

PUBLIC TRANSPORT IMAGE POSITIONING USING MULTIDIMENSIONAL SCALING AND CORRESPONDENCE ANALYSIS

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Abstract

There is still a great demand for public transportation in Malaysia and express buses are no exception. In order to stay competitive, bus companies must position their image and provide a better service for their customers. This study is intended to identify the position of express buses based on customers' satisfaction towards the service quality by using Multidimensional Scaling (MDS) and Correspondence Analysis (CA). It is also intended to identify the presence or availability of the services/features/appearances provided by the bus company. Data were collected from 142 passengers using convenience sampling at an undisclosed Express Bus Terminal in Klang Valley. The bus companies included in this study were SExpress, KTB, MExpress, MahExpress, DExpress and CExpress. Multidimensional scaling was used to compare the position of the express buses based on the customers' satisfaction towards the service quality while correspondence analysis was used to investigate the presence or availability of the services/features/appearances provided by the bus company. Results of the analysis show that KTB has the best performance in terms of its responsiveness and assurance in the service quality whereas SExpress has strong association with empathy service quality. MahExpress performed comparatively well on the tangible service quality. MahExpress is associated with "on board entertainment" and "comfortable ride" whereas MExpress is associated with "more leg space in the bus". SExpress and KTB are highly competitive because passengers in the cluster perceived similar services/features regarding "driver informs passengers when the bus arrives at respective bus stations" and "bus has comfortable seats". In conclusion, both methods have created perceptual maps that illustrate the product positions and their attributes which is important to facilitate marketing of the products and services.

Keywords: Express bus services, customers' satisfaction, Multidimensional Scaling (MDS), Correspondence Analysis (CA)

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1.0 INTRODUCTION

There is still a demand for express bus services in Malaysia. Express bus is widely used because it is convenient, reasonably cheap and can reduce the use of private cars and traffic congestion problems. The bus services market is highly competitive especially during the holiday seasons and long weekend. Tickets are all normally sold out since thousands of people want to rush back to their hometown to celebrate festive season. To face an increasingly competitive environment, bus

companies must position their image and services in order to stay competitive and provide service differentiation to ensure survival in the transportation business.

The 'image' term is used to explain both imagery as well as a discursive method of processing information [1]. In other words, the term 'image' can be described as discursive forms that related to particular attributes and characteristics while the imagery forms can be related to overall feeling, impressions and atmosphere. Basically, the image of express bus does not only depend on logos, branding

and colors but also the chime of the bus arriving in the station and the comfort in vehicle seats [2].

Meanwhile, the objective of any brand positioning strategy is to strengthen positive image, correct any negative image or create a new image [3]. Hence, understanding the express bus features by passengers can lead to a successful image management. This is because Kotler [4] highlighted that images represent a simplification of a large number of associations and pieces of information connected with the place. In terms of marketing research, image or corporate identity is an assembly of visual, physical or behavioral cues representing the company, making it immediately recognizable to consumers [5].

It is important to understand how one's brand and those of competitors are perceived to effectively create a marketing strategy. One of the important tools in marketing research for product positioning is multidimensional scaling [6]. In addition, correspondence analysis is also widely used because categorical data are frequently encountered in the field of market research [7].

MDS is a set of methods for discovering hidden structures in proximity (similarity or dissimilarity) measures between pairs of objects [8]. It uses similarity or preference data that are ratings or ordinal scales [9]. Besides that, it is mostly used by marketing professionals and researchers to study the dimensions that consumers use to evaluate products and brands [10]. On the other hand, CA provides a unique graphical display showing how the variable response categories are related [11]. One only need to put a check mark to state their preferences at each attribute while MDS requires one to state their opinion based on rating scales [12].

2.0 METHODOLOGY

2.1 Sources of Data

This study employed a survey method with development of instruments for the purpose of collecting data. Prior to the preparation of the questionnaire, a pilot study was conducted with a sample of 30 respondents and as a result, a total number of 47 questionnaires are obtained. The analysis revealed 36 attributes found to be important which comprises of 21 service quality and 15 services and features were included in the main study. In accordance with the pilot study results, the most frequently used express bus when travelling from Shah Alam to Kota Bharu were included in the research (SExpress, KTB, MExpress, MahExpress, DExpress and CExpress). The Cronbach's alpha value was found to be 0.948 for the pilot study, indicating a high internal consistency of the scale.

