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Monopolies x Open Standards: An Abridged History of the Personal Computer Industry and its influence on the Cyberspace

Introduction

This paper was originally submitted as a partial requirement for my

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It would be notoriously impossible to recapitulate in such a short essay the whole history of computing, from Charles Babbage's conceptualisation of the Differential Engine, in 1822, to the present stage of the personal computer. In order to develop the necessary analysis of how the computer industry is actively shaping the present and the future stages of cyberspace, the scope of this paper will be focused on the events placed on the second half of the 20th century. Companies like IBM, Microsoft and Apple are just a few of the players who have made the right and the wrong moves in the recent history of computing. The success of any one of the main players in this game is a direct consequence of another participant's lack of vision. As the main axiom in chess says: "the winner is the one who makes the penultimate mistake". And this time *Deep Blue* (1) may have arrived a little bit too late.

As we now realise the future of the computer industry is not only in computing. It has already been over a decade that the main use of PCs has moved from a sophisticated calculating machine into word processing. Another shift is happening at this moment, but this time it is not only your typewriter that will be obsolete. Your TV, phone, fax, standard mail, newspaper, CD collection, and bank account are, just to name a few, at stake. The problem obviously is not in the evolution but how and who will benefit from (not to say control) all this. You can choose how to name our near future. Information Superhighway, Cyberspace or Information Marketplace are just a few of the terms made up to try to describe what is planned for us. What will happen nobody knows although it is not hard to realise that the role of the computer and telecommunication industries will be as (if not more) important as the railways in the US, early this century, or the petroleum industry.

This essay is about putting face-to-face **monopolies** and **open standards**. Many times their front end products may be very similar, but the social consequences certainly aren't. All of us want user-friendly products and solutions, that communicate with each other and are seamlessly integrated. The choice between having the standards widely available for everyone to put his or her ideas into practice, opposed to the actual scenario of proprietary technologies ? widely spread, undoubtedly ? but collecting tokens for just one company, is what this essay addresses. At stake, as we'll see by the end, isn't whether a software application is better than another. It is whether we all will have a voice, and equal opportunities to compete in our society. It is, ultimately, about democracy.

A Blue Ocean

From its early existence in 1896 to its corporate peak in the late 1970s, International Business Machines Corporation turned out to be the largest (and practically the only) computer superpower. Depending on who you listen to, IBM once controlled between 40 percent (by their definition) and 70% (by the United States Government's definition) of the computer market (2).

IBM's most important client ever was undoubtedly the U.S. Government and solving the census problem, early this century, was a major leverage to its business. Among the technology used for the U.S. Census was the IBM Card, a punch card that commanded twice the information compared to the traditional calculating methods. The patented card only worked on IBM tabulating machines, being an early example of what we now call *proprietary technology*. In the 1940s, the US government-funded ENIAC (3) was a setback for IBM and only in 1947 the company developed the Selective Sequence Electronic Calculator (SSEC): a hybrid computer with electronic and mechanical parts that still didn't make up to ENIAC's standards. Only with the launch of IBM 603 and IBM 604 the company provided a solution with speed and flexibility of operation unmatched by any calculator in the marketplace (4). Since then IBM dominated the digital computer market just like it did with its tabulating machines. Mainframes became IBM's core business.

Although the scenario in 1947 is certainly different from today's computer industry, this shows how a company with enough economic power in a monopolistic environment can overcome a late entry into market. IBM repeated this task, in 1981, with the personal computer industry, banishing Apple, the leading PC company at the time, to an eternal second place. But this time IBM did not hold the jackpot for long: in its hurry to create a personal computer in one year, Bill Lowe, the project's head engineer had to buy IBM PC's core modules from different companies creating, thus, an *open architecture* machine. It was the first product in IBM's history that was not completely created from scratch, with proprietary

