

NETWORK EFFECTS AND MERGER ANALYSIS: INSTANT MESSAGING AND THE AOL-TIME WARNER CASE

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1. Introduction

On January 10, 2000, Steve Case, CEO of AOL, and Gerald Levin, CEO of Time Warner, announced the acquisition of Time Warner by AOL. This merger is unique in many respects; it is the largest (to this date) merger ever proposed and consummated, valued at the time at \$183 billion;¹ it also was the first merger of “old” and “new” media, and by far the most significant Internet-related merger to date. Each company was a major player in its industry: Time Warner’s cable properties served over 18% of US cable households, while AOL served about 40% of US online households.

The merger plans were submitted to the Federal Trade Commission for antitrust review under Hart-Scott-Rodino.² In addition, the merger was also reviewed by the Federal Communications Commission, which is required by statute to review all transfers of radio licenses to ensure that such transfers are “in the public interest.”³ The merger attracted a great deal of interest from the press, from public interest and consumer advocate groups, and from competitors and firms that did business with either or both companies.

The FCC approved the merger but imposed several conditions, including a condition that prior to offering “advanced” Instant Messaging (IM) services, AOL Time Warner was required to interoperate with IM competitors. This paper examines the economic rationale behind that condition.

This paper is organized as follows: in Section 2, some background on the merging parties is given; in Section 3, I discuss some of the business reasons for the merger. Section 4 describes AOL’s Instant Messenger (IM) service, the competitive concerns of commenting parties that arise from the service’s network effects and AOL’s refusal to interoperate with IM competitors, and the FCC’s concerns about merger specificity. Section 5 delves deeper into the technology of Instant Messaging and the ability to leverage its proprietary network effects into advanced IM services using merger assets. Section 6 explains the critical empirical issue of the IM case: has the existing market for

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IM “tipped”? Section 7 examines objections to the “tipping” argument and counterarguments to those objections. Section 8 summarized the FCC condition on advanced IM services embodied in the FCC order.

2. Background of the Merger Parties⁴

At the time of this merger, Time Warner was the majority owner of cable systems covering over 18% of US cable households (through its subsidiary, Time Warner Entertainment (TWE)), owned several cable networks such as CNN and HBO, produced and distributed music, films, and magazines such as Sports Illustrated and Time. It was the second-largest cable operator in the US, surpassed only by AT&T, which had recently acquired TCI and MediaOne cable systems. Time Warner was a vertically integrated entertainment firm, owning content production, TV networks, and cable distribution systems.

AOL was founded in 1985 as a popular interactive services firm providing content and services to residential customers via dial-up modems. Originally, customers who subscribed to AOL were limited to AOL content and e-mail (as was typical of Online Service Providers at the time). As the Internet grew in popularity, AOL also provided Internet access to the World Wide Web in addition to its proprietary content. The simple intuitive interface and aggressive marketing led to extremely rapid growth in the late 1990s. At the time of the merger, AOL had 27 million subscribers (2 million in its Compuserve subsidiary), amounting to about 40% of total US online subscribers. The second-largest online provider is Earthlink, with 4.7 million subscribers (Grice (2001)), followed closely by Microsoft’s MSN, with 4 million subscribers (Kapadia 2001)).

AOL offered an interactive service for customers who were not technology mavens, desiring only to connect quickly and with lots of popular services. One of AOL’s most popular services is Instant Messaging (IM), a text-based near-real-time service in which customers can “chat” with each other via typed text messages. Customers who have signed up for IM maintain a “buddy list” which displays which of their “buddies” are currently online and logged on, prepared to “chat.” AOL offers a version of the IM software for non-AOL subscribers (called AIM, AOL Instant Messenger), which can be downloaded from the Internet, and offers full connectivity with all other AOL IM customers.

3. AOL, Broadband, and Content

AOL’s traditional business model was focused on dial-up connections. As broadband Internet access showed more promise, AOL attempted to secure a position for itself in the future broadband market space. As AT&T purchased first TCI and then MediaOne with the avowed intent of using these cable properties to introduce high-speed access over cable, AOL entered into negotiations with AT&T to gain access to these cable systems. Each of these systems already had exclusive ISP contracts, and the negotiations were not

successful. At the same time, AOL negotiated with the various Regional Bell Operating Companies for access to the newly emerging DSL technology of high-speed access over telephone lines. These negotiations were not successful in meeting AOL's needs for rapid broadband rollout. During the merger review of AT&T and MediaOne, AOL called for open access, by which any ISP would have the legal right to reach its customers via any cable system, in particular the AT&T cable system. After AOL announced its merger with Time Warner, their enthusiasm for government-mandated open access waned.

AOL has traditionally been a consumer of content, though not a producer of it. It provides its customers with a rich array of content from a wide variety of sources. In fact, AOL is so popular that it actually charges content providers to be "preferred providers" for AOL, as AOL's large customer base is quite attractive for content providers. AOL has expressed strong interest in ownership of content, although it is not clear why their current model is not sufficient for their needs.⁵ In their Public Interest Statement (AOL, Inc. and Time Warner (2000)), the parties claimed "...the combination of the parties' strengths in providing consumer-friendly Internet services and a rich array of content of all types means that the merged company will be able to bring wholly new interactive services and products to the marketplace more quickly than either could do apart." Apparently, AOL's strategic vision includes ownership of significant content.

In this merger, AOL thus acquires two strategic assets: the nation's second-largest cable television system and a leading content provider.

4. The FCC and Instant Messaging

The merger presented a number of issues of concern to the FCC; the principal issue, and the focus of this paper, is the role of AOL's Instant Messaging service (the other three issues, which both the FCC and the FTC addressed, are briefly described in Appendix A).

Instant messaging is a text-based means of near-real-time communication between customers who have signed up for the service. Customer *A* can send an "instant message" to customer *B* and receive an immediate reply, thus carrying on a text conversation. This service has roots in the original Unix system, in which users on the same server could exchange messages in conversation mode. Instant messaging differs from e-mail in that it is a true dialog, operating in synchronous rather than asynchronous mode. AOL introduced the service as a feature for its customers in 1989. However, it became wildly popular when AOL added the "buddy list" feature in 1996. This feature displays a small window that lists all the customer's (self-designated) "buddies" with an indication of whether or not each buddy is online or not. This feature ensured that if the customer sent an IM to a particular buddy, the customer knew the buddy would receive it immediately and could reply. With the advent of the buddy list, Instant Messaging became one of the most popular features of AOL. In 1997, AOL took the unusual step of offering AIM (AOL Instant Messenger) as a stand-alone free download on the Web for non-AOL subscribers.⁶ AIM customers could IM both other AIM customers and AOL

subscribers using IM, and vice-versa; this is referred to as interoperation. In the same year, AOL bought ICQ, an instant messaging provider based primarily outside the US. However, AOL chose not to interoperate its AIM/IM services with ICQ.

In 1999, several firms established competitive IM services, including Microsoft, Yahoo!, Otigo and Tribal Voice. However, these competitors quickly learned that few customers wanted to sign up for a service that couldn't IM with AOL's huge customer base, reported at the time to be over 30 million subscribers. These competitors designed their IM clients to be compatible with AOL's IM protocols (which they earlier had published on the Web) to ensure their IM clients interoperated with AOL's AIM/IM. AOL chose to interpret these attempts to interoperate as "hacking," and took immediate steps to block such attempts. During the summer of 1999, various attempts by competitors were temporarily successful but quickly blocked by AOL. By year's end, AOL had demonstrated that it had both the will and the capability of blocking all such competitor attempts to interoperate with its AIM/IM services.

