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Are Proprietary Standards Monopolies Possible In New ICT?

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Hypothesis

Present IT monopolies have been established mainly due to specific conditions of the early days of computing. These are unlikely to remain important nowadays. Consequently, current IT leaders will have a hard time in the pervasive computing era

Abstract

This work is devoted to a discussion of the conditions, under which IT monopolies appeared in the early age of computing. The authors try to provide evidence that such situations are gone and consequently establishing of monopolies in the new developing technologies is doubtful.

Keywords: IT industry, monopoly, pervasive computing, Microsoft, IBM, antitrust.

Contents

Introduction

The purpose of this work is to identify and study conditions, under which IT monopolies became possible. We are going to consider a number of examples from the history of computing. Consequently we will try to ascertain, if those conditions still present nowadays and if any company can exploit them to gain monopolistic status in the new developing technologies of ubiquitous computing.

First of all it is necessary to find out the causes of monopolies in the IT industry and name the negative effects produced by them. Two main sources of monopolies are [10]:

1. **Resource scarcity**. Technology, especially at the early stage of its development, often is a subject to a resource scarcity. Examples could be a limited number of VHF channels for broadcast television, short supply of long-distance wired communication lines, frequency channels for mobile phones etc. The resource scarcity generally causes natural monopolies, like TV broadcast networks or communication companies.
2. **High entry barriers**. IT industry has many examples of economies of scale. In some cases fixed cost level is high enough to prohibit numerous players in the market. Another example of entry barrier can be network effects that also constitute a significant obstacle for new entrants.

Monopolistic status of one big company often harms the entire industry and consumers. We can name the following negative effects of the monopolies according to [17]:

1. Substantially higher prices and lower levels of output than would exist if the product were produced by competitive companies.

2. A lower level of quality than would otherwise exist. This includes not only the quality of the goods and services themselves, but also the quality of the services associated with such goods and services.
3. A slower advance in the development and application of new technology. Advances in technology can improve the quality (e.g., ease of use, durability, environmental friendliness) of products, and they can also reduce their costs of production. Innovation is not as necessary for a monopolist as it is for a highly competitive firm, and, in fact, it can be a bad business strategy.

We have been witnesses to how the past and present IT monopolies caused these effects. For example, it is widely accepted that the dominance of Microsoft in the OS market has delayed to a great extent the innovation process in this field, not to mention the vast financial loss incurred by customers as a consequence of numerous Windows' drawbacks.

All this creates high concerns among the computing community about the possible harm, which can be inflicted by monopolies to the future technologies. Such innovations like pervasive computing promise a development of new markets with a significant profit potential. Is it possible that such giants like Microsoft would react to the appearance of new business opportunities in the pervasive computing in the same predatory and destructive manner as they reacted to the emergence of the Internet? If so, the success of the pervasive computing is in danger.

Nevertheless, we claim that this scenario is not likely to be repeated. In our work we will try to present proofs to the fact that conditions, which contributed to the monopolists' successes in the past, are gone. Basing on cases from the history of computing we will provide evidences to the following four statements:

1. An IT monopoly is based on the standards control. If there's no public control – there appears a monopoly. In the early age of computing there was no or little public control over the standards so monopolies emerged. Now the public control

can be established over a promising technology thus impeding appearance of monopolies.

2. A monopolist's technologies become standards if there are adopted by numerous third party developers. In the early age of computing these developers had to support big players in order to survive. Now open source projects can also be big enough to become successful, and for many reasons they can be more attractive to those third-party publishers. An IT monopoly without exclusive support of third party developers cannot exist
3. Predatory tactics of IT monopolists are an important factor in achievement and preservation of their status. Nowadays the chances are high, that such tactics will be prevented by the public resentment, and more important by antitrust legislation, which now observes the IT industry with an increased attention
4. The IT monopolies are temporary in nature. Technological advances constitute a high threat the monopolists. They lower entry barriers and stimulate consumer expectations. Relatively slow technological progress in the past could not prevent monopolies from happening, but being incredibly fast now will effectively prohibit them.

The evidences to statement 1. are presented in chapter 1. 'IT Monopolies In The Past And In The Present'; to the statement 2 – in chapter 2. 'The Role Of The Third-Party Community'; to the statement 3. – in chapter 3. 'Predatory Monopolies vs. Antitrust Laws'; and to the statement 4. – in the chapter 4. 'Technological Innovation Threat to Monopolies' accordingly. The examples, demonstrated by us, may be used more that once in different chapters: this is due to the fact that none of the conditions alone is enough for establishing a monopoly; therefore in some cases we can see evidences of several of them together.

While our work was a constant exchange of ideas each of us concentrated on a separate part: Loc Hoang Xuan wrote chapters one and two, while the remaining parts were written by Oleg Ishenko.

1. IT Monopolies In The Past And In The Present

In the first chapter we will discuss conditions which created IT monopolists in the past and try to show that the conditions can no longer happen nowadays thus making the appearance of new IT monopolists almost impossible. The reason why we discuss this topic are the following:

- The nature of IT requires standardization;

- If there is no authoritative public organization developing and enforcing standards, its place is taken by the most successful private enterprise

- Such an enterprise has a bigger market share. Due to its technological and/or management/marketing advantages this share can grow and at some point will cover such a proportion of the market, which would make its technologies de-facto standard.

- The control over standards for a major part of a market brings a monopolistic power to that enterprise.

First, we discuss the emergence of IT monopolies using a brief review of the history of personal computer. We are going to examine the rise of two monopolists: IBM and Microsoft

IBM

IBM (International Business Machines Corporation) was established in 1896 and reach the pinnacle of the market power in the late 1970s. During that period IBM enjoyed 40% to 70% of the computer market, with the small figure coming from the company's own

estimation and the latter from the Government of the United States. We can consider IBM to be the biggest computer super house.

In the beginning of the twentieth century in order to conduct the Census the U.S. government turned to IBM for help with its computation skills. The U.S. government became IBM's biggest and most important client and its main source of revenue. To facilitate the Census computation need, IBM card was introduced, which can store twice the information when comparing with computing methods available at that time. This punch card was patented and could work with IBM tabulating machines only. We can consider this card as one of the first examples of proprietary technology standard in the history of computing.

Because of the absence of any independent standards organization in that time, IBM card became the de facto standard for tabulating machines. In 1947, IBM introduced IBM 603 and 604, kind of hybrid computer, which had processing speed and flexible operation level surpassing any other calculators available in the market. From that time mainframes became the main revenue source for the company, and the firm gained super power in the digital computer market, the same position it had with tabulating machines before.

Next we discuss the emergence of Microsoft to show that the absence of a standard regulator helped this company to become a monopolist thus enabling it to use its power for domination in the computer and software (application) market.

MICROSOFT

Microsoft was established in July 1975 and for several years acted as a code writer for MIPS programming language. MIPS was the first personal computer company, which created Altair 8800. There was a very important event in 1980 that changed the fate of the company. In that year, the IBM contacted Microsoft to talk about using BASIC language in their PC and they also thought of using Microsoft operating system to bundle with IBM

PCs. At the first meeting, Bill Gates, the Microsoft head, told the IBM that his company wrote languages and applications for CP/M, an operating system from Digital Research. CP/M was a dominating industry standard at that time.

The IBM contacted Digital Research but the negotiation for CP/M licensing eventually failed. The company returned to Microsoft. At that time Microsoft met its luck by finding Tim Paterson, a computer programmer worked for Seattle Computer Products, a small company which had gone bankrupt and located in the same town. The talented computer programmer developed an operating system based on CP/M and called it QDOS. Microsoft paid $50,000 for the operating system with lifetime rights. They gave it a new name: MS-DOS. The company contacted the IBM, offering a package of both the operating system and the programming language.

