

# iTunes and the Basis of Competition in the MP3 Player Market

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“It's official: the only thing more popular than MP3 is sex.”

So said Rolling Stone magazine in 1999.<sup>1</sup>

Virtually unheard of a year ago, MP3—short for MPEG 1 Layer 3—is an audio-coding technology that allows digital music files from CDs or other sources to be compressed into a size practical for Internet transmission and PC storage. Whereas a typical digital recording of a song might take up 40 megabytes of space, an MP3 version will take up roughly 3.5 MB. Those same files can be downloaded in ten minutes instead of two hours (and even faster with the T-1 connections many universities and businesses have). As a result, music is a major Internet attraction.

Karlzheinz Brandenburg had begun work on an audio compression systems years before, while a doctoral student in the early 1980s. The work moved slowly until 1986, when computers began to catch up to the algorithmic complexities of audio compression.<sup>2</sup>

To make an MP3, a program called an encoder takes a .wav file (or some other audio format) and compares it to a mathematical model of the gaps in human hearing. Based on a number of factors—some chosen by the user, some set in the code—it discards the parts of the audio signal that are unlikely to be audible. It then reorganizes repetitive and redundant data in the recording, and produces a much smaller file—often as small as 12 percent of the original file size. The technique of removing redundant data in a file is called *compression*. The technique of using a model of a listener to remove additional data is a special kind of “lossy” compression called *perceptual coding*.<sup>3</sup>

Brandenburg and others worked to make the compressed and then decompressed audio relatively faithful to the original. The researchers used Suzanne Vega's a capella version of “Tom's Diner” to listen for imperfections. Brandenburg claims he listened to the song between 500 and 1000 times during the development of the MP3 algorithm.

The Moving Pictures Expert Group (MPEG) began a standard-setting process for digital compression of music in 1988 under the auspices of the International Standards Organization. MPEG's purpose was to develop standards to digitally encode moving pictures, including their soundtrack. The first meeting of MPEG's audio subgroup ended with a call for digital audio compression proposals that would work for “various applications like CD-ROM for audio and video, DAT recorder, [and] Digital Audio Broadcasting.”<sup>4</sup> In

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<sup>1</sup> Goodman, Fred, “MP3 Technology Poised to Redefine Music Industry”, Rolling Stone, March 9, 1999. Retrieved from <http://www.rollingstone.com/music/news/mp3-technology-poised-to-redefine-music-industry-19990309>

<sup>2</sup> Ganz, Jacob, and Joel Rose, “The MP3: A History of Innovation and Betrayal”, NPR, March 23, 2011. Retrieved from <http://www.npr.org/blogs/therecord/2011/03/23/134622940/the-mp3-a-history-of-innovation-and-betrayal>

<sup>3</sup> Ibid, pp. 1-2.

<sup>4</sup> Sterne, Jonathan, *MP3: The Meaning of a Format*, Duke University Press, 2012, p. 139.

1989, the ISO received proposals for audio coding from 14 companies (later merged into four groups). The proposal including Fraunhofer's work was adopted as a standard in 1992.<sup>5</sup>

This standard, named MPEG-Layer 3, involved technology developed by Fraunhofer, Thomson, and AT&T. At the same time, MPEG-Layer 1 and MPEG-Layer 2 were approved. Each involved different tradeoffs: Layer 3 had the highest quality audio and smallest file-sizes. Layer 1 had lower quality audio but was a less complex algorithm. Layer 2 was in the middle.

Layer 2 received most of the initial attention: it was chosen as the audio standard for video compact discs and satellite radio, among others. Even the first internet site to offer MPEG-encoded files, the Internet Underground Music Archive, launched in 1993, initially used MPEG-Layer 2. Brandenburg said, "In 1992–1994, the main focus was to find companies who would really use this MPEG audio layer 3 and with the exception of some professional applications in the first year, layer 3 was out of luck. Everybody else decided to go with layer 2."<sup>6</sup> The Fraunhofer team began to believe that Layer 2 was winning because it was backed by established music industry companies Philips and Panasonic, that it was a political rather than a technical decision. There were a few early adopters: Microsoft bought a license in 1995 to use the spec, although the Microsoft applications at the time were not much used. Fraunhofer began to lose hope.

### **Creating a Category**

Using MP3 for portable music was not an obvious use case: before 1995 the internet was not in widespread use, and where it was bandwidth was low. In the physical world, where digital music was delivered through the medium of a compact disc, compression was not needed. But Fraunhofer was willing to try anything, and portable music was one thing they tried.

In 1995 Fraunhofer created software to play MP3s on a PC. It was called WinPlay3 and was distributed as freeware. It was ugly, hard to use, had no playlists or other simple features, and could only play 20 songs before the user had to mail in a license fee to Fraunhofer and wait for an activation code to be mailed back. It was little used. (It did, however, need a file extension, and .mp3 was settled on, the first use of that name.) At a 1995 trade conference a Philips executive said to a Fraunhofer representative "There will never be a commercial MP3 player."<sup>7</sup>

The problem was that no one wanted a player if there was no music, and no one wanted to make music in the format if there was no way to play it.<sup>8</sup> It seemed the only way to get a critical mass of music in MP3 was to have the music industry embrace the standard. Without the cooperation of the music industry there seemed no way out of this chicken and egg problem, and the music industry—fat on CD reissue revenues and ever-wary of the potential for piracy—had no reason to cooperate.

But the growing consumer use of the Internet created a demand for music files delivered

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<sup>5</sup> [https://web.archive.org/web/20140101143530/http://www.mp3-history.com/en/the\\_story\\_of\\_mp3.html](https://web.archive.org/web/20140101143530/http://www.mp3-history.com/en/the_story_of_mp3.html)

<sup>6</sup> Sterne, op. cit., p. 198.

<sup>7</sup> Witt, Steven, *How Music Got Free*, Viking, 2015, p. 59.

<sup>8</sup> Ibid. pp. 60-61.

across a slow network connection, and MP3 was far better for this than Layer 2. When the corporate world did not address this problem an anonymous hacker took it into his own hands. As Brandenburg tells it:

In, I think it was '97, some Australian student bought professional grade—from our point of view—encoding software for MP3 from a small company in Germany. He paid with a stolen credit card number from Taiwan. He looked at the software, found that we had used some Microsoft internal application programming interface ... racked everything up into an archive and wired some Swedish side [sic], [and] put that to a U.S. university FTP site together with a read-me file saying, "This is freeware thanks to Fraunhofer."

