A Clustering Method for Categorical Data in Tourism Market Segmentation Research

GEORGE ARIMOND AND ABDULAZIZ ELFESSI

One challenge in tourism market segmentation research is finding a statistical clustering method that can use data from the commonly used qualitative (categorical scale) survey instrument. Current proven methods require the use of quantitative (ratio or interval scale) data. However, quantitative survey instruments are seldom used. Many quantitative clustering methods severely restrict the number of attributes measured despite the fact that segmentation analysis works best when it measures all the multistate attributes that visitors identify as influencing their tourist experience. This study demonstrated that multistate categorical survey data could be successfully used. Using data from a bed-and-breakfast survey (229 guests), a two-stage analysis method was employed. First, multiple correspondence analysis was used to spatially map each of the attributes, and then cluster analysis was used to identify market segments. It is believed this method can be more practical in the field of applied tourism research.

The purpose of this study is to show how qualitative, multistate data from a tourist business survey can be used in market segmentation research. It is a two-part statistical analysis approach. First, a reduced space approach (multiple correspondence analysis) to find spatial coordinate positions of attribute categories is used. Then, a standard proximity measure (K-means clustering) is used to cluster the attribute categories on the reduced space. This method is not limited to two or three dimensions as in other methods that cluster attribute categories using qualitative, categorical data.

The primary audience for this study consists of tourism industry practitioners interested in a practical, cost-effective approach to market segmentation analysis. Market segmentation can be especially important to them in terms of pricing decisions. Proper pricing depends on the combined effect of operational costs, the customers' price sensitivity, and the competitors' influence. Some customer groups may be relatively price insensitive (i.e., price is not a major concern in the purchase decision). In addition, this group may be costly to serve and poorly served by competitors. In this case, a higher price would be appropriate and could earn more profit. Conversely, customer groups who are relatively price sensitive, cheaper to serve, and well served by competitors will warrant a lower price. To make proper pricing decisions, a segmenting of customers and prices is necessary. Without such a precise market segmentation analysis, it is difficult to effectively segment prices, and the imperfect compromise of a single price is the only alternative (Nagle 1987).

METHOD

There are two fundamental types of clustering methods available that are inherently different (Myers 1996). The first one is partitioning methods. In the past, partitioning methods were the most widely used in market segmentation research. However, there is a twofold drawback to these partitioning methods. First, using a diversity of categories (i.e., the more independent in meaning each category is) makes it difficult to find homogeneous market segments. Second, the investigator must specify in advance how many clusters are to be formed. In a typical guest segmentation study, an investigator usually begins essentially "blind." This is important to note because often the investigator does not even know if there are any clusters in the data. Hierarchical methods (also known as linkage methods) are the other fundamental method. Most of these methods work by identifying pairs of guests that closely match with each other based on the guests' selection of similar attribute categories. However, hierarchical methods only provide a starting point and do not consistently produce clusters that are clearly homogeneous and well balanced.

Another more recent alternative is a two-stage cluster analysis method. The hierarchical method is used first and then followed by the iterative partitioning method. It is the hierarchical process that forms the initial clusters. Then, the iterative partitioning process reassigns some cases to different clusters by means of a series of separate (computer-generated) "passes." As it switches cases from one cluster to another (i.e., during each iteration cycle), it improves the homogeneity of all clusters. Thus, this two-stage method produces tighter clusters.

One researcher has investigated the sequence of analysis methods used in two-stage methods. Sheppard (1996), who does tourism research, compared two methods using factor analysis and cluster analysis sequentially. The first method used the traditional cluster analysis first followed by factor analysis, and the second method used factor analysis followed by cluster analysis. In general, Sheppard found neither was necessarily better than the other. Rather, their usefulness was dependent on the individual research study's purpose and the type of instrument used. When the primary purpose

George Arimond is a professor in the Department of Recreation Management and Therapeutic Recreation and Abdulaziz Elfessi is an assistant professor in the Department of Mathematics, both at the University of Wisconsin–La Crosse.

Journal of Travel Research, Vol. 39, May 2001, 391-397

was segmentation, Sheppard believed cluster analysis followed by factor analysis was a better approach, but it would likely provide less generalizable instrumentation.

