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Segmentation of Hedonic Consumption: An Application of Latent Class Analysis to Consumer Transaction Databases

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Abstract

While the broad and growing sector of leisure, culture and entertainment is rapidly adapting to marketing, little is known about segmentation in this field. The sector has customer and transaction databases of very good quality, but usage-based segmentation in this new field poses new problems, as hedonic consumption goods are importantly different from other consumption goods. The type of consumer choice behavior suggested in the literature demands a segmentation of category purchase incidence identified transaction data based on Latent Class Analysis. We illustrate such an approach to a library transaction database. The article concludes with a reflection on the results and suggests further directions for research.

Keywords: Hedonic consumption, segmentation, latent class analysis

1. Introduction

The term hedonic consumption has been introduced to denote consumers behavior, based on subjective criteria relating to 'multi-sensory, fantasy and emotive aspects of product usage experience' (Hirschman & Holbrook, 1982) in contrast to more objective criteria that link conventional goods and services to utilitarian functions (Holbrook & Hirschman, 1982). The multi-sensory aspect refers to the receipt of experiences through sensory modalities such as tastes, sounds, scents, tactile impressions and visual images. These experiences in turn may not only lead to recall of historic images (memories), but also evoke fantasies, such as the images in the head of a fiction reader when translating textual descriptions in pictures. In addition, the multi-sensory input can lead to emotional arousal, i.e. evoke emotions such as joy, jealousy, fear and rage (Hirschman & Holbrook, 1982). For instance, in spite of

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its apparent fictional character, a horror movie will evoke feelings of anxiety among the viewers. A lot of products possess hedonic as well as utilitarian aspects, but particularly in the sectors of leisure, entertainment and art, the multi-sensory, fantasy and emotive aspects play a central role in consumption (Holbrook & Hirschman, 1982; Holbrook, 1980).

The economic importance of hedonic consumption is impressive. Obvious examples are the popular entertainment industries such as movies or recorded music, which reach a multi-billion dollar scale (Lacher & Mizerski, 1994; Hodgson, 1993); the cultural, non-profit sector is often underestimated in its importance. In spite of its somewhat elitist image, one third of the UK adult population claims to have attended at least one type of arts event in the past 12 months with another third as a potential customer (Walshe, 1993). Opera spectaculars, such as "The Three Tenors" or "Pavarotti in the park" drew millions of TV viewers in the United Kingdom (Hodgson, 1993) and economic impact studies of cultural events such as Glasgow 1990 (Myerscough, 1993) or four 1992/93 art exhibitions in New York (AftA, 1993) indicate a major boost to the local economy and employment. Finally, although they operate on tight budgets, most cultural organizations are subsidized with millions of public funding (Stone, 1995) and in 1990 alone they received $7.9 billion in the US from voluntary contributions from charities. Income for American arts organizations from consumer spending is also impressive with $5 billion spent on admission tickets (which is more than the amount spent on sport events), $4.1 billion on movie admissions and $17.6 billion on books (Throsby, 1994).

In the nineties the environment for many organizations in these industries has been changing and the organizations involved have been forced to adopt a more market-oriented approach because of a number of developments and characteristics of their markets:

- The industry, traditionally heavily based on additional funding, was faced with declining support due to economic recession, changing philanthropic priorities among foundations and corporations, severe cuts from government sources and increased competition for contributions due to the significant growth of the sheer number of non-profit organizations competing for funds (Scheff & Kotler, 1996)

- Changes in political climate have led to reduced government funding and to the necessity for the organizations involved to focus more on the market (Stone, 1995; Kinnell & McDougall, 1994). Funders such as government agencies and foundations are restricting their grants for specific purposes. Artistic excellence as a criterion is supposedly replaced by criteria of affirmative action, social justice and equal opportunity (Scheff & Kotler, 1996). Increasing the participation of minority groups becomes more and more important (Dimaggio & Ostrower, 1990), meaning that new marketing information as well as a rethinking of product offering is necessary. At the same time, corporate support is becoming more commercial and conditioned on arts organizations becoming leaner, more business-oriented and able to meet the corporation's own marketing objectives (Scheff & Kotler, 1996).

