Brand Awareness of New Technology in the Introduction Stage: A Study of the Blu-Ray Vs HD-DVD Formats

David S. Waller, Paul Z. Wang University of Technology, Sydney
Harmen Oppewal, Monash University
Mark Morrison, Charles Sturt University

Abstract

The introduction of a new technology into the marketplace generally is a risky endeavour for a company, however, when there are competing new technologies of which it is believed only one can survive, winning over customers is one of the major corporate battles to be fought. This paper presents results of a survey among 1495 people regarding their awareness of the two DVD competing formats (Blu-ray and HD-DVD) in the early stages of the recent DVD format war. The results reveal that in the early stages of the format war more people were aware of the HD-DVD than of the Blu-ray format. A model is presented that predicts format awareness from four consumer characteristic constructs and four demographic variables.

Introduction

In the area of home entertainment, DVDs have been an amazing success since they were introduced in 1990s and they have all but replaced the Video Cassette Recorder (VCR) (Minett 2004). Its diffusion into homes across the world has been extremely rapid, with it being claimed that sales of the first generation of DVDs displayed "the fastest growth ever for a consumer electronic product" (Anon 2005). Yet, an issue that had major implications for the industry was the battle between two new incompatible blue laser high-definition, high-capacity DVD disc formats for acceptance as the preferred next generation optical standard – *Blu-ray* and *HD-DVD*. The brand name "Blu-ray" relates to the blue laser technology used in the DVD, and "HD-DVD" is short for "High-Definition Digital Versatile Disc". While there have been battles for new technologies in the past, for example, VHS and Betamax, Sega Vs Nintendo, Xbox Vs Playstation, Plasma TV Vs LCDs, such battles can cause problems in the marketplace that can be remembered for a long time (Dennis and Reinicke 2004; Gomes 2006; Hein 2006). However, at the time of writing this paper it has become clear that Blu-ray has won the DVD format war, with Toshiba Corporation announcing that it has decided it will "no longer develop, manufacture and market HD DVD players and recorders" (Toshiba 2008).

The aim of this paper is to analyse and explain which format (Blu-ray or HD-DVD) was better known by customers at the beginning of the DVD format war, and how the levels of consumer awareness for these formats depended on various consumer characteristic scales and demographics. The research objectives of this study are to: (1) determine the level of brand awareness for the new DVD formats; (2) discover which consumer characteristics can help predict those who are aware of the new DVD recording formats. The consumer characteristics to be tested for this study were: Consumer Novelty Seeking, Consumer Independent Judgment Making, Expert in Technology and Product Knowledge; while the demographic variables were gender, employment status, age and income. These findings can have important implications for marketers introducing a new technology in the future.

Competing Technologies

Consumers are regularly faced with a range of choices in relation to products and brands, and it is important for the marketer to try to understand the reasons for consumers' purchase behaviour to assist in their planning of their market strategy (Cooper 2000). However, while studies have observed the diffusion of innovation and how consumers progress through various purchase stages (Rogers 2003), the process is complicated when there are competing technology variations that want to be the dominant design (Arthur 1989; Anderson and Tushman 1990). For this context Pinch and Bijker (1987) identified a process of technical variation, selection of an industry standard, and retention via incremental technical change that extends the standard. When seeking to be the dominant design within the market, numerous studies have observed the importance of being the first in the market with an innovation, as being the pioneer can provide a big market advantage in sales and market share (Carpenter and Nakamoto 1989; Kalyanaram and Urban 1992), although there have also been successful late entries (Shankar, Carpenter and Krishnamurthi 1998; Fershtman, Mahajan and Muller 1990; Golder and Tellis 1993).

"DVD" is the name originating from the term "Digital Video Disc" or, according to some, "Digital versatile Disc", which is an optical disc storage media format that can be used for data storage, including movies with high video and sound quality. The first DVD player and discs were available in November 1996 in Japan, March 1997 in the US, 1998 in Europe and in 1999 in Australia. The DVD technology began to increase in popularity with DVD rentals topping VHS rentals in June 2003 and by 2005 many retailers announced plans to phase out the VHS format. However, research on picture quality had seen Sony create the Blu-ray disc, while Toshiba's next generation system had resulted in HD DVD, both using use blue laser technology and can store significantly more data than a standard DVD. The main differences between the formats were that they have different surface layers, with Blu-ray being much thinner, meaning they cost more; however, they hold more data (Block 2005).

