the form of features and extensions targeted to certain classes of users (e.g., business users, game players, graphics professionals, and so forth).

III. Estimating Incremental Software Production Costs

We can not claim to have demonstrated with any great precision what the actual incremental costs of porting programs will be. Estimates range from 10% to 100% with average values of 50-60%. These costs will vary by company size, expertise, coding techniques, and many other factors, making any estimate quite rough.

It is our goal to provide an overall estimate of the costs of breaking up Windows that is very conservative and that can command general agreement among reasonable people. In doing so we probably understate the true costs by a fairly significant factor, but caution seems a prudent path until more detailed evidence can be used.

[12] Interview 4/27/99. Chili!Soft develops and markets software that enables Web developers to build dynamic Internet applications that work across many different computing platforms, including Windows NT, Sun Solaris and IBM AIX

Toward this end, we are going to make some very conservative assumptions about the percentage increase in costs that would be caused by partitioning Windows into two or three versions. We then apply this incremental multiplier to the expected costs of producing, marketing and supporting Windows programs to derive a dollar value of these incremental costs.

A. Assumptions

We assume that spending on development, marketing, and support would have to increase for each new operating system supported. We will return to our actual calculations of these values below.

We assume that multiple Windows would generate no extra sales revenues since the markets served would merely be fragments of the current Windows software market. Since higher costs will lead to higher prices,[13] unit sales of software would to decrease from what they otherwise would have been. Depending on the elasticity of demand, revenues could increase or decrease.

We assume that supporting multiple operating systems would have no incremental effect on General & Administrative expenses.

We assume that R&D increases by 25% for each additional operating system, that technical support increases by 25% for each additional operating system, and that sales and marketing increases by 5% for those few categories affected by having to deal with multiple operating systems.

B. Procedure

First, we estimate the relative size of expenditures of software developers on research and development, marketing, and support for software developers. Then we look at estimates of yearly sales in the Windows software market to determine the current and projected revenues. By combining these two estimates we are able to derive dollar estimates for these various costs involved with producing software. We then apply conservative estimates of potential cost increases brought about by having to port programs to different versions of Windows to derive dollar values of the increased costs to software vendors. We estimate these incremental costs for the three-year period from 2000 through 2002.

C. Relative Costs of Creating Software

First we present, in Table 1, evidence on the various costs of creating software from a study conducted by the Software Publishers Association and KPMG. This study examines profitable software publishers and calculates the share of their various costs as a percentage of their revenues. Note that small firms spend relatively greater shares on research and development than larger firms, but similar shares on sales and marketing, and technical support.

Table 1: Relative Size of Software Production Costs

Percent of net revenue	Companies under $5 million	Companies $5 to $50 million	Companies over $50 million	Weighted Average (Approximate)
Research & Development (incl. software development, documentation, quality assurance)	26.9%	20.9%	16.8%	17.3%
Sales & Marketing (incl. inside and outside sales personnel, advertising, promotions, trade shows)	23.1%	26.2%	29.5%	29.1%
Technical Support (incl. salaries and overhead)	5.5%	6.4%	6.9%	6.8%
Subtotal	55.5%	53.5%	53.2%	53.3%
General & Administrative (incl. salaries, facilities, taxes, bad debt)	19.5%	16.7%	8.5%	9.4%

Source: SPA 1997 Financial Profile of Software Publishers, prepared by KPMG Peat Marwick LLP; Tables 2-4, pages 9-11. These numbers are based on profitable companies only. Figures do not add to 100% because revenues are greater than costs. The approximate-weighted average is more fully described in the Appendix.

Of the costs shown above, the categories influenced by creating multiple Windows platforms are R&D, Sales & Marketing, and Technical Support, which averaged 53% across all companies in the survey. The largest increase in costs from supporting multiple Windows platforms are likely to arise in the categories of R&D and Technical Support.

[13] It is standard economic analysis that increases in variable costs lead to higher prices.

D. Size of Windows Market

The data on current and predicted software revenues in the Windows market are found in Table 2. The numbers come from a 1998 IDC study representing expected revenues in Windows 32-bit markets for various categories of software.