- Both in the United States as well as in Europe audience attendance has fallen or has remained stagnant at best (Kotler & Scheff, 1997). Scheff and Kotler (1996) suggest a number of causes such as a decline in leisure time, competition from less expensive

and more convenient forms of entertainment such as television, the lack of arts education in schools and the declining interest of people to commit themselves in advance through subscription series. Also, in the US population demographics are changing, with amongst others the importance of the ethnic communities increasing. Muret (1994) adds market developments such as economic conditions and trends as a possible effect on performing arts and entertainment venues.

- Most recently, important technological developments have added to the uncertainty of the market environment. For instance the advent of CD-ROM's and the possibilities of the internet force organizations such as public libraries to reconsider the role of books in this information age (Winzenried & Miido, 1997).

In order to survive, cultural organizations face the choice of either improving their marketing or to reconsider their mission. Either way, a shift towards marketing-focused management is essential and many organizations are currently looking for ways to adopt a more market-oriented focus. The market for hedonic consumption is proven to be very heterogeneous (Holbrook & Hirschman, 1982) and therefore modern companies operating in the sectors involved cannot do without a segmentation of their potential customers. The literature indicates that hedonic choice behavior is particularly complex but so far fails to suggest guidelines for choosing the appropriate statistical techniques for segmentation. The current paper is positioned in this context. It aims at contributing to market research methodology in this field—and in particular segmentation methodology—enabling a more market focused management.

In paragraph two we will first outline the specific nature of hedonic consumption and argue why the analysis of transaction databases would be an appropriate method and why mixture modeling would be best suited as segmentation method. The advantages of using electronic library loan systems as data-sets are explained in paragraph three and in paragraph four we present the results of a latent class analysis on a particular data-set. Finally, we will draw conclusions and suggest managerial implications.

2. Segmentation of Hedonic Consumption

Market segmentation has been a central concept in both marketing theory and marketing practice since its introduction by Smith in 1956. It has become a necessary perspective of the market for any organization to provide an optimum match between the increased flexibility of production and the needs of more or less homogeneous groups of consumers (Wedel & Kamakura, 1997). However, in spite of the importance of segmentation to marketing of hedonic goods, only a few studies have empirically investigated the existence of segments among hedonic consumers. In addition, most of these studies look into differences between a-priori defined groups, in particular visitors versus non-visitors (Verwey, 1993; Walshe, 1993; Peterson, 1992; Belk & Andreasen, 1980), consumers in different stages of adoption (Andreasen, 1992) or heavy users versus light users (Semenik & Young, 1980). Rare examples of a more exploratory approach are Sexton and Britney (1980) and Andreasen and Belk (1980).

Whilst only a few studies have looked into the heterogeneity of the markets for hedonic consumption and tried to derive segments post-hoc, no research has addressed the issue of what constitutes an "optimal" segmentation approach for consumers of hedonic goods. The following reasons urge us to focus on the segmentation methodology for consumers of hedonic goods, which comprises of two dimensions: the measurement of segmentation bases and the selection of segmentation methods.

Measurement of Segmentation Bases

The non-utilitarian and multi-sensory character of hedonic products makes it difficult for respondents to put reasons and results of the consumption process into words. Holbrook and Hirschman (1982) suggest that introspection or qualitative in-depth interviews are well-suited to arrive at the intangible motives underlying consumption. Because of the nature of the products, quantitative research cannot validly ask respondents in a survey to explain their choice among a limited number of options presented. Therefore, we argue that for quantitative segmentation studies, interpretation of the analysis of consumption histories is much more likely to yield valid and consistent findings. The argument for analyzing past consumption history over attitudinal surveys is further underlined by the holistic choice strategies that consumers employ for hedonic goods. Because consumers don't maximize benefit by evaluating hedonic product attributes separately (Hirschman, 1983; Holbrook & Hirschman, 1982; Zajonc & Markus, 1982) "an hedonic outlook must involve subjects in consumption-like experiences based on real—or at least realistic—product samples" (Holbrook & Hirschman, 1982). Surveys trying to have consumers trade off product attributes seem burdened with limitations.

