

The Short Life, Slow Death, and Broad Impact of Betamax
Jonah Volk
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Looking back at the history of video in the 1970s and 80s, it could be all too easy to see a format like Betamax as simply a failure, a briefly-successful format that was quickly swept away by VHS. Indeed, its name alone is often used as a one-word cautionary tale; the worst thing anyone can say about a new technology is that it is “the next Betamax.” And yet, despite its short time in the spotlight, Betamax is linked to an inordinate amount of important technological, social, and even legal developments. By examining this format and its history, it becomes clear that Betamax truly did represent a technological breakthrough, that the usage patterns that were popularized by Betamax (notably time shifting, librarying, and the sale, rental and viewing of pre-recorded cassettes) are a crucial part of today’s media world, and that, in some ways, the story of Betamax is the story of home video development.

When Betamax was released in 1975, it was the culmination of a series of attempts by a variety of companies, both American and Japanese, to develop a home videocassette player. The late 1960s saw the development of several non-magnetic technologies which were pointed in this direction – Electronic Video Recording (EVR) from CBS and RCA SelectaVision, aka HoloTape – but none of these caught on in the marketplace. (“In the Sixties”, “The Quest for Home Video”) The first major step was taken by Sony, the Japanese corporation previously known for transistor radios, Trinitron monitors and CV video, when it came out with the U-matic deck in 1971. The first videocassette technology to reach the market, U-matic featured ¾-inch magnetic tape and

used a newly-developed loading system called U-load, wherein the tape is pulled from the cassette by pins and wrapped around the drum in a sideways U shape. U-loading was the solution to one of the primary problems that cassette developers had had to overcome – bringing the tape into the player and allowing both the supply and take-up reels to be contained within the cassette – and it would be used later in Betamax as well.

Despite Sony's hopes for its new format, U-matic never caught on in the home market. Both the tape deck and the cassettes were too large and too expensive for most consumers – the cheapest decks cost over \$1000 and the tapes were \$30 apiece. (Lardner 73) However, U-matic did become a success in the professional realm, particularly after the 1973 development of a cheap digital time-base corrector by Consolidated Video Systems, and Sony soon switched their development and marketing strategies to match. In particular, the format became widely used for capturing news after CBS used a U-matic camera to videotape President Nixon's trip to Moscow in 1974. (Lardner 73)

A number of other home videocassette formats were released in the early 1970s, including V-Cord from Toshiba and Sanyo and a product by Philips, but two technologies are particularly worth mentioning for their impact on later formats: Cartrivision and AutoVision. (Lardner 92) The former was introduced in 1972 by Cartridge Television, Inc. in cooperation with Avco, the only American companies to crack the home video market during these years. A ½-inch magnetic tape format with a recording time of up to two hours, its major selling point was the introduction of a new concept in home video: pre-recorded video rentals. The manufacturers made deals with Hollywood studios, meaning that for the first time, consumers could rent cassettes containing major studio

releases.¹ However, Cartrivision was beset by a bevy of technical and marketing problems, culminating in the mysterious disintegration of the company's entire stock of pre-recorded tapes in a warehouse, and by late 1973, Avco had pulled the plug and Cartridge Television filed for bankruptcy. (Greenberg 47-48) During this same time period, Matsushita, a Japanese electronics company known for its Panasonic brand, released AutoVision. The cassettes were smaller and cheaper than U-matic, but the tapes only held half an hour of video. When the format soon failed, Matsushita execs attributed this disappointment to the tapes' short running time, learning a lesson that they would apply to their next entry into the home video market later that decade. (Lardner 92)

It was in this climate of failure that Sony released its new video format in the spring of 1975. Dubbed Betamax by its designer Nobutoshi Kihara, it was named after a Japanese calligraphy term for a full brushstroke without any gaps, a reference to the fact that the format used the entire surface of the tape (see below on the elimination of guard bands). (Morita 168) Learning from the failure of U-matic in the home market, Sony attempted to make Betamax cassettes and decks smaller than the earlier format. As a result, Betamax cassettes measure 6 1/8" x 3 3/4" x 15/16", roughly the size of a paperback book, and they contain 1/2" videotape. The initial Betamax deck weighed 40 pounds, as compared to the U-matic's 60. The engineers compensated for the small cassette size by decreasing the tape thickness to 20µm (U-matic: 27), shortening the recorded wavelength to 1.45µm (U-matic: 1.9), and as mentioned above, eliminating the guard band, a gap between tracks used on previous videotape formats to prevent crosstalk, a form of