There are three major categories of software: tools, applications, and infrastructure. Infrastructure includes the sales of the operating system itself, and thus we remove an estimate of the sales of 32 bit Windows operating systems from the sum of tools, applications and infrastructure revenues to derive the expected revenues from software in the 32-bit Windows market. These estimates appear in the last row of table 2. These estimates will be used to derive the dollar value of incremental costs of writing for multiple Windows platforms after we have put in place our estimates of the percentage increase in costs.

Table 2: Predicted Revenue in Windows Markets (Millions)

	Forecast Period			3-year
Software for Windows 32-bit Systems	2000	2001	2002	Total
Tools: spreadsheets, information access, programming environments, databases, components, objects, internet tools	$16,425.7	$20,160.1	$24,729.6	$61,315.4
Applications: consumer applications, personal productivity, games, accounting, office applications and other cross-industry packages, office automation, vertical industry applications	$33,659.8	$44,563.5	$56,733.7	$134,957.0
Infrastructure: system management, security, and middleware	$19,971.9	$23,879.6	$27,888.8	$71,740.3
less: Windows 32-bit operating systems	-$12,237.3	-$14,631.7	-$17,088.2	-$43,957.2
Total Revenue for Windows 32-bit operating systems	$57,820.1	$73,971.5	$92,263.9	$224,055.5

Sources: IDC report "Worldwide Software Review and Forecast" Analysts: William Peterson, Steve Hendrick, Clare Gillan, Paul Mason, and Gary Ingram, April 28, 1998. Information on Tools comes from Table 24, Applications from Table 25 and Infrastructure Table 26. Infrastructure revenues include sales of the operating system which were then removed based on estimates of these sales found in the Appendix.

E. Deriving Estimates of Incremental Costs

The predicted revenues from Table 2 make it easy to determine the predicted incremental costs from multiple versions of Windows, once we know the percentage increase in costs imposed on vendors. Table 4 in the appendix lays out our estimate of the percentage cost increase (measured as a percentage of revenues) brought about by increases in a few components of costs affected by vendors having to port and support the program to multiple platforms. The average increase in costs (as a percentage of revenues is 6.46%.[14]

Table 3: Increased Costs of Extra Windows Platforms (in Billions)				
Software for Windows 32-bit Systems	2000	2001	2002	Total
Total Revenue for Windows 32-bit operating systems	$57.82	$73.97	$92.26	$224.06
Incremental Cost Factor	6.46%	6.46%	6.46%	6.46%
Increased Cost due to one additional platform	$3.7	$4.8	$6.0	$14.5
Increased Cost due to two additional platforms	$7.5	$9.6	$11.9	$28.9

In terms of dollar values, the absolute amounts are quite enormous because of the very large amount of resources that are devoted to producing products for the Windows market. ***From Table 3 we can see that the total increase in costs for the three year period is almost 29 billion dollars***. In the year 2000 the costs are $7.5 billion, rising to $11.9 billion in 2002.

IV. The Impacts on Consumers and Producers

A. Higher Costs Will Be Shared by Producers and Consumers

It is an economic truism that increases in variable costs are always split in some fashion by the producers and consumers.[15] Economic theory and decades of analysis make clear that producers will not be able to pass on all variable cost increases to consumers. Nor will the producers absorb the entire cost increase themselves. The types of variable costs that will be partly borne by consumers and producers are items such as increased technical support expense, and sales and marketing costs. Higher prices to consumers makes them worse off and will decrease their purchases of the product. Higher costs to producers will cause some to exit the industry.

14 As indicated in the Appendix, we assume that R&D increases by 25%, that technical support costs increase by 25%, and that sales and marketing goes up by the equivalent 1.50%. As a percentage of costs, this works out to 11.80% for each new platform.

[15] Virtually any microeconomics textbook will have a discussion of how the burden of a new costs, such as a sales tax, is split between producers and consumers. Any increase in marginal cost will be passed on in the same way.

B. Small Producers Will Exit the Industry in Disproportionate Numbers.

Increases in fixed costs are absorbed entirely by producers, reducing the profits of producers and causing some producers to exit the industry.[16] R&D (the creation of the computer code) is a fixed cost, and will increase due to the extra costs of porting the program. Since there is little reason to expect the cost of porting the program to have much to do with the sales of the program, firms with small sales are likely to have a relatively larger increase in this cost than do firms with large sales (just as R&D in general is a higher percentage of the costs of firms with small sales in table 1). It is also the case that the largest component of cost increases is the increase in R&D costs.

