

Impact of Movie Streaming over Traditional DVD Movie Rental—An Empirical Study

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Abstract—Traditional movie DVD rental model has been challenged by a new business model of movie stream. Movie stream possesses convincing advantages over the traditional DVD rental. E-commerce shows a trend in the movie industry that consumers can stream comparable quality movies and TV shows directly from the Internet instead of waiting for the DVDs in the mail. Thanks to global technology advancement, movie stream has already prevailed. This study focuses on consumers' preferences of decision making variables for streaming movie from the Internet and the traditional DVD movie rental. The results indicate that consumers are shifting from DVD movie rental to movie stream, while home entertainment industry needs to improve both in technology and customer service. The consumers favor movie streaming and make it better competing with other ways of watching movie. The quality of movie stream and renting DVD disks may be less important for movie viewers. Movie industry should make movie stream easy to watch.

Index Terms—e-commerce, movie stream, streaming, movie download, movie rental, DVD rental

I. INTRODUCTION

The competition for viewers in the movie industry takes many different forms. Traditional movie theaters, with high quality pictures on large screens and high quality sound effects, need the patrons show up physically; movie rental stores or movie rental websites, which provide the convenience for the customers to obtain DVD disks and watch movies on TVs at home; Herr [1] indicated movie stream via high speed internet connections, which is emerging as a new way that enables viewers watch movies without going to theaters, nor going to rental stores, nor placing DVD orders on websites, nor waiting for DVD disks (including Blue Ray DVD) to show up in the mail boxes, nor returning these disks to rental stores.

This emerging phenomenon of movie stream depends heavily on the technology advancement in computers, networking, and most of all the speed and capacity of the internet. Cisco VNI Report [2] discussed the monthly video internet traffic in 2013 will reach to 24,969 petabytes per month, an amazing 20 folds of the video traffic volume in 2008, about an equivalent of about 300 million DVDs crossing the network each month. What

impacts of this shift will have on businesses and consumers are of great interests. This study aims to explore only some of the impacts of the emerging movie stream in home entertainment industry, and to compare with traditional DVD movie rental.

Video consumption and distribution has witnessed a double digit growth in the past few years, converting and preparing this content for the digital realm was largely a 'black art' until recently, when several enterprise-grade solutions came onto the market. Video-related transactions grew from 12.4 percent of the total IP traffic in 2008 to approximately 39 percent total IP traffic in 2012, or are about twelve folds of the total volume excluding the amount of video exchanged through P2P file sharing. Internet video is predicted a 34 percent Compound Annual Growth Rate (CAGR) from 2008 through 2018. Internet video traffic will increase more rapidly than general consumer Internet traffic. Cisco VNI Report revealed [2] the trends of on-demand viewing and high-definition video are generating very rapid growth in cable video and IPTV traffic transported over IP in metropolitan areas. Fig. 1 presents the monthly internet video traffic trend between 2008 and 2018.

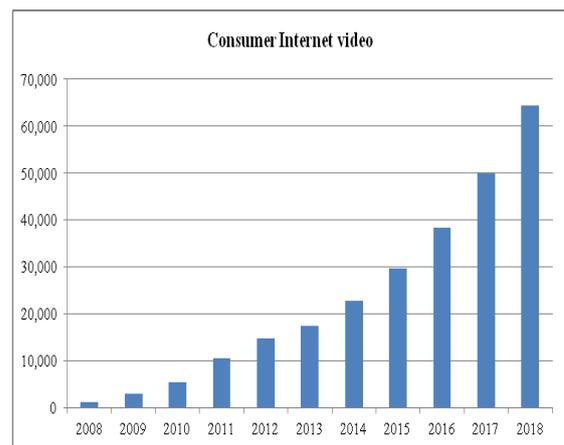


Figure 1. Monthly internet video traffic trend.

