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Description	

2E03　　　Change of Diffusion Mechanism of Media-Based Products
　　　　　　　　　 — *An Empirical Study of Music CD Market in Japan*

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1. Introduction

According to "White Paper - From the Other Side of Copyrighted Product Industry" (2000), the effect of copyrighted business on GDP is described quantitatively. "The value of production of copyrighted businesses in Japan is estimated to be 30,430 billion yen and added value 10,904 billion yen. Based on the figure in 1998, the production value accounts for 2.3% of GDP and the added value is almost equal or higher to that of the electric power sector, iron and steel sector and automobile sector. Moreover, the copyrighted product industry has experienced high growth from 1994 to 1998 with an average growth rate of 5.9% each year. Contrast to the decelerating economic growth of Japan, the copyrighted product industry shows its higher and higher importance." Such concrete figures imply not only the importance of the copyrighted product industry but also the demand for better understanding of the evolution of the copyrighted product diffusion in such an information society.

With the focus on music industry, before the new technology and business model of online downloading service, "music" products have been mainly sold in the form of CD. While the worldwide CD sales figure has dropped rapidly for years, the sales value and the number of million-seller album in Japan still kept increasing during the economic regression. **(Figure 1)** However, even if music industry was considered to be resistant to the overall economic downturn, it has also revealed a declining trend since the mid 90s. **(Figure 2)**

From the perspective of marketing strategy, the sales pattern whose sales figure starts to decrease from the time the product enters into the market is called "initial-stage concentrated pattern." Usually such initial-stage concentrated patterns are taken as a kind of failure of product marketing but music industry

is exceptional. Most albums of top singers and with sales success seem to be products with initial-stage concentrated sales pattern. However, no empirical study has been done about such unique sales patterns of music industry, which is a miniature of contents industry that is highly dependent on information and media. The sales curve of media-dependent content products such as music, movie and game software tends to go through a decline from the day of release.
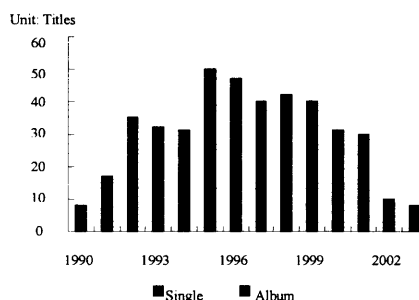

Figure 1. The number of million-seller CD (1990～2003).

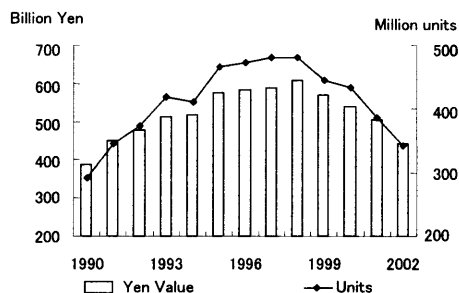**Source: Japan Record Association homepage (2005).**

Figure 2. The sales value and total number of music CD sold (1990～2003).

Source: Japan Record Association homepage (2005).

Furthermore, by examining movie industry, business model has been fixed to gain most profit during the first round of release in movie theaters and then raise the sales gradually by copyright income through telecast and video/DVD for rent and for sale. The key point of fulfilling the success of cinema is how to boost the number of audience that go to the movie theater and such pattern of dissemination can also be categorized as initial-stage concentrated pattern.

1.2 Purpose of the research

This research extracted the index which represents the degree of initial-concentration and concluded the result of 1200 music CD albums as a categorized table. Moreover, this research analyzed the chronological change of the initial-stage concentration degree from 1991 to 2002 in order to elucidate the diffusion pattern of music industry that evolves with the advancement of information technology. Based on the result of analysis, this research schemes to clarify the characteristics of music product diffusion, as a kind of information flow, and provides new perspectives on how technology have affects the spread of information products.