There is another element of concern, not yet mentioned, which is the focus of this study. All of the fundamental methods reviewed here have one thing in common. They all require the use of quantitative (ratio or interval-scaled) data. Many of these methods even have the capacity for measuring quantitative, multistate attribute categories. They measure each attribute along some continuum of desirability using a Likert-type numeric scale for each attribute (see example below). Unfortunately, all of them ordinarily require the use of a lengthy response scale. Here is a typical example from a bed-and-breakfast (B&B) survey:

This scaling method is used in very few market surveys. Tourism surveys done by state tourism departments across the United States show this to be the case. Very few of them include the use of Likert-type scales. Likert-type scales are probably perceived as too tedious and demanding for the respondent when compared with the more common survey method (see example below). An alternative cluster research method is to use a smaller dichotomous quantitative scale, where 1 = desirable and 2 = not desirable (Cheung 1994; Mazanec 1984). This is less demanding for the respondent, but the dichotomous numeric scaling system is still somewhat tedious. Traditionally, the tourism industry has used a qualitative, categorical scale. Here is a typical example in a B&B survey:

What is the most important room amenity you desire? (circle one)
Large/spacious
Separate sitting area
Designer linen
Scenic view
Fireplace
Jacuzzi™
Refrigerator

This qualitative, categorical scale is quicker and less demanding for the respondent than the former quantitative, ratio scale (or Likert-type scale). This is especially true where there are large numbers of attribute categories being measured. In particular, qualitative survey methods are used because they provide a simpler means of data collection, and this also reduces data entry cost (Javalgi et al. 1992). However, the clustering methods discussed earlier cannot use these qualitative survey data with their categorical scaling. The reason for this is that the attributes identified in the latter qualitative survey question are not ordered along some mathematical continuum. In other words, the conventional quantitative market segmentation methods will not work with tourism's traditional qualitative survey method.

There is support for new market segmentation methods among researchers. Some researchers believe there are two primary concerns that future segmentation research should address (Javalgi et al. 1992; Green, Schaffer, and Patterson 1988). First, new innovative statistical methods are needed that allow for simpler data collection and survey methods. Second, these methods should provide graphic displays that reveal the possible structural relationships inherent in the data. In other words, what is needed are methods that allow the use of traditional qualitative survey data with a market segmentation model that will provide vivid display of each segments distinguishing characteristics.

This study proposes a two-stage method that is able to use the more traditional qualitative, multistate categorical survey data. This study is a demonstration of how this model could work within the field of tourism.

Indicate the Degree to Which You Desire the Following Room Amenities (circle a number for each amenity):

Amenity	Very Desirable	Desirable	Neutral	Undesirable	Very Undesirable
Large/spacious	1	2	3	4	5
Separate sitting area	1	2	3	4	5
Designer linen	1	2	3	4	5
Scenic view	1	2	3	4	5
Fireplace	1	2	3	4	5
Jacuzzi™	1	2	3	4	5
Refrigerator	1	2	3	4	5

To demonstrate with a real-world application, data from a successful midwestern B&B was used. The B&B is a dairy farm operation that markets itself as a peaceful getaway where the scenic beauty of hardwood forests, picturesque hillsides, and colorful farm fields can be enjoyed. The B&B provides added on-site attractions such as nature hikes and cross-country skiing. The owners surveyed past guests to gather market-related information on (1) the primary reason for their trip, (2) the primary factor that led them to select this B&B, (3) the B&B amenity they desire most, (4) the room amenity they desire most, (5) the vacation activity they desire most, (6) the innkeeper service they desire most, and (7) whether they plan to return.

Using past guests as the sample population to identify market segments has been proven to be a valid sampling method. For example, Shoemaker's (1994) market segmentation study supported the argument made by other researchers (Pearce and Caltabiano 1983; Woodside and Jacobs 1985). The argument says it is better to ask respondents, based on their recent experiences, what they have done or prefer to do than to ask respondents to tell what they plan to do at some future point in time. Stated in another way, benefits already experienced and realized by past guests are better predictors of guest behavior than the responses from potential future guests, selected from the target market area. Future guests can only speculate on the possible benefits.