After the IBM started using Microsoft operating system, the company realized another big profit source by selling the same operating system to nearly every company which produced IBM compatible PC (PC clone). The big monopolist IBM was a launch vehicle for the MS DOS. Besides, all the applications installed on the new IBM PC worked well with MS DOS only, but not with CP/M. This action helped MS DOS to gain a bigger market, although people in the computer field found out that MS DOS was much more inferior to CP/M. With the big deal with IBM, Microsoft learned the tactic of bundling the operating systems and application software to strategically get rid of rivals in the industry, even if these firms had better products.

We have demonstrated that without independent organizations like say, industry standard bodies, government or even informal user groups it is impossible to realize what would be the better products for end users. Besides this control vacuum creates a situation where the competition in the industry is in danger since firms with aggressive tactics gain the big market share.

Next, we will show that after becoming a monopolist, the firm uses its power to expand its market dominance even more in the same time knocking out potential rivals. The example of confrontation between Digital Research and Microsoft in the OS market is so profound that we will used it to demonstrate monopolistic effects in the following chapters as well.

Digital Research tried to gain back the pie from Microsoft by releasing a new version of CP/M named DR DOS. Although Microsoft did little to improve the MS DOS for many years after the 3.3 version, when introducing the 5.0 version, the company applied a new tactic with hardware manufactures to get rid of DR-DOS. Microsoft forced firms installing MS DOS on every computer paying a fixed license fee, whether the operating system was installed on PCs or not. This term is popular in PC sellers until now. Because the PC sellers have to pay for the operating system anyway, they have no incentive to pay more for another operating system.

With this tactic, Microsoft's market share became more than 80% in term of personal operating system in the late 1980s. At that time, Microsoft did not have big share in the application software. For the spreadsheet application, Lotus took the lead and for the word processor, WordPerfect had the big market share. Next we will discuss how Microsoft also tried to dominate the application market.

In May 1990, Microsoft launched the new version of Windows: Windows 3.0. This move made the position of a monopolist in the software industry much more solid. Another progress happened in April 1992 when the company introduced a new version Windows 3.1, in which some software faults was fixed and some free utilities were included such as calendar, calculator, simple database applications and notepad. This software was provided by third party companies to run on DOS environment. Again Microsoft used the tactic of bundling software with the operating system to get rid of rival companies. Due to network effects the end user, having bought Windows bundled with free utilities, had no incentive to buy another similar product. This tactic made the end user loyal to Windows system via series of application utilities. How Microsoft got paid for this software? With the large

extent of licensing of its operating system, the company got back some money for the cost of including these utilities free with Windows.

The company employed the same strategy to force the Windows users to use its Internet Explorer web browser. This move caused a legal battle between the Department of Justice and Microsoft. After a long sleep the justice waked up, a little bit too late though. In 1996, Microsoft bought Aha Software, a firm specializing in handwriting recognition. In 1997, Lernout & Hauspie, a leading company in speech recognition, also was acquired. The company efficiently destroyed competition in the software market by bundling all important utilities with Windows for free.

Microsoft had the same strategic move with office software, and tried to get rid of the open standard of the Java programming language. It introduced J/Direct, which can be used to write software that could operate only under Window. Furthermore, Java small applications (applets) created with J/Direct could run on Microsoft version of JVM (Java Virtual Machine) only. These applets did not run on Sun JVM and Netscape Navigator, even under Windows. The company also integrated its own JVM into its the programming environment, Internet browsers and operating systems, to try to become a dominant Java solution provider in the world. [2]

In the story of the IBM and Microsoft becoming monopolies there were no traces of public or government organizations' efficient actions in controlling the tactics of monopolists or in providing legislation to govern standards. Such standards are necessary for the long term development of the industry and serve best for the whole society. But now we can witness that governments became more vigorous in battling the predatory tactics of IT monopolist and in standards control. The most well-known government deed in this field is the legal battle between US law enforcement and Microsoft. The government (by which we mean the U.S. Department of Justice, 19 State attorneys general, and attorney general of the District of Columbia that brought the case) asserted that Microsoft engaged in anticompetitive conduct designed to maintain its operating system monopoly to the

detriment of consumers. According to the government, antitrust enforcement would rein in the Microsoft monopoly and result in more competition and innovation in the software industry. [6]

Following the advice of industry specialists governments now play an important role in setting and promoting standards. Government involvement in the IT standards process includes funding, regulatory, and legislative mandates; trade and procurement policies; and sometimes outright control. Examples of all these exist in various countries, jurisdictions, and technical areas around the world. However, governments also play a major role as IT consumers. The specifications adopted by a government facilitate its widespread use in industry. Therefore, governments are in a unique position to participate in the standards creation process in a way that not only reflects the interests of the industry development, but also considers consumer concerns. Just as industry cannot operate without government as a partner in defining priorities and ensuring satisfactory results, governments cannot effectively represent their constituents by taking unilateral action in establishing standards. [7].

The International Standards Organization (ISO) also takes part in setting IT standards for a new Information Society, which includes future technologies such as pervasive computing. In a proposal from International Standards Organizations, including ISO, IEC, ITU and UNECE, they specified theirs roles: International Standards already have a role – and can have an ever greater one – to help maximize the possible benefits of ICTs for development, while minimizing the possible obstacles and barriers, because they [15]:

- simplify the utilization of existing and new technologies, focusing on interfaces and interoperability, reducing costs and complexity, opening markets and fostering broader access to products and services ;

- favour the emergence of rules and agreements on best practices (shared and adopted on a global scale) that will greatly help to develop consumer confidence

and protection, security, and ensure respect of the legitimate interests of all stakeholders ;

- being the result of a process where the six fundamental principles stated by WTO (openness, transparency, impartiality and consensus, effectiveness and relevance, coherence and development dimension) are fully recognized and implemented, International Standards developed within voluntary consensus-based processes offer the highest level of institutional recognition and global acceptance.

International Standards and the voluntary consensus process upon which they are built can offer effective answers to some of the key questions concerning *Vision* and *Access* for the Information Society, i.e. how to ensure that the potential benefits of Information and Communication Technologies for development are maximized, while the possible obstacles and barriers are minimized. [15]

The United Nations, via its International Telecommunication Union (ITU), also is interested in cyberspace, a field it had no influence before. In the next few years, ITU will try to have an active role in high-tech issues ranging from spamming to IP address assignment and high growth fields such as Voice over IP and Internet Government [9]. The interest of UN in pervasive computing is unavoidable.

Through above findings, we can see that now governments and standards organizations have learned lessons from mistakes of the past. Now they are very vigilant to predatory moves of big IT players and participate in setting standards for future technologies. So we can conclude that conditions, which might facilitate the emergence of monopoly in pervasive computing, will be less likely to happen and open standards will prevail in this exciting IT field.

2. The Role Of Third Party Community

This part of our paper is devoted to a discussion of the role of third party developers in promoting of technical standards. Whether these standards are proprietary or open developers' community plays a very important role in supporting and promoting them to the market.

An IT monopoly can promote its technological advances to de-facto standards if these technologies are adopted by a majority of the third-party developers (software and hardware manufacturers, driver writers). Their support is quite a fragile thing: any downfall of the major vendor negatively affects those third-party developers. Before the appearance of the open source philosophy, these companies had no choice, but to support one or (seldom) several monopolists.

With the growing popularity of open source philosophy the number of software publishers participating in such projects also increases. The chances of a technological failure are less in an open source project: unlike the proprietary developments of industry leaders, open source and free software are less influenced by marketing and management decisions. Such decisions being aimed to preserve or achieve monopolistic status are less oriented to satisfaction of the customers' needs and constitute a potential source of breakdown. Besides open source projects allow organizing a vast community of developers into a peer-to-peer network, which is more effective and flexible structure, than the traditional hierarchies – this finding was presented in the famous paper 'The Cathedral and the Bazaar' by Eric S. Raymond.