Finally, the range of products and varieties in markets for hedonic goods is very large, and much larger than in most categories of fast moving consumer goods, durables or services (think for example of the breadth of product lines in markets for books, CD's, movies and art performances), the number of available items easily exceeding 50. In addition in most categories of hedonic goods there is limited or no repeat purchase among the many items available (for example, CD's , concerts, and books are mostly only bought once). One may argue that the variety in these categories is demand driven, where consumers reach optimal hedonic stimulation when the complexity finds a balance between familiarity and chaos, a balance of variety and challenge (Lacher, 1989; Holbrook & Hirschman, 1982; Holbrook, 1980; Huber & Holbrook, 1980; based on Berlyne's work on the Wundt curve). Similarly, authors such as Holbrook (1995), Nantel and Colbert (1992) and Peterson (1992) found a clear distinction between high cultural products and diverting entertainment. Again, simulating such a variety in surveys or interviews poses insurmountable problems, because the range of products has to display a sufficient amount of variety in complexity. The large number of items in hedonic categories coupled with the lack of repeat purchasing however poses problems to the use of purchase histories of items as appropriate segmentation bases. We therefore propose to use the purchase incidence of categories of hedonic goods, being an aggregate of the purchases of individual items and therefore necessarily more stable, across some time horizon as a segmentation base.

For most hedonic products however, unobtrusive measurement of past consumption behavior has not been possible until recently. Technological developments in information technology have created interesting opportunities for tracking consumption behavior in leisure, art and entertainment venues (Prochak, 1996). Apart from general personal computer based office software, the automation of box office administration has improved considerably. New systems not only print tickets, but allow the registration of client name and address, linking personal with sales data. A number of authors have pointed to the opportunities this development creates for marketing in this sector (Kotler & Scheff, 1997; Prochak, 1996; Rawlings-Jackson, 1995; Tomlinson, 1994; Tomlinson, 1993; Tomlinson, 1992; McCart, 1992). We conjecture that these consumer transaction databases, compiled through automated box office administration primarily for accounting purposes, provide researchers with the purchase based segmentation bases that are eminently suited for identification of segments of customers.

Segmentation Methods

Empirical studies into hedonic choice behavior such as McCart (1992) report "a complex matrix of behavioral characteristics for people attending events." The heterogeneity of hedonic choice behavior has been linked to differences in personality (Cooper-Martin, 1992; Holbrook & Hirschman, 1982) and life style (Andreasen & Belk, 1980). It has also been suggested that choice behavior is heterogeneous even at individual level, since hedonic choice behavior is very situation dependent (Holbrook & Hirschman, 1982).

Since many factors may affect the actual choice of a hedonic product, the appropriate basis for segmentation is a consumers pattern of choice. Choice probabilities reflect uncertainty in the transformation of the utility of hedonic products to actual choice, due to unmeasured factors such as situational effects (cf. Ben-Akiva & Lerman, 1985). In addition, such choice probabilities accommodate stochastic switching behavior among hedonic good categories. We assume that observed switching behavior among categories of hedonic goods (but not necessarily within those categories) is due to heterogeneity in consumer tastes, and that when conditioning upon that heterogeneity, choices of categories of goods in successive periods are independent.

Then, for hedonic products, the probability that one particular consumer, n, combines hedonic product categories within a certain period of time equals the product of the probabilities of purchasing each of the categories. Thus, if consumer n has a probability of p_{in} of choosing category i and of p_{jn} of choosing category j, then under those conditions of independence, the probability of choosing products from both categories within a certain time frame equals $p_{in}p_{jn}$. However, estimating those category choice probabilities for each subject separately is not feasible. Thus, an effective approach for segmentation of hedonic goods should involve the estimation of category-choice probabilities within a set of homogeneous segments, where all subjects within a segment are assumed to have identical choice probabilities. Such a segmentation approach should account for the uncertainty of classification of consumers to segments, caused by factors affecting the choice behavior as listed above.

Several authors (Holbrook & Hirschman, 1982; Andreasen & Belk, 1980; Holbrook, 1980) conclude that multivariate classification techniques are the most appropriate in this field, since those derive segments post-hoc. Unfortunately none of these authors specifies which technique would be best suited. The aim of this paper is to fill this gap.

The method we propose to use for segmentation of consumers of hedonic products on the basis of their recorded choice behavior is mixture modeling (or latent class analysis). The applicability of finite mixture models to segmentation on the basis of choice behavior was first recognized by amongst others Grover and Srinivasan (1987), see also Wedel and Kamakura (1997). However, while these authors analyze switching behavior based on cross-classification of purchases at consecutive time periods, we analyze the joint choice probability of a category of hedonic products across a certain time horizon. Here, X_{ni} denotes whether or not subject n has chosen i in that period. It thus reflects incidence or penetration rather than purchase frequency.