¹ In fact, the pre-recorded tapes could only be rewound on in-store equipment, purposely limiting them to one viewing per rental.

interference between tracks. (Kihara 26) Instead of a guard band, which in U-matic tape was 52 μ m wide, the Betamax system eliminates crosstalk through the deck technology, utilizing a slanted azimuth recording system, wherein two rotating heads are skewed in opposite directions, ensuring that each head could only read the tracks that it was meant to read. (Kihara 27-28) Thanks to these engineering breakthroughs, the original Betamax cassettes could record one hour of video, the same as the much larger U-matics. (Shiraishi 1260) Betamax playback displayed 250 lines of resolution and 30 lines of chroma resolution.

Betamax videotape consists of a polyester base with magnetic particles of either chromium oxide (as with U-matic) or cobalt-doped iron oxide. (Shiraishi 1260) It is unclear from the literature whether Betamax tapes utilized only one of these configurations or used both at different times, and the manufacturers have rarely been forthcoming with this information, regarding it as a trade secret. The binder and lubricating material are likewise secret, but were carefully formulated to prevent the tape from sticking to the head drum, a common problem with very thin tape. (Kihara 27) As mentioned earlier, Betamax decks use a U-load system, in which the tape is wrapped almost completely around a rotating drum containing two heads. The tape is read and recorded in a helical pattern and the standard tape speed is 40 mm/s. (Kihara 35) Finally, all early Betamax decks keep the tape wound around the drum at all times, even when the tape is paused and during rewind and fast forward operations. (Prentiss, 38)

When Betamax was first introduced in the US in 1975, the only deck model offered was the SL-6200, which came attached to a Trinitron television (the complete product was known as the LV-1901) and cost \$2295. Shortly thereafter, in February

1976, the first standalone Betamax deck was put on sale: the SL-7200, which sold for the more reasonable price of \$1295, and which became the first successful home VCR.

(BetaInfoGuide) Indeed, the Betamax became an instant hit as soon as it hit the market. One dealer recalled that the tapes “flew off the shelf” and that there were “so many wealthy people who wanted to be the first in the neighborhood” to buy one. (Lardner 96) In all, Sony sold 30,000 Betamax decks in the US in 1975 and another 55,000 in 1976. (Klopfenstein 25) Blank tapes were also a hit – dealers found that consumers would often buy as many as twelve or fifteen blank tapes with their deck, many more than expected.

So what were people doing with their Betamax decks and all those blank tapes? After all, there were at that point no pre-recorded cassettes available to rent or purchase, nor had Sony released a Betamax camera. The answer lies in a concept that would soon become permanently associated with Betamax and that would redefine the way that people interacted with media: time shifting. The phrase was supposedly coined by Akio Morita in a meeting with Time executives, and it referred to the fact that ordinary consumers could, for the first time, tape a television program and watch it later. (Lardner 97) Every Betamax deck from the very beginning came with a built-in TV tuner and a timer, meaning that users could set a tape to record at a later point in time when they would not be around or tape one show while watching another. While the idea of time shifting was not invented by Sony – Hugh Hefner had installed open-reel video recorders in the Playboy mansion in the early 1970s to tape his favorite shows – the Betamax was the first home system to bring time shifting to the masses. (Greenberg 20) To quote Morita on the importance of time shifting: “Betamax will revolutionize television. It will

change the concept of prime time so that any time can be prime time.” While this prediction would be proven right, some of his other statements on this topic would prove less prescient, as when he claimed, “Telecasting companies will produce better programs when they know they are being recorded. And advertisers will demand better programs so their ad will be seen again and again on playback.” (Lyons 210-211)

As soon as Betamax began to sell, people at Sony realized that time shifting was their main selling point and began highlighting this in their advertising. Commercials featured people who worked at night (cab drivers, Dracula) talking about the fact that they could now watch their favorite shows because of Betamax. Other ads highlighted the fact that users would never again have to choose between watching two different shows that aired simultaneously – “With Sony’s Betamax, you won’t miss a thing.” (Lardner 97) The importance of the concept of time shifting to the future of video and television programming cannot be overstated. From videotaping to Tivo to Video-on-Demand to iTunes, time shifting has become a key component of today’s home video realm.

