SPOTIFY AND NETFLIX AS INNOVATIONS: STREAMING MEDIA HISTORY IN THE LIGHT OF INNOVATION THEORY

Anders Fagerjord

Streaming services such as Spotify and Netflix have taken over large portions of the market for music and audio-visual entertainment worldwide, and in April 2018, music streaming had surpassed physical sales in revenue worldwide (Ball & Auchard, 2018), challenging and possibly destroying established industries. In only a decade, distribution of music, film and TV series changed radically from being distributed on discs sold in stores to streaming over the internet. How did this happen?

First: Defining my term. Technically, streaming is a way of transferring large data media files that can be played back before the whole file is downloaded, and that are not stored on the client afterwards. In everyday parlance, however, streaming is used as metonymically to signify immediate access to a vast library of material available on demand.

Several studies of streaming services recount parts of their history. Several good books on Netflix have been published, and at least one thorough study of Spotify came out this year. Each of these books have a history section. These histories focus on individual companies, however. Streaming in music, film, and television have rarely been compared, even if their technical basis is very similar.

In this paper we ask what caused the change from physical sales to subscription-paid streaming, and how traditionally very different industries embraced the same technology and business models.

Innovation theory tries to map what causes industrial development and change. In the words of Schumpeter, the *creative destruction* taking place when new innovations make earlier industries obsolete is the engine driving capitalism forward. *What then, we ask, were the crucial innovations that brought about the age of streaming.*

What we have found is that these companies exist at the interface of computer technology and rights management. Developments in the computer industry have had much stronger influence than what is usually accounted for. The successful companies are those who have exploited new possibilities that were opened by faster computers and more powerful compression technologies.

It is also very clear that these companies live from intellectual property rights management, and thus exist at the mercy of copyright holders. Copyright holding companies in their turn were forced to enter the streaming era by the successful operation of hackers, sometimes called pirates.

Previous work

In his large study of changes in the cultural industries over the last four decades, David Hesmondhalgh[1] notes an «increasing emphasis on paid subscriptions», most notably for streaming services, «partly in order to compensate for this loss of advertisement income» (5). His is the most thorough study across industries, but in his large perspective, the change to streaming is less significant than many other developments.

---

1. David Hesmondhalgh, *The Cultural Industries* (Los Angeles: Sage, 2019).

For music, the history is focussed on the "pirate wars" between music sharing systems and record companies, often described as reconciled by iTunes music, Spotify, and others.[2] Maria Erikson et al., *Spotify Teardown: Inside the Black Box of Music Streaming* (Cambridge, Massachusetts: MIT Press, 2019). provides detailed history of Spotify, noticing not only its reliance on huge investments, but also how the company was founded as a peer-to-peer computer network, and only later became focused on music in particular. Furthermore, most of Spotify's innovative features were the result of copying or acquiring competing services.

Accounts of Netflix' history are mostly concerned with the development of algorithmic recommendations, including the service's famed micro-genres.[3] Changes in consumer behaviour have also been the focus several studies, often pointing out that while binge-watching now is a word, it was described already in the age of VHS video.[4] Interestingly, YouTube tends to be described as its own genealogy,[5] and only a few writers have connected it to the general television industry.[6] This is an oversight, as YouTube does matter to the televison and music industries. YouTube is the service of choice for millions of people, both for audiovisual entertainment and music.

Several detailed works have emerged on the relation between broadcast TV, cable, and streaming. These tend to emphasize the importance of the «last mile», the hardware

---

2. (Spilker, 2017)
3. (Arnold, 2016; Madrigal, 1 January 2014; Smith-Rowsey, 2016; Finn, 2017)
4. (Jenner, 2016)
5. Jean Burgess and Joshua Green, *Youtube: Online Video and Participatory Culture* (Cambridge: Polity, 2009); José van Dijck, *The Culture of Connectivity: A Critical History of Social Media* (Oxford: Oxford University Press, 2013).
6. (Evens & Donders, 2018; van Dijck, 2013; Lotz, 2017)

connection and customer relation already in place between households and the cable companies.[7]

On YouTube, there are a number of influential studies . Interestingly enough, these have not been taken up in studies of others streaming services such as those mentioned above.

