A MODEL-BASED CLUSTER ANALYSIS OF MATERIALISM, FAMILY COMMUNICATION, AND TELEVISION VIEWING

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ABSTRACT

This paper classifies 300 consumers into symmetrical groupings with respect to materialism, family communication, and television viewing, without imposing any structure or direction of the relationship between these dimensions. Upon obtaining the homogenous clusters of consumers, we will be able to profile the groupings using conventional demographical attributes. Data sampling through questionnaire administration is done in Malaysia, a country in Southeast Asia embracing a multi-ethnic and multi-cultural society. Results indicate that television viewing has been used by the optimization algorithm in demarcating the clusters of consumers and that the consumers can hardly be distinguished by family communication or materialism. More importantly, the current piece demonstrates the usefulness of complementing traditional significance tests with more contemporary model-based cluster analysis.

Keywords: Materialism, Family Communication, Television Viewing, Model-Based Cluster Analysis.

INTRODUCTION:

Undoubtedly purchasing behavior, the subject of interest to businesspersons and marketers, is substantially molded by socialization agents surrounding consumers (Reimer and Rosengren, 1990). Traditional socialization agents include family, peer group, work group, church, law, and school, which can be found in most societies whereas modern socialization agents include large organizations representing popular movements and interest groups, and the mass media (Reimer and Rosengren, 1990). As postmodern society grows more and more atomistic, individualistic, and alienated, socialization agent becomes more and more powerful, (Croteau and Hoynes, 2000).

Amongst the values propagated by socialization agents, materialism has received much interest from academics, parents, consumer activist, regulators, and marketers (Korten, 1999). Many studies on materialism have shown dramatic increases in materialistic values amongst youths (Korten, 1999). Whilst studies have associated materialism to television viewing and family communication (for e.g., Moschis and Churchill, 1978; Churchill and Moschis, 1979)authors have always focused on the relationships between the dimensions.

Rather than superimposing the structure of the relationship, the present work classifies consumers into symmetrical groupings with respect to materialism, family communication, and television viewing, without imposing any structure or direction of the relationship between these dimensions. In a sense, this approach is more natural since in the real world with natural setting, a causal relationship is too difficult to be substantiated though we know that the variables are linked to each other. In other words, this approach allows the data itself to reveal the intrinsic information. Upon obtaining the homogenous clusters of consumers, we will be able to profile the groupings using conventional demographical attributes.

The classification tool used is a comparatively new methodology in business and marketing, namely model-based cluster analysis, a pattern recognition technique which has been more widely used in biological and computer sciences. Data sampling through questionnaire administration is done in Malaysia, a country in Southeast Asia embracing a multi-ethnic and multi-cultural society. The objectives of study are as follows:

1. To classify respondents into symmetrical groupings with respect to materialism, family communication, and television viewing without predetermining any directional relationships between these dimensions.
2. To characterize the obtained clusters of respondents by demographical attributes, namely nationality, age category, ethnic group, marital status, levels of education, and levels of personal income.

The rest of the paper is structured as follows. The second section describes the relationships between family communication and television viewing with materialism. The third section introduces the methodology employed, concentrating on measuring instrument and model-based cluster analysis. Section 4 reveals the findings and section 5 discusses and concludes.

THEORETICAL FRAMEWORK:

MATERIALISM:

In 1971, Ward and Wackman defined materialism as “an orientation which views material goods and money as important for personal happiness and social progress” (p. 422). In the same vein, Daun (1983) described materialism as a lifestyle in which high level of material consumption is the goal and the basis of plans that lend meaning to life and provides an aim for everyday work. Similarly, Fox and Lears (1983) regard materialism as the ceaseless pursuit of “good life” through consumption whilst Inglehart (1981) consider materialism as an economic orientation to life, a cultural or structural variable, giving precedence to economic values over other values such as freedom, civil power, aesthetics, and friendship. In broad, materialism can be viewed as any excessive reliance on consumer goods to achieve the end states of pleasure, self-esteem, good interpersonal relationship or high social status (Ger & Belk, 1999).