Of course, for a subset of users, basic time shifting would not be enough. For these devoted users, or videophiles as they would dub themselves, Betamax was the gateway to a new world of fandom, of video sharing and librarying, taping parties and video conventions. While most users were content to tape a show, watch it, and tape over it, these videophiles saw the value in taping shows and movies that aired on TV and saving the tapes, essentially creating home video libraries. In 1976, after buying his first Betamax deck, a small-time 16mm collector named Jim Lowe placed an ad in *Movie Collector’s World* asking if there were any readers who would be interesting in trading

Betamax movie tapes. When he received a few responses in the affirmative, he decided to publish *The Videophile's Newsletter*, the first issue of which came out in September 1976. (Greenberg 23) That issue contained his "Want List," with items like the episode of *Mary Hartman, Mary Hartman* "where Mary finally shows up at Sgt. Foley's apartment," along with some Betamax taping technical notes, and was intended to reach out to other videophiles and create a community. (3-4) In the second issue, sent out a month later, Lowe was already including other videophiles' want lists and was attempting to set guidelines for video trading (for example, "if one person lends out a tape for viewing and return, the lendeer should pay postage... both ways"). (4) Notably, this issue contains input by Marc Wielage, a videophile who would actually be subpoenaed in the Betamax case, and who would later become an amateur Betamax historian.

As the videophile and tape trading community grew, public meetups became more common. Videophiles met at taping parties or electronics conventions, where they would daisy-chain as many as a dozen Betamax decks together to make multiple copies of a single recording. Since HBO subscription at the time required a satellite dish, a rare commodity in homes, some collectors would check into hotel rooms with a Betamax deck if there was something worth taping, then share the tapes around. The atmosphere was collegial and cooperative – while everyone wanted to get the prestige of having recorded something that no one else had, they tended to be just as happy to share their wealth, so to speak, with the community. Debates arose about whether commercials should be taped or skipped, with some videophiles even using multiple decks to create a master tape with all the commercials gathered at the end of the tape as a sort of mini-archive. Of course, as often happens with niche communities, the videophiles were seen as being

representative of all Betamax users, even though *The Videophile's Newsletter* (later renamed to just *The Videophile*), never had more than 8,000 subscribers. (Greenberg 37) In particular, the owners of the content which the videophiles were sharing began to take a hard look at this developing community.

In September 1976, Sidney Sheinberg, the president of Universal Pictures, was sent a Betamax print ad. The ad extolled the virtues of time shifting, saying, “Now you don’t have to miss ‘Kojak’ because you’re watching ‘Columbo.’” These shows, which aired in the same timeslot on different channels were both produced by Universal. (Lardner 21) In fact, the ad executive who sent Sheinberg the ad thought that Sheinberg would be pleased – for the first time viewers wouldn’t have to choose between Universal’s two hit shows. This couldn’t have been further from Sheinberg’s actual reaction. A week later, Sheinberg met with Akio Morita and threatened to sue Sony unless the Betamax were removed from the market. Morita refused, apparently believing Sheinberg’s threat to be a bluff. On November 11, Universal sued Sony for copyright infringement, launching what would become known commonly as “the Betamax case.” (Lardner 34)

The case, formally known as *Universal City Studios v. Sony Corp* in its original incarnation in a California District Court, revolved around the practices of time shifting and librarying, specifically on whether Sony had been encouraging these acts. Sony’s time shifting-related advertising became evidence for the plaintiff, as did a deposition by *Videophile* publisher Jim Lowe, who confessed to having a copy of Universal’s *Psycho* which he had taped off TV. Marc Wielage was also brought into the case by Universal; he admitted to having a library of over 300 tapes, including Universal films. (Lardner