In this chapter we try to show that a monopolist's technologies are standards, when there are adopted by numerous third party developers. In the early age of computing these developers supported big players in order to survive. Now open source projects can also be big enough to become successful, and for some reasons, are more attractive to those

companies. An IT monopoly without exclusive support of third party developers cannot exist.

First we discuss the history of personal computer to see that the third party community can help a big player to make a great success in promoting its products. In his the book “In Search of Stupidity—Over 20 Years of High-Tech Marketing” (2003), Chapman mentions a lot of examples proving this. In 1975, Micro Instrumentation and Telemetry Systems (MITS) introduced the Altair, the world’s first practical and reasonable-priced microcomputer. The Altair contained a powerful (at that time) 8-bit Intel processor and could do a lot of real work when it was supplied with memory, keyboard, monitor, storage devices and software. The introduction of Altair was considered as a “Big Bang” of micro computing at that time. This event helped to create a lot of players in the industry, one of them was Apple. [2]

The main product of Apple was Apple II, and later, Apple II+. These products can be seen as a success of good design and supporting application software. The unit looked beautiful compared with products introduced before. And the price was very reasonable, with a big 64KB RAM, a color monitor and two floppy disks, all only at 4,000 USD. The unit was supported by a lot of business and entertainment applications. Several Apples can even be connected with each other by using software developed by Corvus. Generally, the product was new, competent and highly appreciated by its customers. [2]

Another reason for its success: the system was “open” and allowed third-party manufactures to produces the own parts or even entire clones of the system. In the history of computing there are many examples of this characteristic being pledge of success for various hardware and software products. Apple II was one of the first illustrations to this fact. This computer’s architecture included a number slots and connectors that allowed plugging of expansion cards, memory chips and other hardware enhancements produced by a vast industry of third-party manufacturers emerged around this system. ([2], ch.2).

On the other hand there are many big failures resulted from attempts to make standards proprietary by denying support from third party. We will see how this happened to Apple when the company's bosses considered its own system was "too open". Apple saw moves in the market as a threat to its business. There appeared not just accessories manufacturers but also companies producing entire clones of Apple II. Some of them (especially those from South-East Asia and Taiwan) even had names sound like Apple: 'Pineapple', 'Orange' etc. Despite the contribution of these companies to the growing popularity of Apple II and consequently in the increasing profits of Apple Computers itself, the company saw its future profits at a danger.

What was the Apple's reaction to this situation? In an attempt to prevent the system from further cloning it was decided to establish control over the one of the core points – basic input/output system (BIOS). The BIOS code was copyrighted and the company took legal action against those producers that used it. Apple paid less attention to illegal copying of the software, namely AppleDOS, which used to be spread within the community of Apple users mainly by sharing diskettes. But pirated BIOS were not tolerated. USA domestic as well as Asian manufacturer were force to give up this profitable business and since that time Apple and its offspring Macintosh computers were manufactured solely by its original inventor.

And the results? By cutting off the third-party developers and manufacturers Apple retained control over its system but failed in the strategic outlook. From that time and by now Apple exists in a self-circumscribed world. At the present Apple has a very modest market share in the personal computer industry, only 3-4%. Its products are only reserved for professionals in the print and graphics markets. Still Microsoft considered Apple's existence useful for its legal battle against the Department of Justice.

The story of Apple's success and failure were observed by IBM when it decided to move into the microcomputers' market in 1980-81. Learning the lesson from Apple, IBM dismissed its traditional practices of centralized control over the system development and

took advantages of third party community: "*Rather than attempt to build and manufacture the new computer internally, the PC would be built mainly from parts bought from third parties. IBM would assemble, ship, and support the machines, and they would possess the IBM brand identity, but the contractors would supply most of the critical components, including the unit's microprocessor.*"([2], ch.2).

How did IBM realize the open architecture model? We can look at IBM's methods to see that how an open technology can be successful over a proprietary one, even when the open source (standards) philosophy didn't exist at all. IBM did everything to stimulate the third party supporters. Unlike Apple it did not attempt to establish ay sort of control using BIOS. Instead while keeping the BIOS proprietary its specification was published so that anyone could re-create BIOS using the reverse engineering. The design papers on other parts of the system its interfaces were also made publicly available. Overall this made the creation of PC accessories and clones easy and low-cost. ([2], ch.2).

And what is the outcome? The huge success of IBM PC proved the correctness of the company's strategic attitude towards open standards and third party community. Initial entry of PCs into the market was greeted with public enthusiastic approval. The company's production could hardly meet the growing demand, which was finally satisfied in the next years by the third-party manufacturers. Besides, the open architecture contributed to the relatively low price of PC units: its basic model cost less than Apple and soon won the corporate market. ([2], ch.2).

IBM was successful in following Apple's idea, but the history repeated, it also went after Apple's mistake by cutting the third party community off with introducing new PS/2 standard. Like Apple IBM was not happy with losing control over desktop computers. Its next invention IBM was going to let to itself. IBM announced PS/2 – the system which promised a greater degree of technological advance over the common PCs, which was released in 1987. PS/2 was based on a proprietary standards and IBM's legal department vigorously fought against any illicit attempt to create a PS/2 clone. IBM set high royalty

for licensing this architecture and only a handful of manufacturers could afford it. Moreover IBM announced that PS/2 would replace PC and thus the company discontinues the further support of this standard. The third-party manufacturers, including the future industry giant Compaq reacted by proclaiming a creation of an independent and royalty-free PC-based Extended Industry Standard Architecture (EISA). But "*Most manufacturers ignored both new hardware architectures and simply continued pumping out cheaper and cheaper PC clones to a public eager and ready to buy them"* ([2], ch.2)

As a consequence of these events PS/2 initiative failed. IBM itself was forced to abandon this standard and continue production of PC computers.

We have seen the role of third party community in supporting a successful standard in hardware and drivers field with examples of Apple and IBM. In software/database segment, their role is also extremely important. We will prove this by considering the example of Ashton-Tate.

In 1980 Ashton-Tate was a database king, like Microsoft now in the desktop OS world. Ashton-Tate generated the main cash flow from selling its hit dBASE. The developer community gathered around this product contributed much to the company early success. The database market is in particular sensitive to the developers support. Chapman (2003) point sout that since the powerful databases require highly trained personnel and are difficult to develop deploy and use, DBMS products are generally bought by people who write database applications for other people. ([2], ch. 5)

The support from developers made the product very popular and widely used: "*With dBASE's head start in the market, relational capabilities, and reasonable pricing, a massive aftermarket quickly sprang up around Wayne Ratliff's* (program's inventor – O.I., H.X.L) *creation*" ([2], ch. 5). Soon a profusion of development tools, manuals, books appeared. This stimulated many software publishers to start build programs and services around this system. This third-party market was an invaluable asset to Ashton-Tate because

it served as an unpaid sales force of influencers and recommenders that helped push dBASE into new accounts and markets. ([2], ch. 5).

But Ashton-Tate's database monopoly didn't last long after the new CEO Ed Esber took charge over the company's marketing policy. Esber had demonstrated a profound example of how a deliberate alienation of the supporting developers' community destroys a software product's market power.

Every company being in a position like Ashton-Tate has to find a balance between the natural desire to enhance its product and keeping the third-party utilities compatible with the next versions. One of the ways is to incorporate the external developments into new releases, but this causes complex licensing and profit-share situations and also reduces company's control over the final product. Ashton-Tate was expected to follow this way, and actually made announcements promising this. But in reality the new release dBASE III did not fulfil those promises. As a consequence many companies specializing in development of dBASE add-ons lost their profits and left the market.