AOL was criticized in the press for refusing to interoperate with other IM services. Indeed, many contrasted AOL's call for open access in the pending AT&T-MediaOne merger with their refusal to interoperate their AIM/IM services with competitors. AOL's response was that they had safety and security concerns on behalf of their customers, and were unwilling to expose them to nuisance or even pornographic IMs from non-AOL sources. They did indicate that they would interoperate with competitors, but only when technical protocols were agreed to that ensured the safety and security of their IM customers.

The success of the AOL IM model was replicated closely by the new competitors, who introduced services almost identical to that of AOL's. The feature sets of AOL, Microsoft, Yahoo and other IM services differ only minimally. Incremental feature improvements are built into each upgrade, but these new features are immediately matched by competitors. Absent the future development of a proprietary "killer feature" by one of the competitors, IM appears to be a market in which product differentiation does not play a significant role.

After the AOL-Time Warner merger was under review at the FCC and the FTC, competitors switched their focus to lobbying these two agencies to force AOL to interoperate their AIM/IM service with them.⁷

Network Effects

Instant messaging fits the classic definition of a service imbued with network effects, in which the value to each customer depends upon the number of other customers (and who they are) who also use the service. The first example of a network effects business was telephone, in which each customer only derives value from the system if they can use it to communicate with their friends, neighbors and businesses they use (Rohlf's, 1974). The more customers that subscribe to the telephone, the more each customer values subscribership. Other industries were found to exhibit this property, sometimes referred

to as “demand-side scale economies;” for a review of the extensive literature on network effects, see Katz and Shapiro (1994). Particularly important early work is that of Katz and Shapiro (1985) and an example of more recent research is Fudenberg and Tirole (2000).

Network effects can be beneficial; when all providers of a network service interconnect, then customers of even the smallest competitor get the benefits of connecting to everyone, which enhances competition. However, if a dominant provider chooses to not interconnect, then new entrants and smaller competitors can face a significant barrier to entry. If the provider is large enough, competitors may be driven from the market and near-monopoly may result. A monopoly based on network effects may be particularly difficult to unseat, even with a superior service. Because of this, network effects can raise important antitrust concerns. In FTC Staff Report (1996), the staff found that “In sum, demand-side economies associated with networks warrant a heightened degree of scrutiny in assessing denials of access...” Evans and Schmalensee (1996) also discuss the importance of network effects for antitrust enforcement.

However, refusal to interconnect (or interoperate in this context) need not occur. The theory suggests that in an industry with a number of firms of roughly equal size, the more profitable strategy is to interoperate. Otherwise, a firm that refuses to interoperate may find its competitors agreeing to interoperate, thus establishing a critical mass and condemning the non-interoperator to lose share and eventually disappear as its customers move to the more attractive interoperating coalition. There is some evidence that the Internet backbone market is a network effects business in which the larger players agree to interoperate (“peering”), as described in Kende (2000). See also Cremer, Rey and Tirole (2000). But if a network industry is dominated by a large provider, that provider could refuse interoperability, driving its competitors’ customers toward its larger customer base and eventually (near-) monopolizing the industry. This phenomenon is colloquially referred to as the market “tips” in favor of the largest provider. “Tipping” occurs when a single provider reaches a critical mass of customers that are so attractive to others that competitors must inevitably shrink, in the absence of interoperation.

There is little doubt that instant messaging is a network effects service; it fits the classic definition perfectly. AOL’s refusal to interoperate its AIM/IM services with competitors raises questions about market “tipping,” along the lines of the concerns voiced in the FCC Staff Report (1996, quoted above). But is this a reason to stop (or condition) the merger?

Merger Specificity of IM

In fact, the IM service has nothing to do with the merger. The service pre-dates the merger; it was established by AOL prior to the merger and rose to dominance without the help of Time Warner. Text-based IM has very low bandwidth requirements and works very well over the narrowband telephone connections that AOL has heretofore depending upon. The content of a text-based IM message has only the text of the parties’ messages, and has no external content. Therefore, text-based IM has little to gain from broadband

connectivity nor from ownership of the parent of media content, so the merger would have virtually no effect on AOL's dominant position in the text-based AIM/IM service. In antitrust parlance, the IM issue is not *merger specific*. While some may object to AOL's IM dominance, that dominance has no relationship to the merger, and therefore is off-limits for any remedy or condition that could be imposed.⁸ If this dominance of IM by AOL were thought to be socially harmful, the appropriate remedy would be an antitrust conduct case.

But is this dominance socially harmful? Recall that monopolies are perfectly legal under US antitrust law; it is "monopolizing" that is illegal, extending one's existing monopoly into other markets, or colluding with others to monopolize a market. Patently, AOL created the IM market and as a result dominates (but does not monopolize) it today. This places AOL in an innovator role,⁹ having invested in the development and marketing of IM, and its dominant position in IM can and should be used as a reward for innovation. Its dominance of IM is earned, and many would argue it should be permitted to keep the rewards.

The FTC (and in its initial deliberations, the FCC) followed this line of reasoning, concluding that IM was not merger-specific and therefore beyond the reach of the reviewing agencies. However, the availability to the FCC of knowledgeable technical staff (which the FTC did not have) enabled the FCC to understand the technology of IM more deeply and how network effects could be leveraged from the present text-based IM into future generations of IM services using the assets of the merger, as discussed in the next section.¹⁰

5. Instant Messaging: Going Deeper

The Technology of Instant Messaging

The technology underlying IM is simple and well understood. Each IM provider maintains a directory of customers, which includes (i) their screen name; (ii) IM address (different from either their e-mail address or IP address), and (iii) whether or not they are currently online. When a customer logs on to their IM service, their status is updated in this directory. As the customer's buddy list displays on their computer, their buddies are checked in the directory and the presence information is displayed in the customer's on-screen buddy list. In its order, the FCC referred to this as the Names and Presence Directory (NPD). Each provider has an NPD; it is the infrastructure needed to make the service work.

For two (or more) systems to interoperate, they would provide message completion and presence detection for each other. For example, if customer A is on AOL and customer Y, his buddy, is on Yahoo! and these systems interoperated, then when A logs on, AOL would request presence status of Y from Yahoo!'s NPD and display the result in A's buddy list. If A sent an IM to Y, AOL would hand it off to Yahoo! which would deliver it

to its customer *Y*, just as it does today with e-mail (which is interoperable). Without interoperation, customers *A* and *Y* would be unable to communicate directly via IM.

Without interoperation, the customers of AOL can only reach other customers of AOL, so the value of the network is limited by the size of AOL's NPD. In fact, the network effect of this communication service is wholly contained within the NPD: the larger the NPD, the larger the network effect and the greater the value of the communication service using the NPD, in this case AIM/IM. *The conclusion is that the network effect inheres in the Names & Presence Directory (NPD), which constitutes the service infrastructure, not in the IM service itself.*

The Future of IM

Although IM began as a text-messaging service, AOL and its competitors are adding new features to extend its capabilities. In Version 4.1, AOL added a Voice over IP capability, as well as the ability to exchange pictures with IM. MSN 3.0 has the same capabilities. One commentator expressed a view held by many: "So what does the future hold for IM? Voice, streaming media, advertising messages, files, interactive television and potential revenue are but a few of the things that are beckoning" (Rosen, 2000). The simple text service that AOL pioneered may soon evolve into a much more sophisticated streaming video, interactive gaming, and e-commerce platform, in the view of many analysts.¹¹ The recent addition of features beyond text to several IM services is consistent with this view.