He gave away our business model. We were completely not amused. We tried to hunt him down. We told everybody, "This is stolen software so don't distribute it," but still the business model to have expensive encoders and cheap decoders [was] done. From that time on, we reduced the cost for encoders. There was a company, Music Match, which allowed people early on to take a CD's music, read it into the computer and then have their own music jukebox on that. And they were legal, they paid for the patent fees so that was fine.<sup>9,10</sup>

Fraunhofer had planned to license its patents to create encoding and decoding software. A license for the encoding software would be expensive and Fraunhofer assumed only large companies would license it. A license for the decoding software would be cheap and Fraunhofer hoped many products would be built around it and they would collect a small fee for each product sold. This vision—a few companies making recordings available to a large audience—had been the recording industry model since its inception, the typical mass-media model. The widespread illegal distribution of their algorithm made this business model moot, but the result was that the entrenched music industry players were no longer the gatekeepers to widespread use.

The explosive growth in use of MP3 started right after the Australian release. WinAmp, the first PC software music player for MP3s since WinPlay3, was released shortly afterward. It was downloaded more than 3 million times in its first twelve months.<sup>11</sup> MP3 had become synonymous with digital music, as well as with music piracy. By 1998 the category was established, with one mainstream music magazine writing "Making MP3 copies of favorite songs—then zapping those songs electronically to anyone with an Internet connection—has become not just an underground craze but an international epidemic."<sup>12</sup>

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<sup>9</sup> Ganz and Rose, op cit.

<sup>10</sup> Patents became an issue again once the format had become mainstream. Although Fraunhofer was never a primary beneficiary of the growth of the industry, patent licenses generated hundreds of millions of dollars of income for them. There were also multiple lawsuits trying to enforce these patents and others. C.f. Krazit, Tom, "Apple Settles with Creative for \$100 million", CNET, 8/23/2006, retrieved from [https://web.archive.org/web/20130903064854/http://news.cnet.com/apple-settles-with-creative-for-100-million/2100-1047\\_3-6108901.html](https://web.archive.org/web/20130903064854/http://news.cnet.com/apple-settles-with-creative-for-100-million/2100-1047_3-6108901.html); Ogg, Erica, "SanDisk MP3 seizure order overturned", CNET, 9/7/2006, retrieved from [https://web.archive.org/web/20121104164009/http://news.cnet.com/2100-1047\\_3-6113326.html](https://web.archive.org/web/20121104164009/http://news.cnet.com/2100-1047_3-6113326.html); Hansen, Evan, "MP3's Loss, Open Source's Gain", Wired, 2//2007, retrieved from <https://www.wired.com/2007/02/mp3s-loss-open-sources-gain/>; Krazit, Tom, "Microsoft wins reversal of MP3 patent decision", CNET, 8/6/2007, retrieved from <https://www.cnet.com/news/microsoft-wins-reversal-of-mp3-patent-decision/>.

<sup>11</sup> Bronson, Po, "Rebootlegger", Wired, 7/1/1998. Retrieved from <https://www.wired.com/1998/07/newmedia-4/>

<sup>12</sup> Allen, Harry, "Digital Underground", Vibe, October 1998, pp. 122-126.

### **Creating a Market**

In 1997 Micronas, a German chipmaker, released an MP3 decoder chip.<sup>13</sup> A Korean company, SaeHan Information Systems (now TAK Information Systems) started buying the chips to build the first portable MP3 player, the SaeHan MPMan. The MPMan was introduced in Asia in early 1998. It cost 39,800 Yen (about \$400 at the time) for the 32MB version, which could hold about six songs, and 59,800 Yen (~\$600) for the 64MB version.<sup>14</sup> The design was licensed to Eiger in mid-1998, who distributed it in North America, selling the 32MB version for \$250. The Diamond Rio, also with 32MB, quickly followed in September 1998, selling for \$200<sup>15</sup>, and then a slew of others.

The first MP3 players used flash memory. This made the players portable but limited their capacity. Some later players used hard drives to hold the music. These had much higher capacity, but were larger, heavier, and more expensive. The HanGo Personal Jukebox, for instance, cost \$799 when it was introduced but had almost 5GB of storage. At 6x3x1 inches, it was unwieldy for a handheld. Solutions that were both high-capacity and small, like the I2Go eGo, cost about \$2000. Other innovations included expandable memory, longer battery life, ability to record voice (all three of these were included in 1999's RaveMP), radio reception (1999's Nomad), better sounds (2000's Nomad), better user interface (Apple's iPod), video support (2002's Archos Jukebox Multimedia), etc.

The MP3 standard was not the technically best compression algorithm. The AAC format—created by Fraunhofer and introduced as an MPEG standard in 1997—was better (and later used by Apple), as was the open-source Ogg Vorbis format, released in 2000 and free to use (it is now used by Spotify, among others). Microsoft introduced their own format in 1999 (WMA), perhaps to avoid paying Fraunhofer licensing revenues. But players that bucked the increasingly popular MP3 standard had a hard time gaining any traction. Sony joined the digital audio player market in 1999 with their Vaio MP-P10 Music Clip. Despite its innovative design and small size, it did not natively support MP3 (it used Sony's proprietary ATRAC3 format and included MP3 to ATRAC3 conversion software) and was a failure. Sony tried again in 2003 with the NW-MS70D, but it also did not natively support MP3 and failed. It was not until 2005's Sony NW-HD5 that Sony released a player that supported MP3<sup>16</sup>. The same problem that had dogged MP3 in the beginning—no one wanted to introduce a player that had no music and no one wanted to encode music in a format that no one could play—now worked in MP3's favor: if all of your music was already in the MP3 format, why would you buy a player that used a different one?

<sup>13</sup> <https://spectrum.ieee.org/tech-history/silicon-revolution/chip-hall-of-fame-micronas-semiconductor-mas3507-mp3-decoder>

<sup>14</sup> Akiba Hotline!, 5/1/1998. Retrieved from <https://akiba-pc.watch.impress.co.jp/hotline/980501/mpman.html>

<sup>15</sup> Smith Tony, "Ten years old: the world's first MP3 player", The Register, 3/10/2008. Retrieved from [https://www.theregister.co.uk/2008/03/10/ft\\_first\\_mp3\\_player/](https://www.theregister.co.uk/2008/03/10/ft_first_mp3_player/)

<sup>16</sup> Much of the preceding data came from Ødegård, Andreas, "Celebrating 10 Years of MP3 Players", March 31, 2008. Retrieved from <http://anythingbutipod.com/2008/03/10th-anniversary-of-the-mp3-player/> on 2/1/2014.