For this study, seven questions were selected from a previous study (Arimond 1997). These questions addressed desired services or benefits that B&B guests frequently desire (Table 1: each of the seven subheadings is a question). With each question, respondents were asked to pick one

TABLE 1

CLUSTER PROFILES (IN PERCENTAGES) FOR THE FOUR-MARKET-GROUP SOLUTION

Attributes (7) and Categories (53)	Cluster 1 *N* = 91	Cluster 2 *N* = 70	Cluster 3 *N* = 2	Cluster 4 *N* = 66
Reason for trip				
Romantic stay	**[65]**	12		21
Family event	8	19		**[35]**
Country experience	20			6
Sports activities (biking, golfing, etc.)	1	**[59]**		5
Business trip		2	100	6
Area festival				3
Get together with friends	1	2		20
Overnight en route	6	7		5
Reason for choosing this bed-and-breakfast (B&B)				
Price/value	6	9		27
Amenities	7	11		6
Personalized service and hospitality	2	11		6
Special promotion packages	4	2		3
Architecture/décor	14	3	100	2
Local attractions/activities	11	**[48]**		14
Quiet/privacy and viewing nature	**[45]**	11		**[32]**
Scenic hills and forests	12	5		2
Area events/festivals		2		9
Amenities B&B should provide				
Antiques		9		3
Scenic view	34	**[45]**		**[51]**
Gardens	4	3		
Pets allowed	6	3		8
Quiet atmosphere	**[53]**	34		33
Books/magazines	2	2		
Phone available	1		100	5
Social hour		5		
Room amenities B&B should provide				
Large/spacious	17	**[40]**		**[50]**
Separate sitting area	6	18	100	24
Designer linen	4			
Scenic view	18	14		2
Fireplace	24	14		16
Jacuzzi™	**[29]**	14		2
Refrigerator	2			7
Services B&B should provide				
Innkeepers address you by name		12		3
Tour of the inn		16		6
Privacy	**[66]**		100	29
Innkeepers make restaurant reservations				
Written and verbal guide to community events and restaurants	3	9		9
Dinner available at the inn		3		5
Innkeepers are adaptable to your needs	8	25		5
Homelike atmosphere	10	9		**[35]**
Innkeepers go out of their way to make you comfortable	13	25		8
Activities preferred while at B&B				
Area shopping	6	6		3
Area festivals/events	1	1		23
Socialize with own group	4	7		**[29]**
Active recreation (skiing, biking, etc.)	**[40]**	**[86]**	100.0	21
Semiactive (nature walking)	32			21
Passive (reading, lounging)	17			
Socialize with innkeepers and other guests	1			3
Return to this B&B				
Yes	28	**[43]**	50.0	**[45]**
Probably	**[52]**	43		37
Probably not	19	13	50.0	9
No	1			9

Note: **[ ]** denotes highest percentage within attribute.

characteristic or category that best described their most important preference. Multiple correspondence analysis was used to develop a joint space of guest descriptors. Guests were then clustered by means of a K-means clustering program, using the guest/respondents' coordinate values from the reduced space as input data.

There were 229 guests (62% return rate) who completed this market survey. The respondents in the study were believed to be a good comprehensive representation of recent guests (Arimond 1997). Each guest described his or her preferences by selecting one category from each of the seven multiple-choice attributes shown in Table 1. Thus, the basic data consisted of a 229 × 7 matrix of guests by the attribute categories that they selected that best describe their B&B preferences.

Multiple Correspondence Analysis

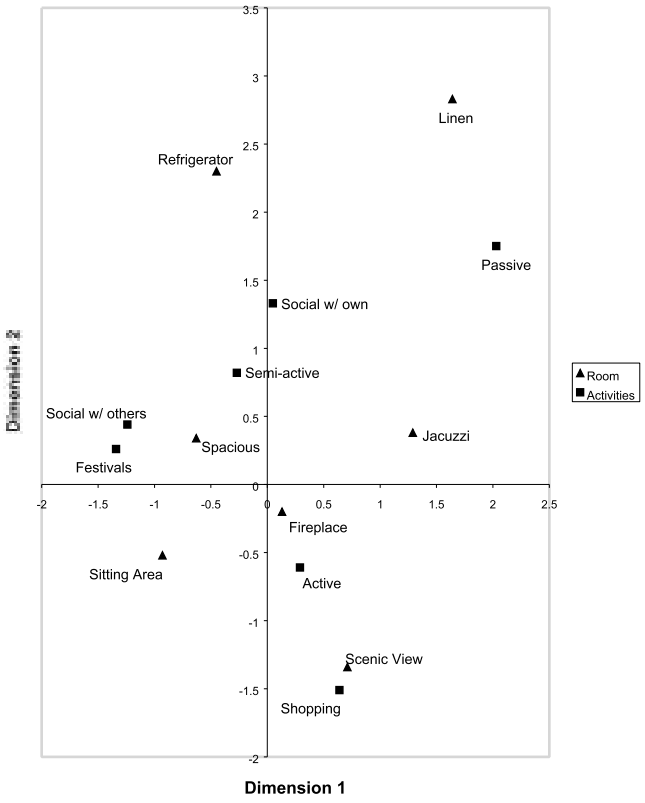
Multiple correspondence analysis (MCA) or homogeneity analysis quantifies nominal (categorical) data by assigning numerical values to the respondents and categories. It is usually applied to three or more variables. Multiple correspondence analysis is similar to nonlinear principle component analysis of nominal data. When there are only two variables to be measured, MCA and correspondence analysis will provide comparable results. In the case of MCA, alternating least squares with optimal scaling is the technique used for estimation. The purpose of MCA is to find optimal quantification that describes the relationships between categories of each variable as well as the relationship between the variables. In a sense, this implies that respondents choosing the same category are plotted close to each other, and respondents choosing different categories are plotted as far apart as possible. It also maximizes the homogeneity of a number of variables.