It is also common that scholars compare Netflix with broadcast (or cable) television, and Spotify with record sales. This is obviously relevant, as those two have been the larger economies, but it should be pointed out that Netflix also competed with DVD sales as well as with digital episode sales in Apple's iTunes Store. Spotify, on the other hand, may compete with record sales for listener payments, but radio is another competitor for listener attention, and thus also advertisement sales. Both of these subscription services have become serious competitors to both linear and copy ownership alternatives.

Method? What method?

In this ongoing study, we collect and systematize the findings of earlier histories of streaming technology under the lens of innovation theory. To date, we have consulted about 50 papers, chapters and book-length studies. These are contextualised with other histories of computer development.

Innovation[8] theory is a broad area, covering studies of individuals, organisations, and

---

7. Tom Evens and Karen Donders, *Platform Power and Policy in Transforming Television Markets* (Cham: Palgrave Macmillan, 2018); Amanda Lotz, *The Television Will be Revolutionized* (New York: NYU Press, 2014); Amanda Lotz, *Portals: A Treatise on Internet-Distributed Television* (Ann Arbor, MI: Michigan Publishing, 2017).
8. (e.g., Friedman, 2017)

netwoks, often from systems or economic perspectives, including studies of history, strategy, and policy studies.[9] Central authors include Schumpeter and his use of Marx's concept "creative destruction", von Hippel, who wrote about "user innovation"[10] , and Christensen[11] with his very influential concept of "disruption".

Results: eight storylines

Studies of innovations invariably find long chains of smaller innovations. Streaming services are similar to most innovations in, in jan Fagerberg's words, "what we think of as a single innovation is often the result of a lengthy process involving many interrelated innovations".[1]

The switch to streaming distribution contains at least six major changes:

1. From disc sales and broadcasting to internet streaming

2. From individual item sales (or advertisement funding) to monthly subscription

3. The introduction of vast catalogues, containing virtually everything of interest

4. Anytime, anywhere: on-demand service on a multitude of devices, many of them mobile

5. Personalized recommendations

6. Global reach

---

9. (Fagerberg, 2006)
10. (von Hippel, 1988)
11. (1997)

In the current literature, we see described many different stories of parts of what is now known as streaming. We trace eight genealogies that have come together to form Spotify and Netflix:

---

[1] (Fagerberg, 2006)

(1) Music and video on demand is a very old idea, imagined since the invention of the telephone.[12] It can be observed in works of fiction and in forecasts by industry observers and scholars, resurfacing every decade at least since 1970. Edward Bellamy is perhaps the most notable example; in his novel *Looking backwards* from 1888, he described how one could order music from an enormous catalogue, and listen over the telephone.[13] Media scholars may be more familiar with Raymond Williams book *Television* form 1974, in which he discusses on-demand television as one of the likely inventions of the future. It may indeed seem that the creative industries have been working towards streaming for more than a century. Yet, neither Spotify, Netflix, nor YouTube were founded to provide streaming subscription services, they all came to it later.[14] Who *did* create the first online libraries of music and video were the file-sharers, often called 'pirates', who in the spirit of hacker culture created Napster, Pirate Bay, and YouTube.

(2) Several technologies have been used to pursue this goal, but what we today call 'streaming' relies on three crucial technological compontents. The first is digital compression

---

12. (Fagerjord et.al., 2010; Williams, 1975)
13. Bellamy, Edward. Looking Backwards. 1888.
14. Burgess and Green, *Youtube: Online Video and Participatory Culture*; Erikson et al., *Spotify Teardown: Inside the Black Box of Music Streaming*.

technology, allowing music and film to be digitized into file formats small enough to be distributed over the internet and played back with a reasonable quality. A personal example may be illustrative: In 1999, I used my University's high-speed Ethernet connection to (illegally, i confess) download a Pet Shop Boys music video in what was then broadcast quality. It took a day and a night. Major milestones in compression technology were the inventions of MP3 (1991-93) and AAC (1997) encoding of music files, and H.263 and H.264 for video (1996 and 2003). These file formats were popularised in part by companies such as Apple and Adobe, and made use of by operations such as Napster, Apple, YouTube, and Pirate Bay. The importance of compression formats to this industry should not be underestimated.