THE RELATIONSHIP BETWEEN FAMILY COMMUNICATION AND MATERIALISM:

Any traits of an individual are inextricably linked to his childhood and family, so is materialism. Indeed, family communication provides a foundation for children's approach to interact with the marketplace (Moschis 1985), affects parental approaches to child-rearing (Carlson & Grossbart 1988; Rose 1999), and influences the development of children's consumer skills, knowledge, and attitudes (Moschis 1985; Carlson & Grossbart 1988; Carlson, et.al., 1992; Rose 1999). In examining these dimensions, researchers have studied single respondents, with early research focuses on adolescents (Moschis & Mitchell 1986) and later research emphasizes

perceptions of mothers of young children (Carlson, Grossbart, & Tripp 1990; Rose, Bush, & Kahle 1998). Concisely, domain of family communication includes the content, the frequency, and the nature of family member interactions (Palan & Wilkes 1998).

In the field of marketing, research in family communication can be traced back to a study by McLeod and Chaffee (1972) which utilizes two dimensions from Newcomb's (1953) general model of affective communication. The first dimension, *socio-orientation*, captures vertical communication and establishes deference among family members (McLeod & Chaffee 1972). The second dimension, *concept-orientation*, involves soliciting a child's input in discussions, evaluating issues from different perspectives, and providing an environment that stimulates the child to develop his or her own views (McLeod & Chaffee 1972). Other studies have utilized a four-category typology of family communication (e.g., Carlson, Grossbart, & Walsh 1990; Moschis & Moore 1979a; Rose, Bush, & Kahle 1998).

Studies have shown that family communication affects the endorsement of materialistic values (see e.g. Kasser et.al., 1995). Family environments including communication were very important predictors of the adolescents' materialism to the extent that their mothers' materialism level and report of family communication style alone could reliably predict their child's level of endorsement of materialistic values (Flouri, 2000). Children in families that use socially-oriented communication patterns, which stress harmony among family members and the avoidance of conflict demonstrate higher levels of materialism (Moschis & Moore, 1979). Children in families that use concept-oriented communication patterns, which encourage independent thinking, demonstrate lower levels of materialism (Moore & Moschis, 1981). Meantime, adolescents who communicate less frequently with their parents about consumption have been found to be more materialistic (Moore & Moschis, 1981).

THE RELATIONSHIP BETWEEN TELEVISION VIEWING AND MATERIALISM:

Television has a number of essential qualities that may contribute to its impact as an agent of consumer socialization and materialism. Television is ubiquitous. In terms of exposure, television rivals many traditional socialization agents such as school, church, and even parents. Television supplies its viewers with images, accounts, and stories of life that are often far removed from the viewer's daily experience and social milieu (O'Guinn & Shrum, 1997). Over time, however, as stipulated by cultivation theory, dominant program contents including favorable portrays of materialism (see O'Guinn & Shrum 1997; Shrum et. al, 2005) will assimilate with personal values.

Accordingly, Moschis and Churchill (1978, 1979) detected a statistically significant association between the strength of favorable attitudes toward materialism and the amount of television viewing. They also found that amount of television viewing among adolescents decline with age. Studies such as Bybee, Robinson, and Turow (1985) also concluded that young heavy viewers of television are more vulnerable to televised materialistic values. Meantime, Brand and Greenberg (1994) compared Channel One viewers and non-viewers among middle and high school adolescents in the United States. Channel One was the television program showing high school students a twelve-minute program with two minutes of commercials and it was discovered that more Channel One viewers than non-viewers reported greater desires on what was featured in the commercials, including designer's labels.

Similarly, using data from Simmons Market Research Bureau, 1996, and the General Social Survey, 1972-1996, Harmon noticed strong correlations between television viewing and materialism.

Comparable findings were found when samples from Korea (Kwak et.al, 2002), and advanced and emerging economies (Smith and Roy, 2008). One explanation to this relationship is that by Shrum et.al (2005) which conjectures that television viewing cultivates perceptions of the prevalence of societal affluence through a memory-based process that relies on the application of judgmental heuristics.

METHODOLOGY:

DATA SAMPLING:

A total of 300 shoppers were surveyed in Johor Bahru, the capital of the state of Johor, Malaysia, the city which borders Malaysia and Singapore. The characteristics of the sampled respondents are as follows, shown in Table 1.