As mentioned earlier, there have been a number of public battles between new technical innovations, with the best known the multimillion dollar battle between VHS and Betamax in the 1980s. There was concern that a similar standards war could erupt over the competing DVD optical formats (Block 2005; Gomes 2006; Hein 2006; Sweeting 2007). Toshiba released their first consumer-based HD-DVD player on 31 March 2006 in Japan, beating Blu-ray to the market (Perry 2006), which often gives an advantage to be the market pioneer (Carpenter and Nakamoto 1989; Golder and Tellis 1993). At first Blu-ray disc sales were slow as they were perceived as expensive, and there were few titles available. However, this changed when PlayStation 3 was launched, as every PS3 unit also functioned as a Blu-ray Disc player. This was a very important move, as it acted as a catalyst for the Blu-ray format, with all PS3s using a Blu-ray disc drive as its primary information storage medium. Soon Blu-ray discs had outsold HD-DVDs (Prange 2007), and during the first three quarters of 2007, Blu-ray outsold HD-DVDs by about two to one. Finally, in February 2008, Toshiba announced it was removing its support for the HD DVD format, leaving Blu-ray as the industry standard for high-density optical disks, and therefore winner of the DVD format war.

It should be noted that this study was undertaken during the introduction stage, when it was important for marketers to discover which format (Blu-ray or HD-DVD) was known by potential customers. Therefore, this study analyses the level of awareness for the new formats at the introduction stage, as well as whether consumer characteristics and demographics are related to their degree of awareness. For the introduction stage of the two new competing

formats it would rationally be assumed that the level of awareness would be low, but the first brand in the market would have a pioneering advantage which would give it more awareness, especially from consumers who are interested in innovation and new technology. In addition, the technology with the more familiar sounding name would also have an advantage. In particular, the name HD-DVD cleverly links to the product, DVDs, which is well known. Consumers, however, may also (incorrectly) believe that HD-DVD means a DVD with a hard drive. Another favourable (but again incorrect) association for HD-DVD was the suggested link with High-Definition (HD) television, which was already available on the market as a new high-end consumer durable. Therefore, the following hypothesis is proposed:

> H1: Due to it being the pioneer brand and having a brand name similar to the product category (ie, DVD), more consumers displayed an awareness of the HD-DVD than of the Blu-ray format.

Consumer Characteristics

Consumer Psychographic Constructs

As well as determining the awareness of new DVD recorder formats, the second objective of our analysis was to examine the effects of various consumer characteristics on awareness of DVDs with the new format. The four consumer psychographic constructs were measured using multi-item scales, and the socio-demographic variables were single-item measures. Two of the constructs were based on previous studies: *Consumer Novelty Seeking (CNS)*, which relates to "the desire to seek out new product information" (Hirschman 1980; Manning, Bearden, and Madden 1995; Im, Mason and Houston 2007), and *Consumer Independent Judgment Making (CIJM)*, measuring the degree to which "an individual makes new product purchase decisions independently of the communicated experience of others" (Midgley and Dowling 1978; Manning, Bearden, and Madden 1995). Two additional constructs were developed for this study; *Expert in Technology,* measuring consumers' perceived expertise in electronic goods; and *DVD Knowledge Test Score,* measuring consumers' actual knowledge of DVD technology. It is assumed that consumers who have a strong knowledge of DVD technology are more likely to be early adopters.

The four demographic variables used in this study were gender, employment status, age, and income. Because the *Expert in Technology* and *DVD Knowledge Test* are the most specific measures, as they relate to a particular category and knowledge domain, we predict that they will be better predictors of awareness than the more general psychographics such as CNS and CIJM, which in turn will be better predictors than general demographics. Therefore we propose the following hypotheses:

> H2: The consumer psychographic characteristics *Consumer Novelty Seeking* and *Consumer Independent Decision Making* are better predictors of the awareness of the new DVD formats than the selected demographic variables.

> H3: Consumer knowledge of DVD technology (*Expert in Technology* and *DVD Knowledge Test Score*) are better predictors of awareness of the new DVD formats than the general consumer psychographics *Consumer Novelty Seeking* and *Consumer Independent Decision Making*.