If we assume the existence of S segments, with prior probabilities (or sizes) π_s, $\Sigma\pi_s = 1$, while there are $i = 1 \ldots I$ hedonic products in a category with purchase probabilities P_{is} identical for all subjects n in segment s, then the mixture model is formulated as:

$$p_n = \sum_{s=1}^{s} \pi_x \prod_{i=1}^{I} p_{is}^{X_{ni}}$$

With $p_n = p_n(X_{n1}, \ldots, X_{nI})$ the probability of observing the entire incidence history of subject n. Thus, the finite mixture model has the property that conditional upon a segment, choices of categories are independent, which is called local independence. The latent class model identifies segment specific need patterns through the estimated product incidence probabilities per segment. In addition the latent class model provides us with the posterior probability of membership of each individual to the segments:

$$\pi_{ns} = \frac{\pi_s \prod_i p_{is}^{X_{ni}}}{\sum_s \pi_s \prod_i p_{is}^{X_{ni}}}$$

If the latent class model is applied to a customer transaction database those posterior probabilities identify for each subject to which segment s/he belongs, and enable direct marketing efforts to be targeted, based on ZIP or other postal code information. Thus, these posterior probabilities constitute very useful statistics in the context of database and direct marketing.

In order to investigate the separation of the segments we compute the entropy of classification, which is defined as:

$$E_s = -\sum_s \sum_n \pi_{ns} \ln \pi_{ns} / n \ln(S)$$

E_s is a measure in between zero and one, where values close to one indicate perfect separation of segments. If values close to zero are found, this may indicate classification uncertainty (Wedel & Kamakura, 1997).

3. Library Loan System Application

We choose a library loan system to demonstrate the segmentation approach. In comparison to other forms of hedonic consumption, the borrowing of library books is of particular interest as object of research since:

- Most library books do not require a certain amount of training or expertise before they can be enjoyed, such as some art forms. Therefore, library books attract a much broader range of consumers as compared to other hedonic goods such as the arts, which is likely to result in substantial heterogeneity to occur in this market.
- Library books represent a broad range of complexity from high literature to simple pulp fiction. Incidence patterns across such a broad range of products are likely to reflect independent consumer needs.
- Reading is a solitary pastime that thus has less social influences than those associated with more conspicuous forms of hedonic consumption of arts and other hedonic goods, which enhances the use of estimated choice probabilities as indicators of personal needs.
- Price and other marketing mix variables play no role in the choice of library books. Possible charges for lending books are the same for every book and advertisement and distribution is likewise identical. Thus in our latent class model there is no need to include such effects.
- Given the broad range of books available, the availability of multiple items of a single book and the large time span of data available, the influence of out-of-stock situations and other distribution effects is negligible, while repeat-loans tend not to occur.

Public Library Data

The public library of one particular city in The Netherlands included in this study was one of the first libraries to recognize the marketing potential of its historical data and was at the moment of this research the only library with data in a suitable format for market research purposes. As coding systems have changed several times over the years, it was decided to limit the data on loans to one full and unaffected calendar year, 1996.

Library information systems are typically composed of one record for each customer-transaction. At each transaction, the customer identification number is entered along with the time and data and the identification numbers of the loaned books. This information is stored in a database that can be accessed by client and book number. Most libraries will, apart from name and address data, also include date of birth in this database as some age groups are eligible for free membership or discounts. Other (socio-demographic) customer data is generally not available. The library automation system furthermore has features to identify and report overdue loans, and produce summary statistics over certain periods (month, year). For this research project, the loan data and personal data were merged to one flat file with one row per client and 52 dummy variables for the category codes (thrillers, novels, poetry, etc.) to indicate whether any books in such a category were borrowed in

Table 1. Comparison of the first eight LCA models.

# classes	df ($\times 10_{10}$)	Log likelihood ratio	Bootstr. Sign.	Chi-square ($\times 10_{10}$)	Bootstr. Sign.
2	450360.0	98764.74	0.00	190953628632100	0.00
3	450360.0	92813.30	0.00	9614132269	0.00
4	450360.0	88736.72	0.00	364791987	0.00
5	450360.0	87110.13	0.01	3963080	0.00
6	450360.0	85650.52	0.05	2908818	0.00
7	450360.0	84639.05	0.04	618340	0.02
8	450360.0	83862.45	**0.19**	268869	**0.12**

1996. In addition, gender, age (8 categories, table 2), number of books lent (5 categories, table 3) and place of residence (3 categories, table 4) were available. Finally, the database included client number and ZIP code, potentially useable for tracking individual clients. The final data set contained 7,359 active borrowers.