TABLE 1 CHARACTERISTICS OF RESPONDENTS

Items		Frequency	Percentage (%)
Nationality	• Malaysian	235	79.1

	• Singaporean	62	20.9
Age	• 18 and below • 19 and above	109 191	36.3 63.7
Ethnicity	• Malay • Chinese • Indian	202 52 17	74.5 19.2 6.3
Marital Status	• Single • Married without children • Married with children • Widowed/Divorced	235 14 48 3	78.3 4.7 16.0 1.0
Education[a]	• SPM/SPVM/MCE • College Diploma • Professional qualification / University degree.	23 34 243	7.6 11.3 81.0
Monthly Gross Personal Income	• Less than RM1 000/ SGD 400 • RM1000/SGD 400 or more	136 164	45.3 54.7

Note:[a] PMR/SRP/LCE is equivalent to nine years of formal elementary and middle school education.

MEASURING INSTRUMENT:

Via questionnaires, respondents were asked to indicate on a five-point scale, the extent to which they agree with a statement operationalizing a dimension (materialism, television viewing, or family communication) from 1 for 'strongly disagree' to 5 for 'strongly agree'.

To operationalize materialism, we adapt a multi-item measure with five-point Likert scale from Wong et al. (2003). Wong et al. (2003) multi-item measure is derived from Richins and Dawson (1992) Materialism Value Scale. Implementing the Material Value Scale (MVS) cross-cultural alternation, we follow Schuman and Presser (1981) by replacing the MVS mixed-worded Likert structure with a 15-item interrogative question (see Appendix A). In other words, rather than forcing respondents to agree or disagree with statements such as "I admire people who own expensive cars, homes, and clothes", the questionnaire requires respondents to react to questions such as "How do you feel about people who own expensive cars, homes, and clothes?" through a set of specific response options, for instance "do not admire vs. greatly admire". The items alter the direction (i.e., left or right side) of these anchors to mirror the original direction of the Likert-style MVS. The mean scores signify the degree of materialism, with higher means indicating stronger endorsement of materialistic values and vice versa. The inter-item reliability (Cronbach's alpha) obtained is 0.69.

As for the television viewing dimension, following Chaffee et.al (1971) and McLeod and O'Keefe (1972), respondents were asked how frequent they watch certain categories of TELEVISION program. These categories are as follows: national and local news, sports events, movies, variety shows, cartoons, police shows, and adventure shows. The response is measured on a five-point scale from the scale of 5 for 'everyday' to the scale of 1 for 'never'. The scores are summed to form a television viewing index.

Lastly, for family communication, the measure comprises of two sections, the first on socio-oriented family communication and the second on concept-oriented family communication. Akin to Moshis and Moore (1979a), the socio-oriented scale consists of seven items measuring the degree to which parents request children to conform to parental standards of consumption. The responses are scaled from (1) 'Strongly disagree' to (5) 'Strongly agree'. These statements include: "My parents often use to say that the best way to stay out of trouble is to stay away from it", "My parents often use to say that their ideas are correct and I shouldn't question them", "My parents often use to answer my arguments with saying something like "You'll know better when you grow up?", "My parents often use to say that I should give in when he/she argues rather than risk making people angry", "My parents often use to tell me what things I should or shouldn't buy", "My parents often wanted to know what I do with my money", "My parents often use to complain when they don't like something I bought for myself".

Concept-oriented family scale is measured in line with previous research conducted by Moschis et.al (1984) and Moschis and Moore (1979a). The scale ranges from (1) 'Strongly disagree' to (5) 'Strongly agree'. The

items include: "My parents often use to ask me to help them buy things for the family", "My parents often use to ask me what I think about things they buy for themselves", "My parents often use to tell me to decide about things I should or shouldn't buy", "My parents often use to say that I should decide myself how to spend my money', "My parents often use to ask me for advice about buying things". The obtained inter-item reliability scores for socially-oriented and concept-oriented scales are 0.70 and 0.67 respectively.

MODEL-BASED CLUSTER ANALYSIS:

Model-based clustering is used to classify the respondents into symmetrical groups or clusters with respect to materialism, television viewing, and family communication. Following discussion is a brief description of the technique.

Amongst cluster analysis methods, there is a relatively new clustering technique, namely model-based clustering (MBC) which was first introduced in computer engineering (see Fraley and Raftery, 1998; Crowley, 2008). Concisely, the MBC method is a clustering technique based on probability models, such as the finite mixture model for probability densities.

According to Bock (1996), the alternative of using MBC arises in the midst of weaknesses in conventional clustering methods in which the number of clusters must either be pre-specified or chosen based on some validation indexes. Nonetheless, none of these methods have been satisfactory from a computational point of view. Another problem is that these cluster analysis methods impose a certain structure on the clusters (usually spherical) and the statistical properties of the clusters are generally unknown. Quite the opposite, MBC is capable of identifying a variety of cluster structures such as ellipsoidal clusters (see Table 2 for other structures). The following note briefly explains the MBC methodology.