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technology. Due to its decision of getting a commercially available microprocessor (Intel's 8080) and a third party operating system, Big Blue not only changed the future of the PC industry, but also created its new-born titans such as Microsoft, Intel and Compaq. The only in-house creation in IBM's PC was the system BIOS (5), a piece of basic software burned into the ROM memory of the machine. Well, that was not enough to keep the IBM PC from being cloned. Compaq was the first to realise it and in 8 months they created a fully compatible version of IBM's BIOS through a legally acceptable process called *reverse engineering*. Many followed Compaq's steps and just another market was created under IBM's blessing: BIOS manufacturers with a dozen of players such as Award Corp. and American Megatrends Inc. (AMI). All that companies like Compaq, Dell, Toshiba and Gateway2000 had to do was going shopping for Microsoft's DOS (in the 80s) or Windows (in the 90s), Intel's microprocessors, and someone else's BIOS if they didn't want to spend a few bucks in R&D. Right out of the stove, an IBM PC clone! When IBM realised its mistake and introduced a proprietary architecture machine, the PS/2, it was already too late. It was clear by then that the world no longer had an IBM standard but the "Wintel" standard. Microsoft currently has 94,1% of the OS market and Intel microprocessors are on 85% of world's computers (Dataquest numbers), thus every innovation in the so called IBM PC is actually jointly defined by these two companies. Big Blue no longer played the cards.

The IBM PC clone market not only made Gates and Moore billionaires, but it also turned their main clients into powerhouses, such as Compaq who in January, 1998, bought Digital Equipment Corp. (DEC), the company who created the minicomputer over a decade before Compaq even existed! The acquisition will raise Compaq's annual revenue to US\$37 billion, making it the second largest computer company in the world after IBM Corp. in a deal valued at US\$9.6 billion (6).

Yes! As we can see, IBM is still the largest computer company on Earth, despite all its mistakes in the personal computer industry and the numerous antitrust lawsuits from the U.S. Department of Justice (DoJ). The most important of them began in January 1969 and proposed to break IBM into smaller competitive companies. It lasted thirteen years and IBM argues that over the twenty-year period ending when the suit was filed, their share of the revenues of the one hundred top companies in the computer industry went from nearly 60 percent down to 40 percent. In 1982, the case was dropped by a judgement ruling it "without merit" (7). IBM never lost any money through judgements, but it spent tens of millions of dollars annually defending itself.

This evidently shows how a strong monopoly in a field can put a company in a comfortable position for many years ahead. Microsoft and Intel over took IBM in a business the company completely ignored, but Big Blue is still the number one player in the business market. As Lawrence Ellison, CEO of Oracle, the world's second largest software company, states "IBM is still doing just fine, but it is not the focus of the industry anymore. So will Microsoft", he hopes. IBM's story is an easy one to tell. It has already happened. At this moment (January 1998), due to its monopolistic practices, Microsoft is going through a similar lawsuit IBM has had. Whether the outcome will be the same no one knows, but it is what we all try to forecast.

1984 won't be like 1984

"What the hell was that ?!", yelled the sports commentator at the beginning of the second half of the 1984 SuperBowl. Apple Computer Inc. paid one million dollars for the thirty-second commercial break of America's most important sports event.

It was an all-in-one event. On the 24th January 1984 not only America stopped to see the Mac commercial but Apple Computer strategically held its annual shareholders meeting. After the shareholders watched *1984*, they listened to Steve Jobs' speech on the history of computing, from a pro-Apple, anti-IBM point of view. The audience went wild. A standing ovation lasted several minutes, but the best was still to come. Jobs carefully took the Mac from its carrying case and placed it on the table. In a tinny, computer-generated voice, the Macintosh addressed the assembly:

"Hello, I am Macintosh. It sure is great to get out of that bag. Unaccustomed as I am to public speaking, I'd like to share with you a maxim I thought of the first time I met an IBM mainframe: Never trust a computer you can't lift!"

Obviously I can talk, but right now I'd like to sit back and listen. So it is with considerable pride that I introduce the man who's been like a father to me, Steve Jobs" (8)

Again the auditorium erupted and Jobs went into his full-power sales pitch.

It was the launch of the Apple Macintosh, the world's best personal computer. Directed by Ridley Scott (*Blade Runner*, *Alien*), *1984* was aired only once and missed the target. The "Big Brother" the film refers to should no longer be IBM, but Microsoft. Very few ? at the moment ? realised it, though. At the same time Apple introduced the first personal computer with a GUI

(Graphical User Interface), based on an innovative concept developed by Xerox at the Palo Alto Research Center (PARC), Microsoft introduced just another text based version of DOS, the release 3.0, for the IBM clone market. A working version of Windows wouldn't come into the market until 1990 and when Microsoft launched Windows 95 it had no more features than the MacOS in 1988.