II. REVIEW OF LITERATURE

Americans in 2015 will spend more money watching movies at home than they did the previous year, to \$26 billion. For years, movie business executives have hoped that new ways to download and stream movies from the Internet would make up for declining interest in watching them on disks. Pressman [3], Deloitte Research Report

[4], and Netflix Annual Report [5] presented the rapidly growing number of televisions connected to the Internet and the widespread adoption of tablets and smartphones gave consumers reason to buy or rent from Netflix Inc., Apple Inc.'s iTunes and Amazon.com Inc., and many others in the recent year. Waterman and Ji [6], Mardanian Dehkordi and Tabataba Vakili [7], and Burroughsa and Rugga [8] studied the rapid growth of online TV industry, and its impacts of movie streaming, and disclosed that Netflix penetrated has penetrated over 36% of the total American Households, on DVD subscriptions revenue in the fourth quarter of 2014 dropped 52%, the movie stream increased by 158%. Movie stream did not only challenge the traditional way of seeing movies in the theaters, but also impacted on the traditional movie rental business. Kim [9], McNutt [10], and Al-Madani, Al-Roubaiey, and Baig [11] discussed the traditional video tape and DVD disk rental company Blockbuster that went bankruptcy, while Netflix emerged as the largest web DVD disk rental company and established movie stream business model. Netflix and its competitors used websites where customers could rent movies for a flat monthly fee. Applications of video streaming included commercial applications such as e-learning, video conferencing, stored-movie streaming; and military applications such as video surveillance of targeted field or specific objects. Video traffic was resource intensive and consumed a lot of network bandwidth; therefore it was challenging issue to stream video over limited-bandwidth networks. Fig. 2 shows the revenue trends between movie stream and DVD rental in Netflix' domestic market.

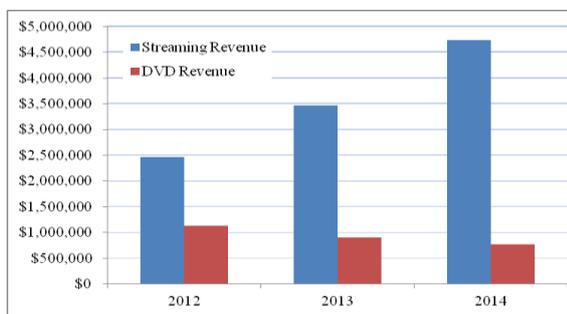


Figure 2. Revenue trends streaming vs. DVD in the U.S., in thousand, Netflix, 2015

While the traditional movie rental giants, Blockbuster, Movie Gallery, and Hollywood were able to generate billions of dollars in revenues in the past, these companies, on the other hand, were losing ground to more totally internet based movie rental firms of Netflix, Apple, and Amazon.com. Netflix [5] had 27 million streaming customers, as it let its customer to pay only \$7.99 a month to search by title or type, then added those titles to a waiting list of movies to watch called a "queue", with no due dates, nor late fees, while shipped to most locations by first class mail the next day or stream these movies.

Many traditional cable companies, i.e. Comcast, Time Warner Cable, and the like were going on the offensive. L. O'Reilly [12] studied long technology laggards, the cable companies had set up skunk works. The aim of

doing so was twofold: putting more of their content online and making the regular television and movie viewing experience more Weblike. Even as they moved online, the cable companies were scrambling to make TV as interactive as the Web. Now the industry might have a hit. It was called tru2way, a service that would allow viewers who had the latest generation of set-top boxes and televisions to more easily search for TV shows, play games, chat, and even browse the Web. Beyond improving the viewing experience, the technology also would allow the cable companies to offer interactive commercials. For example, viewers were able to request more information about a sponsor's product and, at some point, even to buy it through their televisions.

Chao and Li [13] had a study on movie download vs. movie rental which offered a glimpse of the transition. Their study missed in large the movie stream, as stream had just started, and was less popular given the inadequacy of speed in networking and computers. Some critical issues, i.e. copyright movie sharing were not studied. A follow-up study by Chao and Zhao [14] further investigated more in depth of the transition from DVD rental to movie stream.

Stelter [15] probed the convenience of streaming movies from internet had caused some concerns from the movie makers, as untold thousands of people watched a version of "X-Men Origins: Wolverine" online in early April 2009, a full month before its scheduled theater release, while the film's distributor, 20th Century Fox, said it did not know how the unfinished copy of the comic book adaptation was leaked onto the Internet. Even the copy was missing many special effects and included temporary sound and music, and it circulated widely online beginning on April 1, 2009, even prompting some viewers to publish reviews, favorable and unfavorable, of the hotly anticipated film.

