



Integrated home video content procurement and distribution planning under uncertainty



Z. Asadollahi Sohi, S.A. Torabi*

School of Industrial Engineering, College of Engineering, University of Tehran, Tehran, Iran

ARTICLE INFO

Article history:

Received 22 July 2015

Received in revised form 1 August 2016

Accepted 20 February 2017

Available online 22 February 2017

Keywords:

Home video supply chains

Home video enterprises

Content procurement and distribution planning

Epistemic uncertainty

Possibilistic programming

ABSTRACT

In home video supply chains, movie makers as content producers create the most value in the movie industry but they are unable to publish and distribute their videos in an efficient while effective manner. Therefore, they usually sell their videos' licenses to home video enterprises (HVEs) that have expertise in advertising and distributing the procured videos to the market. This paper proposes a novel integrated model for content procurement and distribution planning within the context of home video supply chains. The developed model helps HVEs to determine buying which available videos are more profitable and how to distribute them in terms of distribution timing and quantities. It also determines videos' license prices, which is certainly one of the most important concerns of HVEs in this context. According to deep uncertainty in videos' demands, fluctuation in audiences' expectations and diverse qualities in the content of procured videos, the critical parameters are tainted with epistemic uncertainty and therefore are formulated through possibility distributions in the form of triangular fuzzy numbers. An efficient possibilistic programming approach is tailored to convert the original possibilistic model into the crisp counterpart. Applicability of the proposed model is validated through an illustrative example from which useful managerial insights are also provided.

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1. Introduction

Movie industry and especially home video¹ business belong to the entertainment industry sector. This sector represents a challenging research domain in general and for quantitative modelers in particular. While some people emphasize on the creative and artistic aspects of such products (i.e. movies' contents and home videos); another focus could be on the business aspects of this domain from the perspective of operations management. Some authorities claim that the artistic nature of these products and their uncertain quality make the movie industry inherently different from others. Hence, any analytical methods/models employed in other industries to improve their operational performance are irrelevant here. Experi-

ences and perspectives are different for those who argue that movies are a form of art that cannot be understood with formal analytical modeling methods.

This industry is characterized by multiple distribution outlets for each released product, each of which has a relatively short window of opportunity. Fig. 1 shows the average time windows for these outlets. These various outlets beside artistic aspects of the industry arise many decision problems in different levels so that decision-making issues varies across the different parties involved in the production and distribution of movies. Movie makers with artistic backgrounds, tend to believe in more intuitive styles. In contrast, executives in the home video sector, who interact more closely with retailers and consumers, generally see more value in using formal decision making tools to optimize or improve their processes (Eliashberg, Weinberg, & Hui, 2008).

It is worthy to mention that making a movie is a highly complex technical and contractual activity and a large number of organizations and individuals are involved to take a movie through the processes of: pre-production and investment generation; principal shooting; post production; distribution and finally exhibition. After exhibition in cinemas, every movie has to be entered in other markets sequentially, although some markets are skipped in some cases. Fig. 1, illustrates these sequential markets after exhibition. This is the general value chain structure for a typical movie

* Corresponding author.

E-mail addresses: z.asadollahi@gmail.com (Z. Asadollahi Sohi), satorabi@ut.ac.ir (S.A. Torabi).

¹ Home video is a blanket term used for pre-recorded media that is either sold or rented/hired for home cinema entertainment. This business distributes films, telefilms and television series in the form of videos in various formats to the public. The term originates from the VHS/Betamax era, when the predominant medium was videotape, but has carried over into current optical disc formats like DVD and Blu-ray Discs and, to a lesser extent, into methods of digital distribution such as Netflix. In the remaining of the paper, movie is mostly used as a substitution for general word "video" as the most distributed video type in the home video supply chains.

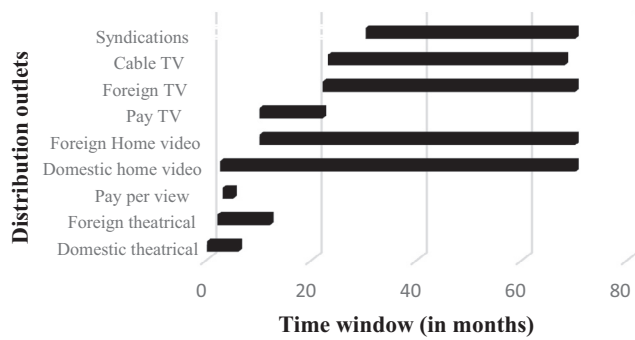


Fig. 1. Distribution outlets for movies in US and their time windows.

(Eliashberg et al., 2008) whose business aspects have been studied from different perspectives (for instance see Christopherson, 2012).