So how did Microsoft get to the actual figure of 94.1% of the operating systems market being consistently 6 to 7 years behind Apple in technology innovation? Simply because Apple, just like IBM, misunderstood the PC market. Jobs thought Apple was a hardware company and did not realise that the secret behind the Mac, the GUI created by Xerox, was the concept that would revolutionise the computer industry, and a *concept is platform independent!* Of course Jobs's expectations were that the Mac would be such a success that there would be no IBM PC market shortly. He was, indeed, right from the technological point-of-view but, although being a better machine, the Mac had *proprietary technology* and its price was much higher than the PC. Also, there was no easy way of doing reverse engineering on **both** the hardware **and** the software that made up the Macintosh. Although nowadays I personally regret the Mac having such a low market share, if Apple became successful it would be as much (if not more) of a monopoly than Microsoft is today, but certainly with better products.

If Steve Jobs had realised the OS market **apart** from the hardware, we would be using MacOS on our PCs today. That is not how it happened and the pieces on the chessboard were moved by the company that understood it before anyone else.

The story shows what people really wanted: widely spread platforms and compatibility! Since there was no independent organisation (government, user groups or even an industry standards committee) to discuss what would be best for the computer industry, from the end-users, industry competitiveness and even social point of view, Apple's lack of vision practically moved the company out of the market and Microsoft's aggressive hard ball game took it over.

At this stage it was only the computer industry, but now a days, it goes way beyond it, as we'll explore shortly. As journalist Nathan Newman recently wrote in an extensive white paper for the consumer group NetAction, the fear is that "Microsoft is not at the peak of an industry's size but at an early stage in markets that are expected to explode geometrically in the next decade. If unchecked, there is a very real possibility of Microsoft becoming an unprecedented financial and technological colossus bestriding more markets and industries than any monopolist has ever aspired to dominate" (9).

Microsoft's Word

What really made IBM go after the PC market was a program called Visicalc. Developed by Dan Bricklin and Bob Frankston in 1979, it turned the Apple II into a business machine. Managers from all levels were able to put their time consuming spreadsheets into the computer and make all kinds of data analysis in seconds. It was what in today's jargon is called a "killer-app", a piece of software that is so good people would buy a computer just to run it. The inventors of the electronic spreadsheet would be billionaires today if they just had patented it. It was a time where most of people would develop their software and hardware to show to their mates at the computer clubs, such as the Homebrew, where an early version of the Apple I was presented by Stephen Wozniak. Dan Bricklin doesn't regret not patenting Visicalc, "we were kids in the 60s and we just wanted to make a better world", he said in a 1996 Channel Four documentary (10).

Bricklin's coeval, William Henry Gates III (born 28/10/1955), didn't share such ideals to the point of giving away software, quite the opposite: his childhood interests included ? but obviously did not end with ? games such as Risk, where players compete for global domination (11).

DOS Kickoff

Microsoft started in July 1975 as a developer of programming languages for MIPS, the world's first personal computer company, creator of the Altair 8800. But it was in 1980 that Microsoft made its most important move. IBM approached them to use BASIC language in their PC and they also believed Microsoft had an operating system to license. Gates told them that they only did languages and their software ran on Digital Research's industry standard CP/M.

IBM went after Digital Research but Gary Kildall, the company's CEO, not only didn't show up when IBM knocked on his door, but his wife, Dorothy, did not like the contract IBM wanted her to sign beforehand, stating that all information exchanged with them should be kept confidential (12).

IBM didn't like being treated that way and went back to Microsoft (who signed the contract) and told Gates that the Digital Research deal turned out to be a total failure. Bill Gates is not the kind of man that allows an opportunity to pass by twice and, in an incredible moment of luck, Paul Allen thought of Tim Paterson, a programmer at Seattle Computer Products, a small

company, going bankrupt, just across town. Paterson developed a system based on Digital Research's CP/M and named it QDOS. The rest of the story everyone knows: Microsoft paid US\$50,000 for complete life-time rights over the operating system, renamed it MS-DOS and phoned IBM, this time offering a complete solution on both the programming language and the operating system.