As for the main study, the data were collected from 142 passengers who use express bus services from the Express Bus Terminal in Section 17, Shah Alam. Data have been collected between October

1 and October 14, 2014. . As a result, a total of 142 usable questionnaires (SExpress =31; KTB=29; MExpress =27; MahExpress =22; DExpress = 17 and CExpress =16) were included for analysis.

2.2 Data Analysis Procedure

The data was analyzed using IBM SPSS 21.0 software and SAS programming for multidimensional scaling and correspondence analysis, respectively.

The final questionnaire consists of four parts. The first section obtained information about the demographic profiles of the respondents; Section A: Demographic profile of the respondents. The second section obtained respondents' travel information; Section B: Respondent travel information. The third section collected data for Multidimensional Scaling; Section C: Customer's satisfaction towards the service quality of express bus and the fourth section collected data for Correspondence Analysis; Section D: The presence or availability of the service and features provided by the bus company.

For the third part, the items used were a 6 point Likert scale ranging from strongly agree, agree, somewhat agree, somewhat disagree, disagree and strongly disagree. The respondents were asked to rate only their most recently chosen express bus and after they have experienced using the same express bus for at least two times. Meanwhile, the last part asked the respondents to put check-marks to indicate which express bus, if any, is described by each attributes. The respondents are allowed to select any number of express buses for each attribute. However, the respondents are not expected to evaluate all possible service quality attributes because the answers are based on their experiences and perception of express bus.

3.0 RESULTS AND DISCUSSION

3.1 Image Positioning Using Multidimensional Scaling Based On Service Quality Attributes

Figure 1 shows the image positioning of the express buses based on five service quality attributes. By using multidimensional scaling, a maximum of three dimensions is preferred in order to ease the visual interpretation of the perceptual map [15].

All five service quality attributes are clustered together and limit the chances of observing the differences. Similarly for the position of the buses. Thus, it is rather difficult to distinguish and interpret the map since the relative position of the express buses and service quality attributes are not clearly defined. The average score of each attribute was not significantly different across the express buses [12].

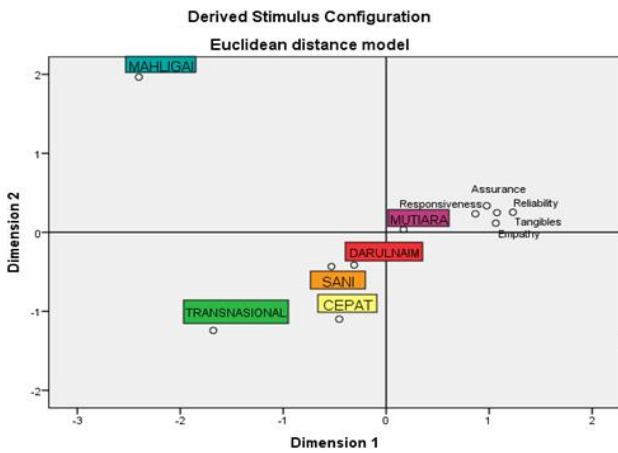


Figure 1 Express bus positioning by multidimensional scaling with five major service quality attributes

Initially there was a problem of 21 attributes overcrowding. This was rectified using factor analysis based on the principal components method where 21 attributes were reduced to five factors. This has helped to facilitate with the labeling and interpretation of the perceptual map [16]. Furthermore, this action has helped to relate the service quality dimensions and the position of the express buses clearly in a perceptual map. Furthermore, the measure of the STRESS fit for this MDS solution was 0.144 and can be considered a fair fit.

Based on factor analysis, the total percentage of variance for the present solution is 95.4%, which is good to represent all the service quality attributes. All factor loadings of the service quality attributes are greater than 0.5, indicating a statistical significance for main study sample size. The final analysis has produced four factors, namely Factor 1 - travel time, ticket price, respond, solution, confidence, help, courteous, safety, complain and attention; Factor 2 - image, comfort, customer friendly, arrival time, breaks down and easy info; Factor 3 - service, purchased ticket, accurate, and operating hours and Factor 4 - interest. These four factors were found to reasonably describe the distinct sets of service quality attributes towards express bus in Figure 2. The stress value obtained was found to be 0.111. This value shows that the diagrammatic illustration of this two-dimensional map has a fair fit which means the model is close to the realistic proximities [17]. R² value of the model was 0.993.