Finlay, Johnson, and Behles [16] did an empirical survey of the contents of a popular film and television video collection and examined for availability and total number of checkouts on three major streaming services: Netflix, Hulu and Amazon Prime. They found that total circulation counts changed depending on the streaming services used. Library titles available on Netflix Streaming had more charges on average than titles not available on Netflix streaming. Titles available on Amazon Instant were twice as likely to circulate then items not available on Amazon Instant. This led to the possibility that Amazon Instant might be used as collection development tool in order to gauge how often certain DVD title could circulate. In addition it could be concluded that availability over subscription streaming services, such as Netflix and Amazon Instant, actually pointed to items that might circulate more frequently. These three companies also competed on different pricing models. Some factors affected movie stream pricing could be summarized in the following manners: (1) Piracy (leakage) that violates the intellectual property right, would make the movie industry hesitate to put movie online for streaming; (2) Competition that forces the ISPs to cut and/or increases prices depending on

market conditions and how many providers in the fields, i.e. Netflix, Walmart, etc; (3) Broadband roll-out (market) that those backbone infrastructure providers, i.e. Cisco, Verizon, Time Warner, etc.

INSEAD [17] reported several studies about online video platforms on the market, and the importance of exploring these sources and experimenting with new ways of video searching. The report particularly discussed the transitions from bridged networks to routed networks, shared networks to switched ones, circuit switching to packet switching, fixed connectivity to mobile connectivity, dedicated resources to virtual ones, and the emergence of smart phone usage for data traffic to voice and video traffic. The merits of this report were not only with focus on one or two sectors, but also gave a bird eye view of global changes in the information technology. For an entire industry that defined itself based on the word "quality", today there was still no agreed upon standard for what classified HD quality video on the web. Both Microsoft and Adobe had different views on what classifies a video as HD. If the industry wanted to progress with HD quality video, some universal standards were needed.

The traditional mail delivery system usually took 3-7 days to have the DVD disks show up in the customers' mail box. Netflix's streaming video [5] was content sent in compressed form over the Internet and displayed by the viewer in real time. This technology revolutionized the delivery as streamed movies could be watch instantly thanks to the high speed network, while downloading enables customers to obtain movies to their gadgets or computers, and watch them later.

As movie stream was emerging as a formidable phenomenon, Li, Wang, Liu, and Zhu [18] provided a comprehensive study of video streaming in the past two decades. They discussed that researches in the first decade largely focused on transport protocols, while researches in the second decade shifted to the peer-to-peer paradigm of video distribution, and more recently, to HTTP streaming based on cloud computing and social media. They reviewed existing results with a focus on peer-to-peer streaming protocols, the effects of social media, and the migration to HTTP streaming. Many of their views were from technological stand points, while the marketing and consumer perception issues remained to be answered: What are the favorable ways for consumers to watch movies? How do the consumers make their movie selecting and purchasing decisions?

This study attempts through an empirical exploration to investigate if there were any significant differences resulted from the consumers' viewpoints between movie stream and DVD rental, centering on products and their qualities, price (including promotions), deliveries, and usability.

III. METHOD

With the focal questions in mind, this research studied the views of consumers with regards to how they stream movies as compared to DVD rental. A survey was developed to investigate the consumer preferences on

products and their quality, price and promotion, deliveries, together with other features available using either movie stream or DVD rental. The following variables were based on literature reviews.

A. Variable Selection

The following variable selections affect how and where consumers make their purchase decisions. These are incorporated into a survey questionnaire.

- Easy to obtain movies
- Attractive prices
- Easy to watch
- High definition movies
- Can be easily carried around
- High sound quality
- Can be easily shared with others
- No need to buy additional special gadgets or instruments
- Easy and free delivery
- Format can be played on any instrument
- No concern of copyright

B. Hypotheses

The hypotheses for this research are to find if there are significant differences between movie stream and DVD rental. The hypotheses for this study state:

Hypothesis 1. There is no significant difference in obtaining movies between movie stream and DVD rental.