When IBM licensed the operating system from Microsoft, the fortune of the company was made as it went on to resell the operating system to almost every company building PC clones. The fact that IBM not only supported MS-DOS but made sure all programs initially shipped with the new IBM PC were compatible only with DOS and not with CP/M, was the opportunity for MS-DOS to quickly dominate the market, despite the fact that almost everyone in the industry considered CP/M a far superior piece of software. Microsoft had already mastered the art of leveraging hardware deals, the bundling of applications software and operating systems in a mutually reinforcing strategy to knock off rivals, even when those rivals had superior products (13).

But Digital Research continued to try to compete with Microsoft's MS-DOS in the form of advanced versions of CP/M called DR DOS. In fact, many people accused Microsoft of doing little to improve MS-DOS for years after launching version 3.3, in 1986, until a far more superior version of DR DOS was created. In 1990, with no version of DOS to ship in competition with DR DOS, Microsoft began issuing press releases about an imminent "new DOS" that would include all the features buyers liked in DR DOS and more, the so-called *vaporware*. Yet Microsoft would fail to ship MS-DOS 5.0 for over a year (slowing DR DOS sales in the meanwhile) and when it did, it used a new system of deals with hardware resellers to essentially destroy the market for DR DOS (14). Microsoft began requiring all manufactures installing MS-DOS on any machine to pay a license fee to Microsoft for every machine they sold ? whether they installed MS-DOS or not. This is the kind of deal PC producers have to agree upon with Microsoft until present days. Essentially, the hardware sellers have to pay for Microsoft's OS in any case so they naturally refused to pay "extra" for a competing operating system.

By the late 1980s, Microsoft controlled the operating system market; versions of MS-DOS ran on over 80% of personal computers. Microsoft did not, however, control any applications markets. Lotus had the top spreadsheet, 1-2-3, and WordPerfect had the leading word processor.

Open the windows, expand your horizons!

It was the introduction of Windows 3.0 in May 1990 that solidified Microsoft position as a software monopoly. In April 1992 Microsoft presented a debugged version (3.1) and included a set of utilities for "free" built into the system (calculator, notepad, calendar and simple database applications) that in the past were third-party software complementing DOS. By bundling such utilities with the operating system or Windows, Microsoft could easily destroy software utility rivals as very few end-users, just like the hardware builders, would buy a similar product after having paid for Microsoft's build in version. Microsoft was able to lock-in loyalty to Windows through its array of software utilities and, through the breadth of its operating system licensing, recoups the costs of bundling those utilities with the operating system.

It is exactly the same strategy being used to impose the Internet Explorer browser, which resulted in current lawsuit against Microsoft by the Department of Justice. The justice seems to have woken up a little bit too late for this long used Microsoft's guerrilla practice. With the acquisition of Aha Software (1996), specialists in handwriting recognition, and Lernout & Hauspie (1997), developers of speech recognition software, whole classes of software competition will be liquidated as next generation Windows bundled-utilities will come "for free" (15). We all will be able to choose the colour of our car, as long as it is black. But this time there will be no other paints on the market!

Going to the Office

Soon after Windows 3.0 was released, Microsoft presented Excel 3.0 for Windows and Word 2.0 for Windows. These products soon surpassed their competitors since Lotus and WordPerfect did not realise the effect that Windows would have on the industry and did not plan ahead for the transition.

It also became clear how Microsoft's control over the operating system market would expand the company's business into a leader in the applications market. Microsoft executives spoke of a "Chinese Wall" between the systems and applications groups, but they didn't admit that sometimes their own developers learned to take advantage of operating systems features before other companies. Furthermore, it was alleged that when Microsoft included a new technology called object linking and embedding (OLE) in Windows, it gave the Excel team the feature set to incorporate into the product before the technology was widely available to other developers (16). Another barrier to the competition was the knowledge of specific operating

system technology. Microsoft's knowledge of the nuances of Windows has allowed them to exploit certain features not disclosed to their competitors. A 1992 book called "Undocumented Windows" by Andrew Schulman listed many of these hidden OS calls that the author discovered by disassembling Windows code (17).

Microsoft knockout punch was the Office Suite. By linking spreadsheets, word processors and databases in one package and allowing users to exchange data between applications, Microsoft locked-in once again. The idea was far from original and as history repeats itself, another standard called OpenDoc already fulfilled what Microsoft's proprietary OLE proposed. OpenDoc was more robust and easier to use, but fears that future Windows upgrades might undermine any approach other than OLE forced almost all software publishers to accept Microsoft's solution. And since Microsoft knew the way around its own maze, MSOffice was developed faster and cheaper than the competing products, notably CorelOffice and Lotus SmartSuite.