Modern portfolio theory suggests that movie studios should inherently mitigate the risk of uncertain performance of any single movie by choosing a mixture of high-, medium-, and low-budget movies in their yearly crops of releases (Cuadrado & Frasquet, 1999). This fact can be a good guide to home video sector as well. Higher prices of high-budget movies make them unprofitable in the distribution phase despite of their capability to attract audiences. While medium- and low-budget movies can compensate the lost profit to some extent (Vogel, 2001).

Risk management in movie industry has been studied by Watson (2004) especially in the pre-production phase. The author studied the effect of movies' elements like their stars and distribution times in the sequential markets (especially in the home video and TV) on the risk and revenue factors. Nevertheless, he mentioned that most of the time, box office² is a sign for movie sale in other markets so that if a movie is not successful in exhibition, its success in other markets would be on doubt as well. So, the author investigates and offers collaborative relations among studios for timing, distribution, advertising and utilizing talents.

Another prominent research stream is predicting the Box office (i.e. demand size) of each movie based on relevant attributes such as stars, directors, release dates, genres, and movie's revenue at the first week, running time, critics' opinion, number of screens, the time window between release in the screens and home video, and other characteristics. Since the most significant uncertain parameter of this market is "demand", an understanding of audience behavior is fundamental to shedding more light on the challenges faced by producers, distributors, and exhibitors. The literature in this area has been divided into two research traditions: the 'psychological approach' and the 'economic approach'. The 'psychological approach' focuses on individual decisions to first attend movies. Researchers by this approach aim to relate those variables such as opinions, needs, values, attitudes and personality traits to consumers' decision-making processes. They generally use data collected by surveying individual consumers. Examples of such studies are Cuadrado and Frasquet (1999) and d'Astous and Touil (1999) among others.

'Economic approach' studies those factors that influence collective movie attendance decisions. This approach is about to explore the variables that influence the financial performance of motion pictures. These studies typically use aggregate data on movie-going behavior collected by industry trade sources. Examples of

these approaches can be found in Wasko and Wasko (2005) and Walls (2008). Although results and methods of predicting audience behavior are different, they can be very useful guides for the market experts to forecast demand in a better way.

The possibility of presenting each movie in sequential outlets encourages researchers to study scheduling of each movie's entrance in every new market. Vogel (2001) states that, sequential distribution patterns are determined by the principle of the second-best alternative -a corollary of the price-discriminating market segmentation strategies. That is, movies are normally first distributed to the market that generate the highest marginal revenue over the least amount of time. They then "cascade" in the order of marginal revenue contribution down to markets that return the lowest revenues per unit time. Distribution "is all about maximizing discrete periods of exclusivity."

Some articles develop econometric models to study a setting in which a new product is launched first in its domestic market and only at a later stage in foreign markets, and where the product's performance ("demand") and availability ("supply") are highly interdependent over the time within and across markets. It is notable to mention about the effect of time lag on theatrical release and home video release which is studied by Anita and Eliashberg (2003). Findings about home video demonstrate that as the time release between cinema and DVD in home video becomes larger, "success-breeds-success" trends is more in doubt.

The prominent role of home video on the movie industry's revenue is considered by many researchers like Caves (2000) and Watson (2004). This role is clearer in Iran's movie market. From the perspective of Operations management, the home video supply chains face many decision problems, for instance those related to buying movies among many movie titles and distributing them in a proper way subject to several constraints.

Motivated by the above discussion and inspired by the home video market in Iran, a home video supply chain is addressed in this paper. More specifically, we develop an integrated decision model for content procurement and distribution planning in the home video supply chains under data uncertainty in both demand and supply sides by which HVEs can choose the best alternatives among the available ones. The proposed model also determines the selected movies' license prices while accounting for both buyer and seller preferences. The model aims to optimize the total profit of a home video enterprise by buying right movies with fair prices and distributing the selected movies via a suitable schedule. As the model involves some imprecise (i.e. possibilistic) parameters, a possibilistic mixed integer linear programming model is formulated for the problem under consideration. The original possibilistic model is then converted to its crisp counterpart by adopting an efficient possibilistic programming method represented by Jiménez, Arenas, Bilbao, and Rodr'guez (2007). In this manner, our main contributions are as follows:

- Development of a novel integrated decision model in the context of home video supply chains that would help HVEs to make optimal decisions regarding some of their important issues that directly impact their profitability and reputation.
- Incorporating the epistemic uncertainty in the critical input data of the developed model and providing a tailored solution procedure that allows the HVEs to find an optimal solution in a reasonable amount of time.
- Providing an illustrative example inspired by the current practice of some active HVEs in Iran's home video market.

Noteworthy, although movie portfolio selection and distribution planning have already been addressed in the literature, however, accounting for these issues besides pricing decision in the context of home video market has not been explored before.

² A box office is a place where tickets are sold to the public for admission to an event. By extension, the term is frequently used, especially in the context of the film industry, as a synonym for the amount of business that a particular production such as a film or theatre show, receives.

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