In probability based clustering, each observation x_i is assumed to be generated by a mixture of underlying probability distributions where each component in the mixture represents different cluster. Given a set of observations, the density of an observation x_i from the k-th component in a total number of c components is $f_k(x_i|\theta_k)$ where θ_k are the parameters. In most cases, $f_k(x_i|\theta_k)$ is assumed to be multivariate normal (Gaussian), so in this instance the parameters θ_k consist of a p-dimensional mean vector μ_k and a $p \times p$ covariance matrix Σ_k. The clusters will then be ellipsoidal with center at μ_k and the covariance matrix Σ_k will determine the other characteristics. The mixture likelihood approach then maximizes the criterion:

$$\ell_M(\theta_1,...,\theta_c:\pi_1,...,\pi_c|x_i) = \prod_{i=1}^{n}\sum_{k=1}^{c}\pi_k f_k(x_i|\theta_k) \quad (1)$$

where π_k is the probability that an observation belongs to the k-th component.

Banfield and Raftery (1993) and Celeux and Govaert (1995) developed a model-based framework for clustering by expressing the covariance matrix in terms of its eigenvalue decomposition which is of the form;

$$\Sigma_k = \lambda_k D_k A_k D_k^T \quad (2)$$

where D_k is the orthogonal matrix of eigenvectors, A_k is a diagonal matrix where the elements of the diagonals are proportional to the eigenvalues of Σ_k, and λ_k is a scalar. This leads to a geometric interpretation of clusters; D_k determines the orientation, A_k determines the shape of the density contours, and λ_k specifies the volume. These characteristics can be allowed to vary between clusters, or constrained to be the same for all clusters. This approach actually subsumes many previous approaches of model-based clustering. The parameterizations of covariance matrix for different models are displayed in the following table, Table 2.

TABLE 2 PARAMETERIZATIONS OF COVARIANCE MATRIX BY MODEL

M^1	Covariance	Distribution				Description[2]			
		Family	Volume	Shape	Orientation				
1	$\Sigma_k = \lambda \mathbf{I}$	Spherical	Equal	Equal	Not Applicable	Diagonal covariance matrices	Diagonal elements are equal	Covariance matrices are equal	**I** is a $p \times p$ identity matrix
2	$\Sigma_k = \lambda_k \mathbf{I}$		Variable					Covariance matrices may vary	
3	$\Sigma_k = \lambda \mathbf{B}$	Diagonal	Equal		Axes		Diagonal elements	Covariance matrices are	**B** is a diagonal

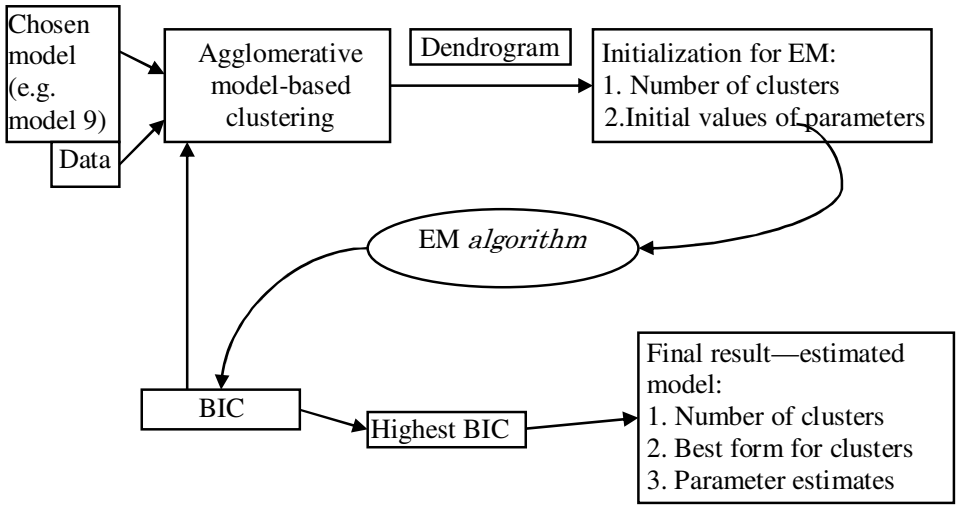
4	$\Sigma_k = \lambda B_k$						may be unequal	equal	matrix
5	$\Sigma_k = \lambda_k B_k$		Variable	Variable				Covariance matrices may vary among components	
6	$\Sigma_k = \lambda DAD^T$	General	Equal	Equal	Equal	Covariance matrices can have nonzero off-diagonal elements		Covariance matrices are equal	
7	$\Sigma_k = \lambda D_k AD$				Variable			Covariance matrices may vary among components	
8	$\Sigma_k = \lambda D_k A_k$			Variable					
9	$\Sigma_k = \lambda_k D_k A_k$		Variable						