By 1997 Microsoft was making an estimated 85% of unit sales of suite software and 90% of all revenues in this key area of home and office software. Between its operating system and its Office revenues, Microsoft had both dominance of the desktop and enough financial power to buy out an eventual late entry into the Internet.

Cyberspace: Heaven or Hell ?

Until early 1990s cyberspace was heaven! Very few of us knew it existed and the ones that were online lived in an almost utopian environment. It is beyond the scope here to go over the history of Internet, but when the hype happened, in 1994, the rest of us realised how wonderful it was. Many were led to believe that we were moving towards a (cyber)world where everyone would have the same chance to speak one's opinion, with freedom of choice, and a major behavioural change towards active decision making as opposed to our passiveness when it comes to the traditional mass media.

On top of that, some even sustained that we would free ourselves from Microsoft!

Let's Navigate!

Mosaic Communications Corporation was created in April 1994 by Jim Clark, founder of Silicon Graphics Inc. and Marc Andreessen, inventor of the NCSA Mosaic browser when he was a student at the University of Illinois. In 14 November 1994 the company changed its name to Netscape Communications and positioned its main product, Netscape Navigator, as the standard browser for the World Wide Web.

In October 1994 the W3 Consortium was created by the Massachusetts Institute of Technology (MIT) with the objective of establishing international standards for client and server protocols that enable online commerce and communications on the Internet. At the time Netscape was already the major software developer for the Net, selling Navigator and Netsite, a WWW server. It would be an excellent opportunity for the company to introduce proprietary standards, but what Netscape announced reinforced our belief that we were actually moving towards an open standards technology.

Netscape Navigator, for example, could communicate seamlessly with the installed base of over 10,000 existing HTTP-based servers, as well as FTP, Gopher, and NNTP-based Usenet (news) servers. Netscape Navigator was also compatible with other HTTP-compatible clients, including Lynx, Cello, and NCSA Mosaic and its derivatives. It could display multimedia data in a variety of widely used formats including GIF, JPEG and MPEG.

Similarly, the Netsite server line was backward compatible with other servers based upon HTTP, including the NCSA and CERN HTTPD servers. Netsite served documents based upon the HTML and a variety of other multimedia formats. Netsite servers could communicate with the installed base of over 3 million HTTP-compatible clients (18).

A few days before joining the W3 consortium, Netscape released its browser to be downloaded free of charge by individuals, academic institutions and non-profit organisations. "By making Netscape available free to individuals for personal use, the company builds on the tradition of software products for the Internet being offered free of charge", stated the company (19). No, Netscape is no saint. It was just trying to put its feet on the door and the idea was to make money on the commercial use of Navigator and Server software.

On the 23 May 1995 Netscape announced its support of the Java standard, developed by Sun Microsystems. It was the programming language to provide a comprehensive solution to the challenges of programming for the Internet, providing portability, security, advanced networking and reliability without compromising performance. Netscape Navigator would be able to download small Java software programs, called applets, which run on the client system. At that time, Netscape already had more than 75 percent of the browser market according to independent estimates (20).

The Empire Strikes Back

The threat of the Internet was obvious: with a thirty-year tradition of open computing standards connecting computers of all kinds, the Internet looked ready to make proprietary operating systems for individual machines an anachronism. As the Internet broke into global consciousness in 1994 and 1995, it appeared that millions of computers were connecting to one another with Microsoft having nothing to say in the matter. The final example of Microsoft's lack of vision seemed to be the introduction of a new proprietary Microsoft Network on-line service as an alternative to the Internet. Within a few months, though, Microsoft shut down the proprietary version and converted it fully into an Internet service provider (21).

But in many ways, Microsoft's quick success in seeking control of the Internet marketplace just shows the inherent monopolistic power of the company's place in the computing world. Having dismissed the Internet until relatively late, Microsoft has in under two years been able to assume not only a competitive position but is now threatening to control the standards of the Internet. Microsoft's slogan has been to "embrace and extend" (and thereby control) the Internet from its position of control over the desktop.

