

# Innovative Media Technologies: Digital Video Recorders Changing the Ad-TV Business Model

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## ABSTRACT

Digital Video Recorders (DVRs) as innovative media technology are expected to have a major impact on the TV industry. This paper analyzes the impact of DVRs on the business model of Ad-TV program providers. It introduces the approach of program choice models which are well established in the media economics literature and enhances the traditional program choice models by taking into account different levels of DVR diffusion implying different levels of ad-skipping. The paper shows that DVR diffusion reduces viewer satisfaction and lowers the numbers of programs offered in Ad-TV. It raises the issue that with significant DVR diffusion only one program provider broadcasting a so-called 'common denominator' program at relatively low costs can stay in the market. From the scenario analysis, the paper derives recommendations for the design of business model of Ad-TV program providers and concludes with a brief summary and an outlook to further research.

## Keywords

Digital Video Recorders (DVRs), Television Industry, Ad-TV, Business Model, Program Choice

## INTRODUCTION

Following Timmers (1998, 4), a business model can be defined as "an architecture for the product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues."

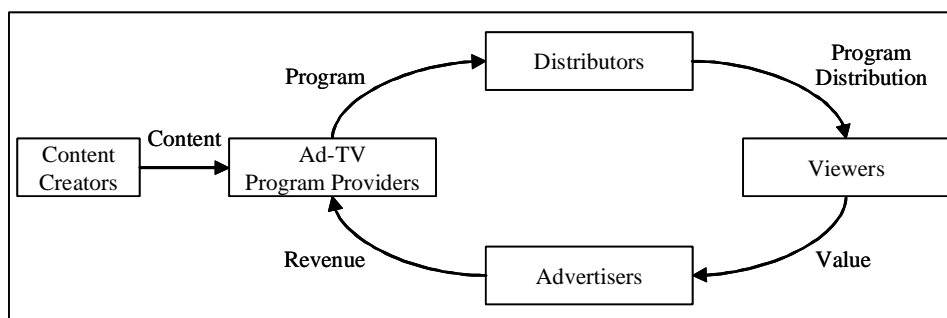
In many industries', business models are challenged by innovative media technologies (Pateli and Giaglis, 2005). One example of such technologies relevant to the TV industry including Ad-TV program providers are Digital Video Recorders (DVRs).

Ad-TV program providers are defined as program providers whose programs are available to viewers without direct payment. They procure content from content creators (e.g., Hollywood Studios, news agencies, TV production companies) and add value by enriching, packing, and presenting it in the form of scheduled programs to viewers (Wildman and Owen, 1992). They distribute their programs via terrestrial, cable, or satellite distributors. In several TV markets such as the US, distributors pay Ad-TV program providers for their content. In contrast, in several European countries, distributors charge program providers for showing their program.

Ad-TV program providers operate in dual markets. When attracting viewers by broadcasting programs, Ad-TV providers generate revenue by selling these consumer contacts to advertisers (Abell, 1980). In other words, the business model of Ad-TV program providers depends on viewers who possess a value to advertisers as potential customers. Viewers watch commercials as non-monetary price for free accessible content (Spence and Owen, 1977; Wildman and Owen, 1985). The generalized business model of Ad-TV program providers is illustrated in Figure 1.

DVRs are specialized set-top boxes that can record up to 1,700 hours of video content on hard disc and allow for suppressing commercials (ad-skipping) by using 30-second ad-jumps and hence evade 'payment' of the non-monetary

price. Similar to traditional Videocassette Recorders (VCRs), they allow watching simultaneously broadcasted programs in succession.



**Figure 1. Business Model of Ad-TV Program Providers**

While the recording functionality of VCRs did not heavily jeopardize the Ad-TV business model (Harvey and Rothe, 1986), the recording functionality combined with the ad-skipping feature of DVRs are expected to severely challenge the business model of Ad-TV program providers (Fortunato and Windels, 2005; Loebbecke, 2004).

In this context, this paper aims to investigate the impact of DVRs on the business model of Ad-TV program providers. It uses the methodology of program choice models which are well established in the media economics literature (see next section) and enhances the traditional program choice models by taking into account different levels of DVR diffusion implying different levels of ad-skipping. From the scenario analysis, the paper derives recommendations for the design of business model of Ad-TV program providers and concludes with a brief summary and an outlook to further research.

### MAJOR PROGRAM CHOICE MODELS IN THE LITERATURE

Major program choice models by Steiner (1952), Rothenberg (1962), and Beebe (1977) help decision makers to select which programs to broadcast as part of their program planning and their business model.