Methodology and Results

To determine the awareness of the Blu-ray or HD-DVD formats, survey data was collected in 2005 from 1495 members randomly drawn from a nation-wide on-line panel. The survey included questions about DVDs and the knowledge of the new formats and several other questions, but this paper will only report on the results relating to the awareness of the new DVD formats. After the data were collected, a number of statistical procedures were used to assess the psychometric properties of the measures. The Cronbach alpha values ranged from 0.67 to 0.90, thus indicating satisfactory reliability for all measures. Both exploratory and confirmatory factor analysis results showed that there existed four distinct factors, as expected, and an overall reasonably good scale fit.

Having assessed the measurement properties of the four measures, the structural relationship between the consumer characteristics, the demographic variables and awareness of the two DVD formats was examined. The first research objective was to determine the level of brand awareness for a DVD recorder with the new format. According to the results in Table 1, when asked if they had heard of the new feature, there was a significant difference between those that were aware of Blu-ray (32.46%) and those aware of HD-DVD (64.83%). This clearly indicates that significantly more people were aware, or at least recognised, HD-DVD as a technology than there were for Blu-ray. Therefore, H1 is accepted.

Table 1: Paired t-test results comparing Blu-Ray and HD-DVD awareness

Awareness	Blu-Ray	HD-DVD	t-value	Df	p-value
Had you previously heard of this feature? (Y/N)	32.46%Y	64.83%Y	-21.49	1253	0.00

The second research objective was to discover whether the consumer characteristics of people can predict those who are aware of the new DVD recording formats. As shown in Table 2, respondents can be classified into three segments in terms of their current awareness of the two competing DVD formats: 31.25% of the respondents were not aware of either Blu-ray or HD-DVD format, 39.10% were aware of only one advanced DVD format, and 29.65% were aware of both DVD formats. An ordered logistic regression (Anderson 1984; McCullagh 1980) was used to profile the three awareness segments based on relevant demographic and psychographic variables.

In order to assess the unique contribution of the psychographic variables, two hierarchical ordered logistic regression models were estimated with Model 1 including only the demographic variables and Model 2 having both the demographic and psychographic variables. Model 1 in Table 2 results indicate that the demographic variables as a whole were significant predictors of consumer awareness of the advanced DVD formats (chi-square = 149.13, df=10, $p < 0.01$). Looking at the individual t-test results, it can be concluded that males had higher degree of awareness of the advanced DVD formats than females ($t = 9.98$, $p < 0.01$). In terms of employment status, students were more aware of the advanced DVD formats ($t = 2.20$, $p < 0.05$) and the other employment group (mainly housewives) were less aware of the DVD formats ($t = -1.99$, $p < 0.05$) than the remaining groups. Young people had a higher degree of awareness than old people and the age effect was largely linear ($t = -2.60$, $p < 0.01$), and people with higher household income were more aware of the DVD formats than those with lower household income.

Unlike the age effect, the income effect was curvilinear ($t = -2.95$, $p < 0.01$), meaning as household income increases, awareness increases at a decreasing rate. The likelihood ratio chi-square test comparing Model 2 with Model 1 was highly significant (chi-square = 175.06, df=4, $p < 0.01$), thus indicating that the four psychographic variables made a unique contribution to overall model fit after controlling for the effects of demographic variables. Expertise in technology had the largest impact on awareness ($t = 7.42$, $p < 0.01$), followed by DVD knowledge test score ($t = 3.93$, $p < 0.01$) and consumer novelty seeking ($t = 3.23$, $p < 0.01$). Consumer independent judgment making was not a significant predictor of awareness ($t = 0.76$, $p > 0.10$) in the model that included all four constructs. It is worth noting that the age effect was no longer significant in Model 2. Therefore, H2 and H3 are accepted.

Conclusion

This study has been undertaken at the beginning of the format war between competing DVD technologies: Blu-ray and HD-DVD. While HD-DVD was first in the market and had some advantages over Blu-ray, the results of this study suggest that more consumers were aware of HD-DVD than of Blu-ray. Although our analysis did not control for extent of media coverage nor for brand associations (e.g. HD-DVD being supported by Toshiba while Blu-Ray supporters included Sony), it would appear that the pioneering advantage and the association with the category brand name (ie DVD) had a favourable effect for HD-DVD. This confirms that for marketers it is important when introducing a new technology to choose a brand name that people can clearly link to the product.