Many of these advanced IM services involve the transmission of much greater amounts of data with each message, such as graphic files, streaming video, or interactive gaming. These uses require substantially more bandwidth than current narrowband telephone connections to be viable services. Streaming video over a telephone connection makes little sense; but streaming video over a broadband cable connection (or a DSL connection) is a viable service. The merger promises to speed up the deployment of new and compelling services, at least according to the parties.¹² Such technological advances are certainly to be welcomed. However, these advanced IM services *will most likely use the same NPD that AOL built up under text IM; any network effects from text IM will carry over into any new advanced IM services that AOL chooses to offer.* AOL is thus able to leverage its existing proprietary network effects in IM into advanced IM services such as streaming video and interactive gaming. As the service evolves, the infrastructure stays the same, as illustrated in Figure 1:

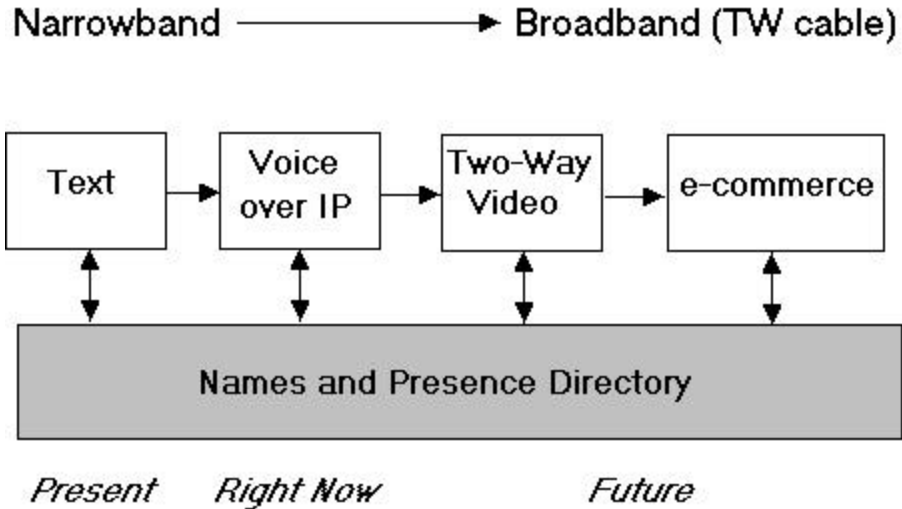


Figure 1

Recall that the network effects inhere in the NPD, and that is precisely the persistent infrastructure that is likely to underpin all future IM-type services. Thus, if the proprietary network effects that AOL has captured in its NPD constitute a significant barrier to entry, AOL will be able to leverage that barrier to entry into new advanced services; if the network effect is strong enough, AOL could gain an “instant monopoly” in advanced IM-based services such as streaming video and interactive gaming.¹³

Merger Specificity Redux

But even this ability to leverage its NPD into new advanced services *per se* would not be sufficient to justify a merger condition. Only if this ability were significantly enhanced by the merger would a condition be warranted; that is, only if the perceived harm is merger specific.¹⁴

However, advanced IM services depend on the availability of broadband access for their viability. For example, streaming video over a narrowband telephone line is very unsatisfactory from the customer’s perspective. But streaming video over a (low latency) broadband connection can be a compelling option, although there is some controversy about customer interest.¹⁵ But there is no doubt that broadband access is a necessary technology for these advanced services to be viable.

And broadband access is precisely what AOL is buying in the merger with Time Warner, which will provide it with access to over 18% of cable viewers in the US, including the critical New York market. Time Warner’s cable plant has been upgraded to digital capability, making deployment of a broadband IP channel possible. Additionally, the acquisition of Time Warner brings with it a very rich content library that may also enable e-commerce options over a cable-based advanced IM service. Merging IM’s NPD with Time Warner’s cable assets (and possibly content assets) may provide an almost insuperable barrier to entry into the advanced IM services market in the future.

Of course, the acquisition only brings 18% of cable viewers to AOL's services, not 100%. Is this sufficient to justify merger specific concerns of using merger assets to enhance AOL's leveraging dominance of its NPD into advanced IM service markets? In fact, couldn't AOL leverage its NPD into advanced IM services simply by contracting to provide its service through other broadband providers? Why is the ownership of cable (and content) assets an advantage?

In a dynamically competitive business, a firm's dominance may be short-lived as its competitors bring new and superior products to market, dislodging the incumbent. Evans and Schmalensee (2001) argue persuasively that this "serial monopoly" is characteristic of "new economy" businesses. But even in dynamically competitive industries, a firm that has established a dominant position in a network effects business is difficult to unseat. Only a clearly superior product with sufficient advantages to overcome the network effect barrier to entry offers hope of competitive discipline being brought to the market. If AOL's NPD has tipped, then this barrier may be difficult but not impossible to overcome. But the merger removes much of that hope:

- (i) Even a clearly superior competitive advanced IM service could be disadvantaged on Time Warner cable systems, through "preferential queuing" and "traffic-type identification" that results in higher throughput for a Time Warner-favored IM provider such as AOL.¹⁶ These capabilities are part of the normal control that cable providers can exercise over Internet traffic. But these capabilities can be used to selectively disadvantage providers of specific services should it be in the interest of the cable provider to do so. Should a merged AOL Time Warner find it profitable to disadvantage a clearly superior innovation in IM services using these capabilities, it could do so undetected.
- (ii) The predicate of this merger is that the vertical integration of content, conduit and Internet service provision will enable faster and more compelling innovation of services, presumably including IM services. None of AOL's IM competitors who are likely to produce the breakthrough innovation that overturns AOL's IM dominance are vertically integrated, nor is there any indication that they might be in the foreseeable future. If we accept this predicate, then the merger raises the barrier to any prospective breakthrough innovation by a competitor even further. The potential for the "serial monopoly" as explicated by Evans and Schmalensee (2001) in IM services becomes vanishingly small with this merger.

The merger parties promise that "...the combination of the parties' strengths in providing consumer-friendly Internet services and a rich array of content of all types means that the merged company will be able to bring wholly new interactive services and products to the marketplace more quickly than either could do apart." (FCC, 2000).¹⁷ This is certainly a welfare-enhancing outcome *ceteris paribus*, and if the predicate is to be believed a sufficient public interest justification for the merger to go forward. However, this welfare enhancement could have the perverse effect of reinforcing the market power

inherent in AOL's NPD, preempting competitors from introducing the breakthrough innovation to overcome its network effects.

The merger thus enables AOL to strongly bolster its NPD market power by (i) giving it the means to disadvantage its competitors for a large fraction of cable broadband customers; and (ii) enhancing (greatly, the parties contend) its ability to preempt a competitor's "killer app" through tighter integration of all parts of the vertical chain.

6. Market Power in AOL's NPD; Has the Existing Market "Tipped"?

A crucial step in the logic that finds merger specific harms to advanced IM services is the assertion that there is significant market power in AOL's NPD. This market power cannot be measured directly, as the NPD merely facilitates the service for which it is the infrastructure. To assess the market power in today's AOL's NPD, we must assess the market power in today's IM, which is the only service that the NPD currently supports. Should AOL's market power in IM be significant, we can conclude that the NPD's market power is significant, and combining that market power with the merger assets of Time Warner is cause for a merger specific concern.