Steiner (1952) developed his model when a technically limited number of channels restricted program diversity. He formed viewer groups and distinguished programs into program types like sports or movies. Under a set of modeling assumptions, valid during the time of his analysis, Steiner compared TV patterns in monopoly and under competition and showed that competition resulted in a waste of resources and program duplication ('excessive sameness', see also Hotelling, 1929). He concluded a superiority of monopoly over competition in terms of viewer satisfaction.

Rothenberg (1962) extended Steiner's model as he took into account gradually increasing TV diversity in the early 1960s. He defined a 'common denominator' program as the program type every viewer was willing to watch instead of and before turning-off the TV. Rothenberg showed that a common denominator program increases competition, but threatens minority programs in the case of a limited number of channels. In his scenario, a monopolist would broadcast only the common denominator program reaching all viewers without causing waste of resources.

Finally, Beebe (1977) enriched the models further. He introduced differently skewed viewer distributions among channels and less preferred choices in preference patterns among viewers. He also took into account program costs and allowed for unlimited channel capacity. Beebe found that competition among providers was likely to produce more desirable results than monopoly resulting from limited channel availability.

### TRANSFERRING PROGRAM CHOICE MODELS TO THE DVR-DRIVEN TV ERA

#### Terminology and Assumptions

This paper uses the following terms: *Ad-TV program providers* are TV stations that present content to viewers. *Programs* are sets of content which can be divided into several program types like movies, sports, or comedy. *Viewer satisfaction* is measured as the number of first and second choices in viewers' preference patterns that are satisfied. *Total TV Viewing* stands for the total of all satisfied choices.

The analysis assumes that every viewer can be assigned to a viewer group with homogenous tastes regarding different program types. Viewer groups rank their desired program types through different choices. Without DVRs, viewers watch commercials during the program as non-monetary price for these programs.

In detail, twelve assumptions (see Figure 2) specify the model. The first seven assumptions are derived from program choice models in the literature; they relate to viewer characteristics and preferences. Assumptions 8, 9 and 10 directly relate to DVRs. Characteristics of Ad-TV program providers are represented in assumptions 11 and 12.

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|------|--|
| (1)  | Viewer groups are highly unequal in size and have homogenous preferences per group   |
| (2)  | Viewers watch programs of first choices or a common second choice (Rothenberg, 1962); viewers rather watch the common denominator program than turning-off the TV.   |
| (3)  | Viewer audience is shared equally in case of program duplication (Steiner, 1952).  |
| (4)  | Advertisers do not value all viewer groups equally; they have different WTP schemes (Takada and Henry, 1993).  |
| (5)  | Program types differ in their cost structures. Higher cost is correlated with more viewer first choices.   |
| (6)  | Competition occurs within a single program period, e.g., 30 minutes (Steiner, 1952).   |
| (7)  | Competitors maximize single channel profits (Beebe, 1977).   |
| (8)  | Viewers with DVRs skip commercials.  |
| (9)  | Viewers with DVRs watch preferred programs in succession.  |
| (10) | The percentage of DVR users is the same over all viewer groups.  |
| (11) | Program providers can add mark-ups on the equilibrium price up to a certain amount without causing market entry of duplicators (Croften, Laband and Long, 2000).   |
| (12) | Ad-TV program providers generate revenues by selling commercial time to advertisers at prices per actually watching viewers (Wilbur, 2005). Other revenue sources like product placement, sponsoring, or call-ins are ignored. |

**Figure 2. Assumptions for Transferring Program Choice Models to DVR-Driven TV Era**

For illustration purposes, the analysis is organized around a hypothetical numerical example (Beebe, 1977):

It assumes an audience of 8,750 viewers, divided into three groups of 5,000, 2,500, and 1,250 viewers respectively and different first choices. Group 1 likes to watch Program 1 (P1), whereas Group 2 prefers P2. P3 is the common denominator program. Each program is associated with different costs. P1 is the most expensive program, whereas the common denominator P3 is the cheapest. Advertisers have different WTP schemes for each group with different values for viewers. Without perfect competition, program providers charge advertising prices above equilibrium price of €25.00, €22.00, and €19.50 for P1, P2, and P3, respectively (see Tables 1a and 1b).

Group	1	2	3
<b>Viewers</b>	5,000	2,500	1,250
<b>Advertisers' WTP per Viewer (in €)</b>	30	25	20
<b>Preferences</b>			
<b>1st Choice</b>	P1	P2	P3
<b>2nd Choice</b>	P3	P3	-
<b>3rd Choice</b>	-	-	-

**Table 1a. Viewer Preferences & Advertisers' WTP per Viewer**

	Program Costs (in €)	Advertising Price per Viewer (in €)
<b>P1</b>	68,000	25.00
<b>P2</b>	44,000	22.00
<b>P3</b>	20,000	19.50

**Table 1b. Program Costs and Advertising Price per Viewer**

**Situation without DVRs**

Without DVRs, the following scenario appears:

	<b>P1</b>	<b>P2</b>	<b>P3</b>
No. of Channels	1	1	1
Viewers	5,000	2,500	1,250
Revenue (in €)	125,000	55,000	24,375
Profit (in €)	57,000	11,000	4,375
<b>Total TV Viewing</b>	<b>8,750</b>	<b>Viewer Satisfaction</b>	<b>Programs Offered</b>
		1st choice: 8,750	3

**Table 1c. Scenario without DVRs**

**Situation with DVR Diffusion: Three Scenarios**

To investigate the impact of different levels of DVR diffusion on Ad-TV program providers, the following shows three scenarios - again based on hypothetical numbers - with 10%, 33%, and 75% of viewers using DVRs and thus skipping commercials (Table 2).

<b>DVR Diffusion (in %)*</b>	<b>Total (8,750 Viewers)</b>		<b>Group 1 (5,000 Viewers)</b>		<b>Group 2 (2,500 Viewers)</b>		<b>Group 3 (1,250 Viewers)</b>	
	<b>without DVR</b>	<b>with DVR</b>	<b>without DVR</b>	<b>with DVR</b>	<b>without DVR</b>	<b>with DVR</b>	<b>without DVR</b>	<b>with DVR</b>
<b>10</b>	7,875	875	4,500	500	2,250	250	1,125	125
<b>33</b>	5,863	2,887	3,350	1,650	1,675	825	838	412
<b>75</b>	2,188	6,562	1,250	3,750	625	1,875	313	937

\*Percentages point to viewers using DVRs over total viewers

**Table 2. Scenarios with Different Levels of DVR Diffusion**

With 10% of viewers skipping commercials as using DVR features, program providers would keep the number of their viewers, but lose 10% of their revenues. The possibility to record content would cause 750 additional viewers to watch P3 as their second choice. But advertisers could not reach those viewers with their commercials; therefore the P3 provider cannot gain financial benefit. His profit drops to €1,938. Overall, the scenario satisfies 750 second choices in addition to 8,750 first choices. Viewer satisfaction and total TV viewing are larger compared to the situation without DVRs, while the program diversity remains the same (see Table 3).

	<b>P1</b>	<b>P2</b>	<b>P3</b>
No. of Channels	1	1	1
Viewers (without DVR)	4,500	2,500	1,125
Viewers (with DVR)	500	250	875
Revenue (in €)	112,500	49,500	21,938
Profit (in €)	44,500	5,500	1,938
<b>Total TV Viewing</b>	<b>9,500</b>	<b>Viewer Satisfaction</b>	<b>Programs Offered</b>
		1st choice: 8,750	2nd choice: 750
			3

**Table 3. Situation with 10% of Viewers Skipping Commercials with DVRs**

With 33% of viewers using DVRs and thus skipping commercials, program providers would lose 33% of their advertising revenues from their respective first choice viewers. P2 would attract only 1,675 viewers who do not use a

DVR and generate €36,850 of revenues. Considering P2 costs of €44,000, the provider of P2 would have to accept a loss, even if the advertising price for Group 2 were raised to €25.00 per viewer (generating €41,875 of revenues). Hence, the P2 provider would exit the market leaving only a choice of two programs. P2 viewers would be expected to switch to their second choice P3, which - in this example - is also the common denominator program. The P3 provider would lose 33% of his first choice viewers, but add the previous P2 watchers. Overall, the P3 provider would gain €29,004 of profit from 2,513 viewers without DVR and 2,887 with DVRs. This scenario leads to 6,250 satisfied first choices, compared to 8,750 without any DVRs in the market, and 4,150 satisfied second choices. Total TV viewing would increase to 10,400 (see Table 4).

	<b>P1</b>	<b>P2</b>	<b>P3</b>
No. of Channels	1	0	1
Viewers (without DVR)	3,350	0	2,513
Viewers (with DVR)	1,650	0	2,887
Revenue (in €)	83,750	0	49,004
Profit (in €)	15,750	0	29,004
<b>Total TV Viewing</b>	<b>Viewer Satisfaction</b>		<b>Programs Offered</b>
10,400	1st choice: 6,250	2nd choice: 4,150	2

**Table 4. Situation with 33% of Viewers Skipping Commercials with DVRs**

75% of viewers skipping commercials would lead to 75% less revenue for program providers generated by their first choice viewers. P1 would disappear as offering P1 would not be affordable at costs of €68,000 and only 1,250 viewers watching P1 commercials. Viewers of P1 would switch to P3, the common denominator program. The program provider of P3 would reach all 8,750 viewers, but only 25% of them would watch commercials. Leading to a profit of €22,666. This profit would be lower than in a scenario where only 33% of viewers skip commercials, but - interestingly enough - higher than in the scenario without DVRs where nobody skips commercials. Since P3 would be the only program left, only one program would be broadcasted. Total TV viewing would decrease to 8,750, the level of 'no DVRs'. Overall, 1,250 viewers could watch their first choice and 7,500 would watch their second choice (see Table 5).