2. Framework of analysis

2.1 Bass model

$$X(t_i) = [p + qY(t_i)][m - Y(t_i)] \quad (1)$$

This model is called Bass' discrete innovation diffusion model with p as the innovation coefficient and q imitation coefficient. $f(t)$ is the possibility density function of adoption by time and $F(t)$ the distribution possibility function. The model in (1) can be shown as a continuous innovation diffusion model as (2).

$$f(t) = \frac{dF(t)}{dt} = [p + qF(t)][1 - F(t)] \quad (2)$$

By applying the initial condition $F(t) = 0$, the functions can be shown as (3) and (4).

$$F(t) = \frac{1 - e^{-(p+q)t}}{1 + \frac{q}{p} e^{-(p+q)t}} \quad (3), \qquad f(t) = \frac{(p+q)^2 e^{-(p+q)t}}{p\left\{1 + \frac{q}{p} e^{-(p+q)t}\right\}^2} \quad (4)$$

The accumulated number of adopter until time t is equal to $mF(t)$.

Once the innovation coefficient p, the imitation coefficient q and the potential m are specified, the diffusion curve will be specified. This enables the prediction of diffusion process at any time.

クラス	タイミング	下限		上限
I	$0 \leqq T_{IN}$	0	$<p/q<$	0.072
II	$T_{IN} \leqq 0 < T_1$	0.072	$<p/q<$	0.268
III	$T_1 \leqq 0 < T^*$	0.268	$<p/q<$	1.000
IV	$T^* \leqq 0 < T_2$	1.000	$<p/q<$	3.732
V	$T_2 \leqq 0$	3.732	$<p/q<$	∞

Table 1. Classification of diffusion curves

2.2 Data construction

This research utilized the so-called Original Confidential Charts in "Oricon Yearbooks," which are usually called Oricon Charts. "Oricon Yearbook" comprises all charts for the whole year. However, since the charts describe only top 100 singles each week, it is difficult to know the sales figure after the singles drop out of the charts. The accumulated sales data in this research does not include the sales not recorded in Oricon charts. However, the CD sales figure tends to decline continuously after the single drops out of top 100, so such lack of data is considered to be ignorable.

3. Results and discussion

3.1 Classification

Table 2. lists the number of single CDs in each class of each year.

	I	II	III	IV	V	
2002	5	3	13	3	76	100
2001	4	6	9	7	74	100
2000	8	3	8	5	76	100
1999	5	7	8	8	72	100
1998	6	6	7	6	75	100
1997	4	11	16	11	58	100
1996	6	9	14	10	61	100
1995	6	8	17	7	62	100
1994	4	9	25	10	52	100
1993	11	10	18	14	47	100
1992	6	21	21	10	42	100
1991	10	11	10	4	65	100
合計	75	104	166	95	760	1200

Table 2. Classification of top single CDs from 1991 to 2002
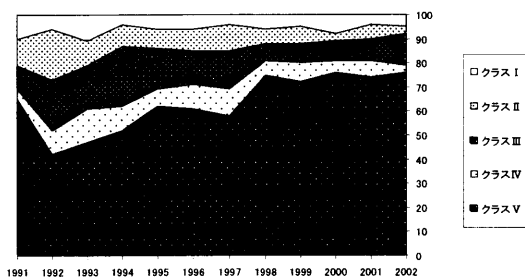

Figure 3. Trend of classification of top single CDs (from 1991 to 2002).

Class V and Class IV can be characterized as "initial-stage concentrated sales patterns." Among all the top CDs, 855 belong to initial-stage concentrated sales patterns while Class I consists only 75. The two lower sections of the graph constitute 71.25% but Class I, which is most common in the case of traditional product diffusion curves, only occupies 6.25%.

Judging from the t-values of parameters p, q and m at 5% or 1 % significance, it is proved that all the CDs which belong to Class I, II, III and IV fit the diffusion model well. However, in the case of CDs that are clearly included in Class V, q values are not statistically significant. Such result shows that those CDs might fir other kinds of diffusion curves better and it also implies the limitation of Bass model. According to the original data pf those CDs, they had been ranked in the top-seller chart for only 10-15 weeks (about 3 months). Because CDs that are highly initial-stage concentrated usually remain in the chart shortly, it is inappropriate to neglect them even if Shintaku (2003) and Srinivasan (1986) suggested that data of at least 10 periods is necessary for statistical analysis. Therefore, since $q \ll p$, we conducted non-linear regression analysis again by supposing that $q = 0$ and $p<1$ as a condition to prevent p from diverging. The new result of p falls into the 95% interval of the previously estimated p, and the estimations of CDs with p converging to 1 are also statistically significant. The estimations of p, q and m are listed in the appendix.