Notes: 1 M for model. 2 p is number of dimensions (variables).
Source: Martinez and Martinez (2005).

Given the different model parameterizations above, agglomerative hierarchical clustering can be used by merging clusters so as to maximize the resulting likelihood as specified in equation (1) above. The algorithm used for maximizing the likelihood function is the Expectation-Maximization) EM algorithm (see Redner and Walker, 1984). EM iterates between an E-Step, which calculates the posterior probability that the *i*-th observation belongs to the *k*-th component given the current values of the parameters, and an M-Step which updates the parameter estimates using the estimated posterior probability. In the limit, the parameters usually converge to the maximum likelihood values for the Gaussian mixture model.
The mixture model approach allows the use of approximate Bayes factors to compare the appropriateness of the models. The Bayes factor is the posterior odds for one model against the other assuming neither is favored a priori. A convention is to choose the model and the number of clusters according to the Bayesian Information Criterion (BIC):

$$2\log p(x|M) + \text{const} \approx 2\ell_M(x|\theta) - m_M \log(n) \equiv \text{BIC} \qquad (3)$$

where $p(x|M)$ is the likelihood of the data for the model M, $\ell_M(x|\theta)$ is the maximized mixture log likelihood for the model and m_M is the number of independent parameters to be estimated in the model. The larger the value of the BIC, the stronger the evidence for the model and hence the cluster solution. A standard convention for calibrating BIC differences is that differences of 10 or more correspond to 'strong' evidence.
Figure 1 illustrates the MBC procedure, implemented using R statistical package and a toolbox provided by Fraley and Raftery (2009).



Source: Martinez and Martinez (2005).

FIGURE 1 THE MODEL-BASED CLUSTERING PROCESS

RESULTS:

Figure 2 plots the BICs against the respective numbers of clusters. It can be seen that the highest generated BIC

corresponds to Model 5, that is, according to Table 2, the model characterized by a distribution of varying volume and shape, and axes orientation, as portrayed in Figure 3, which displays the distributions of the clusters by variable. In that figure, there are two clusters of cases, the one represented by triangles in blue can be labeled as the first cluster whilst that indicated by squares in red can be called the second cluster. The axes quantify the values of the corresponding variables.

If we look at the distribution of the clusters by family communication and television viewing in Figure 3, it can be obviously seen that the first cluster is less dense than the second one and that the first cluster maintains higher television viewing. A similar pattern can be observed when we plot television against materialism, in which the first cluster exhibits greater television viewing than the second cluster. When we compare family communication with materialism however, the pattern is less clear and we can see cases of the first cluster scattered over the second cluster.

On this evidence, it can be inferred that the optimization algorithm has classified the cases based on television viewing, that is, greater television viewing characterizes the first group and lesser television viewing distinguishes the second group. To further examine the structure of the clusters, Figure 4 displays the coordinate projection of the classification by, for instance, television viewing and family communication. It shows the centers, the spread, and the shape of the clusters. With greater details, we can notice that the first cluster center is located at higher television and lower family levels whilst the second cluster center is situated at greater family and lower television levels.

Though the cases are assigned to either the first or the second cluster, there are still cases which "stand on the fence" or are located somewhat distant from the cluster centers but are nevertheless assigned to either group by the algorithm. These cases are represented by dark and grey circles in Figure 5. The larger dark circles generally lie on the borderline between the two clusters whilst the smaller grey circles are located somewhat away from the cluster centers.