Further technical statistical details of MCA analysis have been excluded to avoid a protracted explanation that would cause clutter and confusion; they can be found in the correspondence analysis articles by Carroll and Green (1986; 1987; Carroll, Green, and Schaffer 1987). In addition, books are available that describe correspondence analysis methods (Greenacre 1984, 1989; Lebart, Morineau, and Warwick 1984; Heiser 1981; Meulman 1982; Gifi 1981; Nishisato 1980). Other tourism and service businesses have successfully used this correspondence analysis as well (Kara, Kaynak, and Kucukemiroglu 1996; Cheung 1994; Kaynak, Kucukemiroglu, and Kara 1994/3; Javalgi et al. 1992).

The purpose for using multiple correspondence is to map out each of the 53 attribute categories (14-category example shown in Figure 1). This is the first stage in this two-stage process. Through appropriate scaling, all squared distances are comparable (Carroll and Green 1987). Because guests pick only one category from each of the seven attributes, the data could be described as a seven-way contingency table.

Multiple correspondence was applied to the 229 × 7 matrix using Statistical Package for the Social Sciences' (SPSS) homogeneity analysis (HOMALS). Accounted-for variation was 43.1%, 62.7%, and 81.8% in two, three, and four dimensions, respectively. For explanation purposes and better visual clarity, only a two-dimensional simple correspondence analysis is plotted in Figure 1 using 14 categories from two variables, room amenities and preferred activities (see Table 1 for complete descriptions). However, all 53 categories were used in the actual study analysis. Visually, it is impossible to clearly display 53 categories all in the same graphic.

FIGURE 1
PLOTTED CATEGORIES USING SIMPLE CORRESPONDENCE ANALYSIS



Interpretation of the Figure 1 plot is fairly simple—categories from the same attribute that are close together are more alike than those categories that are far apart. As an example, the plot shows that those who like to socialize with others are close to those who like to attend festivals. This indicates that these two groups are similar in their choice of room amenities. In contrast, the plot shows that those who like passive activities are quite far away from those who like festivals and are therefore very different. It is also possible to get a general idea of how categories of the two attributes (room and activities) are related to each other. For example, those who like to socialize with others prefer large spacious rooms with a separate sitting area.

K-Means Cluster Analysis

Clustering analysis has had a long and active history in marketing research (Green and Krieger 1995). The K-means clustering method, which requires ratio or interval-scaled data, is an iterative partitioning method and is used in the second stage of this analysis. It is an effective clustering procedure for market segmentation analysis (Mazanec 1984). Another strength is that it allows for the use of a large sample size. It has been used quite frequently in market research.

For this second stage of the analysis, SPSS's K-means clustering method was used. The algorithm in this statistical procedure requires an investigator to specify the number of clusters (Green, Schaffer, and Patterson 1988). Possible cluster solutions (three through six) were run to determine the optimum cluster solution needed. On balance, the four cluster results produced the clearest distinguishable guest segments, and there was no evidence of extreme outliers that could distort the findings. There was, in fact, optimal homogeneity among guests within each cluster. Equally important, three out of the four clusters had a good distribution of guests in each. The cluster sizes were 91, 70, 2, and 66, respectively for Clusters 1 to 4. Hence, Cluster 1 represented the largest proportion of the guests with 39.7%, while Cluster 2 was next with 30.6%, followed closely by Cluster 4 with 28.8%. Cluster 3 with 0.8% was not large enough to produce meaningful data because it only had a *N* of 2. A three-cluster solution was originally tried, but it did not produce three balanced clusters. Table 1 shows the dominant characteristics (or attributes) of each cluster.