The most compelling demonstration of market power in AOL's NPD would be to show that the market for IM has "tipped." For a market to be tipped does not mean it is monopolized; in fact, network effects markets usually are not completely monopolized, for reasons discussed below. Rather, tipping occurs if market conditions are such that, absent interoperation, *ceteris paribus*, the largest provider inexorably gains market share at the expense of competitors, because customers prefer to communicate within a larger community.¹⁸ As more customers switch to the dominant provider, its network effects increase, leading to even more customers leaving competitors to join its system.

What empirical evidence would demonstrate tipping, or the lack thereof? This issue became the central issue at the FCC, both within and without the agency, regarding the strength of the case for advanced IM services. There are two obvious candidates:

1. **DMarket:** if, absent interoperation, the number of customers of the largest provider is increasing while number of customers of its competitors is shrinking, then *ceteris paribus* the market has tipped. If this is not true, then the market hasn't tipped.
2. **Refuse to interoperate:** if the largest provider has chosen not to interoperate, then *ceteris paribus* this can only be because that provider understands the market has tipped and wishes to gain customers at the expense of its competitors. If the market hasn't tipped, all providers are better off interoperating.¹⁹

Initially, there was no evidence regarding number of customers for any of the existing IM providers, and certainly not the growth in customers per provider. Each provider made somewhat extravagant claims concerning their customer base: AOL, for example, on their AIM website claimed over 60 million users, but disavowed this number in

discussions with the agencies.²⁰ In November, AOL introduced share numbers produced by MediaMetrix indicating that all IM providers were growing, and AOL's competitors were growing faster than AOL. This appeared to contradict the assertion of market tipping; we address this issue in depth below.

There was, clearly, evidence that the largest provider²¹ was refusing to interoperate. This would appear to prove that the market had tipped; however, *ceteris* is not always *paribus*, and AOL introduces other factors that they claimed were behind their refusal to interoperate in the short run, while maintaining their claim to desire interoperation in the long run. Again, we address these arguments in depth below.

The linchpin of the argument supporting merger specific harms was whether or not the current IM market had tipped. If it were tipped, then the NPD was a significant barrier to entry into advanced IM services, which when coupled with the Time Warner cable and content assets became practically insuperable for competitors. If it were not tipped, then it was difficult to argue that there was much market power in the NPD to leverage into the new markets, and a case for a merger condition could not be supported on these grounds.²²

7. Objections to the Advanced IM Reasoning

Not surprisingly, AOL asserted the market had not tipped, emphasizing the arguments for *DMarket* and objecting to arguments for *Refusal to interoperate*. All of these arguments are discussed fully in FCC (2001), as well as those raised within the FCC but not by AOL; I review the more significant arguments here.

1. *“Customers can download various IM clients and keep them all on their computer desktop, using each when he/she wants. Interoperability is really unnecessary, as there is no cost to the customer of maintaining multiple IM clients. In fact, many of our customers do this.”*

It is true that every IM download is free, so customers can indeed have multiple clients on their screen without paying a fee. However, very few customers keep multiple clients of any sort on their desktop, even when free. For example, most corporate customers can get any word processor or spreadsheet they wish without personal payment, but few maintain more than one for active use. Apparently, it is simply too troublesome for most customers to switch between applications. There is no reason to suspect that IM is any different. In fact, the use of multiple clients in IM is probably more difficult than with other applications, as it is a communications service. Being unable to communicate simultaneously with buddies on different systems appears to be a significant drawback. The fact is that many customers do use multiple IM clients, and some become quite adept at it. However, this is not an indication that the cost of doing it is low; rather, it is an indication that the *net benefits* are high, at

least for customers that use multiple clients. It is likely that for this group, even a bad form of interoperability is better than none, and they are willing to put up with an awkward, manual form of interoperability.

2. *“Interoperation is technically difficult; even our competitors haven’t accomplished it, and the IETF [Internet Engineering Task Force] hasn’t achieved it either.”*

The FCC’s technologists did not find this assertion credible; their professional view was that interoperability of IM systems was slightly more difficult than interoperability of e-mail, which is *technically* quite easy. Nor did AOL produce any evidence in support of this assertion. At the very least, the case would have been much more compelling if AOL engineers or programmers made the case rather than the firm’s attorneys, who of course could not answer the questions of the FCC technologists.

The failure of AOL’s competitors to interoperate was most likely an incentive problem: the only provider really worth interoperating with was AOL as they had by far the largest customer base.²³

The IETF is not a formal standard-setting body; it adopts standards for which there is an effective consensus. In the case of IM standards, there was no effective consensus. Their failure to settle on a standard was a consequence of consensus failure, not technical difficulty.

3. *“We are concerned that interoperation would put our customers at risk; we will interoperate when we can solve these safety and security problems.”*

This was a legitimate concern; experience has shown that e-mail systems can bring junk mail, unwanted sexually-oriented mail, and viruses, similar to the telephone system. AOL claimed to aim for a higher standard for IM, which could well be a welfare improvement for customers, perhaps worth the wait for interoperability. On the other hand, the argument could be merely a delaying tactic, pushing off interoperability until AOL had driven its competitors out of business.

AOL was unable or unwilling to support the credibility of its “safety and security” argument. It would have been easy to do so, in any one of several ways:

- A clear and explicit statement of what criteria a “safe and secure” IM system in order for them to be willing to interoperate with it.
- A “alpha” version of the software and protocols for implementing such a system; since they claimed to be working on such a system for a trial in August, 2001, such a prototype should have been available in late 2000, but was never produced.

- A briefing by AOL engineers on how they were solving their “safe and secure interoperability” problems, and what their development timetable was. Again, no engineers were produced to discuss this issue with FCC technologists.

AOL’s unwillingness to provide supporting evidence (such as outlined above) for their safety and security argument tended to undermine what was likely their best case. Technical arguments put forth by attorneys without backing by knowledgeable technologists are especially suspect.²⁴ In the event, the FCC reluctantly rejected this argument as without evidentiary support.

4. *“Market share data from MediaMetrix shows that Microsoft and Yahoo! had large customer base increases from July, 2000 to September, 2000, while AOL’s customer base increase was more modest. If the market has tipped, Microsoft and Yahoo!’s customer bases would be shrinking, not growing. Therefore, the market has not tipped.”*

This was the strongest economic argument AOL made against tipping. If in fact the IM market were stable, then this objection would be compelling as a matter of theory. However, the market is not stable; it is growing quite rapidly. New customers are constantly entering the market, and their choice of provider is likely guided by marketing efforts of the providers, as they are likely to know little about the network effects of the business until they experience the service (and are unable to connect with friends on other services).

I develop a model in Appendix B in which under certain circumstances a growing market can indeed be tipped and yet competitors make investments in customer acquisition and grow their customer base as a result. The circumstances in which the theory leads to this prediction appear to comport with the circumstances present in the IM market at the time MediaMetrix collected its data: July-August, 2000. Thus, competitor growth in customer base is not, as a matter of theory, dispositive of market tipping. Therefore, AOL’s strongest economic argument against tipping, based on market data and a theory of tipping applicable in a mature market, does *not* contradict market tipping if the market is growing.