Hypothesis 2. There is no significant difference in attractive prices between movie streaming and DVD rental.

Hypothesis 3. There is no significant difference in easiness of watching movies between movie streaming and DVD rental.

Hypothesis 4. There is no significant difference in high definition movies between movie streaming and DVD rental.

Hypothesis 5. There is no significant difference in easiness for carrying movies around between streaming and DVD rental.

Hypothesis 6. There is no significant difference in high sound quality between streaming and DVD rental.

Hypothesis 7. There is no significant difference in easiness for sharing movies with others between streaming and DVD rental.

Hypothesis 8. There is no significant difference in requirements for buying additional special gadgets or instruments between streaming and DVD rental.

Hypothesis 9. There is no significant difference in easiness and not cost for movie delivery between streaming and DVD rental.

Hypothesis 10. There is no significant difference in movie formats that can be played on any instrument between streaming and DVD rental.

Hypothesis 11. There is no significant difference in concerning of movie copyrights between streaming and DVD rental.

The alternative hypotheses stated: there are significant differences on these variable between movie streaming and DVD rental.

C. Survey and Tests of Hypotheses

Due to the nature of this empirical study, the questionnaires were distributed to respondents at a couple of large university campuses in the northeast America for a convenient sampling since these respondents tend to browse on the websites and stream movies, and rent DVD disks. The respondents were asked to evaluate the selected variables using a five point Likert scale, with 5=strongly prefer, 4=prefer, 3=neutral, 2=not prefer, and 1=least prefer.

According to Conover [19], Hamburg [20], and Davis [21] when two samples are involved and the values for each sample are collected from the same individuals (that is, each individual gives two values, one for each of the two categories), or the samples come from matched pairs of individuals, a paired-samples *t*-Test is an appropriate statistic to use. The paired samples *t*-Test can be used to determine if two means are different from each other when the two samples that the means are based on were taken from the matched individuals or the same individuals. The paired samples *t*-Test compares the means of two variables. This procedure computes the difference between the two variables for each case, and tests to see if the average difference is significantly different from zero, under the assumption of both variables should be normally distributed. The nulls should be rejected if the significance level is less than or equal to five percent in these criteria, in another word, five percent of the paired sample *t*-Test two-tailed probability level signifies the differences in effectiveness between movie stream and DVD rental.

IV. RESULTS

About eight hundred survey questionnaires were distributed, with 342 completed and usable responses for analysis that represents 43 percent of the total surveyed. Table I presents the general information of the respondents.

TABLE I. BACKGROUNDS OF THE RESPONDENTS

| Variables | Groups | Valid % |
|-------------------------|-------------|---------|
| 1. Age | <18 | 1.2 |
| | 18-35 | 97.1 |
| | 36-55 | 1.8 |
| 2. Gender | Male | 55.8 |
| | Female | 44.2 |
| 3. Family annual income | <\$30k | 23.0 |
| | \$30-50k | 17.4 |
| | \$50-75k | 25.7 |
| | >\$75k | 33.9 |
| 4. Educational level | High school | 13.8 |
| | College | 75.6 |
| | Graduate | 10.6 |
| 5. Marital Status | Married | 24.8 |
| | Single | 75.2 |

A. Backgrounds

Table II below presents the respondents' pattern of seeing movie. The study indicates that nearly all respondents have access to for their movie watching.

TABLE II. THE RESPONDENTS' MOVIE EXPERIENCE

| Variables | Answer | Valid % |
|--|--------|---------|
| 6a. Have you ever streamed a movie? | Yes | 89.5 |
| | No | 10.5 |
| 6b. Have you ever used any special gadget(s) that let you watch movie, i.e. smart phones, tablets, etc.? | Yes | 45.0 |
| | No | 55.0 |
| 7a. Movies seen in theaters/month | 0 | 7.3 |
| | 1 | 45.0 |
| | 2 | 30.7 |
| | ≥3 | 17.0 |
| 7b. Movies watched not in theater/month | 1 | 39.6 |
| | 2 | 26.1 |
| | ≥3 | 34.3 |

Table III presents the paired samples *t*-Test results with paired mean differences, standard deviations, *t* values, degrees of freedoms, the significance levels.