(3) Although advanced file compression allows smaller files to be moved across the internet, there is still a need for sufficient transfer rates. In order to enjoy streaming music and television, you will need a broadband connection. A proper history of streaming technology must also include infrastructure such as broadband cable networks and mobile networks for telephony and data traffic. Users have gotten used to watching and listening to entertainment wherever they are, a fact that has both been enabled by broadband mobile networks, but also have increased the demand for mobile broadband, and thus fueled its development. Less discussed, also in these conferences, is the growth of so-called Content Delivery Networks, that is, networks of high-bandwidth cables running between the allowing large files to be moved without bottlenecks.This a booming industry where companies like Microsoft and Akamai are among the largest players. Yet, to control the infrastructure they rely on, both Google (including YouTube) and Netflix have laid down millions of miles of undersea cables to build their own Content Delivery Networks. Google began this work in 2005, and by 2008, they carried 15% of the total internet traffic. Netflix launched its Open connect Network in

2010. The rise of CDNs has led Nishant Sastry to state in 2016 that «the Internet has been flattened» with hardly anyone noticing.[15] The innovations taking place in network technology are highly technical, and that is perhaps why it seems that most of this development has taken place under the radar of the AoIR conference.

(4) The third key technological component is plain computer power. Today's advanced compression techniques is not just smarter than earlier generations, they involve more calculation along the way from video or sound signal to digital representation and back again. Following Moore's law, the computers — or mobile phones — of 2019 are 64 times as powerful as those in 2007. 64 times! This computer power is also given even more leverage through networking. Networked computing, walready utilized for peer-to-peer file sharing in the Napster era. Nowadays, the main streaming providers rune Hadoop and similar software, which has exploded their computing power.[16] To put this into perspective: Netflix, with its thousands of videos, and YouTube with its millions, do not encode each video file once. Each file is transcoded into several *hundred* different file formats in order to ensure smooth playback on any device over variable connections.[17] The development of semiconductors is not done by media companies, but the immense rate of innovation taking place inside that industry is again the foundation of the services we study in this conference.

(5) The fifth of genealogy is the history of electronic devices used for playback. At the outset, streaming was for computers.

---

15. Joon Ian Wong, "The Internet Has Been Quietly Rewired, and Video is the Reason Why," *Quartz* (2016). cf. Also Fagerjord and Kueng forthcoming.
16. (Friedman, 2017)
17. Fagerjord and Küng, forthcoming.

In 2007, Apple introduced its revolutionary iPhone. Before 2007[18], the technology to stream to mobile devices did not exist. Spotify added support for TiVo set-top boxes and Samsung Blu-Ray players in 2008.[19] In the history of streaming television, the launch of the Apple iPad in 2010 was a major event, as Amando Lotz has documented in *Television will be revolutionized,* inspiring several of the major American television networks to create streaming apps. Today, Netflix and YouTube make sure to have apps installed in every new TV set, while Spotify has partnered with many stereo makers to sell playback devices with Spotify support.

(6) The Sonos/Spotify collaboration that was shown as the background in the previous slide is an example of strategic cooperation. This is not a new phenomenon, and is sometimes called "coopetition". What was an important innovation, however, was the ability first of Apple, and later of Spotify to get licences from all major record labels within one service. The necessary business models and revenue sharing schemes had to be invented in order for streaming services to exist.

(7) Subscription is a business model that has a long history in cultural industries, but for contents that had regular new issues, like a newspaper. Spotify is not like that, it resembles more subscription libraries (for books) that has a quite long history. For Netflix, however, subscription was (almost) always the form of payment, since the day of mail-order DVD service. To introduce monthly subscription to streaming services was an innovation, however, and only appeared as the preferred solution after major companies had tried both

---

18. Lotz, *The Television Will be Revolutionized*.
19. Ramon Lobato, *Netflix Nations: The Geography of Digital Distribution* (New York: NYU Press, 2019).

selling individual downloads and advertisement funding.