FINDINGS

The largest proportions of Cluster 1 respondents have come for a romantic experience (65%). They chose this B&B because they wanted a quiet, private place with the opportunity to view nature (45%). They are highly motivated by the need for the innkeeper to provide privacy (66%) and feel the B&B should provide a quiet atmosphere (53%) with a scenic view (34%). In addition, they desire either active (40%) or semiactive recreational activities (32%). Recreational activities that lend themselves to viewing nature are likely very popular with this cluster. In terms of room amenities, fireplace (24%) and Jacuzzi (29%) are of moderate importance to them. Things that are of low interest are socializing, attending area festivals or special events, and the concern of price and/or value when choosing this B&B over other B&Bs. These low-interest items differentiate them sharply from Cluster 4, where respondents reveal a greater desire to socialize and are more concerned about price and/or value.

The largest proportion of Cluster 2 respondents have come for (59%), and are highly motivated by, the need for active outdoor sports-type activities (skiing, biking, etc.) (86%). They chose this B&B because of the local attractions and activities (48%) that are available. In addition, they desire a B&B with a scenic view (45%) with large, spacious rooms (40%). Like Cluster 1 respondents, they have much less concern about price and/or value when choosing this B&B over other B&Bs. They are not interested in less-active or passive types of activities.

Cluster 3 with a *N* of 2 is an underrepresented group. Therefore, it is not a viable market segment and does not warrant reviewing.

Cluster 4 respondents have come for several reasons—to get together with family (35%) or friends (20%) or to have a romantic stay (21%). Like Cluster 2 respondents, they want a B&B with a scenic view (51%) and large, spacious rooms (50%). They want the innkeeper to provide a homelike atmosphere (35%). They chose this B&B because they wanted a quiet, private place with the opportunity to view nature (32%). Furthermore, they believe this B&B provides a better price and/or value (27%) over other B&Bs. Things that are of low interest are semiactive and passive leisure activities as well as rooms with a Jacuzzi.

TABLE 2

CLUSTER PERCENTAGES BY GUESTS' PLACE OF ORIGIN

Cluster	Wisconsin *N* = 90	Illinois *N* = 70	Minnesota *N* = 38	Iowa *N* = 12	United States *N* = 19
1	46	29	53	42	26
2	28	34	24	25	47
3	1		3		
4	26	37	21	33	26
	100	100	100	100	100

Customer return rate is a concern to most B&Bs these days. In this analysis, it appears that Cluster 2 and 4 respondents are more likely to return than Cluster 1 respondents. This is important because returning guests are less costly in terms of advertising costs. Thus, by focusing more on market segments with more returning guests, the B&B could potentially increase its profits through reduced advertising expenses.

Besides reviewing the characteristics of each cluster, it is also appropriate to measure whether clusters differ with respect to the geographic origin of guests. From a market analysis perspective, there could be, in some instances, important geographic differences between clusters. Table 2 depicts this type of analysis.

The B&B is located in the southwestern corner of Wisconsin, so naturally the three states Wisconsin, Minnesota, and Illinois are a significant part of their market. Wisconsin (*N* = 90) and Minnesota (*N* = 38), as seen in Table 2, exhibited similar cluster patterns. Approximately half the guests are found in Cluster 1 (Wisconsin = 46%, and Minnesota = 53%), and the other half are evenly split between Clusters 2 and 4. The other major market area, Illinois (*N* = 70), differed from Wisconsin and Minnesota. Here, Clusters 1, 2, and 4 are more evenly split, with Cluster 4 the largest at 37% and Cluster 1 the smallest at 29%. From this analysis, we can assume the B&B would probably take a somewhat different marketing approach with Illinois.

Limitations

Because this was a post hoc market segmentation study, the study sample did not represent the B&B's entire market. The respondents represented past B&B guests only, but it is safe to say some generalization can be made.