Judging from the diffusion curves of the same singers at different time, the following features are noticed.
(1) Ayumi Hamazaki: The sales curve of her singles remained in Class II and III since her first single until the seventh. However, the sales curves belong to Class V since the eighth single until the twenty-eighth.
(2) Utada Hikaru: Her first single in 1998 constructed a Class I sales curve and then all her singles reveal Class V curves.

The empirical analysis of other singers also shows that once the sales curve of a single CD results in Class IV or V curve, the sales curve of next single will never belong to the lower classes anymore. Therefore, by taking the line $p = q$ in $p - q$ graph a the borderline, the empirical analysis of Japanese music market confirms that the points which represent the same singer's sales curves can only evolve from the lower section toward the upper part without any reverse movement.

Since p values became higher, the sales during the first week occupy more of the total sales. The decrease of the sales during the first week can result in the decrease of the total sales. (**Figure 4**)

The change is similar with that of the total sales; they started to drop since the later 90s. Unfortunately, such a trend also implies that the most common promotion strategy that emphasizes on the sales at the beginning does not work well anymore. Furthermore, pirating might has deteriorated this problem. Consumers can buy the pirated CDs and copy the music from their friend or the CDs borrowed from the rental shops or
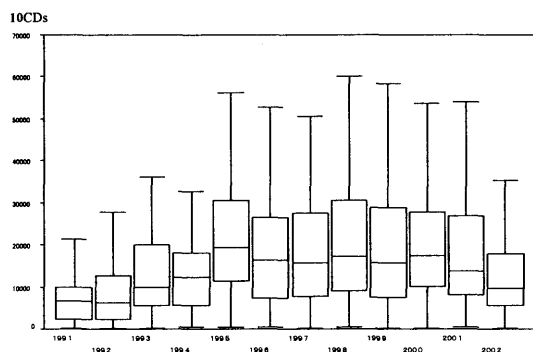
obtain the files on the Internet.

10CDs

Figure 4. The change of the sales during the first week

4. Conclusion

4.1 Conclusion

This research analyzes the diffusion curves of music CDs by Bass model to categorize 1200 best-seller singles. The result shows approximately 70% of music CDs followed the initial-stage concentrated diffusion pattern. By focusing on several specific singers who released many singles, it is proved that once their product diffusion trajectories enter the classes of initial-stage concentrated diffusion curves, the diffusion curves will never return back to the lower diffusion classes.

In the 90s, the exogenous parameter p has increased continuously, and it indicates the degree of initial-concentrated patter is higher and higher. However, the sales figure during the first week after release has decreased dramatically since the late 90s. As a result, the total sales figure dropped obviously.

It is important for the music industry to realize the traditional way of selling music CDs can no long last as well as before. Not only the innovations such as the Internet and MP3 have caused much effect, but also the unique diffusion curve in music market should be considered in order to devise a new kind of business model. Significant concerns placed on exogenous mass media propaganda and efforts made to increase the short-term sales figure may not work well in the low growth economy anymore.

4.2 Policy implications

Even if the music CD market stepped into the low-profit stage, the whole music industry is still trying to use huge budget o mass media propaganda to create million-sellers. Such strategies reveal their insufficient understanding about the society that has rapidly changed by new information communication technology. The mass production way may not be the optimal path for the music industry anymore.

New functions should be built based on the full utilization of core competences of music products. Furthermore, the adaptation to, not escape from, new information communication technology is also necessary. The music downloading service by mobile phone is a new service that combined mobile phone service and music downloading. In the future, such new combination is definitely to necessary to create new paradigm of music industry.

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