**Table 1: Some Digital Audio Players Supporting the MP3 Format**

<b>Manufacturer/Distributor</b>	<b>Model</b>	<b>Date Released</b>	<b>Capacity</b>
<b>SaeHan</b>	MPMan	Spring 1998	32 MB
<b>Eiger</b>	MPMan	May 1998	32 MB
<b>Diamond Multimedia</b>	Rio	September 1998	32 MB
<b>Sensory Science</b>	RaveMP 2100	Mid 1999	64 MB
<b>Creative Labs</b>	NOMAD	June 1999	32 MB
<b>HanGo/Compaq</b>	Personal Jukebox	1999	4.8 GB
<b>I2Go</b>	eGo	2000	2 GB
<b>Creative</b>	NOMAD Jukebox	2000	6 GB
<b>Cowon</b>	iAudio CW100	October 2000	
<b>Archos</b>	Jukebox 6000	December 2000	6 GB
<b>Intel</b>	Pocket Concert	2001	128 MB
<b>Bang &amp; Olufsen</b>	BeoSound2	2001	128 MB
<b>Apple</b>	iPod	October 2001	5 or 10 GB
<b>Archos</b>	Jukebox Multimedia	2001	10 or 20 GB
<b>Creative Labs</b>	Muvo	2002	64 or 128 MB
<b>Apple</b>	iPod 2 <sup>nd</sup> Generation	2002	10 or 20 GB
<b>Creative Labs</b>	Nomad Jukebox Zen	2002	20 GB
<b>Creative Labs</b>	Nomad Jukebox Zen	2003	60 GB
	NX/Xtra		
<b>Creative Labs</b>	MuVo NX	2003	128 or 256 MB
<b>Apple</b>	iPod 3 <sup>rd</sup> Generation	2003	40 GB
<b>Diamond</b>	Rio Karma	2003	20 GB
<b>Microsoft</b>	Zen Portable Media Center	2004	
<b>Apple</b>	iPod Mini	2004	4 GB

### **The Recording Industry Backdrop**

“Home Taping is killing music.”

- Logo of the British Phonographic Industry’s 1981 anti-piracy campaign

Home taping did not end up killing music, but the recording industry has never not been paranoid about piracy, the illegal copying of music for distribution. Music piracy was not invented by MP3 aficionados, but the combination of perfect digital copies and worldwide, instant internet distribution made the problem several times more acute.

Cassette tapes meant for audio storage were introduced in the 1960s. Early sound quality was poor, but advances in technology meant that by the early 1970s, cassette tapes rivaled eight-track tapes in sound quality. Not coincidentally, the International Federation of the Phonographic Industry pushed through the first anti-piracy measure, the Geneva Phonograms Convention. During the recession of the late '70s and early '80s, the IFPI tied the decline in record industry revenues to the increased sale of cassette tapes and recorders.

## ITUNES AND THE BASIS OF COMPETITION

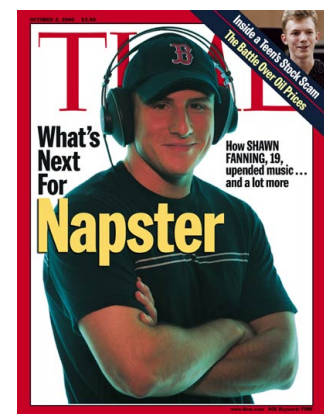
But the possible impact of tape recording on record sales was fundamentally limited by the technology: a tape had lower quality than its vinyl source, a tape of a tape lower still. The distance between the listener and the original purchaser could not be high. Regardless, the IFPI estimated piracy at 11% of the total market in the US and Canada in 1982 and higher elsewhere. So when consumer digital audio recorders started to become available in 1987 with the release of Sony's Digital Audio Tape (DAT) standard, creating the potential for flawless duplication, the recording industry pushed back: the Recording Industry Association of America (RIAA) began lobbying for legal protection. The result, in the US, was the Audio Home Recording Act of 1992 (AHRA) that, among other things, mandated a Serial Copy Management System to be built into all digital audio recorders. This SCMS chip prevented second-generation recordings. AHRA also levied fees on DAT recorders and blank media to be distributed to the existing recording industry. This crippled the market for DAT and it never caught on among consumers outside of Japan. The personal computer industry successfully lobbied to have personal computers exempted from AHRA, not a huge concession at the time given how small the PC market was.

Five years later, the cheap availability of both encoding and decoding software and the exemption of PCs from AHRA laid the groundwork for the growth of MP3s on PCs. Early digital audio enthusiasts were limited because without widespread access to CD burners and with no MP3 players yet on the market, songs had to be listened to on a desktop computer, they could not be played in the car or while running, or anywhere else that people listened to music. And the rarity of high-bandwidth consumer connections to the internet in the 1990s meant that even a 3 MB MP3 file was difficult and time-consuming to share. CDs were still a better way to consume music.

But when the Diamond Rio MP3 player came on the market in the Fall of 1998, this all changed. The RIAA decided to nip the phenomenon in the bud. The Rio had no SCMS chip, and the RIAA contended that it thus violated the Audio Home Recording Act. But by June of 1999 the courts ruled that since the Rio was only a storage device, not a recording device, it did not fall under the Act. Between the exemption for PCs and the failure of the RIAA to prevail in the Diamond lawsuit, the MP3 player market was entirely legal.<sup>17</sup> In fact, the publicity generated by the lawsuit seemed to spur MP3 player sales.

The RIAA was not done yet. Unable to regulate the devices themselves, they went after the distribution channels. By 1999 the largest source of "shared" MP3s was Napster.

Napster was developed by Shawn Fanning, a college student at Northeastern University. Released in June 1999, Napster allowed its users to find MP3 files on other users' computers and make copies of them over the Internet. The number of Napster users started to grow rapidly soon after its release (see Chart 1) and it quickly became a phenomenon. Time Magazine put Fanning on its cover in October of 2000.