The most visible part of the battle for control of the Net is the so-called "Browser war", the fight between Microsoft and Netscape over which piece of software is used by computer users to surf the Internet. Netscape has dominated the market of browsers since 1994, but it is rapidly losing market share to Microsoft, mainly due to its strategy of bundling Internet Explorer into Windows 95 and forcing computer manufactures to do the same. The US DoJ is currently moving a lawsuit against the company, accusing Microsoft of using Windows' monopoly position to force its browser onto the public, willing or not. Microsoft insists there is no clear line between browser and operating system.

To illustrate its point, Microsoft stooped so low as to demand that a government witness identify all the ".DLL" (22) files associated with Internet Explorer. All this exercise proved was that the witness was not superman. Not a single Microsoft employee could state from memory all of the files associated with Microsoft Word, yet we all accept Word as an application distinct from the OS (23).

The browser war is more than a fight over a piece of software or even over an operating system. It is a battle over the whole cyberspace: they have a decisive impact on all standards for web design. Browsers are means for any user to read information from a World Wide Web server at some distant place. If the dominant browser is designed not to interpret a certain kind of information ? a kind of graphics, software effect, etc. ? then web page designers will be loathed to use that kind of information or technology, while they will tend to support software standards that are compatible with the dominant browser.

Besides giving computer resellers discounts on licensing Windows if they include Explorer in the package sold to customers, Microsoft is also paying Internet service providers like AT&T, Netcom, Compuserve, America Online, MCI and Prodigy to bundle Explorer with their services. It is hard to see paying other companies to accept free software as anything other than a monopolistic practice when the only expectation of profit derives from increased technological domination of the Internet. In other cases, Microsoft is accused of going further in threatening to withhold Windows licenses altogether from computer resellers who bundle anything other than Explorer on computers sold to consumers (24). The final move was Microsoft deal with Apple where, by buying US\$150 million in Apple shares, the company got Internet Explorer to be bundled as the standard browser for the Mac, trying to dominate, thus, both the Windows and the Mac platforms (25).

Coffee Break

Microsoft's monopolistic strategies are at its peak in its attempts to destroy the open platform standards of the Java language. Java is ultimately a way for the Internet to act as a giant computer where programs can be located anywhere and be accessed instantly, over the Net, from any desktop. The key innovation of Java is to be platform independent, meaning that a piece of code can be written only once and read by any computer with a Java Virtual Machine (a layer between the native Java code and the OS, available for all platforms). A Windows user can run software from a Unix server or even run sophisticated applications from simple and inexpensive network computers (NC) that need only a stripped-down OS for Internet access; most software functions will be run somewhere else on the network and only small program ("applets") need be to sent to the client computer.

Obviously Java's "write once, run everywhere" standard is another menace to Microsoft domination who recently announced its J/Direct initiative, which it sees as a way to use the Java language to create programs that run on Windows only. In other word's, Java applets using J/Direct can run only on Microsoft's Java Virtual Machine (JVM) and are therefore useless to anyone running the "100% pure" JVM that Sun is licensing to its other partners. And in a further slight to Netscape, these applets written for J/Direct won't run in Navigator, even under Windows.

By following this strategy, Microsoft is doing its damndest to divide the Java community into

two incompatible camps. To make sure that its camp wins, Microsoft seems bent on shipping its proprietary JVM with everyone of its operating systems, browsers and programming environment, in an effort to establish itself as the dominant Java solution on the planet.

It's also important to note that Microsoft's Java environment does not include key components of Sun's core Java implementation, including its Remote Method Invocation, which is necessary to build distributed Java applications, and, perhaps more important, its Java foundation classes, which offer a simpler, more sophisticated way for developers to write applications. Why? Cornelius Willis, director of platform marketing at Microsoft, admits that these new Java components are "basically a bunch of features that compete with Windows". By omitting advanced Java features, Microsoft continues its campaign to marginalize Java as just another programming language and prevent it from becoming a viable new application platform.

And the future ?

There is no crystal ball here, but we are certainly not as optimistic as back in 1994. Our laws, particularly in the US, where most of the trials are taking place, are not prepared to cope with the speed of technological development, neither with the nature of the cyberspace. As David Hudson so well defines it, in his book-critique to Net-optimism, "The Internet, virtual reality, cyber-this, and cyber-that present yet another possible future even more promising or more threatening precisely because for most it is an invisible one. This is a change that is hard to keep an eye on. Further, the language seems so strange, sometimes as if it were meant to be that way so that only those who understand what is going on in the wires twisting through our homes will have control over it" (26). Most of our society, including the judges on the Microsoft trial, certainly doesn't.