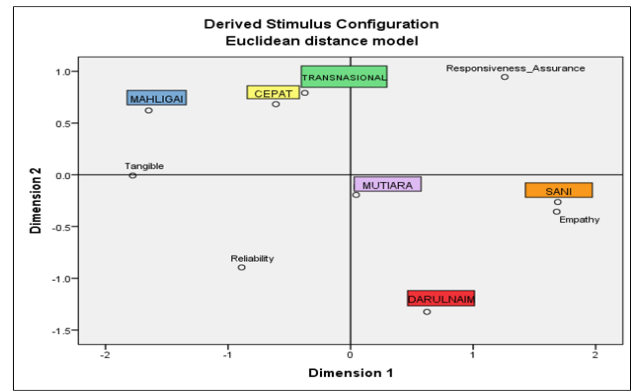


Figure 2 Express bus positioning with four factors using multidimensional scaling

The closer the express bus is to a service quality factor, the more it is related to that factor. In contrast, the further the express bus is from a service quality factor, the less it is associated with that factor. Based on Figure 2, CExpress and KTB are positioned in upper left quadrant and are located near each other, indicating a close competitiveness between the express bus companies. It gathered that these express buses were perceived to be very similar to each other by the customers.

From all the express buses surveyed here, KTB has the best performance in terms of its responsiveness and assurance in the service quality. In the lower right quadrant, SExpress is closer to empathy than any other express buses. Thus, SExpress is strongly associated with empathy service quality. On the other hand, MahExpress performs comparatively well on the tangible service quality as seen in the upper right quadrant in the two-dimensional map. In terms of the reliability in service quality, it can be seen that its distance is further than the other factors and thus not quite related. On the other hand, MExpress and DExpress have unusual attribute profiles and are isolated from other express buses.

3.2 Presence or Availability of Services and Features Provided based on Correspondence Analysis

Table 1 displays the contingency table on the availability of the services and features provided by the express bus companies. It shows 15 services/features (rows) across six types of express bus companies (columns). The aim is to explore the relationship between the presence or availability of the services and features provided by the respective bus company.

Table 1 Contingency table for availability of the services and features provided by the express bus companies

Services/Features	Express Buses						Total
	Sani	Transnasional	Mutiara	Mahligai	DarulNaim	Cepat	
Professional appearance	22	15	17	17	10	11	92
Safe manner	18	20	17	18	9	10	92
Responsible manner	18	16	13	12	11	12	82
Informs passengers	26	21	21	14	9	11	102
Polite	15	18	17	12	6	7	75
Helpful	21	18	13	15	15	10	92
Clean	24	24	23	17	8	9	105
Comfortable seats	24	21	16	17	7	8	93
Comfortable ride	13	13	15	13	9	10	73
Less noisy	18	14	16	13	5	6	72
Spacious interior	13	11	12	18	10	11	75
Leg space	13	13	14	13	5	6	64
Air condition	22	23	19	16	8	9	97
Entertainment	10	11	12	10	6	7	56
Luggage compartment	22	21	13	15	9	10	90
Total	279	259	238	220	127	137	1260

Table 2 displays the row profiles of availability of the service and features provided by the express bus companies. Table 2 represents the row profiles correspond to the relative frequencies of the differences services/features within each express bus. For example, among 93 respondents who reported that bus has comfortable seat, most respondent had chosen SEexpress (0.258%) followed by KTB (0.226%), MahExpress (0.183%), MExpress (0.172%), CExpress (0.086%), and DExpress (0.075%). These values are obtained by dividing the counts in a row with the total count for that row based on Table 2. Meanwhile, the average row profile is presented in the bottom row of Table 2. The average row profile shows that when pooling across services/features, SExpress is the dominant express buses (0.221), whereas DExpress is the least common (0.101).