4. Results

The data set was analyzed using a special version of PanMark (Van de Pol, Langeheine & De Jong, 1991), adapted by the one of the authors of the program to accommodate large data sets with up to 60 indicators. Solutions for two to ten latent classes were generated with 100 random start values per solution to avoid local optima. Bootstrapping was used to determine the significance of the Likelihood ratio and Pearson chi square (Wedel & Kamakura, 1997). These statistics are used to determine the optimal number of segments for representing the data. However, the usual statistical properties for testing a model with S relative to one with $S + 1$ classes do not apply, reason why a bootstrap approximation for the distribution of these statistics is used. In bootstrapping, repeated samples are drawn from the data at hand to empirically simulate the distribution of the statistics. All measures indicated a solution of eight latent classes: (table 1)

The eight segments were profiled with consumer demographics by computing the percentages of people in each segment falling into particular classes of these variables. The result is presented in table 2.

The eight segments show clear and distinguishing patterns of borrowing behavior. Before labeling the classes, we first explore the typology by profiling the posterior probabilities of class membership with the remaining variables for description.

Age

As is well known from previous research, age is an important determinant of choice behavior where books are concerned. In this study, age was a particularly powerful predictor of segment membership, as we can see in table 3. The segments have a very distinct age distribution:

Table 2. Eight class solution LCA.

	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7	Segment 8
size of the segment	**0.287**	**0.057**	**0.064**	0.117	0.130	0.096	0.048	0.201
CD 1	0.039	0.310	0.312	**0.420**	0.062	0.203	**0.532**	0.319
CD 2	0.006	0.108	0.101	0.202	0.007	0.094	0.253	0.132
novels (AG)	0.004	0.111	0.315	0.292	0.189	**0.650**	**0.753**	0.018
adventure/thrillers	0.001	0.124	0.256	0.303	0.385	**0.796**	**0.652**	0.081
Detectives	0.005	0.116	0.178	0.199	0.271	**0.615**	**0.531**	0.029
war & resistance	0.001	0.072	0.117	0.052	0.126	0.327	0.217	0.026
science fiction	0.001	0.032	0.045	0.067	0.051	0.174	0.235	0.022
horror	0.005	0.038	0.042	0.041	0.052	0.167	0.181	0.019
sea	0.000	0.000	0.025	0.009	0.010	0.084	0.047	0.002
county/family saga	0.001	0.104	0.084	0.104	**0.535**	**0.688**	0.344	0.032
[unknown]	0.000	0.008	0.009	0.012	0.119	0.186	0.057	0.000
romance	0.002	0.059	0.040	0.051	0.317	0.545	0.271	0.000
historic novel	0.001	0.079	0.186	0.135	0.213	0.557	**0.491**	0.015
humoristic roman	0.001	0.056	0.064	0.061	0.064	0.243	0.240	0.010
comics	0.027	0.163	0.027	0.053	0.013	0.043	0.137	0.014
novels (AV)	0.004	0.142	0.221	0.262	0.391	**0.853**	**0.654**	0.031
literary prose	0.005	0.260	**0.838**	**0.609**	0.390	**0.827**	**0.881**	0.197
literary poetry	0.000	0.029	0.181	0.098	0.003	0.041	0.201	0.031
general	0.002	0.049	0.085	0.087	0.007	0.049	0.318	0.023
philosophy	0.000	0.011	0.057	0.197	0.000	0.053	0.343	0.025
religion	0.004	0.059	0.078	0.182	0.017	0.061	0.390	0.022
social sciences	0.002	0.051	0.056	0.182	0.025	0.127	0.337	0.032
economy	0.004	0.073	0.080	0.154	0.020	0.068	0.359	0.039
law	0.002	0.019	0.047	0.099	0.018	0.105	0.266	0.012
war	0.002	0.019	0.014	0.032	0.002	0.023	0.114	0.006
psychology	0.000	0.078	0.092	0.369	0.038	0.163	**0.640**	0.059
education	0.004	0.109	0.033	0.215	0.022	0.109	0.339	0.050
math & physics	0.009	0.084	0.130	0.190	0.023	0.109	**0.404**	0.070
biology	0.035	0.150	0.072	0.167	0.027	0.086	0.339	0.043
health & sport	0.030	0.260	0.154	**0.534**	0.114	0.327	**0.761**	0.139
card games & puzzles	0.003	0.058	0.020	0.072	0.017	0.080	0.162	0.021
DIY & cooking	0.006	0.168	0.089	0.329	0.070	0.273	**0.526**	0.070
pets & plants	0.046	0.147	0.067	0.266	0.065	0.189	**0.439**	0.095
technical	0.014	0.135	0.110	0.191	0.029	0.140	**0.506**	0.087
(visual) art	0.009	0.100	0.212	0.241	0.025	0.113	**0.551**	0.073
photography and craft	0.000	0.045	0.055	0.151	0.010	0.070	**0.411**	0.023
music/dance/film/etc.	0.004	0.144	0.145	0.144	0.001	0.104	0.390	0.047
language, lit. and philology	0.002	0.035	0.083	0.096	0.008	0.045	0.194	0.026
literary (extra group)	0.000	0.033	0.222	0.058	0.002	0.031	0.270	0.022
history	0.018	0.202	0.321	0.338	0.056	0.305	**0.748**	0.135
countries & people/travel	0.023	0.214	0.390	**0.558**	0.138	**0.448**	**0.803**	0.196
literary drama	0.000	0.007	0.148	0.013	0.000	0.004	0.039	0.010
lit. essays/biography	0.000	0.031	0.257	0.051	0.005	0.035	0.226	0.016