	<b>P1</b>	<b>P2</b>	<b>P3</b>
No. of Channels	0	0	1
Viewers (without DVR)	0	0	2,188
Viewers (with DVR)	0	0	6,562
Revenue (in €)	0	0	42,666
Profit (in €)	0	0	22,666
<b>Total TV Viewing</b>	<b>Viewer Satisfaction</b>		<b>Programs Offered</b>
8,750	1st choice: 1,250	2nd choice: 7,500	1

**Table 5. Situation with 75% of Viewers Skipping Commercials with DVRs**

Table 6 summarizes the results of the three purely illustrative scenarios:

10% and 33% of viewers skipping commercials due to the new media technology would lead to higher levels of viewer satisfaction and to more viewers watching TV. The lower number of ad-watching viewers would reduce the Ad-TV program providers' revenues.

Programs, preferred as first choices by some viewers, would be likely to disappear as soon as the profit break-even would be missed. Ultimately, only the common denominator program would be shown with an increasing diffusion of DVRs.

In addition to the ad-skipping functionality, the recording functionality may further influence viewer satisfaction: Viewers could also watch programs broadcasted simultaneously and thus also satisfy their less preferred choices.

However, with a strong DVR diffusion (here 75%), the recording functionality of DVRs would lose its relevance, as viewer satisfaction would fall below the level of 'no DVRs'.

DVR Diffusion	None	10%	33%	75%
<b>Total TV Viewing</b>	8,750	9,500	10,400	8,750
<b>Viewer Satisfaction</b>	1st choice: 8,750	1st choice: 8,750 2nd choice: 750	1st choice: 6,250 2nd choice: 4,150	1st choice: 1,250 2nd choices 7,500
<b>Programs Offered</b>	3	3	2	1

**Table 6. Scenario Overview**

### RECOMMENDATIONS FOR THE BUSINESS MODEL OF AD-TV PROGRAM PROVIDERS

As illustrated with the three program choice scenarios with different levels of DVR diffusion let us derive several lessons regarding the business model of Ad-TV program providers in the DVR-driven TV era:

Apparently, innovative media technologies such as DVRs challenge the established business model of Ad-TV program providers. Especially the ad-skipping functionality of DVRs questions the providers' raison d'etre. In response, Ad-TV providers should focus on the following strategies to align their business model to the DVR-driven TV era:

- (1) Ad-TV program providers need to create interest for the rather cheaply produced common denominator program, which will be watched by all those viewers whose first choices are not broadcasted any longer due to lack of profitability. The respective program provider would become the sole Ad-TV 'survivor'. Of course, any 'winner-takes-it-all' strategy is risky, especially as such a scenario leads to a monopoly situation associated with lower program quality and less program diversity (Picker, 2004).
- (2) Ad-TV program providers should broadcast content that is less vulnerable to ad-skipping and redistribution. Examples include extremely scarce content such as the Super Bowl final (Hirsch, 1976) where viewers have incentives to watch programs 'live', even if they are exposing themselves to commercials.
- (3) Ad-TV program providers should prepare for revenue sources other than traditional commercials as those may lose relevance with increasing DVR diffusion. Examples include sponsoring (Chorianopoulos and Spinellis, 2006), product placements, or customized commercials (Picker, 2004).

### SUMMARY AND FURTHER RESEARCH

In many countries, DVRs have already entered the TV industry. Different players like program providers, distributors (cable providers), or electronic retailers push the new devices into the market.

The above analysis shed some light on a purposefully simplified situation, it outlines how a significant DVR diffusion would impact Ad-TV program providers and their business models - generating Ad-TV revenues calculated as viewers times advertisers' WTP per viewer. The analysis showed that the provider offering a comparatively cheap and 'low quality' common denominator program would stay as single profitable player in the market.

Taking the well established program choice approach and transferring it into the era of new technologies such as DVRs has proven to be valuable. At least it helped to clarify and structure the impact of new technologies on an industry structure and players' business models.

To push the analysis further, the role of cable providers and their contribution to business model calculations should also be taken into account. However, the position of cable providers in the value chain of the TV industry differs among countries. Thus the integration of cable providers necessarily limits the generalizability of insights gained.

The scenarios presented in this paper could be further developed by using a game-theory based simulation approach. Such an effort could shed light on to the question at which DVR diffusion rate, the Ad-TV market will tip to one single Ad-TV program provider. Further, such game-theory based simulation could take into account other revenue

constellations reaching from any combination of cable and advertising revenues to alternative streams of income stemming from sponsoring or product placement.

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