(8) Automatic recommendations were popularized by Google and Amazon, although Netflix also used the same technology for its mail-order DVD-service. It was probably less surprising that it would be brought to music and television around 2010-12, but its influence has been tremendous..

Innovation is not just about creation of something new, it is also the destruction of established businesses. Schumpeter called the process 'creative destruction,' and characterized it as the motor behind capitalism. The most obvious destruction is the disappearance of record stores, video rentals, and DVD sales outlets, becoming obsolete as distribution shifted from discs to broadband.

The shift in distribution has also hit television, but the destruction is less marked. Cable distributors of television are still doing exactly that, distributing TV, but now using interactive technology allowing viewers to watch on demand, and at the same time now distributing a lot of what used to be sold on discs.

As everyone here knows, the streaming revolution took place in the same period of time as Google and Facebook took over large parts of the advertising market in another act of creative destruction: Through automatic analysis of searches and user behavior, they were able to sell more targeted and thus presumably more effective advertisements. This hit advertisement-financed television hard, and has encouraged the shift towards viewer payment in the form of subscription services.

What was the innovation that brought streaming about? Our argument is that it was the

combination of compression technology and networked computing that allowed for efficient distribution of music and video files. It opened the possibility of switching music distribution from disc sales to the internet, destroying the physical sales distribution chain, and making a legal alternative to the pirate sites.

It has turned both the music and the television businesses on their heads and forever changed their organization and operation. Yet, it is neither the history of disruption that Anderson has found in many areas of business, where new, small players sneak up from behind and leave the incumbents out of business. The large film and TV studios and networks continue to thrive, and the «big three» in the music business earn more profit now than a decade ago.

 It was not, however, a planned development by these companies. When Williams summed up the history of television, he described it as a technology sought with a certain outcome in mind. That was not the case for streaming, *even if* the idea has been around for a century and a half. Rather, the invention of streaming is a case of disruption through social innovation, reclaimed by big business.

In his account of the «pirate wars» in the music industry, Hendrik Spilker concludes that it was the pirates who «won». The file-sharing network Napster operated grew to a huge catalogue of illegally distributed music in 1999. Through a series of interviews, Spilker finds that the file sharers never was opposed to paying artists and record companies for the music. They wanted a convenient library of online music, spanning «all music» or at least something functionally similar, and when the record companies did not provide that, they created it themselves. As Erikson et.al. have pointed out, Spotify also originated as a file-sharing network, illegally distributing music. What made Spotify turn into a legal service was that the

company was able to secure distribution deals with the three major record companies, which even entered as investors in the firm. Spotify was not the only company to achieve this, however, Tidal and Deezer were competing firms that provided more or less the same music catalogue.

Furthermore, Spotify continued to operate as a peer-to-peer network for several years, until the company had built sufficient server capacity on its own.

What can we learn from the innovations of streaming companies so far?

If innovation, or the process of *creative destruction* is what advances capitalism, as Schumpeter claimed, the advances here are more convenient distribution from the perspective of the consumer, and the destruction of physical sales. Video rental stores, DVD sales, and record stores are for the most part a thing of the past in the countries where streaming has become popular. It also seems that this has benefited the record companies and studios rather than the artists, although this is a complex picture to paint, with enormous differences between the big star and the newcomer.

Has this made the production of culture more effective? An argument can be made to support that. The move into streaming and binge watching has enabled a new kind of television fiction. We have seen a change into complex, expensive, long-running series that are binge-watched by eager fans. *House of Cards* and *Game of Thrones* are the most pronounced examples of that.

Music has not seen the same development, however. Where film and TV has developed longer formats, popular music is less about albums and more about individual songs nowadays. One could say that is caused by the different focus: Spotify identifies and recommends single songs to its subscribers. Netflix (and its competitors) has moved towards

long series and away from single films. To state that this is only due to interface design would be too simple, however. YouTube's basic unit has always been the clip, and although it changed to a more TV-like flow in …, and allows for longer shows and even entire feature-length films, the single clip that runs to about ten minutes is still the standard.