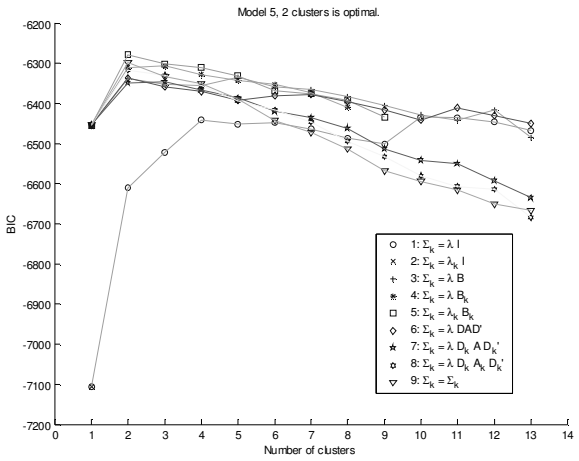


FIGURE 2 BICS AND NUMBER OF CLUSTERS

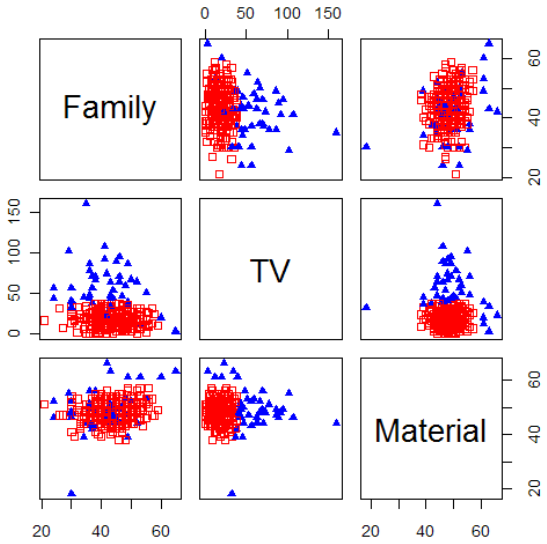


FIGURE 3 SCATTER MATRIX SHOWING THE DISTRIBUTION OF THE CLUSTERS BY VARIABLE

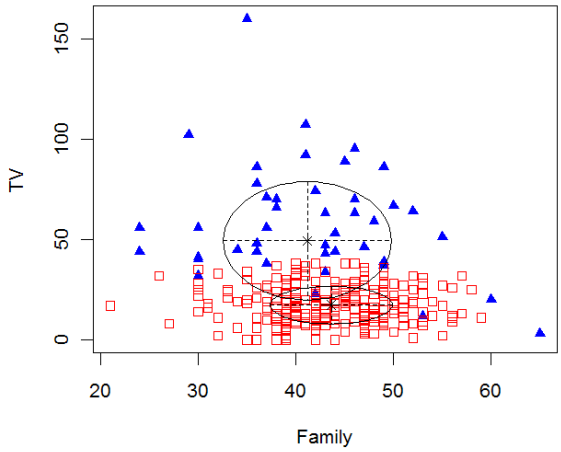


FIGURE 4 COORDINATE PROJECTION SHOWING CLASSIFICATION

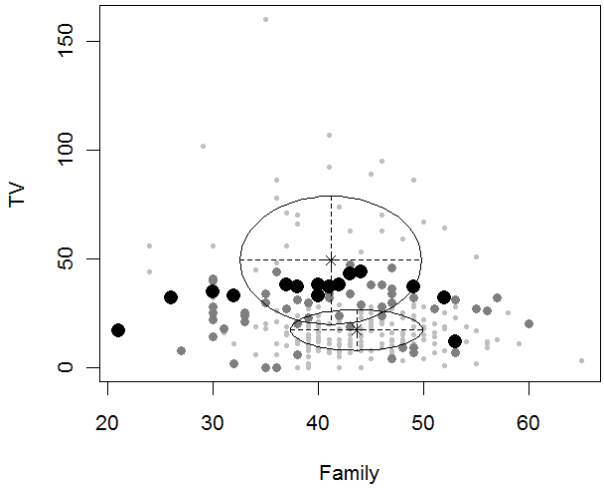


FIGURE 5 COORDINATE PROJECTION SHOWING UNCERTAINTY

Upon obtaining the classification, it is instructive to examine the characteristics of the clusters. Table 3 displays the mean and standard deviation for each of the variables by grouping. Noticeably, those in the first cluster, on average, maintain slightly lower family communication, a little greater materialism, and substantially higher television viewing. These means and variations indeed reflect the distributions depicted in Figures 3 and 4 above. In fact, the results of independent samples I-test confirm that the first cluster maintains significantly higher television viewing than the second cluster one.