Without the third-party tools and utilities the new products dBASE III and dBASE III+ could not be considered as fully-functional DBMSs – their code generating feature allowed creation of simple programs only. More advanced application had to with the use of SDK designed for older releases. Such programs were able to work having a run-time version of dBASE. Ashton-Tate set high royalties on this runtime environment, which forced developer to turn away fro the company and create their own compilers able to interpret dBASE language directly into the computer code.

In the response to that Ed Esber decided to make the dBASE language it its name proprietary. Ashton-Tate took legal actions penalizing companies, even training organization from using the dBASE mark. These energetic activities had finally destroyed the remnants of the community support and the followed release of dBASE IV resulted in a total failure.

And again, the bad outcome happened to the database king. In 1989, revenue growth for the company came to a stop. Esber was thrown out of the post by the board of directors. But it was too late: ex industry giant Ashton-Tate was doomed. In 1991 Borland paid $440 million in stock to buy it. The company eventually vanished.

So above examples show that the third party community has always been an essential factor for product promotion. This characteristic is readily exploited by monopolists. However after the monopolists realize profit potential, they try to get rid of the community involvement in their products (although this action turns out to be a clear blunder). The community was aware of this but had no choice but to support the industry giants turning to more successful players. Example – Microsoft, which always cherished its development community. Despite some missing profit opportunities the corporation consistently shows its respect to the third-party support and eventually this helps Microsoft to keep its products on the top.

Nowadays with the advance of the open source philosophy, especially in the future technology like pervasive computing, we can witness the emergence of developer's communities around open source project.

One of the reasons why developers turn to open source standard is the pride of the ownership of the open source products. The intellectual property rights of the products are owned by the people who develop them, not the company or organisation who made or commercialize it [3].

The second reason is the pride, which the community has when participating in the development of an open source product. The quality, not profit made them feel proud when observing that the product was widely adopted by the market and users.(ibid)

Another reason is the open source community is really "open", there are no "frills" in the process of building, modifying a product. They used an approach like one in a bazaar,

taking initiatives and ideas from anyone. We can see this in the Linux's archive. The result is that users had a stable and coherent product which "could seemingly emerge only by a succession of miracles" [12]

This approach is crucial to the efficiency and promptitude of the debugging process. Chudnov (1999) argues that it "can move faster when more individuals have both access to code and an environment in which constructive criticism is roundly welcomed. This leads to extremely rapid improvements in software and a growing sense of community ownership of an open source application. The feeling of community ownership strengthens over time because each new participant in the evolution of a particular application-- as a programmer, tester, or user--adds their own sense of ownership to the growing community pool because they are truly owners of the software. This community effect seems similar to the network effect seen across the internet, whereby each additional internet user adds value to all the other users (simply because each new user means there are more people with whom everyone else might communicate). For open source products which grow to be viable alternatives to closed-source vendor offerings, this growing community ownership begins to exert pressure on the vendors to join in" [3].

But how can the community earn a livelihood? With the expertise in developing, modifying and debugging open source products they can provide an excellent "plug-in" products and services to companies or institutions using open source commodities. This market will be very big and competitive, providing service suppliers a lot of fair opportunities to grow. And this depends only on their competency, not on the will of the giant players in the software industry.

We can see from the above that open source market provide a lot of incentives to the third party community, so it is very clear that they will prefer open products to monopolists.

3. Predatory Monopolies vs. Antitrust Laws

In this chapter we will discuss predatory tactics of one of the IT monopolists, namely Microsoft, in 1980s and 1990s. In order to demonstrate the contribution of such practices to the achievement and preservation of its monopolistic position we will study examples of the most eminent cases – monopolization of OS market and the attempt to monopolize the Internet browser market. We will try to show that such tactics have brought public attention to the malicious actions of the IT monopolist and have initiated several antitrust lawsuits, which negative effects constitute a significant obstacle for predation today and in the future.

The reasons, why we introduce this chapter into our work are to demonstrate the following:

- predatory tactics are an important factor in preservation of monopolistic status;

- such tactics in he IT industry were possible in the past until they have attracted attention of the public bodies enforcing the antitrust legislation;

- nowadays a possibility of an antitrust lawsuit creates barriers if not prevents at all such practices, thus ensuring legal competitive tactics in the pervasive computing.

First it is necessary to define the predatory tactics in order to distinguish them from the vigorous competitive conduct. One of the definitions of this practice is based on pricing: professors Areeda and Turner have claimed that “a firm’s prices, if below its average variable cost per unit, are subject to a rebuttable presumption of illegality; conversely, if a firm’s prices are above its average variable cost, the prices are presumptively legal” [8] However pricing definition is debatable in the IT industry for two reasons: first, the average variable costs in software development (consider pervasive computing platform) are close to zero, and second, this “rule may provide too little scope for firms to use low

prices as promotional investments, particularly in markets with network effects" (3.2) (p.15).

The predatory conduct is not just about the pricing, and we will demonstrate this in the case studies further in this chapter. Therefore we need a more general definition of predation, which according to Ordover and Willig (1981) is "*a response to a rival that sacrifices part of the profit that could be earned, under competitive circumstances, were the rival to remain viable, in order to induce exit and gain consequent additional consequent monopoly profit*". In general words the purpose of predatory behavior is an elimination of a current or future rival for the sake of long term benefits by giving up current earnings. However there is an exclusion from this rule: an action causing rivals exiting may not be considered as predatory unless it is not profitable without any additional monopoly power it generates. ([11]. p.3) In IT industry such case is called 'catastrophic entry' – a product dominates the market until a new innovation appears much superior technologically and eliminates previous market leader supremacy.

What might be seen as a predatory tactics in the IT industry? The history of computing shows, that it can be an introduction of products which are substitutes to those of the rivals and which contain components non-compatible with the rivals' systems. This tactics can be coupled with a release of products which are complementary to those of the rivals. As a result the rivals' products are avoided by the end users.

Predation has a long record in the IT industry. Perhaps the earliest case of an unsavory conduct in the OS market which has secured the Microsoft Windows monopoly was the 'killing' of DR-DOS.

In August 1981 the Boca Raton division has finally released the IBM-PC – a long-awaited IBM's movement into the personal computer market. Prior the release the IBM had to make a choice on an OS to run on its new PC. An internal development of such an OS would have required about 5 years without any guaranteed success. So the IBM had

decided to outsource it. Two companies had attracted the attention of the IBM: Digital Research and Microsoft. The first one happened to have an OS ready to be supplied: CP/M-86, but as a result of a number of misunderstandings and misinterpretations Gary Kildall – the head of Digital Research – had missed his opportunity and the IBM turned to the Microsoft. The latter did not have an OS of its own, but Bill Gates managed to convince the IBM that the Microsoft's OS development is almost finished. Some people give another explanation of this marvel: one of the IBM bosses happened to be a member of the same charity as Gates' mother. Nevertheless Microsoft secured the deal and won the biggest market share by supplying one of the three PC compatible OS available by that time: MS DOS. The other two were UCSD p-System and CP/M-86. The latter didn't make it to 1984 – a sequence of legal and marketing mistakes on part of the Digital Research had buried this promising system alive [2].

The story above was a necessary introduction to the following account of Microsoft's predation, whose victim was the next creation of Digital Research – DR-DOS.

By the mid-80s it was clear for everyone that the future generation of the PC OS had to have a fully functional GUI, like the one that Macs already possessed for years. Microsoft stepped forward with its new graphical shell Windows, which run on top of MS-DOS. However it was possible to create a MS-DOS clone (the copyright on the DOS source code was in doubt that time – Microsoft itself purchased its OS from Seattle Computing), which was able to work with Windows GUI. In fact an appearance of such a 'clone' might be a hit, since MS-DOS was full of bugs, and there were no significant improvements published in years. And in 1987 DR-DOS (Digital Research Disk Operating System) was released. This system enjoyed some short-term success over the Windows 3.0/MS-DOS bundle: it had less bugs, more features and the most important – it cost less for the OEM's, which made it possible to be supplied to second and third tier manufacturers. [2]. In a relatively short time the MS-DOS market share had decreased from 90% to 80%.[5]. Microsoft observed the threat and took action. But instead of fixing bugs, introducing more features helpful for the end users and making a better product Microsoft behaved as a predator. Its

purpose was to destroy the DR-DOS market and ensure that MS-DOS dominance would never be threatened.