107) Jack Valenti, the president of the Motion Picture Association of America (MPAA) also testified against Sony, arguing against even simple time shifting by claiming that someone who taped a show at 8PM and watched it at 2AM would then be unable to watch the normal 2AM programming. In fact, Valenti would always be one of the most prominent and forceful opponents of Betamax and VCR technology; in 1982, when Congress was holding hearings on the issue, Valenti hyperbolically claimed that “the VCR is to the American film producer and the American public as the Boston Strangler is to the woman home alone.” (US House) In addition to these high-profile witnesses, Universal also commissioned a survey of LA-area Betamax owners, finding that 23% of them used their Betamaxes mostly for librarying. Sony countered with their own study which found that 75% of Betamax recordings were viewed only once. (Lardner 108) Finally, while Universal tried to argue that time shifting practices were also harming advertisers whose commercials were being skipped by time shifters, the judge ruled that any effect on the advertisers was irrelevant to the case.

In the end, the case was decided in October 1978, with the judge ruling decisively in favor of Sony, declaring that “home use recording from free television is not copyright infringement and even if it were, the corporate defendants are not liable.” (Lardner 121) And yet, Sony’s victory was short-lived, as the decision was overturned by a Court of Appeals in October 1981. The appeals court ruled that Sony had infringed Universal’s copyright, that Betamax was likely to have a negative impact on Universal’s revenues, and that “videotape recorders are manufactured, advertised, and sold for the primary purpose of reproducing television programming.” (Lardner 134) The case then entered its third and final incarnation in 1983 when it was heard before the Supreme Court.

Again, the issue at hand was “contributory infringement,” whether Betamax users were copyright infringers and, if so, whether Sony was responsible for this infringement. The verdict was announced on January 17, 1984: the Court ruled 5-4 in favor of Sony. In the majority decision, Justice John Paul Stevens wrote that contributory infringement can not be found to exist if a product has “substantial noninfringing uses,” and further that home time shifting does not constitute infringement. While Sony and time shifting had finally been vindicated and intellectual property law had been substantially altered, the video landscape had changed significantly in the seven years since the case had first been filed. The videophile community had dwindled away, Betamax had been reduced to a niche format in the world of VCR technology, and time shifting had been replaced by a new usage pattern: the purchase, rental and viewing of pre-recorded videotapes.

To address the last of these changes first, it is necessary to turn the clock back to 1977. Pre-recorded videotapes were not a new innovation; as mentioned earlier, Cartrivision had offered rental tapes which included a variety of Hollywood movies. However, with Cartrivision’s failure, the pre-recorded video market had been pushed to the side for several years as time shifting rose to the forefront. And while pre-recorded cassettes are generally linked with the rise of VHS, the early developments in the field were all connected to Betamax. In late 1976, a businessman named Andre Blay sent a letter to all the Hollywood studios proposing that he sell videos of Hollywood movies through his company Magnetic Video. Fox was the only studio receptive to the offer; they reached an agreement with Blay wherein fifty Fox films, including such recent hits as *Patton* and *The French Connection*, would be available for sale through Blay’s company for a cost of \$50-75 per cassette. (Greenberg 52-54) Even at these relatively

steep prices, the business was a success and in 1979, Fox bought out Magnetic Video and began distributing their own videos. From 1979-1982, every other Hollywood studio started a home video department to sell their material. (Wasser 96-97) At the same time, other entrepreneurs were going a different route with pre-recorded cassettes, opening up video rental stores with tapes they had bought from the studios. Ironically, by the time the Betamax case was decided, home video sales represented a major revenue stream for the studios. In the end, the technology that they tried to kill in its infancy became the studios' savior.

Amazingly, most of the developments mentioned up to this point took place during the span of about three years when Betamax dominated the home video market. By 1986, barely a decade after its introduction, Betamax occupied no more than a minor niche in the video industry. The reason, of course, was the famous format war between Betamax and VHS, a conflict that has entered technology lore. Still used as a shorthand reference for any technology-related format wars, it also carries with it a healthy load of misinformation. So what really happened and why, and is Betamax really better than VHS, as much anecdotal evidence claims?