5. *“Claiming that refusal to interoperate is evidence of tipping is circular.”*

Many attorneys within and without the FCC made this objection, noting this evidence was “merely behavioral” rather than “factual.” Since virtually all economic data is “behavioral,” this objection was puzzling. There appeared to be two concerns: (i) as a matter of economic logic, this was circular reasoning;²⁵ and (ii) the observed “behavior” could have been caused by some other factor, such as concerns about safety and security.

- (i) In the economic model of the Appendix, the “threshold market share” at which tipping is defined is rigorously defined as an equilibrium outcome that follows logically from the assumptions of the model. Perhaps it is unfamiliarity with game-theoretic reasoning that is responsible for the confusion regarding circularity.
- (ii) Each possible reason raised by AOL and others for refusing to interoperate was carefully evaluated and found lacking as a credible rationale for their actions (see above, items 1 – 4). We are left only with the strategic explanation of market tipping.

8. The Outcome: the IM Condition

The result was that the FCC imposed a condition on the merger relating to advanced IM services. The full text of the condition is in FCC (2001), §§ 191-200; in brief, the condition is that AOL must offer interoperability before it is permitted to offer advanced IM services, defined as services which include streaming video. No technical standard was imposed on AOL regarding how it was to interoperate, and no price was established.²⁶ AOL was permitted several options in how it could achieve interoperability, either by contract or by standard, and it was given an opt-out to request relief should market conditions change so that it no longer dominated the IM market. AOL was not required to interoperate its current text-based IM service.

All five Commissioners approved the merger; the two Republican Commissioners dissented on some of the conditions, with Commissioner Powell’s dissent on instant messaging (see FCC, 2001a and endnote 25) argued at length and persuasively. This was perhaps the most cogent case against the IM condition, far more persuasive than AOL’s. Interestingly, one Commissioner who voted in favor of the conditions insisted that the word “tipping” be removed from the text of the Order, as the word itself had become somewhat controversial during the proceeding.

In sum, the case for a condition on instant messaging was controversial. The economics appear sound, although reasonable people can differ over the logic. It is the first merger issue in which tipping in the context of network effects played a central role, and it points up the measurement problems associated with network effects generally and tipping in particular. While network effects have received much interest in the antitrust area, this case should stand as a caution regarding the difficulties of making the economic and legal arguments.

-- Appendix A --

In addition to Instant Messaging, there were three other issues of concern to both the FCC and the FTC:

1. Open Access: should Time Warner cable be required to grant access by any ISP to its high-speed IP channel (for Internet access)? Should it be required to grant access to several (non-affiliated) ISPs (if not ever ISP)?
2. Interactive TV: AOL was on the verge of launching an interactive TV product (AOL/TV) to bring the Web experience to TV customers. Should Time Warner be required to deal with all interactive TV vendors, including AOL/TV, on a non-discriminatory basis?
3. AT&T partial ownership of TWE: AT&T inherited a 25.5% ownership stake in TWE as a result of its previous purchase of MediaOne. However, this was a non-voting stake, which AT&T was apparently anxious to sell to Time Warner. There was concern that the two largest cable operators were intertwined through this ownership stake, and that this stake should be unwound as a condition of the merger.²⁷

Open Access

This issue was the most public at the time of the merger announcement. AOL had been quite active in promoting open access at the time of the AT&T-MediaOne merger, and its partners in the open access movement were anxious that AOL be consistent in its position as a prospective cable operator.

The standard model in the cable industry for Internet access was designated monopoly; customers of a cable firm's cable modem service were required to take service from a designated entity, such as [Excite@Home](#), Roadrunner, or other broadband ISP. Although cable firms owned stakes in these broadband ISPs, the relationship between the ISP and its cable host were often rocky. Recently, cable firms have been moving toward a multiple ISP model. "Open access" is generally interpreted to mean a legal requirement for the cable firm to provide any ISP that requests it access to its high-speed Internet conduit.

The FTC moved early to establish open access as *the* issue of greatest concern. Although AOL had announced that it intended to open its cable IP channel to selected ISPs,²⁸ the FTC Competition Bureau entered into hard negotiations with AOL Time Warner, eventually resulting in AOL entering into a service agreement with EarthLink (an ISP) as their first non-affiliated ISP *prior* to FTC approval. The Consent Decree required AOL to open their major market cable systems to two more ISPs (from a list of ISPs provided by the FTC) within 90 days of AOL providing ISP service itself over Time Warner cable systems.²⁹

As a result, the FCC (which reached its decision after the FTC, by mutual agreement) imposed relatively minor conditions regarding open access on the parties. However, it did issue a Notice of Inquiry into cable open access, as part of its ongoing rulemaking process, an option open to the FCC but not the FTC. Open access is still a pending issue at the Commission.

Interactive TV

Interactive TV is a family of technologies and prospective services that permit TV viewers to interact over their cable system. Such interaction could include: (i) viewing e-mail; (ii) viewing specialized content in a small on-screen window; (iii) having an online chat with others watching the same program as the viewer; (iv) requesting a different camera angle on (say) a sporting event. Several firms have offered versions of interactive TV, such as WebTV and more recently AOLTV.³⁰ Currently, service is provided via a device similar to a cable set-top box, through which the cable (or satellite) signal is routed. The device detects signals³¹ sent by the video programmer to trigger on-screen hotspots that permit the viewer to interact with the program. It also enables a return path for viewer requests to be sent back to the programmer.

The cable operator must pass these signals through its head-end and its set-top box in order for this service to work. Should the cable operator block or degrade these signals, or restrict access to a cable return path, for interactive TV providers other than its affiliate, competition would be severely restricted.

Several interveners, notably Walt Disney, Inc., argued that the FCC and/or the FTC should take strong action guaranteeing that Time Warner Cable could not discriminate in favor of AOLTV post-merger, urging continued “monitoring and oversight” by the Commission.³²

Early on, many analysts at the FCC took the view that this was not really a market yet, as none of the early entrants had demonstrated a profitable business opportunity (a “nascent” market, in FCC-speak). Further, the Commission exercised continuing oversight over the cable industry and its practices as part of its normal rulemaking authority and should there be problems in the future with interactive TV, the FCC had both the technical expertise and the authority to deal with it at that time. As a consequence, the FCC imposed rather mild non-discrimination language in its order and simultaneously launched a Notice of Inquiry into interactive TV.

The FTC became interested in interactive TV somewhat later; because they lacked the technical expertise to understand the issues, they relied on FCC cable TV experts to inform their policy decisions.³³ Eventually, the FTC consent decree language was quite similar to the FCC’s, requiring non-discrimination.

AT&T Ownership Interest in TWE

The AT&T 25.5% ownership stake in TWE raised a question regarding possible collusion between the two largest cable MSOs in the US. Of course, this ownership stake pre-dated the merger, and AT&T had indicated its desire to sell this stake to Time Warner.³⁴ However, the two firms had not been able to agree on terms. There was no evidence of collusion between the two cable giants, and it was not clear how this was a merger-related problem. Further, it was not clear how this cross-ownership could be untangled in the context of this merger. AT&T could not be ordered to divest, as they were not a party to this merger.

The only merger-specific harm that was envisioned was that AOL could more easily collude with AT&T to enter into an exclusive ISP relationship with AT&T's cable properties. Some viewed such collusion as more likely given the AT&T ownership stake in TWE. Both the FCC and the FTC eventually adopted similar language, forbidding AOL and AT&T from entering into a contract that in any way limited AT&T's ability to contract with other ISPs.