TABLE III. THE PAIRED SAMPLES T-TEST (2-TAILED)

| Variables | Mean dif. | Std. Dev. | Df | Sig. |
|--|--------------|-------------|------------|-------------|
| easy to obtain movies | 0.34 | 1.31 | 339 | 0.00 |
| attractive prices | 0.56 | 1.27 | 339 | 0.00 |
| easy to watch | -0.24 | 1.37 | 337 | 0.00 |
| high definition movies | -0.11 | 1.39 | 338 | 0.14 |
| can be easily carried around | 0.67 | 1.41 | 341 | 0.00 |
| high sound quality | -0.19 | 1.49 | 341 | 0.02 |
| can be easily shared with others | 0.30 | 1.38 | 338 | 0.00 |
| no need to buy additional special gadgets or instruments | 0.22 | 1.28 | 339 | 0.00 |
| easy and free delivery | 0.32 | 1.35 | 338 | 0.00 |
| format can be played on any gadgets | 0.37 | 1.17 | 339 | 0.00 |
| no concern of copyright | -0.07 | 1.15 | 338 | 0.24 |

B. Results of Paired Samples *t*-Tests

The paired sample *t*-Test results indicate significant differences exist in nine out of the total eleven variables: **easy to obtain movies, high sound quality; attractive prices, easy to watch, can be easily carried around, can be easily shared with others, easy and free delivery, format can be played on any instrument, and no need to buy additional special gadgets or instruments.** The respondents favor stream against DVD rental over all variables, except **easy to watch**. Consequently, the variable related null hypotheses are rejected as the significance levels are less than or equal to 5%.

There are no significant differences in two variables: **no concern of copyright, and high definition movies.** Consequently, the variable related null hypotheses are accepted as the significance levels are more than 5%.

C. Discussion

Our study concludes movie stream is favored by the respondents in **easy to obtain movies, attractive prices, can be easily carried around, high sound quality, can be easily shared with others, easy and free delivery, format can be played on any instrument, and no need to buy additional special gadgets or instruments.** While the respondents favor DVD movie watching as it is **easy to watch**.

The respondents' favored areas may tell movie industry should continuously focus on these issues. Particularly, movie industry should make movie stream easy to watch, as some respondents indicated, i.e. functions of forward or backward, or search were still lacking.

Not surprisingly, the respondents do not view movie quality significantly differently, i.e. high definition and sound quality, as they believe they would obtain the same quality either from DVD disks or streamed movies.

D. Managerial Implications and Recommendations

Movie stream presents tremendous growth and can result in substantial reduction in delivery and handling costs, enable the providers to better control the movie products. Meanwhile, online video advertisement spending has increased from \$1.42 billion in 2010 to a predicted \$8.04 billion in 2016 [22], an increase of 4.7 folds. Movie industry needs to take advantage of this growth and prepare for its own future growth. This will make the movie and TV streaming better competitive with other ways of viewing movies, ultimately, consumers will be benefited.

E. Limitations and Future Research

This research, as it surveyed only a small sample, mostly college students, it has several limitations. First, technology advancement will enable movie stream more feasible, as the capability of Internet will be expanded and the computers and networks will be greatly enhanced, the time required for streaming a high definition movie will be greatly reduced. However, this may take some years.

Second, the sample size is small and the representation of respondents is narrow, cautions must be made when one tries to generalize the outcome of the research. The consumers from other segments, rather than college students may present different views about obtaining movie in different ways.

Third, although the key issues of product, price, promotions, and delivery discussed, they mainly focus on the limited number of big players in the market place, i.e. Netflix, Amazon, Hulu, Google, and Apple, many players are left out, i.e. Tudou, etc, not to speak of numerous small and emerged companies with relatively new business models.

Despite these limitations, as investigators, we believe this study may throw some lights for more in depth and broader future studies.

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