Microsoft started a campaign to scary user out from using Windows on top of DR-DOS. A publicly available Beta version of the GUI included code, which detected DR-DOS and displayed warning messages questioning Windows' ability to run safely on non-MS-DOS systems. Technically it was nonsense – the only reason was to destroy DR-DOS credibility as a stable system.

Microsoft had finally released a long-awaited upgrade to MS-DOS containing lots of new features and bug fixes. But it was not just a 'better product'. The new features were designed to stop working under DR-DOS – a conscious incompatibility aimed to turn users away from the rival OS.

And finally Microsoft had changed its licensing policy in a way that forced manufacturers to offer MS-DOS only. Microsoft's predatory pricing – a set of discount policies – made supply of DR-DOS equipped PCs unprofitable for manufacturers albeit DR-DOS cost less. [5].

What was the result? An inferior product won the market, and a promising technology was destroyed as a consequence of an unfair competition. Evident lie, predatory pricing and conscious incompatibility were the Microsoft's weapon, which helped it to succeed in preserving its monopoly in PC desktop OS for years.

It is very unlikely that Microsoft would have acted a legal way, but what could have happened if it did so? There would have been a choice of a minimum two OS for OEM, developers and end users. The entire PC community would not have been restricted to the messy MS-DOS and its offspring for more than a decade – a competitive product would have forced Microsoft to release better OS versions in a shorter time. The high entry barrier would have never been created in the OS industry, and more players would have

been expected to appear long before this barrier was finally broken through by the open source community.

In the previous case we have shown the predatory tactics application to defend the previously achieved monopoly. Further we will demonstrate how the predatory conduct can contribute to an achievement of a monopolistic market power.

The rapid developments of the Internet and the related technologies have taken Microsoft by surprise. By the beginning of 1995 the Internet paradigm, technologies and new business models became attracting a growing attention of IT community. Microsoft by the moment had no leading position in this market and had to react fast, sometimes even overreact. In May 1995 Bill Gates "*released a companywide memo instructing Microsoft employees to focus their energies on understanding the different opportunities and challenges presented by the Internet to Microsoft and Windows*"[2].

In 1994 two important events took place that later influenced much the development of the Internet. One of them was the first release of Netscape Navigator v. 1.0 on December 15. Another was the appearance of Java 1.0a – programming language implementing the 'write once – run anywhere' paradigm.

Shortly after the beta release Netscape Navigator became the most popular web browsing software. Starting from version 2.0 it was equipped with a mail client and turned into a fully functional Internet suite. Up until the Internet Explorer 3.0 release it was an unbeatable leader in the market. Even meeting a fierce Microsoft competition this suite (it has changed the name to Netscape Communicator in 1997) managed to keep a significant market share for a long time, until finally gave it up to IE in 2000.

Java language promised platform independence and was considered to be a major drive for the Internet development. The announcement made by the Netscape that it would include

the Java support in its browsers caused a steep growth of Java popularity among the Internet developers community.

Gilbert and Katz (2001) point out that Microsoft observed the threat from the browsers combined with the Java language and server-based applications, considering them to be particularly powerful sources of potential competition for Windows. Java was a menace for the Windows since it offered a 'middleware' platform for the application developers, who then could write software without regard of a specific OS. Since its early history Microsoft realized the importance of the profusion of applications for its OS – in fact, users bought OS that had the most of applications to run on (especially 'killer' apps, like spreadsheets or word processors). Java could create such a situation where this factor would no longer work and consequently reduce network effects favouring Windows.

The Netscape's promise to support Java could make Netscape Navigator a distribution vehicle for the Java platform. Furthermore, the following scenario seemed to be possible: the Netscape suite growing into a Windows OS replacement by promoting the use of server-based application thus minimizing the utilization of the desktop OS [6].

The Microsoft reaction to this situation later composed the set of allegations of a lawsuit called 'U.S. v. Microsoft'. Microsoft had two objectives: "the first was to eliminate Netscape's browser as a commercially viable product through an offer of market division and - after that offer was rejected - a combination of predatory and exclusionary actions. The second was to undermine Java as an operating-system-independent platform by promoting a Windows-specific version of Java". [6]

To destroy the Netscape's market domination Microsoft undertook predatory pricing for its Internet Explorer browser. It started offering it free of charge and in the same time made a deal with Apple, which accepted its Mac OS version. Some people may argue the profitability of giving the IE gratis: it would decrease profits from selling Windows OS bundled with the IE by the marginal cost of the browser. But Microsoft considered the

browser threat significant enough to do so. By sacrificing its current profit from selling browsers Microsoft was trying to get benefits from preserving the OS market dominance in the future. This strategy complies with the predatory conduct definition, since it would not be profitable without elimination of the rival.

Microsoft didn't restrict itself by targeting the Netscape Communicator browser only. It was quite obvious that the corporation was going to drive Netscape from the business entirely. Microsoft started targeting Netscape income sources. In fact Netscape didn't make much of its profit from selling browsers – Netscape Navigator/Communicator was released on a shareware basis and anyone could use it for a significant amount of time free of charge. The main income stream was generated from the server software. Therefore Microsoft offered its Internet Information Server, mail and proxy servers cost-free or at huge discounts. Finally Windows NT became a popular server platform for Internet and Intranet networks, and Netscape had lost most of its profits. Consequently the position of Netscape browser was weakened. [14]

Microsoft had also undertaken a set of actions that can be characterized as exclusionary. Gilbert and Katz (2001) mention the following three:

- Microsoft entered into an agreement with major Internet service providers (AOL, AT&T Worldnet) and included a feature into Windows OS that allowed users easily establish connections with these ISPs. In return the service providers restricted the browser options for their subscribers by IE only. Microsoft also made it easy for smaller ISPs to release their own branded versions of IE, which also influenced the users' browser choice.[14].

- Microsoft changed its licensing agreements with computer manufacturers. This change did not allow manufacturers to remove IE desktop icon and penalized them for shipping the rival browsers.

- Microsoft introduced a so called ‘channel bar’ into the IE, and offered a free of charge links placement for Internet content providers, which in return had to promote IE as their browser of choice. [6]

These actions finally destroyed Netscape dominance in the browser market. Having a market share of more that 85% in the mid-90s Netscape was bought by AOL in 1998 and Internet Explorer became the new leader with a peak share of 96% in 2002. [14]. (Some sources show other numbers – but still the prevalence was acute).

Netscape browser’s market domination was not the only threat. Netscape supported Java and its popularity leveraged the distribution of this programming language. Java developers claimed its ability to provide platform independence for applications, which endangered Windows OS future dominance. Therefore ‘write once – run anywhere’ ability of Java became the main target of Microsoft’s predation.

Microsoft developed an ‘adjusted’ version of Java language – an action that later was described as an attempt to ‘pollute’ Java. Elements included into Microsoft’s version of Virtual Java Machine (JVM) were not fully compatible with the original Java platform, and destroyed inter-platform operability of the Java-applications. Microsoft claimed that the changes were made to fully utilize Windows OS features. The real purpose was to undermine Java credibility as an open standard, and preclude its evolvement into a widely accepted middleware framework.