Following this, the next step would be to characterize the clusters by demographical attribute, of which the counts and percentages are put together in Table 5. The table reveals that with respect to ethnic group, Malay is the majority ethnic group for both clusters but for the second cluster, the proportion of Chinese is remarkably greater than that of the first cluster. The ratios of Indian are similar for both clusters. As for nationality, the ratios across the clusters are similar, that is, about three quarters Malaysian, and a quarter Singaporean. A more significant difference can be seen when age is examined in which the first cluster contains more of the younger group, aged 18 and below, whilst the second cluster contains a greater portion of the older group, aged 19 and beyond.

As regards marital status, for both clusters, more-than-70% majority is single but for the first cluster, the second largest group of 14.3% is those married without children whereas for the second cluster, the second largest group of 17.1% is those married with children. Along this line, the first cluster contains proportionately more married people without children whilst the second cluster contains proportionately more married people with children. When it comes to education, college diploma holders are proportionately larger in the first cluster. With respect to income, the proportions of lower- and higher-income groups are quite similar for both clusters.

In addition, cross-tabulation significance tests are carried out and it is found that there is significant difference between the clusters with respect to the proportion of the age group. The results are presented in Table 6. The Pearson chi-square and associated tests, and the Phi test commonly suggest that the first cluster is

predominantly made up of those aged 18, the younger group, and below whilst the second cluster is predominantly consisted of those aged 19 and beyond, the older group. Even tests accommodating for direction, namely Goodman and Kruskal tau, and uncertainty coefficient, also suggest significant association between age group and cluster, if age group or cluster group is assumed as the dependent variable. Similar tests have also confirmed that the first cluster contains relatively more married people without children whilst the second one contains comparatively more married people with children.

Recall that the first cluster has been shown to have greater television viewing earlier, hence, together with the association between age and marital status with cluster group, the first cluster can be essentially characterized by older (working) age, married status without children, and greater television viewing.

TABLE 3 MEAN AND STANDARD DEVIATION BY CLUSTER

	Mean (Std. Deviation)	
	Cluster 1	**Cluster 2**
Family Communication	41.571 (8.985)	43.411 (6.417)
TV Viewing	58.952 (28.375)	17.627 (9.392)
Materialism	49.476 (8.097)	48.174 (3.820)

TABLE 4 INDEPENDENT SAMPLES *T*-TESTS

	Levene's Test for Equality of Variances, F-ratio	**Equal variances assumed**	**df**	**Mean Difference (Cluster 1 – Cluster 2)**	***t*-value**
Family	7.539**	Yes	298	-1.83942	-1.619
		No	48.038		-1.275
TV	88.183***	Yes	298	41.32447	18.168***
		No	42.474		9.355***
Materialism	24.295***	Yes	298	1.30177	1.683
		No	44.016		1.023

Notes:
*Correlation is significant at 0.05 level.
**Correlation is significant at 0.01 level.
***Correlation is significant at 0.001 level.

TABLE 5 PROPORTIONS OF CLUSTERS BY DEMOGRAPHICAL ATTRIBUTE

Cluster	**Ethnic group**			**Total**	**Nationality**		**Total**	**Age**		**Total**
	Malay	Chinese	Indian		Malaysian	Singaporean		18 and below	19 and above	
1	31	3	3	37	31	10	41	25	17	42
Within cluster 1	83.8%	8.1%	8.1%	100.0%	75.6%	24.4%	100.0 %	59.5%	40.5%	100.0%
2	171	49	14	234	204	52	256	84	174	258
Within cluster 2	73.1%	20.9%	6.0%	100.0%	79.7%	20.3%	100.0 %	32.6%	67.4%	100.0%

Cluster	**Marital status**				**Total**	**Education**			**Total**
	Single	Married without children	Married with children	Divorced or Widowed		SPM	College Diploma	Professional Qualification/University Degree	
1	31	6	4	1	42	1	9	32	42
Within cluster 1	73.8%	14.3%	9.5%	2.4%	100.0%	2.4%	21.4%	76.2%	100.0%
2	204	8	44	2	258	22	25	211	258
Within cluster 2	79.1%	3.1%	17.1%	.8%	100.0%	8.5%	9.7%	81.8%	100.0%