Table 2. (continued)

	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7	Segment 8
fiction youth	**0.946**	**0.947**	0.139	0.117	0.064	0.106	0.311	0.055
non-fiction youth	**0.712**	**0.803**	0.086	0.070	0.007	0.046	0.196	0.052
foreign novels	0.000	0.006	0.275	0.003	0.003	0.023	0.154	0.011
foreign adventure/thrillers	0.000	0.009	0.267	0.011	0.006	0.033	0.187	0.024
foreign detectives	0.000	0.000	0.228	0.010	0.005	0.017	0.107	0.010
foreign literature	0.000	0.004	0.271	0.007	0.011	0.041	0.157	0.005
foreign literary prose	0.001	0.017	**0.682**	0.037	0.009	0.042	0.277	0.062
parenthood & guardianship	0.043	0.142	0.003	0.009	0.002	0.003	0.026	0.004
large print books	0.002	0.025	0.101	0.026	0.131	0.181	0.106	0.035

Table 3. Latent classes and age distribution.

age in years	**Segment 1**	**Segment 2**	**Segment 3**	**Segment 4**	**Segment 5**	**Segment 6**	**Segment 7**	**Segment 8**
–12	**85,5**	**33,1**	0,4	0,2	0,7	0,0	0,0	4,8
13–15	11,1	**34,3**	6,3	2,8	3,2	1,0	1,7	10,4
16–20	1,3	8,8	**38,0**	9,8	7,0	3,4	10,1	19,3
21–30	0,4	4,9	4,6	17,3	10,5	10,5	8,7	15,2
31–40	0,8	9,2	6,5	**22,6**	15,8	17,2	20,2	15,8
41–50	0,6	7,3	12,4	**25,5**	14,7	**21,5**	**28,9**	15,1
51–64	0,2	1,2	15,0	15,4	18,9	**22,9**	19,7	9,7
65–		1,2	16,9	6,4	**29,2**	**23,5**	10,7	9,6
	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

The first two segments, both high on borrowing reading children books (table 2) are further distinguished because of their age difference. The second segment is somewhat older and, as table 2 shows, is more likely to borrow CD's or non-fiction books. Segment five from table 2 that scored high on easy romantic fiction turns out to be older, where as segment three scoring high on (complex) literature seems to consist for a considerable part of secondary school students who have to read classical literature for their exams. In general, the relationship between borrowing behavior and age is relatively clear-cut.

