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DEVELOPING A PRODUCT MIX DECISION MODEL FOR DIRECT MAIL IN THE DEPARTMENT STORE

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Abstract

This research develops a model for selecting the best-selling product mix in the direct mail (DM). The research was conducted in two stages. Firstly, the evaluation criteria of product mix are formed based on the reviews of literature and experts' opinions collected via the modified Delphi method followed by the use of Analytic Hierarchy Process (AHP) to assess the criteria weight. Secondly, Grey Relational Analysis (GRA) was performed to select the best product mix. We also used this model to verify the effectiveness of discount marketing strategy. The results address that product promotion, product attractiveness, company collaboration, and layout of design are identified as the most critical criteria. The product mix is identified to have the most influences on individuals' product selections during the discount campaigns. Hence, this research not only provides useful guidelines for marketers, but also given the advantages of obtaining an effective marketing strategy among department stores.

Keywords: Direct Mail, Evaluation model, Analytic Hierarchy Process, Modified Delphi method, Grey Relational Analysis

INTRODUCTION

Direct mail (DM) has been considered the most effective medium for acquiring potential customers in direct marketing over decades. The messages and target customers are regarded as critical components in promoting a successful direct mail campaign (Bult & Wansbeek, 1995). Prior studies mostly emphasize the importance of selecting the target demographics and channels in order to promote the effectiveness of direct mail (Bawa & Shoemaker, 1987; Bult & Wansbeek, 1995; Dwyer & Evans, 1981). While little attention is paid to the successful elements used in the direct mail that facilitate the communications of product offerings and persuasive messages towards its target audience (TA).

In practice, luxurious department stores in Taiwan generally used direct mail to promote unique and discount products in their marketing activities. The frequency and usage of direct mail have been increased annually and reflected in the growth of advertising budgets. A proper design of direct mail is expected to attract consumers' attention and generate purchase intention among customers (Bawa & Shoemaker, 1987). Storeowners might want to use direct mail to communicate with their customers. For instance, they might wish to promote different product packages or persuade customers by advertising information along with direct mails delivered to the households. Prior scholars have confirmed the fact that the use of direct mail would effectively facilitate customers' brand awareness and purchase intention in the evaluation time spans between pre- and post-purchases (Bawa & Shoemaker, 1987; MacInnis, Shapiro, & Mani, 1999).

Nevertheless, marketers generally agreed that a success of direct mail is helpful in generating the volume of sales revenue and competitive advantages for stores and advertisement (Bawa & Shoemaker, 1989). The storeowners are thus required to frequently examine what product mix should be shown to their customers via the direct mail. Such task has caused high pressure and burdens for them to make regular decisions in selecting the product mix contained in the direct mail. The variety and pricing of different products promoted by the stores also make it more difficult to choose among the list of alternatives. So far, little research has been found that explicitly describes the selections of product mix in the direct mail(Bult & Wansbeek, 1995). In addition, the evaluation of product mix should reflect on the objectives of promotion, which present further challenges for decision makers. Therefore, this study aims to develop a decision model that provides information for marketers to determine the ideal solution among multiple criteria and options.

LITERATURE REVIEW

Direct Mail (DM) is defined as a promotion tool for communicating with potential customers by the delivery of postal services (Bearden, Ingram, & Laforge, 1995; Katzenstein & Sachs, 1992; T. A. Shimp, 1993; Terence A. Shimp, 2007). It can be used to contain product-sampling, coupons or cash back form, to draw immediate customer responses (McGuinness, Brennan, & Gendall, 1995). Comparing to the use of e-mail in the concerns of spam, DM still has some advantages, such as source accountability and flexibility in visual presentation (Terence A. Shimp, 2007). Hence, still 69% of markers use DM as a promotion strategy to drive store traffic and acquire new customers, according to the annual report by Target Marketing in 2011 (McGee, 2011).

For direct to consumer advertising (DTCA), Menon, Deshpande, Zinkhan, and Perri (2004) listed the factors that predict the effectiveness of advertising from four dimensions, such as audience, source, message and channel. The format of a DM is an essential element in direct to customer advertising which contained creative and promotional information by marketers (Nash, 2000). The sales information contained in the DM are enclosed and displayed in different formats, such as envelope, postcard, catalogue, brochure and coupon. The goal of using DM is mainly to stimulate customers' response and provide personalized information and news (Nash, 2000). It is also prominently for marketers to use DM in precision targeting, personalization and calling for immediate action (Roberts & Berger, 1999). The effect of using DM in retailers can also be easily evaluated through costs-to-sales relationship and customer responses (Hasouneh & Alqeed, 2010; Menon et al., 2004). In contrast to other media that targeted on mass consumers, retailers can use DM more efficiently with precise information extracted from customer database to attain better market segmentation (Bauer, 1988; Hasouneh & Alqeed, 2010). Hence, it is doubtless that department store retailers adapt DM as the main tactic in promotion and advertisement. Terence A. Shimp (2007) summarized a list of functionality of DM and illustrated as follows.

- Increase of sales and usage from current customers.
- Sell products and services to new customers.
- Build traffic at a specific retailer.
- Stimulate product trial.
- Generate leads for a sales force.
- Deliver product relevant information and news.
- Gather customer information that can be used in building a database.
- Create personalized information for target customers.