First the facts: in June 1977, Matsushita, along with its subsidiary, the Japanese Victor Company (JVC), released a new home video format in the US (it had launched in Europe and Asia the previous fall). Known as Video Home System (VHS), the new format was in most respects very similar to Betamax. The cassettes contained ½" magnetic tape, they used the slant azimuth formatting, and they were played in decks which utilized a two-head helical-scan system. The formats were so similar that Sony executives were shocked when they first saw VHS at a meeting hosted by JVC in early

1976; to quote Morita, “It’s a copy of Betamax.” (Lardner 152) The first major difference between the two was in the loading system. Where U-matic and Betamax used the U-load, VHS used a system called M-load, where the tape is pulled from the cassette by two pins and pressed directly against the head drum, forming an M shape. (In fact, the M-load had been developed by Sony engineers during the design of the U-matic, and rejected because they thought that the two-pin system put undue stress on the tape.) (Lardner 152) Additionally, there were a number of small differences between the formats: VHS tape moved slightly slower through the tape path (33.35 vs. 40 mm/sec), the head drum was smaller (62 vs. 74.5 mm diameter) and the azimuth angle was different (6° vs. 7°). (Kihara 26, Shiraishi 469)

The second major difference, and the one which ended up being the most important, was the recording length. While Sony had done everything in their power to make Betamax cassettes as small as possible, Matsushita, having learned their lesson from the failure of AutoVision, realized that longer recording time was the key to success, particularly since they were coming into a market where Betamax was already established. As a result, when VHS launched in Europe and Asia, the cassettes were larger than Betamax, but they could record up to two hours of video to Betamax's one. By the time VHS reached the US, Matsushita, acting on the advice of its American partner RCA, had added a slower-speed feature which allowed four hours of recording, enough to tape an entire football game. (Wasser 73) While Sony would later try to make up for this disparity by increasing Betamax’s recording length, their gains were always met by VHS gains, with Matsushita always remaining ahead. Sony even released a Betamax automatic tape changing device to allow longer record times, but its clunky

design and high failure rate doomed it. In addition, Matsushita was able to price the first VHS decks at \$300 cheaper than Betamax. The results were immediate and definitive. By 1979, less than three years after its launch, VHS controlled 55% of the US VCR market. By 1980, VHS pre-recorded tapes were selling at twice the level of Betamax and VHS blank tapes at almost three times Betamax. (Klopfenstein 27-29) By 1985, Betamax had been reduced to 8% of the market and in 1988, Sony conceded defeat by announcing that they would begin manufacturing VHS products. (Wielage)

Marc Wielage, as an avid Betamax scholar, has put forth a number of theories on the failure of Betamax, beyond these length and price differences. First, he points to a number of consumer-friendly features that were pioneered by VHS, including remote control pause, a multi-event timer, audio/video inputs, and a front-loading design. Second, VHS was able to offer much faster fast forward and rewind speeds, due to the fact that the decks would retract the tape into the cassette during these operations. While this also meant that VHS tapes were much slower to start playing after the button was pressed, these delays were eventually eliminated by Matsushita engineers. Finally, Wielage argues, Sony was never able to make the critical deals with other Japanese manufacturers or with US hardware distributors prior to Betamax's release that would have assured it true marketplace domination. Instead, Sony sat back as Matsushita shook hands and made deals, assuring that VHS had a built-in advantage before it even came on the market. Once VHS arrived, it had a network in place to allow it to surge past Betamax. As it began to overtake Betamax, a snowball effect took place where studios began to line up behind VHS for pre-recorded tape sales and Matsushita was able to lower its prices due to their greater volume of product.