However, importantly for marketers, since Blu-ray has now won the DVD format war, it should be noted that non-product based factors, like changes in the marketing environment, availability, compatibility (eg Blu-ray with PS3), etc, also affect the future of the competing technologies before a dominant technology or industry standard emerges. In this case the decision was not totally based on the product features of the two competing technologies. Further research is recommended in this area to discover what factors are important in the decision making process for purchasing a new technology.

Table 2: Demographic and Psychographic Profiles of Three Awareness Segments

Had you previously heard of this feature?	**Percentage**				
(1) Unaware of both Blu-Ray and HD-DVD features	31.25%				
(2) Aware of either Blu-Ray or HD-DVD feature	39.10%				
(3) Aware of both Blu-Ray and HD-DVD features	29.65%				
Total	100.00%				
Model 1: Demographic Variables Only	**Coefficient**	**S.E.**	**t-value**	**p-value**	**Sig**
Intercept 1	-1.0764	0.1279	-8.42	0.0000	***
Intercept 2	0.7551	0.1255	6.02	0.0000	***
Effects coded gender for male	0.6121	0.0613	9.98	0.0000	***
Effects coded gender for female	-0.6121	0.0613	-9.98	0.0000	***
Effects coded employment status for full time	-0.1776	0.1154	-1.54	0.1238	n.s.
Effects coded employment status for part time	-0.1529	0.1491	-1.03	0.3052	n.s.
Effects coded employment status for students	0.4255	0.1930	2.20	0.0275	**
Effects coded employment status for employed	0.2774	0.2466	1.12	0.2607	n.s.
Effects coded employment status for retired or pensioner	0.0189	0.1782	0.11	0.9155	n.s.
Effects coded employment status for others	-0.3913	0.1964	-1.99	0.0464	**
Age linear effect	-0.0134	0.0052	-2.60	0.0093	***
Age quadratic effect	0.0001	0.0004	0.29	0.7751	n.s.
Income linear effect	0.0381	0.0154	2.48	0.0131	**
Income quadratic effect	-0.0068	0.0023	-2.95	0.0031	***
Chi-Square Test Comparing Model 1 with Intercepts Only Model	149.1252	Df	10	0.0000	***
Model 2: Demographic Plus Psychographic Variables	**Coefficient**	**S.E.**	**t-value**	**p-value**	**Sig**
Intercept 1	3.8177	0.5853	6.52	0.0000	***
Intercept 2	5.8717	0.6011	9.77	0.0000	***
Effects coded gender for male	0.3415	0.0661	5.17	0.0000	***
Effects coded gender for female	-0.3415	0.0661	-5.17	0.0000	***
Effects coded employment status for full time	-0.1386	0.1189	-1.16	0.2440	n.s
Effects coded employment status for part time	-0.0185	0.1542	-0.12	0.9046	n.s
Effects coded employment status for students	0.4949	0.1989	2.49	0.0128	**
Effects coded employment status for employed	0.1030	0.2549	0.40	0.6862	n.s
Effects coded employment status for retired or pensioner	0.0210	0.1846	0.11	0.9093	n.s
Effects coded employment status for others	-0.4620	0.2051	-2.25	0.0243	**
Age linear effect	-0.0018	0.0054	-0.33	0.7419	n.s
Age quadratic effect	0.0001	0.0004	0.33	0.7430	n.s
Income linear effect	0.0264	0.0158	1.67	0.0941	*
Income quadratic effect	-0.0059	0.0023	-2.50	0.0123	**
Consumer novelty seeking	0.2830	0.0876	3.23	0.0012	***
Consumer independent judgment making	0.0554	0.0724	0.76	0.4444	n.s
Perceived expertise in technology	0.6546	0.0882	7.42	0.0000	***
DVD knowledge test score	0.5179	0.1318	3.93	0.0001	***
Chi-Square Test Comparing Model 2 with Model 1	175.0616	Df	4	0.0000	***

p< 0.10; ** p< 0.05; *** p<0.01

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