-- Appendix B --

Economic Model of Tipping in Growing Markets

There are two firms A and Y offering identical IM services, with N potential customers and N_0 actual initial customers. Firm A 's initial market share is s_0 . The value of an IM network to each customer $v(x)$ depends upon the number of other customers x that can be reached on that network, with $v' > 0$, and $v'' < 0$. For simplicity, we assume $v()$ is identical for all N customers, and there are no expectations effects.³⁵ The value to all customers if both networks interoperate is $v(N_0)$; the value to customers of A if A does not interoperate is $v(s_0 N_0)$.

In addition to network effects, customers have switching costs. These costs could be pecuniary but could also be non-pecuniary, such as inconvenience of switching to a new user interface, migrating one's "buddies" to a new vendor, etc. (see the discussion in Section 7). Indexing customers by $q \in [0,1]$, denote the cost of switching of customer q as $c(q)$; choose the index so that $c' > 0$, and assume $c'' > 0$. Note that switching costs could also be present if the two providers offer differentiated services; the greater the differentiation, the higher are switching costs.

I assume that firms capture the same fraction a of the value, either via prices or through advertising, and is thus not a strategic variable. I make this assumption for simplicity and to focus the model on what appear to be the key strategic variables in the IM market, viz., network effects and customer acquisition.³⁶

Firms can undertake costly marketing activities to acquire new customers among those $N - N_0$ who do not currently take either IM service. If the firms spend M_A and M_Y on customer acquisition, the number of customers they each acquire is $a_A(M_A, M_Y)(N - N_0)$ and $a_Y(M_A, M_Y)(N - N_0)$, with $a_A + a_Y < 1$, $\frac{da_Z}{dM_Z} > 0$, $\frac{da_Z}{dM_{-Z}} < 0$, for $Z \in [A, Y]$, $-Z$ the complement of Z .

The Game

Stage 1: Firms choose M_A, M_Y and acquire customers, increasing the total market to $N_1 = N_0 + [a_A(M_A, M_Y) + a_Y(M_A, M_Y)](N - N_0)$, with firm A 's market share = s_1 .

Stage 2: firms decide whether or not to interoperate. Firm A 's initial market share is s_1 ; if it interoperates, all customers have the advantage of access to the full network $v(N_1)$, but customers of Y have no incentive to switch to A because they are already receiving the full network effects. If it does not interoperate, its customers receive a lower value $v(s_1 N_1)$, but the customers of Y have some incentive to switch to A because of network effects.

Stage 3: IM customers choose whether or not to switch their provider to the larger firm, and profits are realized. Firm A's final market share is s^* , and profits are $\mathbf{a}(s^*N_I) \cdot s^*N_I$.

Solution to the Game

In stage 3, if the firms interoperate absent interoperation, no customer gains by switching, because they are already capturing all network effects through interoperation. If firm A does not interoperate, the customers with low switching costs migrate to the larger provide to take advantage of the greater network effects. The value of switching from Y to A for any customer if s customers are already on A is $(1-\mathbf{a})[v(s \cdot N_I)-v((1-s) \cdot N_I)]$. The cost of customer $\mathbf{q} = (s-s_0) \cdot N_0$ switching is $c((s-s_0) \cdot N_0)$. Assume that the cost of switching increases at a greater rate than the value of switching:³⁷

$$c'((s-s_I) \cdot N_I) > (1-\mathbf{a})[v'(s \cdot N_I)+v'((1-s) \cdot N_I)], \text{ for } s \in [s_I, 1]. \quad (1)$$

The final market share s^* solves³⁸

$$\begin{aligned} s^* &= s_I \text{ if } c(0) > (1-\mathbf{a})[v(s_I \cdot N_I)-v((1-s_I) \cdot N_I)] \\ s^* &= 1 \text{ if } c((1-s_I) \cdot N_I) < (1-\mathbf{a}) [v(N_I)-v(0)] \\ c((s^*-s_I) \cdot N_I) &= (1-\mathbf{a}) [v(s^* \cdot N_I)-v((1-s^*) \cdot N_I)] \quad \text{otherwise.} \end{aligned} \quad (2)$$

Condition (1) assures that the stage 3 outcome is unique and is characterized as above. The first outcome occurs when switching costs are quite high relative to the value from the network effect; in this case, no customer switches to the larger player because the costs are too high. This could occur, for example, if the initial s_I is so high that the remaining network effects are low, so that the larger firm is already as dominant in the market as it can be. The second outcome occurs when switching costs are quite low relative to the value from the network effect; in this case, all customers of Y switch to A, and Y wins the monopoly. The third outcome occurs when the value of the network effect outweighs the switching costs for customers who find it easiest to switch, but not for customers for whom it is more costly and less valuable. In this case, network effects will drive the share of the larger firm higher than without such effects, but does not necessarily result in monopoly (as the "diehard" Y customers find it too costly to switch, even with high network effects value).³⁹

Proposition 1: Comparative statics of the last condition yields

$$\begin{aligned} [c_s((s^*-s_I)N_I) - v_s(s^*N_I) - v_s((1-s^*)N_I)]ds^* &= [c_s((s^*-s_I)N_I)]ds_I \Rightarrow \\ \frac{ds^*}{ds_I} &= \frac{c_s((s^*-s_I)N_I)}{c_s((s^*-s_I)N_I) - v_s(s^*N_I) - v_s((1-s^*)N_I)} > 1 \end{aligned} \quad (3)$$

Proof: Follows directly from condition (1). ■

The Proposition shows that the final market share of firm A is increasing in the initial market share, as network effects from the larger share make firm A more attractive. It is easy to show that the greater the switching cost the less is the final market share, and the greater the value of network effects the greater is the final market share.

Stage 2 Firms perfectly anticipate the outcome of customer choice in stage 3, and choose to interoperate or not, depending upon which choices yields greater profit. Firm A prefers non-interoperability iff

$$a(s^*N_I) (s^*N_I) > a(N_I) (s_I N_I). \quad (4)$$

In words, if the gain in market share from refusing to interoperate more than offsets the price decrease necessary to offset the loss of customer value from refusing to interoperate, then the larger firm refuses to interoperate.

Proposition 2: If the elasticity of s^* with respect to s_I is greater than 1 ($\epsilon_{s^*, s_I} > 1$), then there exists a unique initial market share $\hat{s}_1 \in [1/2, 1]$ which solves (4) at equality; for $s_I > \hat{s}_1$, firm A refuses to interoperate; for $s_I < \hat{s}_1$, firm A interoperates.