Therefore, the tens of billions of dollars of increased development costs from having to port programs to multiple versions of Windows will fall disproportionally on small firms, causing them to leave the industry in disproportionate numbers. To the extent that small firms are responsible for new software ideas, this would prove damaging to the progress of the software industry and have negative effects on the consumers of software who will not come to benefit from these innovations. [17] This result is the exact opposite of the stated claims of many of Microsoft's critics, although it would work to the advantage of the larger Microsoft competitors who would have reduced competition from small firms as well as a weakened Microsoft.

V. Costs That We Have Not Measured

We have focused on a single result of breaking Windows into multiple platforms: the increased cost of producing software. We have seen how this increased cost affects both producers and consumers. There are other costs that may potential be of even greater magnitude that we have ignored in this study.

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[16] The logic here is that fixed costs can not affect the output level which maximizes a firm’s profit since it is a cost that doesn’t change when output changes. The fixed cost, however, reduces a firm's profit by an amount equal to the fixed cost, causing some firms to become unprofitable and eventually to leave the industry.

[17] According to Nathan Associates, there were over 230,000 small computer establishments in the US, over half of whom had annual sales under $500,000 [Table 1]. These "high-tech entrepreneurs" generated over $300 billion in revenue in 1997 from services, software, and hardware. They employed 2.2 million Americans. [Table 1] Source: "The New High-Tech Entrepreneurs", by Nathan Associates Inc. 1998.

One major cost, to consumers, is the decrease in compatibility that will arise between users of competing flavors of Windows. No longer can consumers be assured that they will have access to the full set of programs that run under Windows, since some version of Windows will likely garner greater market share than the others and a larger library of applications. Just as some consumers are reluctant to buy Macintosh because they can not be sure that the software they want will be ported to the Macintosh world, consumers in the Windows market will face the same uncertainty. Consumers will also find that exchanging files, even those from the same program, will become more costly, just as it is more costly to exchange files created using the same program on PCs and Macintoshes.

In economic terms, consumers are losing some value from the network effects that they now capture under Windows but which they will lose under a regime of multiple Windows.

Other large potential costs arise in related industries. For example, firms providing computer consulting services (which generate larger revenues than the software application market) will find themselves with additional costs and additional business as Windows-based customers try to wade through the now fragmented operating system and application software environment. Although consulting revenues will likely increase as a result of fragmented Windows, this will be a net drain on the economy since resources will be removed from some productive activity into solving problems that were artificially created by the antitrust authorities.

In addition, independent resellers, or value-added resellers (VARs) are likely to have increased hardware and integration costs for their corporate customers, for many of the same reasons as consulting firms. The process of evaluating, selecting and installing application software packages will be more complex and costly if fragmenting Windows reduces selection and increases prices. These resellers will also have to add staff and/or training in the new operating systems.

Another service sector that depends upon operating system stability is the training and educational market. These companies will likely need to add resources when serving the same base of customers now using the fragmented operating systems.

The consumer costs mentioned earlier were costs that individual users were likely to encounter. In addition to those costs, the internal information technology departments of nearly every organization that uses computers will also find its costs increased. Choosing operating systems and software will be a more difficult task, and the likelihood of supporting multiple operating systems within the organization will increase when various flavors of Windows coexist.

VI. Conclusions

Breaking windows will increase software industry costs by approximately $10 billion annually. Over a three-year period, we expect approximately $29 billion of increased costs. These costs are easily avoidable and thus are unnecessary.

These increased costs will harm the software industry and software consumers in several ways:

- Part of these higher costs will be passed along to consumers in the form of higher prices.
- Part of these higher costs will be absorbed by software vendors in the form of reduced margins, causing some firms to exit the industry and/or scale back production.
- The producers who will suffer the most from reduced margins will be small producers who are likely to exit the industry in greater numbers than their larger competitors.