The band Metallica sued Napster in 2000, after finding a copy of one of their unreleased

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<sup>17</sup> Recording Industry v. Diamond Multimedia Systems, 180 F. 3d 1072 - Court of Appeals, 9th Circuit 1999.



singles available through the system.<sup>18</sup> The RIAA also rounded up several record companies to sue Napster for aiding in copyright infringement.<sup>19</sup> Fans seemed less than sympathetic to the wealthy rockstars: “Why should I feel guilty for downloading MP3s—I’ve seen all their concerts, I own all the CDs, I’ve bought T-shirts—they’ve got my money already” said one.<sup>20</sup> A preliminary injunction, essentially shutting down Napster, was granted in February 2001 and Napster usage declined rapidly. But other file sharing systems quickly took its place. This new generation of file sharing sites like Limewire, Grokster, and Kazaa and file-sharing protocols like gnutella, FastTrack, and BitTorrent did not have central servers for indexing and peer discovery, as Napster did. They could not easily be shut down by court order.

Despite the record industry’s successful efforts in suing the creators of the file-sharing clients, the decentralized nature of the new systems meant that the RIAA was playing whack-a-mole with the file-sharers. Millions of people downloaded or shared music in violation of copyright. A 2003 Pew Internet & American Life Survey found that 29% of internet users had downloaded music files to their computer. Of these, 67% said they did not care that the music they downloaded was copyrighted:

Americans’ attitude towards copyrighted material online has remained dismissive, even amidst a torrent of media coverage and legal cases aimed at educating the public about the threat file-sharing poses to the intellectual property industries. Consumers argue, in some news reports, that downloading simply supplements their regular music purchasing habits or serves as a form of sampling new music. Some consumers have also been quoted as saying that the prices of CDs and DVDs are too high with too little profit going to the artists, while others say the music they want simply isn’t available offline because it is out-of-print or otherwise hard to find. Still others say that they are entitled to make “fair use” of the music they purchase by sharing it with friends over these networks.<sup>21</sup>

Album sales fell precipitously.<sup>22</sup> In response, the RIAA began to sue individual file sharers in 2003. While a publicity disaster, this effort arguably seemed to have some impact on file-sharing (see Liebowitz, *op cit.*) but industry revenues did not respond.

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<sup>18</sup> For every Metallica, there was a David Bowie:

“A few days ago a kid downloaded one of my songs from my Web site. He re-recorded it at home, changing the bits that he didn’t like and then put up his version on his own site. The new version is written his way, with changes to the melodies and some of the lyrics and it is available as an MP3. It is unbelievable. If he can do that, imagine what can happen in the future,” Bowie said. “Of course a lot of artists are absolutely terrified by the idea, but I love it because I love process. To me, the end result is not nearly as interesting as the process of getting involved in something.”

Brown, Janelle, “Ch-ch-ch-changes: Bowie loves MP3”, Salon.com, January 19, 1999. Retrieved from [http://www.salon.com/1999/01/18/log\\_15/](http://www.salon.com/1999/01/18/log_15/)

<sup>19</sup> [http://en.wikipedia.org/wiki/A%26M\\_Records,\\_Inc.\\_v.\\_Napster,\\_Inc.,\\_114\\_F.Supp.2d\\_896](http://en.wikipedia.org/wiki/A%26M_Records,_Inc._v._Napster,_Inc.,_114_F.Supp.2d_896)

<sup>20</sup> Simon, Richard B., “Metallica’s Anti-Napster Crusade Inspires Backlash”, MTV News, 5/31/2000. Retrieved from <http://www.mtv.com/news/971500/metallicas-anti-napster-crusade-inspires-backlash/>

<sup>21</sup> Lenhart, Amanda and Mary Madden, “Music Downloading, File-sharing and Copyright”, Pew Research Center, July 31, 2003. Retrieved from <http://www.pewinternet.org/2003/07/31/music-downloading-file-sharing-and-copyright/>

<sup>22</sup> Although, as Sterne says, “We should not be too quick to accept this simple explanation. The record industry is prone to crisis. In the late 1970s, sagging profits were blamed on the failed promise of disco and on lost profits from home taping. Between roughly 1990 and 2000, record-industry profits were artificially elevated by format changes and resale and repackaging of back catalogues. Once lp collections were replaced by cds this market dried up and, with it, a substantial portion of industry profits. Some have argued that the failure to agree on a high-definition audio standard to supersede the compact disc must also be considered a part of the crisis. Experimental high-definition formats like hddc and dvd-a found

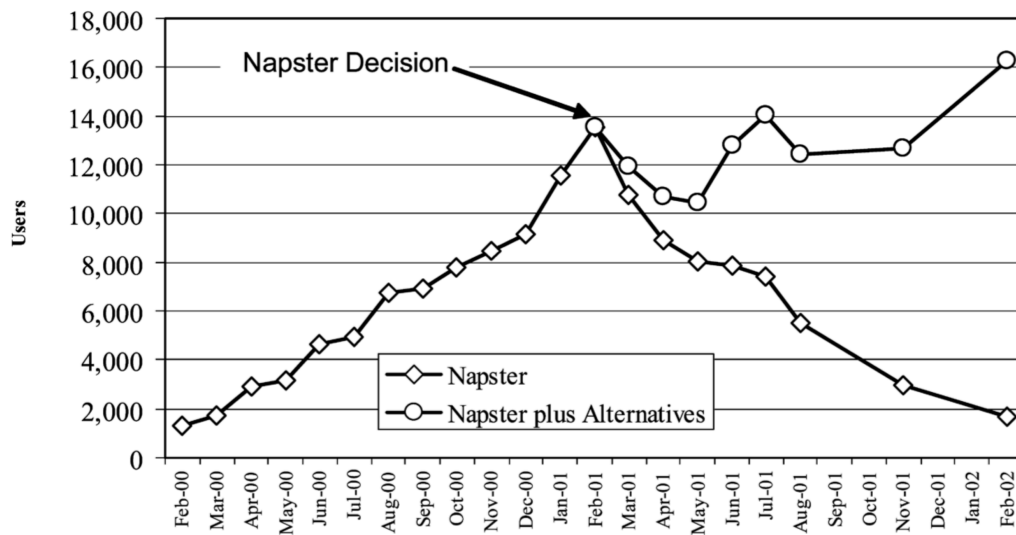
Chart 1: Number of Users of File Sharing Services<sup>23</sup>

FIGURE 1.—American file sharers at home (1,000s)

With many people, some in the record companies themselves, saying that file-sharers obtained digital music files illegally because there was no legal alternative, the record companies tried, starting as early as 1998, to provide an alternative to MP3. They formed the Secure Digital Music Initiative (SDMI) to provide digital watermarking so that shared files could be traced back to the source.