In studies of B&Bs, there is some question about how attributes and categories are to be chosen. For example, choosing B&B attributes and categories different from those used in this study may lead to slightly different segmentations and slightly different guest profiling. There is some empirical evidence supporting this view (Arabie and Hubert 1994). On the other hand, Green and Krieger (1995) questioned whether Arabie and Hubert's critique was valid and called for more empirical investigations.

Admittedly, these limitations may have reduced the richness of this study's findings, but they have certainly not invalidated the findings. Certain limitations should really be viewed as future research needs.

DISCUSSION

The purpose of this article has been to illustrate a market segmentation model that will work with qualitative survey data because qualitative type surveys are the industry standard in tourism. The explanation of this study's model demonstrates how correspondence analysis can create a data reduction tool for developing attribute-positioning maps as well as provide a preliminary spatial representation of multistate categorical data. This reduced space representation provides a basis for developing proximity measures that can then be used as input to various clustering procedures (e.g., K-means or hierarchial) for finding market segments.

Having used B&B survey data as an example, this article shows how multiple correspondence analysis and K-means clustering can be used in a two-stage process to cluster individual guests into homogeneous groups. Members of each group exhibit similar patterns in their preferences of categories (i.e., services and amenities).

The findings from this study have led the B&B innkeepers in this study to either make or consider making certain management changes. For example, the Cluster 1 guests who sought privacy will be served meals individually, while guests from Cluster 2 and 4 would be served in groups. Although individualized meals are time-consuming, they increase the privacy for Cluster 1 guests. For Cluster 2, the innkeepers currently have outdoor activities available on the B&B properties. To better accommodate Cluster 2's need for active outdoor recreation, they have expanded the organized activities they provide. They now regularly host special events that include such things as cross-country skiing events, dog sled events, and disc golf tournaments, as well as regular instructional lessons for many of these activities. Cluster 4 guests wanted opportunities to socialize as well as attend area festivals and special events. The innkeepers now have plans to publish and distribute to guests a flyer that lists all area festivals and special events. Equally important, they encourage social interaction among guests during the B&B's outdoor special events. Last, they are thinking about making changes in their marketing plan. As an example, the innkeepers can now search for the media sources that have the best market reach for each of the respective market segments (i.e., Clusters 1, 2, and 4). This will likely improve the effectiveness of their yearly marketing campaign.

Knowing guests' pattern of preferences is important to the entire lodging industry. Specifically, some industry analysts speculate that owners and operators need to take a "laser-like focus on high-potential guests" if they are to prosper, especially during periods of economic uncertainty (Schultz 1994). In the hospitality and lodging industry, it is often said guests do not want to pay for services and amenities they do not use. Therefore, the industry needs a market segmentation survey method that not only accurately records the desired services and amenity of guest segments but also provides a less expensive, easy-to-use survey method. Equally important, the survey method must help generate a stronger response rate than the traditional quantitative models. This study's two-stage method will, with continued testing, provide an answer to the lodging industry's needs.

With respect to the B&B industry and this study's results, future B&B studies of this nature should investigate whether and how the inferred services and amenities (i.e., attributes and categories) vary from one B&B to another. Then, they should determine whether selection of the appropriate attributes and categories affects the accuracy of the cluster analysis. As an example, this study looked exclusively at the relevant services and amenities of a single B&B with a rural country setting. Although the attributes and categories were very relevant for this particular B&B, some categories would not, as an example, be relevant for an urban B&B.

Other methods for clustering market segments with qualitative, categorical data can and should be investigated. It would be useful to run comparative studies using the traditional quantitative ratio scale segmentation methods. Green and Krieger (1995) suggested such an approach. Furthermore, authors Cohen and Ramaswamy (1998) claimed their one-step method, which uses latent conjoint analysis, is superior to two-step approaches, like the method used in this study.

In summary, this article provides support for a unique tourism market segmentation research model that can use the more commonly found qualitative categorical survey data. While it is not the only solution, it does nonetheless provide a convenient workable solution for working with categorical data. It could easily be used with other types of tourism-related businesses. And, on a more global scale, it could be useful for national or statewide tourism studies. It is hoped that this study will prompt further studies that will test its usefulness and validity within the tourism research field.

REFERENCES

Arabie, P., and L. Hubert (1994). "Cluster Analysis in Marketing Research." In *Advanced Methods of Marketing Research*. Cambridge, MA: Blackwell, pp. 160-89.

Arimond, G. (1997). *Market Survey of Past Guests Just-N-Trails Bed and Breakfast*. La Crosse: University of Wisconsin–La Crosse, Department of Recreation Management.