Proof: Condition (4) is equivalent to $v(s^*N_I)(s^*/s_I) > v(N_I)$. Note first that at $s_I = 1/2 s^* = 1/2$ and $v(s^*N_I)(s^*/s_I) < v(N_I)$. Also, if $s^* = 1$, then $v(s^*N_I)(s^*/s_I) > v(N_I)$. So if the left hand side is increasing in s_I , the result is proved. The derivative of the LHS is

$$v \left(\frac{s^*}{s_I} \right) + v \frac{s^*}{s_I} \left(\frac{ds^*}{ds_I} \frac{s_I}{s^*} - 1 \right) > 0 \text{ so the LHS is monotonic, guaranteeing a unique}$$

solution to (3) for s_I at equality; this solution is \hat{s}_1 . ■

Discussion Proposition 2 establishes a threshold market share, \hat{s}_1 , above which it is optimal for the larger firm to deny interoperability and below which the larger firm interoperates. This threshold market share depends upon both the value function of the network effect, $v(\cdot)$ and the switching cost function $c(\cdot)$. If the current market share is above \hat{s}_1 , we say the market has “tipped,” in that the size of the larger firm is such that the potential gain in customers who switch from competitors as a result of non-interoperability is worth more than the loss in individual customer value (and therefore price) which non-interoperability. The strategic behavior of refusing to interoperate when the initial market share exceeds this threshold \hat{s}_1 is a profit-maximizing response by the larger firm A to the fact that the market has tipped; that is, that $s_I > \hat{s}_1$. Note that firm A doesn’t tip the market by its actions; tipping is a result of market conditions $v(\cdot)$, $c(\cdot)$, and s_I . The ultimate outcome of a tipped market, s^* , is the desired result of (near-) monopolization.

In stage 1, firms play the equivalent of an “advertising war,” but with a network effects twist.

Of course, firm Y would like to use customer acquisition in order to overcome its network effects disadvantage, perhaps even gain a market share advantage by acquiring many new customers. Firm A is aware of this threat and also undertakes customer acquisition. As a result, new customers are brought into the market and a new market share of s_I (for firm A) is determined. Each firm’s investment in customer acquisition is informed not only by the profitability of new customers but by the likelihood that such customers may switch from Y to A if the post-customer acquisition market is tipped in A ’s favor (and vice-versa should Y ’s customer acquisition investment result in its gaining the lead in market share).

Customer acquisition expenditures M_Z solve the system

$$\frac{\partial \mathbf{a}(s^* N_1) s^* N_1}{\partial M_Z} = \mathbf{a} \cdot (v' + v) \cdot \left(\frac{\partial s_1}{\partial M_Z} \frac{ds^*}{ds_1} N_1 + s^* \frac{\partial N_1}{\partial M_Z} \right) = 0, \text{ for } Z \in [A, Y].$$

I cannot characterize the general solution to this game; however, there are interesting special cases we consider.

No switching costs, positive network effects ($v > 0, c = 0$). In this case, firm A captures all customers in stage 3, regardless of firm Y ’s customer acquisition activities in stage 1. Firm Y has no incentive to acquire customers that it is bound to lose, and therefore only firm A invests in customer acquisition in stage 1.

No network effect, positive switching costs ($v = 0, c > 0$). This is a classic advertising war, in which new customers are “sticky” and stay with the firm that first acquires them. This is a prisoner’s dilemma game, in which each firm spends “too much” in order to counter expenditures of its competitor.

Network effects relative to switching costs large at s_0 but decreasing sharply with s and

moderate acquisition cost $\left(\left. \frac{d(v-c)}{ds} \right|_{s=s_0} \gg 0, \left. \frac{d^2(v-c)}{ds^2} \right|_{s>s_0} \ll 0, \frac{da_Z}{dM_Z} > 0 \right)$. In this

case, newly acquired customers of Y will switch to A , but not all. Moderate acquisition cost leads to both A and Y acquiring customers; however, A expects that it will gain some of Y ’s new customers in stage 3 if it refuses to interoperate from its superior network effects. The net result is that acquiring customers that will stay is more costly for Y than it is for A . However, if Y acquires few customers, it may be further disadvantaged by A ’s network effects, so the benefit of acquiring customers for Y may be higher than for A . Depending on this balance between costs and benefits of customer acquisition, Y may actually invest more than A in such acquisition: $M_Y > M_A$. Should this case occur, the outcome would show the smaller firm undertaking greater customer acquisition activities than the larger firm. Subsequently, many of these acquired customers would switch to the larger firm, should it refuse to interoperate.

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-- Notes --

¹ *Washington Post*, "AOL to Acquire Time Warner In Record \$183 Billion Merger; Old, New Media Joining Forces In Record \$183 Billion Merger; Old, New Media Joining Forces," p. A1, January 11, 2000.

² In the past, the FTC has reviewed mergers in the cable industry, such as Time Warner-Turner in 1996. However, the Department of Justice has handled mergers in telecommunications, such as the AT&T-TCI and AT&T-MediaOne mergers, also involving cable firms. In this case, the FTC assumed jurisdiction.

³ The FCC reviews mergers using a public interest standard and is therefore not limited to classic competitive analysis. In fact, this public interest standard is not defined in the governing statute and is open to Commission interpretation (and court challenge). The Commission has been criticized for extending its writ to impose "voluntary" conditions on merging parties that perhaps are more properly considered under the Commission's formal rulemaking procedures. This review authority is only granted for a radio license transfer; then-Commissioner Furchtgott-Roth pointed out that since Time Warner held the radio licenses in question, if Time Warner had acquired AOL, then no license transfer was required and the FCC would have no jurisdiction.

⁴ For a more complete background on the merging parties, see AOL, Inc and Time Warner (2000)

⁵ The entertainment market is quite broad and deep, including content producers (such as Hollywood studios), distributors, movie theater chains, video distributors, video stores, books and magazines, and networks (such as HBO and ESPN). While Time Warner is an important player in this content market, it is not possible to meaningfully characterize their importance by a simple market share measure.

⁶ All other features of AOL, such as chat rooms and proprietary content, are provided only to AOL subscribers. AIM represents the first and only (to the author's knowledge) departure from this policy.

⁷ See, for example, "Tribal Voice calls on FCC to remedy AOL IM issue," *ZDNet e-Week* April 26, 2000, at <http://www.zdnet.com/eweek/stories/general/0,11011,2555969,00.html>

⁸ At least in the US; the EU has imposed conditions on parties to a merger that are apparently unrelated to the merger itself. For example, the EU Competition Commission demanded that Boeing rescind its exclusive contracts with various US airlines (European Commission, 1998) as a condition for approving its merger with McDonnell-Douglas in 1997.

⁹ But not the inventor. As noted above, online messaging and presence detection were available in Unix systems as early as 1974.

¹⁰ The FTC was not so endowed, and reached a different conclusion regarding IM. I do not assert that the excellent staff of the FTC's Bureau of Economics under the able leadership of Professor Jeremy Bulow would have reached the same finding as did the FCC had they had the same technology advice as did the FCC. But lacking that advice, the FTC's analysis of IM was that outlined in Section 4 of this paper.

¹¹ More recently, one analyst noted "Already, instant messaging applications from mainstream software and media companies Yahoo, AOL Time Warner and Microsoft offer a long menu of communications tools that go beyond the traditional text-based instant message. These include audio chat and PC-to-phone telephony, videoconferencing, file sharing and multiplayer games." See Festa, (2001) for further analysis of future IM options.

¹² "...the combination of the parties' strengths in providing consumer-friendly Internet services and a rich array of content of all types means that the merged company will be able to bring wholly new interactive services and products to the marketplace more quickly than either could do apart." (FCC, 2000)

¹³ The FCC referred to these services as "Advanced IM High-Speed (AIHS) services." (FCC, 2001).

¹⁴ Of course, leveraging an existing dominant/monopoly position into new markets may warrant antitrust intervention. The Department of Justice's case against Microsoft (still being litigated at this writing) is precisely that: the leveraging of Microsoft's alleged market power in its Windows operating system into browser markets. *US v. Microsoft* has been a controversial case; it is not clear that a future DoJ/FTC would be willing to file suit (and would prevail) should AOL leverage its NPD and its attendant market power into advanced IM services.