Microsoft released MS Audio 4.0 in 1999 claiming that it was faster than MP3 and had digital rights management (DRM) that would foil copiers. But the record companies were wary of Microsoft's intentions, not wanting to lose control of distribution. As the New York Times' Neil Strauss put it: "They just do not want Microsoft in their business."<sup>24</sup>

Also in 1999, RealNetworks announced their RealJukebox software. RealJukebox ripped CDs and allowed users to download songs from the Internet. It used DRM technology built by AT&T and IBM. The record industry was not supportive of Real either. RealJukebox still allowed the user to play MP3 files; RealNetworks had tried to please both the consumers--by supporting the leading format--and the record companies--by supporting a DRM format. As a result, neither was impressed.

The record companies had placed their hopes in the SDMI initiative. But the SDMI was unable to meet the technical challenges of creating a secure audio format and could not convince the hardware makers to go along with it. The SDMI made no real progress and

no commercial success, so no new avenue exists for the back-catalogue business that propped up sales figures in the 1990s." Sterne, op cit., p. 185.

<sup>23</sup> Liebowitz, Stan J., "File Sharing: Creative Destruction or Just Plain Destruction?", Journal of Law and Economics, Vol. 49, No. 1 (April 2006), pp. 1-28.

<sup>24</sup> Strauss, Neil, "Record Companies Are Wary of New Microsoft Technology", New York Times, April 12, 1999. Retrieved from <http://www.nytimes.com/1999/04/12/business/record-companies-are-wary-of-new-microsoft-technology.html>



seemed to disappear by 2001. Instead the record companies tried to launch their own digital music services.

**Chart 2: Per Capita Album Sales (including digital purchases)**<sup>25</sup>

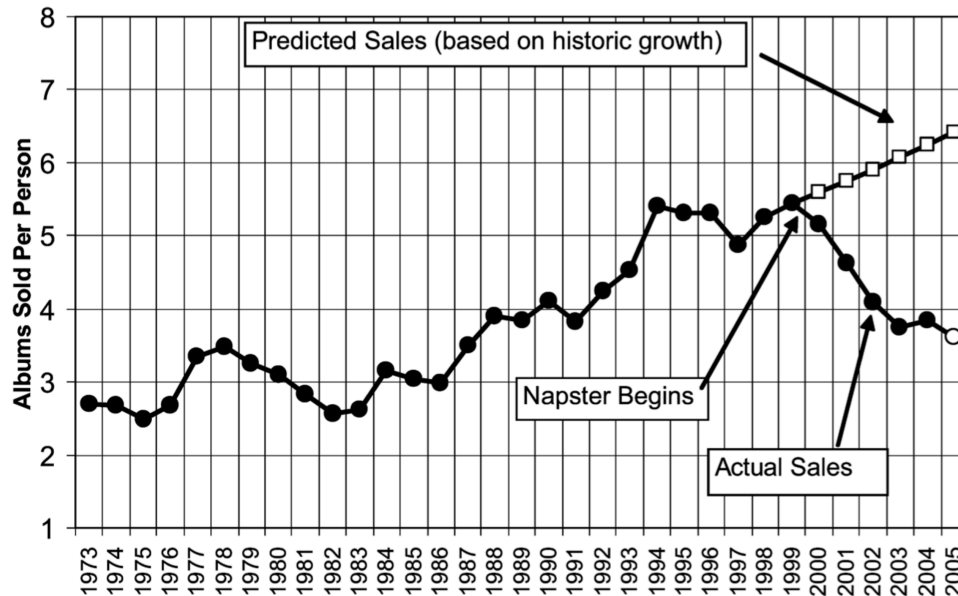


FIGURE 3.—Albums sold per capita

Two label-backed online music stores/software clients were launched in 2002. Pressplay was backed by Vivendi Universal and Sony. MusicNet was backed by the other three major labels: AOL Time Warner, Bertelsmann, and EMI. Both products were the result of internal compromises at the labels. This ambivalence can be seen in the resulting software. As PC Magazine said, in their article “The 25 Worst Tech Products of All Time”<sup>26</sup>:

Digital music is such a great idea that even record companies finally, begrudgingly accepted it after years of implacable opposition. In 2002, two online services backed by music industry giants proposed giving consumers a legitimate alternative to illegal file sharing. But the services' stunningly brain-dead features showed that the record companies still didn't get it.

PressPlay charged \$15 per month for the right to listen to 500 low-quality audio streams, download 50 audio tracks, and burn 10 tracks to CD. It didn't sound like an awful deal, until you found out that not every song could be downloaded, and that you couldn't burn more than two tracks from the same artist. MusicNet cost \$10 per month for 100 streamed songs and 100 downloads, but each downloaded audio file expired after only 30 days, and every time you renewed the song it counted against your allotment.

<sup>25</sup> Liebowitz, Stan J., op cit.

<sup>26</sup> Tynan, Dan, “The 25 Worst Tech Products of All Time”, PC World, May 26, 2006. Retrieved from [http://www.pcworld.com/article/125772/worst\\_products\\_ever.html?page=0](http://www.pcworld.com/article/125772/worst_products_ever.html?page=0)

Each of the services had music just from its own backer labels, so subscribing to one meant the user only had a 50/50 chance of hearing the song they wanted. The services were never widely used and the record companies abandoned them in 2003.

### Apple<sup>27</sup>

At the turn of the century Apple had a problem. The personal computer had become a commodity; Apple's revenue had fallen from its high of \$11 billion in 1995 to \$5.4 billion in 2001 (see Chart 5). But Steve Jobs had a vision. Apple's mission would be to make the personal computer the "digital hub" of the home. Televisions, stereos, cameras, and any other device that processed digital information would connect to it. Photos, videos, and music would come and go from the computer to all these ancillary devices.

Jobs was a notorious micro-manager. For any new product to meet his exacting standards Apple needed to control it. If Apple computers were to be the centerpiece of the digitally connected home, then Apple would have to write the software to run the connected devices, and even make the devices themselves. Apple would be end-to-end.

Jobs' desire for control was more than perfectionism, it was strategic. He knew that one of the primary customer complaints about personal computer peripherals—any devices, even devices like printers whose entire purpose is to be connected to computers—was that they were difficult to get working. By owning the entire end-to-end system, he could make the experience seamless. Also, if much of the functionality that was on the device (editing, organizing, managing storage) was done on the computer instead, the device itself could be much simpler and more elegant.

The first piece of this strategy was video. Between the FireWire interconnection standard, iMovie, iDVD, and a DVD burner, Apple users could make their own movies. Apple did not need to make camcorders because they judged those on the market to be sufficiently good already. The next piece would be music. Jobs saw the popularity of CD burners and how the existing digital music software was so bad it was holding back the market.