Microsoft domination goes way beyond the few topics raised here. Microsoft is taking over not only the technological part of cyberspace but, maybe even more threatening, across a plenitude of industries, from on-line car sales (CarPoint 27) to travel (Expedia 28) to financial advice services (Microsoft Investor 29) to local entertainment (Sidewalk 30) to e-mail addresses (Hotmail 31) and, ultimately, a full virtual shopping centre (The Microsoft Plaza 32).

While Microsoft currently faces competition in each of these individual online markets, it is the only company in all of them. Its technological expertise and deep pockets give it a built-in advantage to begin with, but the company's ability to bundle these on-line services together allows it to repeat its "suite" strategy of linking and cross-promoting its different ventures into one dominant "super-site".

And it doesn't stop there: Bill Gates personally invested out of his pocket in a project called Teledisc, a plan to launch 288 low-orbit satellites that will relay Internet traffic to any point on the Earth. It is a 9 billion dollar venture and Gates has a major participation in it. But maybe the most culturally terrifying of Gate's venture is a privately owned company called Corbis, created in 1989. With early anticipation, Gates began cutting bargain deals with museums like the Philadelphia Museum of Art and the National Gallery in London for the right to redistribute reproductions of their masterpieces. With over 18 million images and 120 employees, Corbis is already the No. 1 company in the USD\$500 million/year photo licensing business (33). While the slowness of the Net download times have limited its expansion, the company expects explosive growth as everything from business reports to Web pages add quickly accessible pictures into their content. Bill gates will not only collect a coin on each download you make, but you'll also do it from your Windows machine using Internet Explorer.

What can be done ?

As we can see, the main factor that creates monopolies in the technology industry is proprietary technology. If unsuccessful, a proprietary technology approach may drive a company out of the market, which was the case for Sony's Betamax or even the Apple Mac, but, on the other extreme, may create predatory giants like IBM and Microsoft. It is imperative that our social, political and judicial systems not only understand this, but also create mechanism of fair competition and a commitment to open standards. A computer operating system is as important today as our highway system, monetary system, or air traffic control. These key areas, if not completely in control of the State are, at least, under constant vigilance. I won't be utopian to the point of suggesting that the OS market should move from the private sector into the Government, since it would certainly cause fatalistic results as well. But more control is certainly necessary. The greatest inventions of mankind were funded by the government or by non-profit organisations. From Babbage's creations (founded by Cambridge University), to IBM's tabulating machines (whose first client was the US Census bureaux), moving into the Internet (US Military) and, finally to the World Wide Web (developed at the *Conseil Européen pour la Recherche Nucléaire* ? CERN), the technological innovations that are now being dominated by a handful of people were created with public funds. The government seems to do a decent job providing means for research but a lousy one in making sure its commercial use is based on **open standards**, for the benefit of most of us.

Markets cannot drive everything in our lives. There must be an equilibrium between a person's public will and another's quest for power and a third-party should set the guidelines. Tim Berners-Lee, the creator of WWW stated: "the thing that the Web has given the world is interoperability [which] is something that has just never happened on such a scale. And if that broke, that would be a big shame. The thing spread largely because I didn't make World Wide Web Incorporated in 1991." (34)

But for Bill Gates, "when Tim Berners-Lee invented the World Wide Web in 1989 as a way for high energy physicists to exchange information, he didn't foresee all the great applications that would be developed for it" (35). Well, Microsoft never created a "killer-app" as important as the Web!

Unfortunately, at this time, the best we can predict about "the road ahead" is, ironically, a thought from someone inside Microsoft. One of the company's senior executives, who has made a small fortune in the industry, had an extremely candid, although obviously anonymous, conversation with David Shenk, author of "Data Smog ? Surviving the Information Glut". A person Shenk describes as "not sanguine about the social consequences of advanced technology".

"This is like the atomic bomb. People just don't understand how tumultuous this technological revolution is going to be. They think that the world will look pretty much the way it does now, just faster. But they don't get it: It's going to be a completely different world. I'd say democracy has about a fifty-fifty chance of survival." (36)

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