Annual Borrowing Frequency

The segments were also compared on the average number of books they borrow each year. The numbers of books (first column of table 4) were classified into 20% percentiles. Every deviation from 20% among the classes in table 4 thus indicates over- or under representation. Segment 7 consists mainly of heavy users that borrow across a wide range of categories (table 2), where as segment 8 consists mostly of light users that occasionally borrows a CD

Table 4. Latent classes and average number of books per year.

number of books p.a.	**Segment 1**	**Segment 2**	**Segment 3**	**Segment 4**	**Segment 5**	**Segment 6**	**Segment 7**	**Segment 8**
–7	21,7	2,9	4,3	2,0	19,2	0,1	0,0	**51,0**
8–15	23,2	20,6	24,3	17,1	**25,5**	2,6	0,0	29,6
16–29	20,0	**26,9**	**27,3**	**35,3**	19,6	12,3	1,7	12,4
30–55	18,8	**28,4**	**29,9**	**30,6**	19,8	**32,3**	18,4	5,3
> 56	16,3	21,2	14,1	14,9	16,0	**52,7**	**79,9**	1,7
	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Table 5. Latent classes and place of residence.

	Segment 1	**Segment 2**	**Segment 3**	**Segment 4**	**Segment 5**	**Segment 6**	**Segment 7**	**Segment 8**
City	96,7	96,6	95,2	94,4	95,8	94,0	90,2	91,7
Village 1	1,4	1,7	1,3	2,2	1,8	2,4	2,3	3,4
Village 2	1,7	1,5	2,8	2,5	1,4	2,6	5,2	3,5
Other	0,2	0,2	0,7	0,9	1,1	1,0	2,3	1,4
	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

but few of the other categories. Segment 6 consists of somewhat more heavy users, where borrowing behavior seems concentrated on fiction categories. Segment 5 is a category of somewhat lighter borrowers of mainly family saga. The other segments are medium users of books. Overall, the relationship of segment membership with borrowing frequency seems quite pronounced.

Distance

Contrary to age and borrowing frequency, the relationship with distance is rather weak. To a certain extent, distance explains that segment 8 hardly reads any books (table 5). This type however, like all others, comes primarily from the city in question itself. Segment 7 of heavy users, more than the other types, comes from the surrounding towns, although the percentages are still low. This result basically shows that the library tends to attract more heavy readers from a wider distance, while it may be a reason for less avid readers not to go to the library if the distance is too great.

Adding Up the Findings to a Full Typology

When we look at the book categories every segment borrows as well as the three descriptor variables discussed above, we can come to an interpretation of the eight segments (table 6):

Table 6. Summary of the eight latent classes and their descriptives.

Segment 1: **Young child**	Borrow almost only the two youth categories: • fiction youth (94,6%); • non-fiction youth (71,2%).
Segment 2: **Older child**	Borrow—apart from the two youth categories—some of the non-fiction categories for grown-ups and CD's: • CD's (31%) • health & sport (26,0%); • countries & people/travel books (21,4%) • history (20,2%)
Segment 3: **Literature reader**	Mainly read the two literary categories: • literary prose (83,8%) • literary prose (foreign) (68,2%) Notable is the large number from the age group 16–20. In the Netherlands all secondary schools have Dutch and at least one foreign language as compulsory exam subject. Reading literature is part of this.
Segment 4: **Grown-up general**	Borrows four categories in particular: • literary prose (60,9%) • countries & people/travel books (55,8%) • health & sport (53,4%) • CD's (42%)
Segment 5: **Family saga reader**	Particularly reads family saga's and local stories (53,5%) and to a lesser degree other types of novels.
Segment 6: **Fiction reader**	This type scores high on various categories of fiction: • novels (AV) (85,3%) • literary prose (82,7%) • adventures/thrillers (79,6%) • county/family saga (68,8%) • novels (AG) (65,0%) • detectives (61,5%)
Segment 7: **Heavy user**	A small group of clients who borrow both fiction and non-fiction and within these two main categories many different sub-categories.
Segment 8: **Light user**	Occasionally borrows a CD (31,9%), but hardly any of the other categories

Table 7. Class distribution.

	Distribution in first 25%	**Distribution in highest 25%**	**Average distribution**
Segment 1: Young children	,01	,01	,02
Segment 2: Older children	,03	,02	,03
Segment 3: Literature reader	,21	**,10**	,18
Segment 4: Grown-ups general	,22	,20	,20
Segment 5: Family Saga Reader	,14	**,21**	,15
Segment 6: Fiction readers	,06	**,17**	,07
Segment 7: Heavy users	,23	**,13**	,26
Segment 8: Light users	,09	**,16**	,09
	1,00	1,00	1,00

To briefly summarize table 6, segment 1 is a fairly large segment of young children, with a loan probability pattern that reflects the need states of their age. The same holds for segment 2, be it that this segment is much smaller, and their need for complexity seems to expand relative to segment 1 as indicated by a wider range of categories. Segment 3 are young readers of literature, where those needs are potentially induced by the Dutch school system, where the categories in question are part of compulsory exams. Segment 4 comprises of adults that are medium users and read a mix of literature and leisure categories. Segment 5 consists of older people that are relatively light users of family saga, while segment 6 tends to consist of middle aged heavier readers of fiction. Segment 7 consists of heavier users of a wide range of fiction and non-fiction categories, and segment 8 comprises light users that occasionally borrow CD's.