In July 2000, Apple negotiated an exclusive license for SoundJam, software written by ex-Apple engineers and distributed by small publisher Casady & Green. Apple hired the SoundJam developers to turn it into a Rio music manager for the Mac. Jobs worked with the SoundJam team to strip down the software and make it simpler. In January 2001 the software, renamed iTunes, was launched.

Unlike camcorders or digital cameras, the Apple team did not like the existing MP3 players. They were either small with too little storage, or large and clunky. The only ones they thought were any good were the ones based on the new 2.5-inch hard drives from Fujitsu. But they all used USB to transfer music at a much slower rate than FireWire, had awful user interfaces, and minimal battery lives. Apple started to look into making their own.

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<sup>27</sup> Much of this section is from Walter Isaacson's 2011 book *Steve Jobs*, chs. 30-31, and from Kahney, Leander, "Straight Dope on the iPod's Birth", *Wired*, October 17, 2006, retrieved from <http://www.wired.com/gadgets/mac/commentary/cultofmac/2006/10/71956>

Jon Rubenstein of Apple was in charge of building it. He found the right screen and the right batteries. Then in February of 2001 he visited Toshiba in Japan where they showed him their new 1.8-inch hard drive. They had no idea what it could be used for. Without letting Toshiba know what he planned to do with them, Rubenstein negotiated exclusive rights to all of the 1.8-inch drives they could produce.

Apple built very few of the iPod's components: the reference design was licensed from a small company called PortalPlayer, the iPod operating system from another small company called Pixo, off-the-shelf parts included a battery from Sony and chips from Texas Instruments. An Apple engineering team integrated the pieces. The challenge was understanding and engineering around the deficiencies of the existing players. For instance, to extend the battery life, Apple created a 32 MB memory buffer so the hard drive could be spun down until needed.

The device itself was designed to feel solid, not a cheap plastic toy like its competitors. And the user interface was simplified to its bare essentials: the scroll wheel. Any functions too complicated for the scroll wheel, like making playlists, could be done in the iTunes software.

The iPod was introduced to the public on October 23, 2001, with 5GB of storage and priced at \$399. It only worked with the Macintosh, less than 4% of the U.S. computer market at the time.<sup>28</sup> By the Summer of 2002 the price for the 5GB model had come down to \$299 and a 10GB and 20 GB model were introduced.

The next step was to get rid of the clunky process of getting digital songs. Buying CDs and then ripping them seemed inefficient. The existing digital download sites (legal and illegal) were inelegant or incomplete. Jobs wanted to build an iTunes store.

As part of the SDMI initiative, executives from AOL Time Warner came to Cupertino in January 2002 to ask Apple to be part of their consortium. They began their presentation to Jobs and got four slides in before he interrupted them by telling them, in his inimitable way, "You have your heads up your asses." Steve Vidich, the AOL Time Warner lead, gamely replied, "You're right. We don't know what to do. You need to help us figure it out." Jobs agreed to work with them.

Seeing the label-initiated stores fail, Jobs decided to build his own. He knew he needed to convince the labels, all of them, to let him offer their music for it to succeed. Apple wanted to sell each song individually for \$0.99. Apple would keep 30%, the labels would get 70%. The price was about right, but the labels balked at selling songs individually: they had built a business selling whole albums on the back of one or two good songs.

Jobs had two good arguments to use with the labels: because iTunes/iPod was end-to-end, Apple was in a unique position to prevent piracy through effective DRM; and the Macintosh installed base was so small that if the experiment did not work, then little harm was done. While Microsoft ended 2000 with \$23 billion of revenue, nearly 40,000 employees, and a market capitalization of \$231 billion, Apple was comparatively tiny, with revenue of \$8

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<sup>28</sup> Wilcox, Joe, "Apple: Looking for a few good converts", CNet, March 26, 2002. Retrieved from <https://web.archive.org/web/20020612135104/http://news.com.com/2100-1040-869160.html>

billion, fewer than 9,000 employees, and a market cap of \$5 billion.<sup>29</sup> Apple was hardly the threat Microsoft was.

Jobs convinced all of the labels except Sony. As a hardware maker and a record-label owner, Sony had hoped that they would be the end-to-end provider. Eventually, once all the other labels had signed on, Sony felt obliged to follow.

On April 28, 2003, Apple unveiled the iTunes Store. It soon became clear that the system was popular with customers and Apple decided it needed to broaden its market. In October 2003, after another round of negotiations with the labels, Apple announced iTunes for Windows.

In 2004, there were more than 50 different models of MP3 players being sold. But the competition to own the MP3 player market was already over, even though not everyone knew it yet. Apple had more than 65% market share in the United States (some estimates place it at close to 75%), a share it maintained through 2012.<sup>30</sup> Apple ceased selling iPods in 2017.<sup>31</sup>

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<sup>29</sup> Apple Inc. 2000 Annual Report, Microsoft 2000 Annual Report, market cap data via CRSP.

<sup>30</sup> “iPod still has 70% of MP3 player market”, MacTech, 7/24/2012. Retrieved from <http://www.mactech.com/2012/07/24/ipod-still-has-70-mp3-player-market>

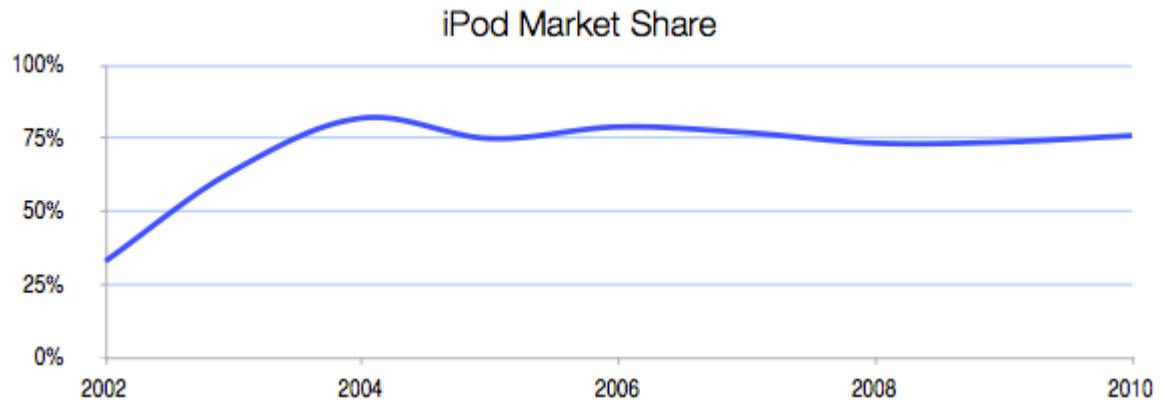
<sup>31</sup> “Goodbye iPod and Thanks for all the Tunes”, Wired, 2/27/2017. Retrieved from <https://www.wired.com/story/goodbye-ipod-and-thanks-for-all-the-tunes/>