¹⁵ Microsoft's recent announcement of its new Windows Messenger service with Windows XP explicitly includes video conferencing as a feature (Wilcox, 2001). However, AOL has indicated that it does not believe there is strong customer demand for video (Festa, 2001).

¹⁶ The means by which cable providers can control the quality of service (bandwidth and latency at the packet level) over their high-speed Internet cable modem connection is fully described in Cisco (1999). Cisco is a producer of Internet routers and "New World" networks for cable providers.

¹⁷ It is not entirely clear how Time Warner-owned content could enhance Instant Messaging. Perhaps with a video-enabled IM, one person could send a clip of an HBO movie trailer (available from HBO's owner, Time Warner) to another. It should also be noted that AOL has recently begun inserting advertising into instant messages; with video-enabled IM, these advertisements could be much more compelling, even interesting, than with today's narrowband IM advertisements.

¹⁸ We abstract away from other events, both exogenous and endogenous. For example, a new invention of a clearly superior product could cause a reversal of tipping, in which the innovator gains share at the expense of the largest firm if customers perceive that the superiority of its product outweighs the network effects of the dominant provider. One provider could launch a marketing campaign, giving away free Christmas turkeys perhaps, to capture new customers. Or a customer of the dominant provider could suffer an injury or liability from his or her use of the system, resulting in negative publicity for that provider. However, we do include other switching costs in the customer's decision to switch. Customers may have strong preferences for a smaller provider, sticking with that provider in spite of network effects. For example, even though Microsoft apparently enjoys large network effects from its Windows operating system, there are still customers who prefer the Macintosh system and who continue to use it.

¹⁹ Strictly speaking, interoperation always increases customer welfare. This assertion is based on the assumption that providers will be able to capture at least a portion of that increased customer welfare, through higher traffic levels and/or higher prices.

²⁰ This strategy is perfectly understandable; if there are network effects, the firm wants to advertise a large number to entice customers to join up. But the firm would want to tell regulators a smaller number to counteract allegations that the market had tipped in their direction.

²¹ Although there was much dispute concerning market share numbers during the FCC's deliberations, there was never any dispute over the fact that AOL was the largest provider and had well over 50% market share. Even if all its competitors had agreed to interoperate amongst themselves, AOL's customer base would still have been larger than the combined customer base of all its competitors.

²² It should be noted that there was little doubt in the minds of industry analysts that AOL commanded substantial market power in its AIM/IM service. For example, Whyman (2000) asserts "AOL's IM is a closed service using proprietary protocols. With dominant market share this creates huge network effects."

²³ If, say, Microsoft and Yahoo! decided to interoperate using an agreed-upon protocol, and then later AOL or some other body announced another protocol, then a changeover could be costly to Microsoft and Yahoo!.

²⁴ The tendency of firms to present an all-attorney "face" during merger discussions may have its drawbacks, but it is understandable. Using managers or engineers during such discussions may result in inconvenient opinions or facts being revealed. During an early meeting with FCC staff and AOL representatives, a high-level manager responsible for AOL's IM service opined that if Microsoft Messenger were to gain significant market share, "...you can bet we would interoperate real quickly." (author recollection). Needless to say, this executive was absent at subsequent meetings with FCC staff.

²⁵ Commissioner (currently Chairman) Michael Powell, in his richly worded riposte, referred to "...this theory having the leathery taste of the bootstrap..." FCC(2001a).

²⁶ The failure to establish a price for interoperability/interconnection is perhaps the largest flaw in the merger order. It is obvious that should AOL wish to maintain non-interoperability in the face of the requirement to interoperate, it could simply set a standard and charge an extremely high price per message to any competitor wishing to interconnect. Early staff discussions suggested that interconnection should occur at a price of zero, which is the case for e-mail. However, this was perceived as "too regulatory" and possibly confiscatory as well, and was abandoned early on.

²⁷ It was never clear exactly how this was to be accomplished, as AT&T was not a party to this merger and no conditions could be imposed on it as part of the merger.

²⁸ Indeed, it filed a Memorandum of Understanding (MOU) with both the FTC and the FCC concerning the terms and conditions under which it would offer access to non-affiliated ISPs. However, it did not commit to a particular number of ISPs, nor did it indicate which ISPs would be chosen.

²⁹ The full text of the order is available at the FTC website: <http://www.ftc.gov/os/2000/12/aoldando.pdf>.

³⁰ For a service description of WebTV, see <http://www.webtv.com>; and for AOLTV, see <http://www.aol.com/anywhere/aoltv/home.html>

³¹ The US industry standard for such signals are "ATVEF triggers," established by the Advanced TV Enhancement Forum; see www.atvef.com

³² See Disney *ex parte* describing a meeting with Chairman Kennard's Chief of Staff, at http://www.fcc.gov/transaction/aol-tw/exparte/disney_exparte122100.pdf.

³³ The FCC was fortunate to have on staff or on academic loan leading technologists with deep and broad knowledge of the Internet and cable TV systems. There does not appear to be a similar level of understanding of technology matters at other government agencies, and unfortunately many of the key personnel are no longer at the FCC. In the author's view, the value of these experts to the analysis of this case was inestimable.

³⁴ In approving AT&T's merger with MediaOne, the FCC required AT&T to divest itself of at least one of several properties, including its stake in TWE, in order to meet the FCC's horizontal ownership cap. AT&T had indicated it wished to divest its TWE share, but was not required to do so.

³⁵ Customer expectations of who the eventual winner will be can affect the outcome in a network effects market. An early lead by an unknown firm may be insufficient to overcome the reputation of a market leader that enters second. In the case of IM, the principal firms (AOL, Yahoo, and Microsoft) competing in this market were well known by customers, each with its own particular strengths. There is no reason to suspect that customers would believe *ex ante* that one or the other would be the likely winner.

³⁶ Up to this date, no IM provider charges a price for its service. IM has been positioned as a feature for the provider's online service bundle, which providers expect will drive customers to their online service. Recently, AOL has begun inserting advertising in its customers' IMs, which of course is an implicit price. However, it appears that price, implicit or explicit, is not a strategic variable in this market.

That being said, I have examined a model with price (but not advertising) included; the results are similar and the model is much more complicated and notation-rich.

³⁷ This is a (rather strong) sufficient condition to guarantee a unique solution to the customers' switching problem. This captures the idea that the net benefits of switching providers, which is network effects gain minus switching costs, eventually decreases for increasing q . Thus, we may see customers with great loyalty to their provider (high q) stay with that provider in spite of strong network effects. This appears to have occurred with users of Apple computers who have remained loyal to their product in the face of the strong network effects of the Windows OS.

³⁸ Customers perfectly foresee s^* , and so base their switching decision on s^* , not s_j .

³⁹ In what follows, we do not consider the first two outcomes. The first outcome only occurs with very weak network effects, very high switching costs, or if the network has already "tipped" and the larger firm is already dominant. The second outcome occurs only if network effects are so strong as to be unrealistic. It suggests that the smaller firm is completely driven out of the market; historically, smaller firms remain in the market, serving a niche of "diehard" customers. Examples include Apple Computers, Betamax videotapes, and Dvorak keyboards, all of which are still available. We restrict our attention to the interior outcome, defined by the third outcome.