More analysis of the streaming business is needed to chart what listeners and viewers now prefer, and to see who are able to create what profit in these rearranged cultural industries. What we already see, however, is yet again that the relation between technology and social life is a complex interplay that cannot be reduced to one or the other. Streaming is absolutely dependent on powerful computers and compression technology, networked server clusters and worldwide broadband connections. Recommendation algorithms have also proven to be popular and useful.

The history of streaming is the history of what Lucy Küng has called «the ascendancy of tech» in the media industry, or what David Hesmondhalgh has called the influx of new companies that are technology companies, and not creative industry companies. The changes brought about by streaming distribution were made possible by computer technology, and for a long time actively resisted by the creative industries. As Hendrik Spilker has pointed out, however, computer technology also brings with it the hacker culture of sharing and of collectively working together to create solutions. For years dubbed 'piracy' by the creative industries, these hacker activities started by YouTube, by Napster, and by Pirate Bay showed audiences that the online libraries dreamed of for a century was possible and desirable. Science and technology studies have for years claimed that it is not a question of culture *or* technology as the driving force behind developments. That is the only description that fits the history of streaming, and it is worth noting that there is a certain *technology culture* that created the streaming services.

References (incomplete)

Burgess, Jean and Joshua Green. *Youtube: Online Video and Participatory Culture*.

Cambridge: Polity, 2009.

Erikson, Maria, Rasmus Fleischer, Anna Johansson, Pelle Snickars, and Patrick Vonderau.

Spotify Teardown: Inside the Black Box of Music Streaming. Cambridge, Massachusetts: MIT

Press, 2019.

Evens, Tom and Karen Donders. *Platform Power and Policy in Transforming Television

Markets*. Cham: Palgrave Macmillan, 2018.

Hesmondhalgh, David. *The Cultural Industries*. Los Angeles: Sage, 2019.

Lobato, Ramon. Netflix Nations: The Geography of Digital Distribution. New York: NYU

Press, 2019.

Lotz, Amanda. *Portals: A Treatise on Internet-Distributed Television*. Ann Arbor, MI:

Michigan Publishing, 2017.

Lotz, Amanda. *The Television Will be Revolutionized*. New York: NYU Press, 2014.

van Dijck, José. The Culture of Connectivity: A Critical History of Social Media. Oxford:

Oxford University Press, 2013.

Wong, Joon Ian. "The Internet Has Been Quietly Rewired, and Video is the Reason Why."

Quartz (2016):

Appendix: important events

1993	MP3			
1995	RealNetworks demonstrates live audio streaming			
1997	Real Video streaming			
1999		Napster		
2000		Gnutella LimeWire		
2001	iPod	Napster closes down		

				NBC streaming live baseball
2002				NBC streaming live baseball
2003		Pirate Bay founded		
2004			Apple iTunes music store.	
2005			Spotify founded	YouTube founded and launched. TV episodes in iTunes Google builds CDN network
2006	Facebook public launch Hadoop	Pirate Bay raided by police		Google tries Google video store, then acquires YouTube Hulu partners with Disney ABC, CBS, ESPN, Fox begin streaming services
2007	iPhone, Apple TV Android VMWare public Twitter Kindle Sotware-enabled mobile networks		*Spotify beta release* (invitation only)	*Netflix opens streaming service*
2008	Apple App Store		*Spotify public launch*	Hulu becomes publicly available Netflix streaming to large number of devices
2009		Pirate Bay lawsuit	Spotify mobile app	Google's CDN delivers 5% of global traffic
2010	iPad		Tidal launched LimeWire ordered by court to close	Netflix in Canada YouTube switching to more TV-like interface

2011			Spotify in Australia, Austria, Belgium, Denmark, New Zealand, Switzerland, USA	
2012		«War on piracy» declared over.		Netflix creates OpenConnect CDN Netflix original programming: Lillyhammer, House of Cards, Arrested development season 4
2013				
2014			Spotify closes P2P network	
2015			Spotify introduces Discover Weekly Apple Music launch	