**Table 2: Sales of MP3 Players<sup>32</sup>**

MP3 sales\year	1998	1999	2000	2001	2002	2003	2004	2005
Global sales – units (millions)	0.17	0.70-0.84	2.42	NA	NA	14	40	140
US sales – units CEA estimates (millions)	NA	0.500	0.510	0.724	1.737	3.031	7.13	24.8
US market CEA <sup>a</sup> (US\$ million)	NA	80	80	100	178	425	1,290	4,230
iPod global sales – units (million)	–	–	–	0.125	0.531	1.413	8.263	31.96
iPod global market share (percent)	–	–	–	NA	NA	10	20.1	22.8
iPod US market share (percent)	–	–	–	2.3	15.7	31	65	66

**Note:** Millions of units

**Chart 3: iPod US Market Share<sup>33</sup>**



<sup>32</sup> Abel, Ivan, "From technology imitation to market dominance: the case of iPod". Retrieved from [www.emeraldinsight.com/1059-5422.htm](http://www.emeraldinsight.com/1059-5422.htm)

<sup>33</sup> Thompson, Ben, "Apple and the Innovator's Dilemma", Stratechery. Retrieved from <http://stratechery.com/2010/apple-innovators-dilemma>

Chart 4: iPod Sales

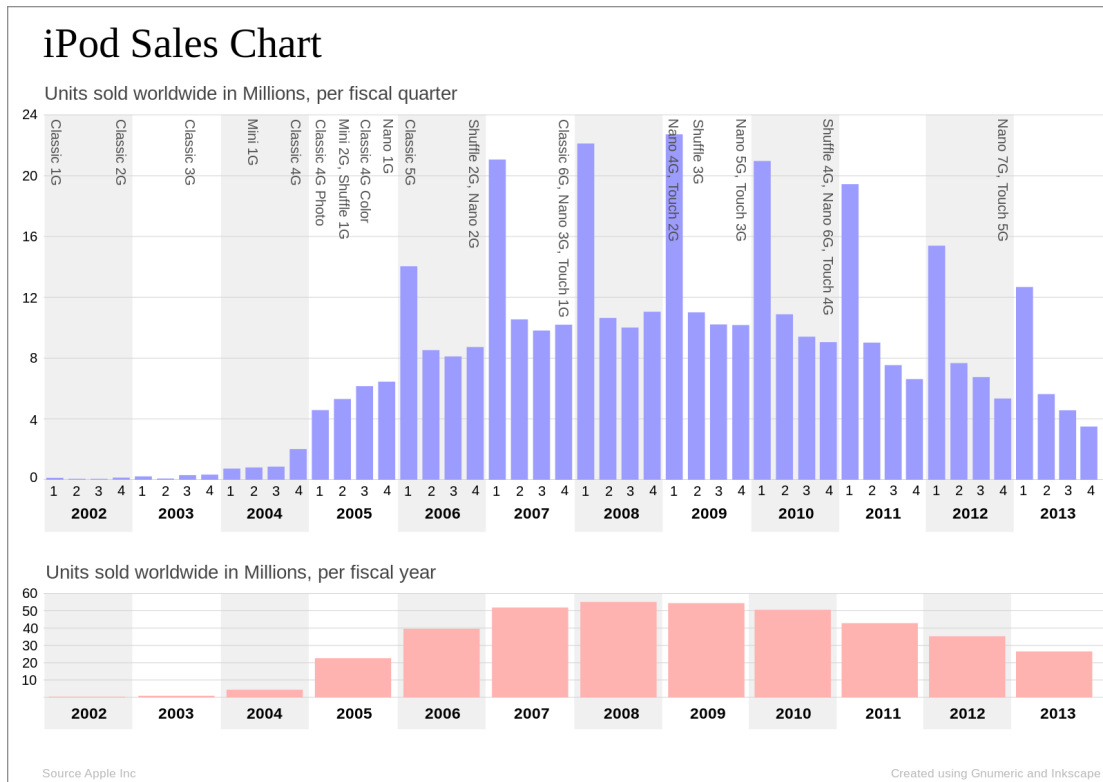
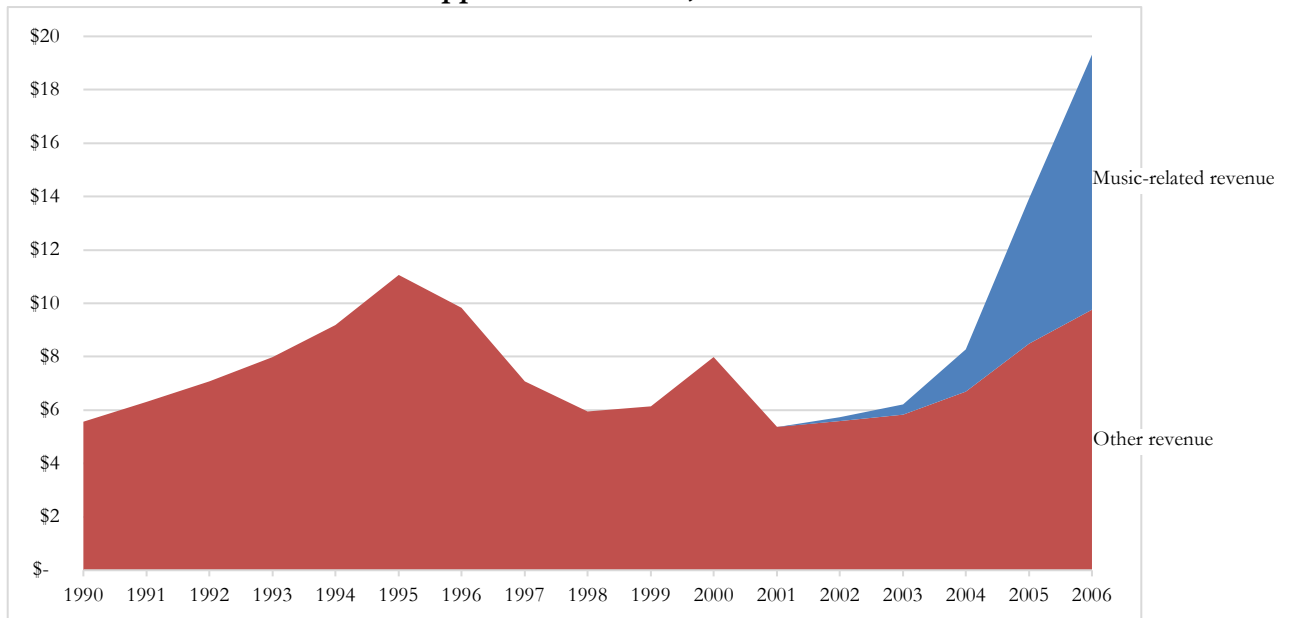


Chart 5: Apple Inc. Revenue, in billions<sup>34</sup>



<sup>34</sup> Apple Annual Reports.