It is also important to note that the 1980s saw a number of developments in the Betamax and VHS formats as both manufacturers tried to outdo the other. The first of these was Beta Hi-Fi in 1982, followed shortly by VHS Hi-Fi. Both supposedly offered higher-quality audio but suffered from serious audio distortion and crosstalk problems. In 1983, both manufacturers released camcorders (combination camera/VCRs) for consumers to use to record home movies. Sony's Betamovie, the first consumer camcorder² had a number of technical flaws, notably that it could not play or rewind its own tapes and that it featured an optical, rather than an electronic, viewfinder. (BetaInfoGuide) Matsushita's camcorder, which recorded to smaller VHS-C tapes was more successful, becoming, along with Hi8, the major analog home movie recorder. The next major release was SuperBeta in 1985, which featured 25% higher picture resolution than regular Betamax, though Sony was again bested when Super VHS (S-VHS) was released in 1987, which completely retooled the head and tape design to produce a much higher-quality image than SuperBeta. Finally in 1987, Sony released Extended Definition (ED) Beta, which surpassed even S-VHS. Unfortunately, the decks cost \$3300 and by that point Betamax's market share had sunk to below 1%, putting this development firmly in the category of too little, too late. (Wielage)

The conventional wisdom (often repeated in news articles about Mac vs. Windows, HD-DVD vs. Blu-Ray, etc.) would have it that Betamax failed despite being a superior technology. But is this really true? Ray Glasser, the self-styled "videoholic" behind the Ultimate Betamax Information Guide website, offers a list of reasons why this is the case. This list is too extensive to repeat here, but it includes many technical points such as that Betamax's larger drum size results in higher writing speed and larger video

² Sony had actually released a professional Betacam camcorder in 1982.

bandwidth, that Betamax's wider video tracks result in higher signal-to-noise, and that Betamax's larger azimuth angle results in less crosstalk. Others, including the anonymous Betaphile behind the Mister Betamax website, rely on anecdotal evidence, claiming that VHS tapes "looked like they were recorded through a screen door or in a fish tank." In fact, looking at a series of professional head-to-head comparisons between the two formats, the results are inconclusive. *Consumer Reports* issued four such assessments in 1978, '80, '82 and '83 with the results favoring VHS, Betamax, VHS, and neither, respectively. *Popular Electronics* published the results of a similar comparison in 1981, concluding that VHS was the winner in picture quality, while Betamax came out ahead in audio. Of course, these tests present an obvious flaw: each was comparing not the formats but the specific playback decks that were available on the market at the time. Given this, is it even possible to evaluate which format is superior, independent of specific hardware? It seems unlikely. Even were it possible, the test results suggest that such comparisons might be equally inconclusive.

In the early 1980s, as Betamax was failing, Sony was having success in another realm. 1982 saw the release of Betacam, a new professional-grade format built in a Betamax shell. The earliest Betacam format, known as Betacam Oxide because it uses a similar oxide tape formulation to Betamax, includes timecode and is a component video format, meaning that luminance and chrominance information are stored on separate tracks. (Betacam PALsite) Thus, while a Betacam cassette has the outward appearance of Betamax, the formats are not particularly similar, with the former offering much higher resolution broadcast-quality video. The identical cassette design does mean that Betamax tapes can be played and recorded on Betacam decks, although Sony did not

recommend this practice. Betacam ended up being a great success, displacing U-matic as the Electronic News Gathering format of choice. It was succeeded by a further series of formats: Betacam SP (Superior Performance) in 1986, which used a metal-formulated tape and had increased resolution over Betacam Oxide, and Digital Betacam in 1993, a 4:2:2 digital video format, both of which became dominant in the production, post-production and archival realms and which remain so today.

So where does that leave Betamax? Even after the bottom fell out of its market in the US, Sony continued to manufacture the format in Japan until 2002, when it was finally killed by the emergence of DVD. (BetaInfoGuide) Looking back, perhaps the most remarkable fact about Betamax is that it was only a successful format for perhaps three years, and yet it was the vehicle through which a great many technical innovations and social concepts came into the public eye. While it was not the first home video format, nor the first to introduce time shifting or pre-recorded cassettes, it was the first successful format to do any of these things and, as such, it is permanently linked to these concepts, keeping it in the public consciousness long after it would have otherwise faded. In a way, much of what makes up today's home video landscape can be traced back in some way to Betamax – quite an impressive achievement for such a short-lived format.