Furthermore Microsoft addressed the developers’ community. Microsoft development tools through their entire history were favored by programmers for their efficiency, ease of use and other advantages. This time Microsoft released SDK based on its language J++, which included extensions not available in the original Java specifications. This encouraged developers to create applications that could be run properly on Microsoft JVM only. “*As a result, applications written using Microsoft's development tools may not run on other*

operating systems such as MacOS, UNIX, or other browsers such as Netscape Navigator." [21]

Microsoft also released Internet Explorer v.4.0 and refused to include certain components that could enhance portability of Java supplied with this browser [6] (p.20). Therefore software products written using Sun's Java Development Kit that run on MacOS, UNIX and Netscape Navigator may not run on IE 4.0. [21]. Also Microsoft attempted to force other software vendors, such as Real Networks to rely on its Java development instead of the original standard. [6] (p.21)

Predatory tactics in these cases didn't help Microsoft to fully accomplish its objectives. Java framework finally became an internationally accepted open standard. Nevertheless, the threat of Java enabled Netscape browsers replacing desktop operating systems and making Windows obsolete has never been realized. The most important result of this 'war' can be found in a different field.

Microsoft unsavory strategy triggered a large scaled public indignation. The company's practices were a subject of investigation by Federal Trade Commission and Department of Justice (DOJ) under suspicion for anticompetitive conduct before, and Microsoft didn't escape lawsuits this time. On May 18th 1998 DOJ together with 19 states filed an antitrust case against Microsoft, which is widely known as 'U.S. v. Microsoft'. [22]

There were four main allegations ([4]. p.10):

1. Illegal monopolization of operating systems for PC market.
2. Contractual agreements with manufacturers and Internet server providers (ISPs) aimed to preserve and enhance its monopoly, which were considered illegal due to their anti-competitive nature.
3. Illegal attempt to monopolize Internet browser market.
4. Illegal anti-competitive bundling of Internet Explorer product with Windows operating systems.

The actions above were considered illegal according to the Sherman's Antitrust Act §1 and §2.

The anti-Java campaign also resulted in a lawsuit: in 1997 Sun Microsystems filed a lawsuit against the Microsoft. Sun alleged Microsoft in breaching its contractual obligation to deliver products that compatibly implement Sun's Java technology. [16].

Microsoft defence denied allegations by arguing that its conduct cannot be considered anticompetitive and did not harm consumers. It claimed that while competing with Netscape it took some vigorous actions that were not predatory in nature. Microsoft argued that it did not possess monopoly in the OS market claiming that such a monopoly could be anytime easily broken by a 'catastrophic entry' of a new player with a better technology. It was also asserted that customers benefited from low pricing of Internet browsers and de-facto standard operating systems. ([4]. p. 11).

In April 2003 the trial resulted in the following decree: Microsoft had to be split into two companies, one producing operating systems, and another producing other software like Internet browsers or office products. This remedy was expected to be effective in preventing future anti-competitive actions in the software market on the part of Microsoft. The split-up never happen: Microsoft appealed against this judgment and in November 2001 achieved a settlement with the DOJ and 7 states. According to the settlement conditions, Microsoft was obliged to share its API with third-party companies. Also a panel consisting of 3 people had to be established and allowed access to Microsoft's systems, records and source code for five years. But Microsoft was not restricted from tying other software with its operating systems in the future. [22]

It is widely accepted that Microsoft settlement was a failure of antitrust. In fact, the settlement is full of loopholes that allow the restrictions to be easily bypassed. It is expected that these loopholes will be readily exploited in an anti-competitive struggle with future rivals. An example of such ambiguities could be a questioned users ability to choose

non-Microsoft software installed by default on computers – but Microsoft still can dictate that this software to be based on its technologies [1].

Despite the fact that the punishment of the monopolists was not pursued to its fullest, it still can be argued that a legal prosecution constitutes a significant barrier to the anti-competitive conduct of IT monopolists. Consider the following:

- The 'U.S. v. Microsoft' case was late to stop the browser war and save Netscape, but consequently Microsoft was restrained from enhancing and preserving its Internet browser monopoly, which now is being effectively eliminated by a variety of rivals including open source products. It is also can be considered as a positive result of the case that since the end of the 'browser war' there was no evidence of any major predator conduct in the IT industry.

- The 'U.S. v. Microsoft' antitrust lawsuit has attracted an unprecedented society attention and caused a devastating effect to the Microsoft public image. To the industry players Microsoft and Bill Gates seemed as tough, ruthless and predatory foes long before the trial ([2]. ch. 10). After the trial the common public began considering them in the same manner as well. The 'Antitrust' (2001) movie was shot during the case and reflected the new 'evil monopolist' image of Bill Gates and his Corporation. It took enormous efforts and significant PR campaign expenses to soothe this damage, but still words 'Microsoft' and 'antitrust' sound like synonyms.

- A four year lawsuit caused massive legal expenses and threatened a radical split up of the company. Parallel antitrust lawsuit also caused significant financial losses: Sun settlement in 2004 alone cost Microsoft $1.6 billion.

In view of negative consequences mentioned above it is unlikely to expect predatory behaviour from any existing monopolist in new markets such a pervasive computing.

4. Technological Innovation Threat to Monopolies

In this chapter we will discuss the devastating effects of rapidly developing technologies to the existence of IT monopolies. We will try to show that appearance of a more advanced product can turn into a 'catastrophic entry' of a new player into a previously monopolized market. We will demonstrate examples of how technological advances weaken and subsequently eliminate exclusive positions of previous market leaders.

The reason, why we introduce this chapter into our work, is to demonstrate the following:

- IT monopolies are temporary in nature and tend to lose their positions despite efforts to preserve it;

- one of the main factors reducing the monopolistic power is technological advances;

- in the early age of computing this advances were relatively slow thus giving monopolies a chance to become more eminent;

- accelerating progress in IT technologies allows new innovations to appear fast enough thus preventing any product from achieving a monopolistic position.

Any existing monopoly creates opposition challenging its status. An example of such opposition is government intervention in terms of antirust legislation and regulation attempts. Other players protecting their market shares can also take action against monopolies competing more vigorously or filing lawsuits. Another way of challenging can be technological advance, which may lead to lower production costs for existing product or to creation of a much superior invention. [17].

There are many examples in the history of how technological advances created more choices in markets and raised customers' expectations to products thus stimulating the

competition and removing high entry barriers. Monopolists observe the threat from the new developments and tend to prevent them from happening. It is widely accepted that one of worst damages inflicted by IT monopolies is "a slower advance in the development and application of new technology" [17]. Even the research and development work of the monopolies is often aimed to preserving the leading status of their products by finding ways to suppress those of the rivals.

Besides catastrophic entry there is another explanation of the devastating effect of technological advances. The monopolistic position of some IT monopolist depends on the economies of scale. This effect is common in software and communication services industries in particular, where variable costs or products are almost at zero while fixed costs constitute entry barrier for possible competitors. Fixed costs can be reduced by a new innovation and the barrier can be removed

One of the most famous technology monopolists of the past was AT&T. It was a natural monopoly under a strict governmental regulation and was a clear example of economies of scale – to avoid losses it served a large portion of the market. For decades its monopoly remained unchallenged since no potential competitor had enough resources to create an expensive landline infrastructure and subsequently win a percentage of customers, which could bring profits. The situation changed with the introduction of microwave communications. The fixed cost required to build a competitive network were lowered enough so that it became possible to reach economy of scale starting from less that 10%. At this point the natural economy was eliminated and several new companies began competing to serve the growing market. [10]

The following example relates more to the computing industry. Until the mid 80s the low capacity of microcomputers' market and its relatively high R&D expenses allowed accommodation of only a handful of manufacturers. "*The market for "computers for the home" was controlled by Apple Computer and a supporting cast of interesting players, including Atari, Commodore, Radio Shack, and Texas Instruments. Aside from Apple, none*

of these was particularly healthy" ([2].ch. 3). This situation has changed drastically with the intervention of IBM with its PC – a cheap and powerful alternative to the existing designs. But its most important innovation was open architecture.