Here, latent class analysis does produce very clear and meaningful segments, where the choice probabilities within segments seem to reflect independent need states. The individual heterogeneity mentioned in the literature would result in the data not providing accurate information enabling the classification of all subjects to one particular segment, thus leading to low entropy of classification (E_s). However, for this data set $E_s = 0.84$, indicating a good separation of segments.

To explore whether particular latent classes lead to more classification difficulty than others, the subjects were ordered by their highest classification probability for the eight classes. The first 25% of the customers (subjects with a low classification probability for their highest grade of membership) was compared to the highest 25% (subjects with a high classification probability for a particular class) for distribution of the latent classes (table 7):

It is in particular in the last 25% in the cumulative frequency that we see some distinct differences in de distribution of the classes in respect to the average distribution for the whole group. The *Family saga reader* and *Light user* segments seem to lead to less classification uncertainty than the *Literature reader* and *Heavy user*. Apparently the switching behavior of the former is more consistent with the zero order assumption than the latter. The importance of the complexity dimension or the distinction between high culture and entertainment as mentioned earlier, could account for this as family saga's as a hedonic good of low complexity may be read by relatively lower educated people who will less easily read

high literature, where as vice versa *Literature readers* and *Heavy users* are known to be higher educated and can therefore more easily switch to another (less complex) form of hedonic consumption leading to a violation of the zero-order assumption in the latent class model. This is in line with findings of Peterson (1992), who concluded from his research that a distinction omnivore and univore consumption would be more appropriate than the previously often used distinction of elite and mass consumption.

5. Conclusion

The latent class analysis on this data set suggests that there are indeed different need states for individuals. Examination of the results indicate that inconsistent switching behavior due to variety seeking or situational heterogeneity is partly prevented by the different optimal stimulation levels of individuals based on their different levels of education, thus limiting their choice set of relevant products. Further research is necessary to infer more firm and general conclusions about the segmentation of hedonic consumption. No other library systems have yet made the necessary adaptations to enable analysis besides transaction administration, but a number of theaters and concert halls have recently upgraded their box office systems to take advantage of technological developments and extension of the research presented in this paper to other forms of hedonic consumption such as drama, entertainment and concerts is anticipated.

Managerial Implications

The results presented in this paper are of managerial importance and suggest that the technological developments in library loans systems or theatre box office systems may significantly contribute to the adoption of the marketing concept. So far, only a few publications have dealt with the potential use of library automated systems for management decisions. Gumilar and Johnson (1995) give an extensive overview of the potential and actual use of automated library systems as a management information system, but neglect to see the potential use of these systems for marketing purposes. Ottensmann (1997) shows the potential of the zip code information in the library system to location planning.

In practice, already some libraries have used their systems to extend the service to their customers. Recently a new service has been installed to warn clients if they borrow a book already borrowed in the preceding period. This is particularly targeted at the elderly who sometimes forget what they have already read. But with analysis of borrowing behavior such as presented in this paper, the service could extended further by a service of targeted recommendations for further reading. The internet book company Amazon already automatically generates other relevant titles when the order for a particular book is placed. Segment membership probabilities and category incidence probabilities estimated with the mixture model may provide a device for such a recommendation system, while the relatively strong relationship with demographics found would even enable the provision of recommendations to new customers. And finally, like Ottensmann (1997) uses analysis for the optimal location of a library, the information on segments and their combinations

of choice would prove valuable for an optimal placement of shelves and categories in the library to minimize customer traffic and to maximize exposure of the relevant products for the customer.

Recent publications indicate that many libraries employ the product concept rather than the marketing concept (Savard, 1996; Gumilar & Johnson, 1995; Doherty, Saker, & Smith, 1995) while having difficulties of implementing the shift in management focus. It is our contention that better use of customer transaction databases through the application of segmentation concepts and methods and information technology may prove contribute to remedy this state of affairs.

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