Table 2 Row profiles of availability of the services and features provided by the express bus companies

Row Profiles	Express Buses						Total
	Sani	Transnasional	Mutiara	Mahligai	DarulNaim	Cepat	
Professional appearance	0.239	0.163	0.185	0.185	0.109	0.120	1.000
Safe manner	0.196	0.217	0.185	0.196	0.098	0.109	1.000
Responsible manner	0.220	0.195	0.159	0.146	0.134	0.146	1.000
Informs passengers	0.255	0.206	0.206	0.137	0.088	0.108	1.000
Polite	0.200	0.240	0.227	0.160	0.080	0.093	1.000
Helpful	0.228	0.196	0.141	0.163	0.163	0.109	1.000
Clean	0.229	0.229	0.219	0.162	0.076	0.086	1.000
Comfortable seats	0.258	0.226	0.172	0.183	0.075	0.086	1.000
Comfortable ride	0.178	0.178	0.205	0.178	0.123	0.137	1.000
Less noisy	0.250	0.194	0.222	0.181	0.069	0.083	1.000
Spacious interior	0.173	0.147	0.160	0.240	0.133	0.147	1.000
Leg space	0.203	0.203	0.219	0.203	0.078	0.094	1.000
Air condition	0.227	0.237	0.196	0.165	0.082	0.093	1.000
Entertainment	0.179	0.196	0.214	0.179	0.107	0.125	1.000
Luggage compartment	0.244	0.233	0.144	0.167	0.100	0.111	1.000
Average row profile	0.221	0.206	0.189	0.175	0.101	0.109	1.000

Table 3 shows the column profiles of availability of the services and features provided by the express bus companies. The column profiles are the relative frequencies of the different services/features within each express bus. For example, among the respondents who stated that KTB as their primary bus, majority have reported that inside of bus is clean (0.093%). They also mentioned about the reliability of air conditioning (0.089%) and about driver informing the passengers when the bus arrives at respective bus stations. This is followed by their preference for comfortable seats and spacious luggage compartment (0.081%). Meanwhile, the least chosen services/features among KTB respondents were spacious interior and on board entertainment each at 0.042%, respectively. The average column profile shows that when compared across the services and features of the express buses, cleanliness of the bus interior is the dominant primary services/features whereas on board entertainment is the least common feature chosen.

Table 3 Column profiles of availability of the services and features provided by the express bus companies

Column Profiles	Express Buses						Average column profile
	Sani	Transnasional	Mutiara	Mahligai	DarulNaim	Cepat	
Professional appearance	0.079	0.058	0.071	0.077	0.079	0.080	0.073
Safe manner	0.065	0.077	0.071	0.082	0.071	0.073	0.073
Responsible manner	0.065	0.062	0.055	0.055	0.087	0.088	0.065
Informs passengers	0.093	0.081	0.088	0.064	0.071	0.080	0.081
Polite	0.054	0.069	0.071	0.055	0.047	0.051	0.060
Helpful	0.075	0.069	0.055	0.068	0.118	0.073	0.073
Clean	0.086	0.093	0.097	0.077	0.063	0.066	0.083
Comfortable seats	0.086	0.081	0.067	0.077	0.055	0.058	0.074
Comfortable ride	0.047	0.050	0.063	0.059	0.071	0.073	0.058
Less noisy	0.065	0.054	0.067	0.059	0.039	0.044	0.057
Spacious interior	0.047	0.042	0.050	0.082	0.079	0.080	0.060
Leg space	0.047	0.050	0.059	0.059	0.039	0.044	0.051
Air condition	0.079	0.089	0.080	0.073	0.063	0.066	0.077
Entertainment	0.036	0.042	0.050	0.045	0.047	0.051	0.044
Luggage compartment	0.079	0.081	0.055	0.068	0.071	0.073	0.071
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Interpretation of the statistical output generated by correspondence analysis is not complete without the discussion of the joint graphical display. The two dimensional solutions map is presented in Figure 3.

The origin of the map corresponds to the centroid of each variable. The closer a row profile's vector location is to the origin, the closer it is to the average profile. Horizontal axis is represented by Dimension 1 whereas the vertical axis is represented by Dimension 2. This representation is strategically important to express bus company as the map reveals the underlying structure and the positioning of service/features and respective express buses. From Figure 3, MahExpress bus is most closely associated with "on board entertainment" and "comfortable ride". Positioned in the upper left quadrant of the

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