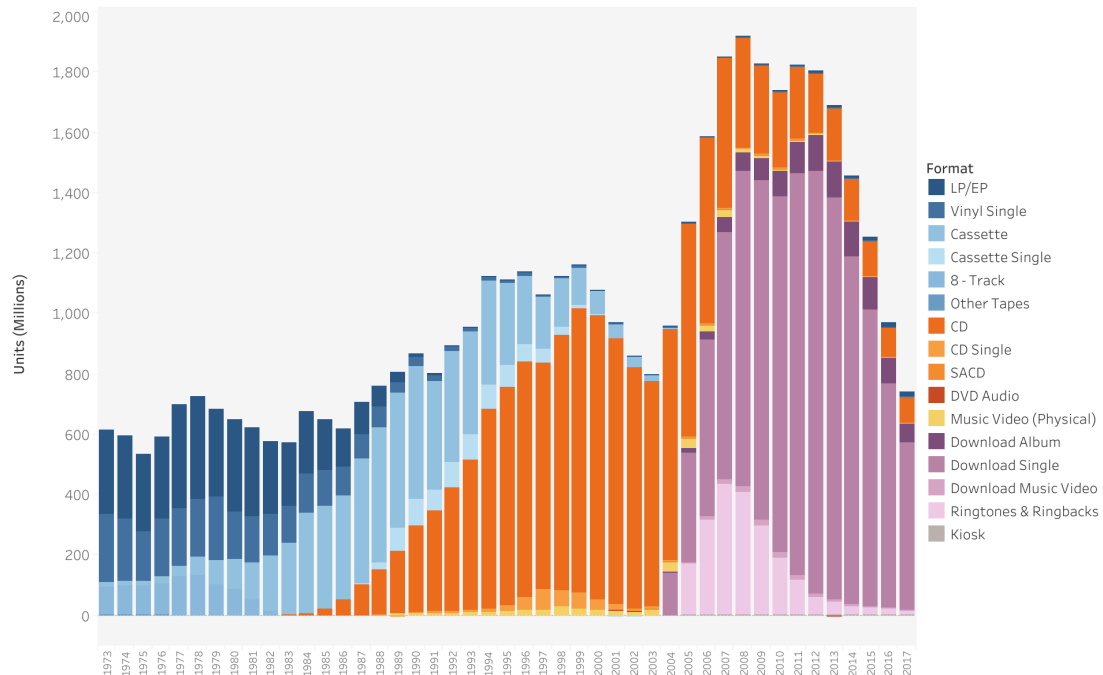


Chart 6

**U.S. Recorded Music Sales Volumes by Format**

1973 to 2017, Format(s): All

Source: RIAA



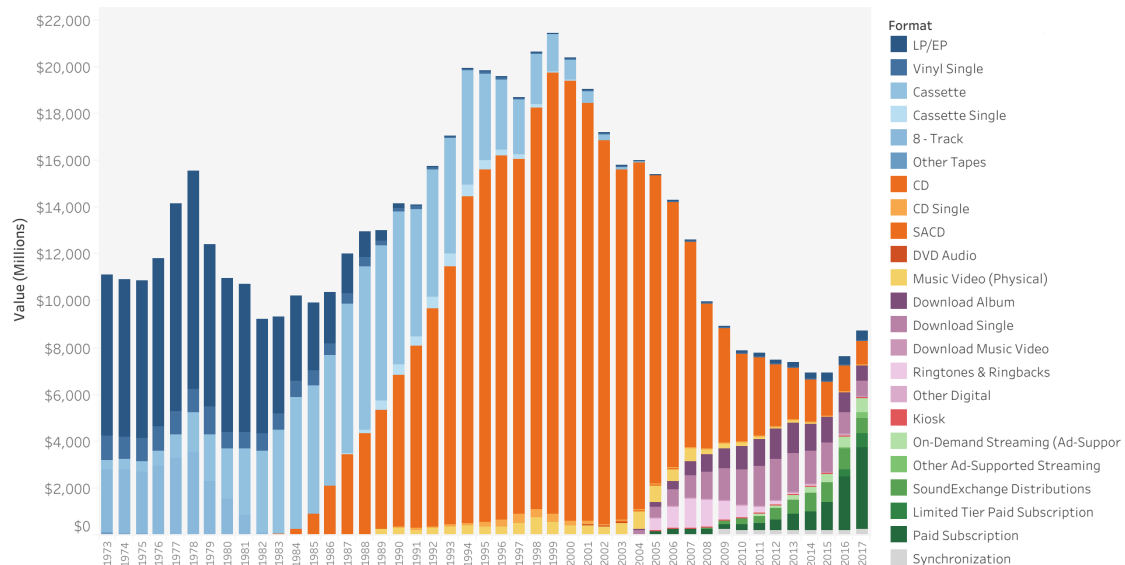
Source: RIAA, <https://www.riaa.com/u-s-sales-database/>, Retrieved October 18, 2018.

Chart 7

**U.S. Recorded Music Revenues by Format (Adjusted for Inflation, 2017 Dollars)**

1973 to 2017, Format(s): All

Source: RIAA



Source: RIAA, <https://www.riaa.com/u-s-sales-database/>, Retrieved October 18, 2018.

Questions

1. a. What was basis of competition before iPod? After iPod?  
b. Is the basis of competition now the same as it was in 2005? Why have iPod sales declined since 2010?
2. Why did the iPod become the dominant design in the MP3 player market? What technologies came together, what complementary assets, what strategic maneuvering, what understanding of the user?
3. Was the iPod disruptive? Why did the record labels and other electronics manufacturers not dominate the market before the iPod or displace Apple afterwards?