Apple's triumph was based on the third party manufacturers providing accessories and expansion cards for the open system of its microcomputer. Apple was fine with accessories but eager to destroy the 'grey' market of Apple clones copying its design. It declared its BIOS proprietary and took legal actions against pirates and the seized the clones supply. IBM considered the openness of the architecture as a vital factor for the future success of its own PC system. IBM surpassed Apple in this sphere by publishing PC BIOS and made its interfaces widely and cheaply available [2] This resulted in appearance of many small and medium hardware manufacturers building numerous PC clones.

The market got an affordable personal computer under a famous IBM brand that seemed a pledge of quality. In 1982 IBM alone shipped 200000 PCs and could meet the demand that later was satisfied by the third-party manufacturers - these now are famous: Dell, Compaq, Toshiba etc. Overall result: Apple Computer was moved away from its original leading position; the fixed costs were lowered; market was able to accommodate more players; and competition was increased.

Another prominent example of catastrophic entry was the exclusion of Novell NetWare from its monopolistic position in network software resulted from the introduction of Microsoft NT system. Chapman (2003) tells the story:

The company was established in 1979 in Utah under the name 'Novell Data Systems' and originally was a hardware manufacturer of CP/M compatible machines. This business didn't make a profit stream big enough to escape a near-collapse situation, in which the company found itself in 1983. Firm's new head Raymond Noorda renamed the company to Novell Inc. and made a strategic move to network operating systems. [19]

Novell's new product named NetWare originates from 'Superset' project started by a small group of contractor programmers. This NOS promoted Novell to the top ten IT software companies and helped to retain this status for over 10 years. The NetWare appearance was itself a catastrophic entry. NetWare offered a much superior technology allowed to share files over the network. Before NetWare existing NOS like that one of 3Com simply divided servers' hard disks into partition, where users could remotely store their files, but those files were not available to other users. NetWare instead represented server storage as a common resource and users could get permissions to directories and subdirectories. Individual files could be seen by other user in the network and access rights were controlled via sets of permissions. Another important feature was the ability to share printing resources. [2].

Novell had rapidly achieved a monopolistic status in the NOS market. A sequence of well-though marketing moves and technological innovations contributed much to this success. First of all Novell's NOS was compatible with a majority of network hardware available by that time, while its rivals were designed to support particular systems. Novell also acquired several network cards manufacturers and started selling Ethernet cards for a lowered price. This measure resulted in an increase of NetWare's market to such extent that Novell's proprietary IPX network communication protocol became industry standard until the open TCP/IP protocol became popular in 1990. [2] ,[19]

However monopolies tend to loose power. The technological progress in IT industry was on a constant rise and by the beginning of 1990s some of NetWare weaknesses became eminent and the Novell's creation was doomed to be surpassed by a new innovation from Microsoft.

In July 1993 Microsoft released its own NOS Windows NT version 3.1. It's been 9 years since Macintosh presented its graphic user interface; and by 1993 GUI became desirable among users and common among OSs. But NetWare lacked one. And what is more "*at one juncture Drew Major* (head of the 'Superset Project' – *O.I.*, *H.X.L*) *proclaimed that there*

would never be a GUI for NetWare"! [2] (ch.9.). GUI is not just a tribute to a pretty and slick image of an 'up-to-date' system: it allows simpler and cheaper user training. Besides specialists who are able to deploy and maintain GUI systems generally demand lower wages.

Another important advantage on Windows over Novell NetWare was the availability of efficient and easy-to-use development tools. Microsoft is also famous for its successful SDKs. Application development for Windows NT was fast, easy and at relatively low cost – comparing to that of Novell's. Novell's development tools were widely criticised for their primitivism and high price. Furthermore, while Microsoft extensively relied on third-party software developers in promoting its NOS, the Novell's attitude to application programmers was something different. "*The corporate zeitgeist at Novell was "If anyone is going to develop applications for our product, it should be us. We understand it and cherish it. If we allow just any hoi polloi to develop for our baby, they might change and deform it horribly."*" [2](ch.9.). Really, development of applications for NetWare required considerable efforts from anyone outside Novell. Of course this factor made a big contribution to the NetWare's defeat – we discussed the importance of third party developers in the second chapter.

Chapman (2003) points out another grievous consequence of Novell's neglect to the developers' community. The mid 90s was the dawn of the Internet and WWW. Many IT companies had realized the perspectives of these new technologies and reacted in time. And some of them acted so vigorously attempting to get a share in the new market that ended up in antitrust lawsuit (consider Microsoft). But Novell did almost nothing to get itself prepared for this new turn. Instead it effectively destroyed its developers' base by shutting down in 1994 a Texas-based center, which in the past played an important role in promoting development of NetWare compatible applications among third-party publishers. This resulted in the fact that by the time Internet became popular in the business word, there were too few NetWare applications available to be used in the Net. Unwillingly Novell restricted itself to Intranet file and print share services.

On the other hand Windows NT was superior. While in terms of stability NetWare was still ahead, the Microsoft's product had other valuable features that were enough to win the market. Windows NT's practical GUI interface, extensive product support, developers' community ready to build a profusion of applications for the system and lower price were the drives that finally destroyed NetWare monopoly.

One can argue that this technology advance resulted merely in one monopoly replacing another. Still this proves the statement that monopolistic power can be destroyed by a 'catastrophic entry'. And again – did Windows NT dominate the market as long as NetWare did? No. Before Linux began challenging Windows NT's positions as an Internet and Intranet server platform in late 1990s, Microsoft's creation didn't even succeed in a complete replacement of NetWare servers. Now Microsoft's monopoly in this market is debatable.

A brief summary of the said above: a sequence of innovations in the network operating systems created a situation where an establishing of a monopoly in this sector no longer seems possible and a dominance of a single product cannot last for long.

Now we will discuss another aspect in which accelerating technological progress threats monopolists. Innovations increase customers' expectation from a technology. Customers demand new features made possible by new technology advances and willingly turn to products that have them. Considering the fact that "*monopolies often make strenuous efforts to stifle the development of new technology and to prevent its application"* [17] we can expect that products featuring desirable innovations will be offered by rival companies. To prove this we will discuss an example presented by Notebaert (1995):

Broadcast television in many countries is a natural monopoly. It was so in the US as well. Natural monopoly in this industry is mainly due to the scarcity of resources. There are 12 VHF channels only available. This situation doesn't allow much competition. But as long as the number of household owning a TV set was relatively small consumers were fine

with it. Eventually it turned out that the quality of broadcast depends much on the geographic conditions. In mountainous locations people experienced serious problems with their private antennas, some times weak signal made the broadcasted programs unwatchable. The solution came fast with the community antenna television (CATV). A single antenna mounted on an eminence captured high quality signal and then distributed it to the neighbouring houses via a cable network. Soon it turn out that cable network have enough capacity to transmit much more channels – like dozens. This made possible to deliver customers on a subscription basis a variety of TV programs satisfying anyone's preferences. Consequently many new TV companies appeared to serve this market and the monopoly of broadcast television was eliminated. An innovation originally aimed to improve broadcast quality also stimulated consumers expectations, removed natural monopoly barrier and allowed competition in the market.

Another example of this effect we can find in the computing industry. In previous chapter we already discussed the 'browser war' between Microsoft Internet Explorer and Netscape Navigator. As a result of predatory conduct Microsoft succeeded in replacement of Netscape's prevalence with Internet Explorer's monopoly. But this did not last long. In the present time we all are witnesses to the 'Second Browser War'.