Cluster	Income		Total
	Less than RM1 000/ SGD 400	RM1000/SGD 400 or more	
1	15	27	42
Within cluster 1	35.7%	64.3%	100.0%
2	121	137	258
Within cluster 2	46.9%	53.1%	100.0%

TABLE 6 CROSS-TABULATION TESTS BY AGE AND CLUSTER

Cluster		Age		Marital Status[1]		
		18 and below	19 and above	Single	Married without children	Married with children
1		25	17	31	6	4
2		84	174	204	8	44
			Value			Value
Pearson chi-square			11.354***			11.212**
Continuity correction [2]			10.218***			-
Likelihood ratio			10.897***			8.470**
Phi			.195***			.194**
Goodman and Kruskal tau	Dependent:	Age	.038***		Marital Status	.007**
	Dependent:	Cluster	.038***		Cluster	.037**
Uncertainty coefficient	Dependent:	Age	.028***		Marital Status	.022**
	Dependent:	Cluster	.045***		Cluster	.035**

Notes:
1 The small "divorced or widowed" group is omitted.
2 Computed only for 2x2 table.
*Correlation is significant at 0.05 level.
**Correlation is significant at 0.01 level.
***Correlation is significant at 0.001 level.

DISCUSSION AND CONCLUSION:

Hitherto, the study has implemented model-based cluster analysis on 300 consumers with respect to materialism, family communication, and television viewing, and two clusters have been identified of which one cluster maintains significantly greater television viewing than the other. Results indicate that television viewing has been used by the optimization algorithm in demarcating the clusters of consumers and that consumers can hardly be distinguished by family communication or materialism. Upon obtaining the classification, the analysis attempted to profile the groupings by common demographical attributes and it has been discovered that older consumers who are married without children are distinguished by greater amount of television viewing.

With respect to implication, the novelty of the current piece lies in its demonstration of the usefulness of complementing traditional significance tests such as independent samples *t*-test and Pearson chi-square tests with a contemporary pattern recognition technique of model-based cluster analysis in marketing research rather than the findings per se. Along this line, model-based cluster analysis can also be used together with other conventional marketing research tools such as discriminant analysis, logistic regression, analysis of variance, multiple regression, and the like, by providing a classification of respondents based on the constructs or variables of interest rather than commonly used demographical dimensions. Of course, since the cluster analysis can accommodate many dimensions simultaneously (though only 3 variables are demonstrated here), future researchers can include greater number of variables, which is the norm in marketing research.

Despite the above, this study has its limitation. The survey employed a convenience sampling, therefore is not appropriate to generalize the findings to all consumers in Malaysia even though they can serve as a good reference for future research. But then again, the contribution of the paper lies in its methodology, rather than its findings.

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Appendix A:

Materialism Scales adapted from Wong et.al (2003)
The following statements are the 15 items interrogative format, which consist of the following questions and responses;

1. How do you feel about people who own expensive homes, car, and clothes?
   [1 = "Do not admire", 5= "Greatly admire"].
2. How do you shop?
   [1= "Buy anything I might want", 5= "Buy only what I need"].
3. How do you feel about owning things that impress people?
   [1= "Makes me uncomfortable", 5= "Makes me feel great"].
4. How do you feel about acquiring material possessions as an achievement in life?
   [1= "Not important", 5= "Very important"].
5. How do you approach your life in terms of your possessions (i.e., buying and owning things)?
   [1= "More is better", 5= "Simple is better"].
6. Would your life be any better if you owned certain things that you don't have?
   [1= "Not any better", 5= "Much better"].
7. Do you think the amount of material objects people own shows how successful they are?
   [1= "Very much", 5= "Not at all"].
8. How would you feel if you could afford to buy more things?
   [1= "Not any happier", 5= "Much happier"].
9. How would you feel if you owned nicer things?
   [1= "Much happier",5= "Not any happier"].
10. What do the things you own say about how well you are doing in life?
    [1= "Very little", 5= "A great deal"].
11. How do you feel about spending money on things that aren't practical?
    [1= "Do not enjoy", 5= "Really enjoy"].
12. Do you feel that you have all the things you really need to enjoy life?
    [1= "Need more", 5= "Have all I need"].
13. How much pleasure do you get from buying things?
    [1= "Very little", 5= "A great deal"].
14. How do you feel about the things you own?
    [1= "Very important", 5= "Not all that important"].
15. How do you feel about having a lot of luxury in your life?
    [1= "Do not enjoy", 5= "Really enjoy"].