Carroll, J. D., and P. E. Green (1986). "Interpoint Distance Comparisons in Correspondence Analysis." *Journal of Marketing Research*, 23 (August): 271-80.

———(1987). "A New Approach to the Multiple Correspondence Analysis of Categorical Data." Working paper, Wharton School, University of Pennsylvania, Philadelphia.

Carroll, J. D., P. E. Green, and C. M. Schaffer (1987). "Comparing Interpoint Distances in Correspondence Analysis: A Clarification." *Journal of Marketing Research*, 24 (4): 445-50.

Cheung, Y. (1994). "Categorical Criteria Values: Correspondence Analysis." *Omega, International Journal of Management Science*, 22 (4): 371-80.

Cohen, S. H., and V. Ramaswamy (1998). "Latent Segmentation Models." *Marketing Research*, 10 (2): 14-21.

Gifi, A. (1981). *Non-Linear Multivariate Analysis*. Leiden, the Netherlands: University of Leiden, Department of Data Theory.

Green, P. E., and A. M. Krieger (1995). "Alternative Approaches to Cluster-Based Market Segmentation." *Journal of the Market Research Society*, 37 (3): 2-11.

Green, P. E., C. M. Schaffer, and K. M. Patterson (1988). "A Reduced-Space Approach to the Clustering of Categorical Data in Market Segmentation." *Journal of the Market Research Society*, 30 (3): 267-88.

Greenacre, M. J. (1984). *Theory and Application of Correspondence Analysis*. London: Academic Press.

——— (1989). "The Geometric Interpretation of Correspondence Approach." *Journal of the American Statistical Association*, 82: 437-47.

Heiser, W. J. (1981). *Unfolding Analysis of Proximity Data*. Leiden, the Netherlands: University of Leiden, Department of Data Theory.

Javalgi, R., T. Whipple, M. McManamon, and V. Edick (1992). "Hospital Image: A Correspondence Analysis Approach." *Journal of Health Care Marketing*, 12 (4): 34-41.

Kara, A., E. Kaynak, and O. Kucukemiroglu (1996). "Positioning of Fast-Food Outlets in Two Regions of North America: A Comparative Study Using Correspondence Analysis." *Journal of Professional Services Marketing*, 14 (2): 99-119.

Kaynak, E., O. Kucukemiroglu, and A. Kara (1994/3). "Consumers' Perceptions of Airlines: A Correspondence Analysis Approach in a Global Airline Industry." *Mir*, 34: 235-54.

Lebart, L., A. Morineau, and K. M. Warwick (1984). *Multivariate Descriptive Statistical Analysis: Correspondence Analysis and Related Techniques for Large Matrices*. New York: John Wiley.
Mazanec, J. A. (1984). "How to Detect Travel Market Segments: A Clustering Approach." *Journal of Travel Research*, 23 (1): 17-21.
Meulman, J. (1982). *Homogeneity Analysis of Incomplete Data*. Leiden, the Netherlands: DSWO.
Myers, J. H. (1996). *Segmentation and Positioning for Strategic Marketing Decisions*. Chicago: American Marketing Association.
Nagle, T. T. (1987). *The Strategy and Tactics of Pricing: A Guide to Profitable Decision Making*. Englewood, NJ: Prentice Hall.
Nishisato, S. (1980). *Analysis of Categorical Data: Dual Scaling and Its Applications*. Toronto: University of Toronto Press.
Pearce, P. L., and M. Caltabiano (1983). "Inferring Travel Motivation from Travelers' Experiences." *Journal of Travel Research*, 22 (Fall): 25-30.
Schultz, R. (1994). "A Decade of Segmentation." *Lodging Hospitality*, 50 (10): 20.
Sheppard, A. (1996). "The Sequence of Factor Analysis and Cluster Analysis: Differences in Segmentation and Dimensionality through the Use of Raw and Factor Scores." *Tourism Analysis*, 1: 49-57.
Shoemaker, S. (1994). "Segmenting the U.S. Travel Market According to Benefits Realized." *Journal of Travel Research*, 32 (3): 8-21.
Woodside, A. G., and L. W. Jacobs (1985). "Step Two in Benefit Segmentation: Learning the Benefits Realized by Major Travel Markets." *Journal of Travel Research*, 24 (Summer): 7-13.