Some costs not included in the above estimates are:

- Higher costs are likely to discourage some software companies from supporting some of the new Windows varieties, which means consumers of any single version of Windows will have less choice of programming compared to the current Windows environment--not more.
- There are large ancillary industries that have developed in conjunction with the software industry (e.g. consulting, VAR). Costs will rise in these industries if Windows is fragmented.
- Consumers will find that their network benefits are diminished since the fragmented market will decrease interoperability with other users.

Given these very large costs, it seems unreasonable to believe that a drastic remedy such as breaking Windows could benefit either consumers or society, although it might benefit large software producers who were competitors with Microsoft. It would certainly benefit the producers of alternative operating systems.

VII. Appendix

Incremental Cost Percentages for each new Windows version (as percent of revenue)							
Adapted from SPA/KPMG study	< $5 mil	$5-50 mil	> $50 mil	approximate weighted average	Incremental Factor	Impact on Total Cost	Explanation
R&D:	26.90%	20.90%	16.80%	17.32%	25.00%	4.33%	based on interviews; most implied greater than 25% increase
Sales & Marketing Expenses:							
Outside sales salaries	3.50%	4.20%	5.20%	5.08%	-		no new reps needed
Inside sales salaries	1.60%	3.40%	2.40%	2.50%	-		no new reps needed
Outside sales commissions	1.20%	1.20%	1.60%	1.55%	-		no new sales
Inside sales commissions	0.30%	1.40%	1.00%	1.03%	-		no new sales
Overhead/depreciation	1.00%	1.20%	2.20%	2.08%	-		
Other sales expenses	1.80%	3.00%	4.10%	3.96%	5%	0.20%	increased training, demo equip
subtotal of sales	9.40%	14.40%	16.50%	16.21%			
Marketing salaries	2.80%	3.20%	3.40%	3.37%	-		no new staff
Advertising	4.30%	3.00%	1.80%	1.95%	-		more ads, but smaller circulation
Cooperative marketing	0.60%	0.70%	1.00%	0.97%	5.00%	0.05%	w/ new OS vendors
Trade shows	1.80%	1.50%	0.80%	0.88%	5.00%	0.04%	for new OS developers & users
Direct mail	1.90%	0.60%	0.90%	0.88%	5.00%	0.04%	new production costs
Promotions	0.10%	0.70%	1.10%	1.05%	5.00%	0.05%	new production costs
Other marketing programs	1.30%	1.30%	1.90%	1.83%			
Overhead	0.40%	0.50%	0.60%	0.59%	5.00%	0.03%	
subtotal of marketing	13.20%	11.50%	11.50%	11.52%			
Technical support salaries	2.80%	4.60%	4.00%	4.05%			more support people and training
Tech support overhead/depreciation	0.70%	0.50%	1.60%	1.48%			more support equipment
Total Technical Support	5.50%	6.40%	6.90%	6.83%	25.00%	1.71%	from interviews
Total Increase in Costs as a Percentage of Revenue						6.46%	

Data come from: Table 3, page 10, SPA/KPMG. The Incremental Factor is our conservative guess. The approximate weighted average constructed by assuming that the 16 firms in the less than $5 million category average $2.5 million, the 15 firms in the $5-50 million category average 27.5 million, and the 21 firms in the $50 million + category average 50 million except for 10 firms that are over $300 million, which we assume averages to $300 million.

Table 4: Adjustment to IDC Sales Forecasts to deduct sales of Windows Operating Systems:		
Units sold (000):	1997	Source & notes
Windows NT Server	1,505	MS Halloween paper
Windows NT Workstation	6,937	http://www.opensource.org/halloween2.html
Windows 95	76,447	(author cites Dataquest source)
Total Windows 32-bit OS sales	84,888	
Average preinstalled price:		
Windows NT Server	$650	CFA Paper, compiled from market surveys
Windows NT Workstation	$100	Microsoft Memorandum
Windows 95	$50	Microsoft OEM PC Value Analysis, CY 90-96, 3/4/96
Revenues ($ millions):		
Windows NT Server	$978	= avg price times units sold/1000
Windows NT Workstation	$694	
Windows 95	$3,822	
Total Windows 32-bit OS revenues	$5,494	
Total Systems Software for Win-32 systems	$8,967	Table 26 of IDC study, 1997
Windows OS as percent of Systems Software	**61.3%**	reduces IDC forecasts for System Software