After Netscape's defeat IE rapidly gained increasing market share peaking 88% in March 2003 (see Table 1.). Since IE version 5.5 there were no major improvements added by Microsoft to its browser. And it didn't seem that there were any to expect. For few years Microsoft achieved its goal in removing rivals: Netscape acquired by AOL was descending into limbo while free and open source browsers were in their infancy. Absence of competition did not stimulated any enhancement of the IE – for Microsoft it worked 'fine', while the number of users complaining its poor quality and lack of helpful features grew. On the other hand independent and open source browsers for long time have been on the edge of technological progress. While having 1-2 percent of popularity these browsers still constituted a serious threat to the IE dominance with innovations featured by them.

In 2003 Opera browser v. 7 was released. Opera is a creation of a Norway company Opera Software. It was never aimed to replace IE, and eventually its desktop version never exceeded 2% of popularity. However Opera uses Small Screen Rendering technology, which helps it to conquer the leading positions in browser market for PDA and SmartPhones. Opera featured a number of features that were greeted with an overwhelming consumer acclaim. Among them are [20]:

- tabs: actually this feature in particular made Opera famous – multiple document browsing is an extremely useful thing, which helps saving place in the OS task bar;

- sessions: whenever Opera browser is shut, it is possible to resume browsing exactly where it was let off. The history information can be saved separately and when necessary can be called even at a different computer;

- mail and news client – this promotes Opera to an Internet suite status, like Netscape before;

Also there was enhanced accessibility, mobile devices support, realization of the most up-to-date standards of the Internet etc. IE lacked most of these elements and did not promise to bring them in.

Growing Opera users' community consisting mainly of computer geeks rather then of common PC users actively advertised those features and made them desirable by many. And there is no wonder that introduction of the new Mozilla Firefox was successful even when there was almost no hope left to beat IE.

Firefox is free, open-source and cross-platform Internet browsing software developed by the Mozilla foundation. [18]. Its first version appeared in November 2004 and was downloaded 79 million times by now. Such a rapid adoption was due the set of useful characteristics of the browser [23]:

- like Opera, Firefox supports multi document browsing. This feature is on such a demand that Microsoft finally announced it in the next IE version;

- built-in pop-up blocker;

- built-in Google search and incremental find feature automatically highlighting occurrences while the search time being typed;

- complementary web development tools;

- improved mail client with anti-spam filters.

Microsoft representatives started a campaign trying to soothe the fuss around the IE weaknesses comparing to the Firefox. In fact Firefox is not free of flaws and several security loopholes have been discovered recently. However in contrast to the Microsoft we can expect that the open source development community will release fixes and improvement more readily and faster than an industry monopolist.

The case before proves the statement that technology innovations threaten monopolists by increasing customers' expectation. And while these expectations cannot be promptly satisfied by the monopolist new players can destroy its power. Consider the number: the Firefox use ratio reaches 19.8% in July 2005 [13].

To summarize this chapter we claim that the examples, which we have presented, can be considered as a sufficient proof of the following statement:

Monopolies in IT industry can lose their power with appearance of new technologies. The devastating effect on innovation is twofold: first, it lowers the fixed costs in the economies of scale, second it stimulates users' expectation from a product. The relatively slow

introduction of the new technologies in the past allowed some companies to keep their monopolistic position for a considerable amount of time. The accelerating technological progress in the present time will prevent this from happening again.

2005	**IE 6**	**IE 5**	**Ffox**	**Moz**	**NN 7**	**O 8**	**O 7**
August	68.1%	5.4%	19.8%	2.5%	0.5%	0.8%	0.3%
July	67.9%	5.9%	19.8%	2.6%	0.5%	0.8%	0.4%
June	65.0%	6.8%	20.7%	2.9%	0.6%	0.7%	0.5%
May	64.8%	6.8%	21.0%	3.1%	0.7%	0.7%	0.6%
April	63.5%	7.9%	20.9%	3.1%	0.9%	0.4%	1.0%
March	63.6%	8.9%	18.9%	3.3%	1.0%	0.3%	1.6%
February	63.9%	9.5%	17.9%	3.3%	1.0%		1.7%
January	64.8%	9.7%	16.6%	3.4%	1.1%		1.9%
2004	**IE 6**	**IE 5**	**Moz**	**NN3**	**NN 7**	**NN 4**	**O 7**
December	65.5%	9.9%	17.0%	0.2%	1.2%	0.2%	1.8%
November	66.0%	10.2%	16.5%	0.2%	1.2%	0.3%	1.6%
October	67.3%	10.8%	14.7%	0.3%	1.3%	0.3%	1.6%
September	67.8%	11.2%	13.7%	0.3%	1.4%	0.3%	1.7%
August	67.0%	13.0%	12.7%	0.4%	1.4%	0.4%	1.6%
July	67.2%	13.2%	12.6%	0.4%	1.4%	0.4%	1.6%
June	67.6%	13.2%	12.2%	0.5%	1.4%	0.4%	1.6%
May	68.1%	13.8%	9.5%	0.6%	1.4%	0.4%	1.6%
April	68.2%	14.0%	8.5%	0.8%	1.4%	0.6%	1.4%
March	68.2%	14.6%	7.9%	0.8%	1.4%	0.6%	1.4%
February	68.3%	15.2%	7.3%	0.6%	1.5%	0.4%	1.5%
January	68.9%	15.8%	5.5%	0.4%	1.5%	0.5%	1.5%
2003	**IE 6**	**IE 5**	**Moz**	**NN 3**	**NN 7**	**NN 4**	**O 7**
November	71.2%	13.7%	7.2%	0.5%	1.6%	0.5%	1.9%

September	69.7%	16.9%	6.2%	0.6%	1.5%	0.6%	1.8%
July	66.9%	20.3%	5.7%	0.6%	1.5%	0.6%	1.7%
May	65.0%	22.7%	4.6%	1.0%	1.4%	0.9%	1.4%
March	63.4%	24.6%	4.2%	0.9%	1.4%	1.1%	1.2%
January	55.3%	29.3%	4.0%	1.2%	1.1%	1.7%	
2002	**IE 6**	**IE 5**	**AOL**	**NN 3**	**NN 5+**	**NN 4**	**IE 4**
November	53.5%	29.9%	5.2%	1.1%	4.9%	2.0%	
September	49.1%	34.4%	4.5%	1.3%	4.5%	2.2%	
July	44.4%	40.1%	3.5%	1.2%	3.5%	2.6%	0.5%
May	40.7%	46.0%	2.8%	1.2%	2.7%	3.4%	0.7%
March	36.7%	49.4%	3.0%	1.2%	2.4%	4.1%	0.7%
January	30.1%	55.7%	2.8%	1.3%	2.2%	4.4%	1.0%

Table 1. Browser usage statistics. Source [13]

Conclusion

In the previous four chapters we have presented evidences, that in our opinion prove the statement we introduced in the introduction part and our hypothesis overall.

In the first chapter we have shown that the IBM and Microsoft have promoted their products and internal standards to the monopolistic positions at the absence of significant control from governmental and standards organizations. Now such organizations have more power and authority to promote open standards.

In the second chapter we have demonstrated a number of cases showing that developers' community (third-party firms) constitute an essential factor for promotion of one company's product to the monopolistic status. We demonstrated that absence of such support is devastating for any company. We also have shown that nowadays the developers' community have high incentives to give up supporting big vendors and turn to the open source.

In the third chapter we discussed the contribution of predatory conduct to the achievement and preservation of IT monopolies. We also have shown that nowadays such practices create a wide public resentment and cause numerous lawsuits from rival companies and the government. Such lawsuits not only incur financial losses from settlement payments and legal expenses but also can threaten the existence of the monopolist.

Finally in the fourth chapter we demonstrated how vulnerable can a monopoly be to the technological advances. We have shown that effects of a 'catastrophic entry', lowering fixed costs and increase of consumer expectations eliminate monopolistic power. We also demonstrated that today's fast technological progress will give monopolists few chances to make their products prevalent in the market.

Consequently, we argue that our hypothesis has enough evidence to be proven.

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