Although DM is vital to the success of marketing campaigns in department stores, prior research has not yet addressed the importance of product selection and display in the DM from the retailers' regards. Researchers addressed the issues of using DM in advertising promotion by means of different methodologies. Most prior studies put their efforts to evaluate the effectiveness of DM that influences customers' brand choices (Bawa & Shoemaker, 1987). Some studies evoke to identify the relationship between the use of DM in advertising and consumers' purchase decision mostly through individuals' perceptions (Bauer, 1988; Bawa & Shoemaker, 1989; James & Li, 1993). Other studies pointed out the critical tasks of selecting DM in advertising through different econometrical analyses (Bult & Wansbeek, 1995; Dwyer & Evans, 1981; Rao & Simon, 1983). However, little study was found that develops an objective method to evaluate the product selection in the DM. It is therefore essential for marketers to attain an optimized decision making process in the stage of pre-purchase before a DM is delivered to the target customers.

METHODOLOGY

The evaluation of selecting the best of product mix in the direct mail is divided into two sections. Firstly, a modified Delphi method is used to aggregate experts' opinions and helped to from the evaluation criteria. Analytic Hierarchy Process (AHP) is chosen to determine the criteria weight based on the hierarchy of criteria. However, there are many merchandizes and alternatives in the DM and AHP is not a suitable option for handling over seven elements in one level. Hence, after constructing the decision model, Grey Relational Analysis (GRA) is preferred and utilized to verify the selection of products mix in the samples of department stores.

Modified Delphi method

Rand Corporation originally developed the Delphi method in the 1950s. This approach consists of a survey conducted in two or more rounds. It is commonly assumed that this method makes better use of group interaction (Delbecq, Ven, & Gustafson, 1975; DeSanctis & Gallupe, 1987; Rohrbaugh, 1979; Woudenberg, 1991). The opinions from participants are equally considered and reached in consensus to solve some complicated issues (Linstone & Turoff, 1975; Rowe, Wright, & Bolger, 1991).

Although the Delphi method has been widely applied in different fields, the traditional Delphi method has been criticized for low convergence in result generation, long process of interrogation, and loss of valuable information from expert opinions (Garrod & Fyall, 2005; Murry & Hammons, 1995; Spinelli, 1982). Acknowledging the drawbacks of the traditional Delphi method, Murry and Hammons (1995) proposed a modified Delphi method to bypass the complicated process in the first round of expert query and complemented with the results of literature reviews, or substituted by the results from expert interviews or collected by a structured questionnaire. The advantage of this application is to save large amount of time in obtaining the experts' consensus and direct the attentions to the agreeable issues. As for the proper number of participants, a number of five to nine participants is recommended in conducting a Delphi method (Delbecq et al., 1975). Hence, this research chooses the principle of modified Delphi method. A group of five to nine people was recommended for conducting a modified Delphi method (Delbecq et al., 1975). Nine experts participated in this study and the questions were derived from related literature and suggested by experts in an open format.

Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process (AHP), developed by Saaty(1980), was another tool in dealing with uncertain situation of multi-attribute decision making(MCDM). This method is generally used to determine the priorities of decision alternatives via pair wise comparisons of attributes with respect to a common criterion. It also provides an objective way for reaching an optimal decision for both individuals and group decision makers. The AHP technique is widely used in modeling the human judgment process (Lee, Kwak, & Han, 1995). Bryson (1996) applied this method to assess the performance of group decisions in determining the consensus of relevant information. Dyer, Forman, and Mustafa (1992) used AHP to help advertisers in the media selection. Lin and Hsu (2003) also applied AHP to select Internet advertising networks. Hsu (2006) further used AHP to select public relation firms for high-tech companies. Thus, AHP has been successfully applied to solve a wide variety of problems. The process of AHP is illustrated as follows:

1. ***Establishment of Pairwise Comparison Matrix A***

Let $C_1, C_2, \ldots, C_n$ be the set of elements, while a_{ij} represents a quantified judgment on a pair of elements C_i, C_j. The relative importance of two elements is rated using a scale with the values 1, 3, 5, 7, and 9, where 1 stands for "equally important", 3 for "slightly more important", 5 for "strongly more important", 7 for "demonstrably more important", and 9 for "absolutely more important". The digits 2, 4, 6 and 8 are used to facilitate a compromise between slightly differing judgments (Saaty, 1994). Besides, Beynon (2002) compares the appropriateness of the 1-9 scale with other alternative 9-unit scales, also used in AHP, by looking at the probability distributions of the associated priority values.

A n-by-n matrix A is derived as follows:

$$A=\left[a_{ij}\right]=\begin{array}{c} \\ C_1 \\ C_2 \\ \vdots \\ C_n \end{array}\begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \dots & C_n \end{array} \\ \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \end{array} \qquad (1)$$

Where a_{ii} = 1 and a_{ji} = 1/a_{ij}, i, j = 1,2,…,n.

In matrix A, the problem becomes one of assigning to the n elements $C_1, C_2, \ldots, C_n$ a set of numerical weights $W_1, W_2, \ldots, W_n$ that "reflects the recorded judgments." If A is a consistency matrix, the relations between weights W_i and judgments a_{ij} are simply given by $W_i/W_j = a_{ij}$ (for i, j = 1,2,…,n).

2. Eigenvalue and Eigenvector

Saaty (1990) suggested that the largest eigenvalue λ_{max} be:

$$\lambda_{\max}=\sum_{j=1}^{n} a_{ij}\frac{W_j}{W_i} \qquad (2)$$

If A is a consistency matrix, eigenvector X can be calculated by the formula (3):

$$(A-\lambda_{\max} I)\,X=0 \qquad (3)$$

3. Consistency Test

Saaty (1990) proposed utilizing consistency index (CI) and consistency ratio (CR) to check the consistency of the comparison matrix. CI and CR are defined as follows:

$$CI = (\lambda_{\max} - n) / (n-1) \qquad (4)$$

$$CR = CI / RI \qquad (5)$$

Where RI denotes the average consistency index over numerous random entries of same order reciprocal matrices. If CR≦ 0.1, the estimate is accepted, and otherwise a new comparison matrix is solicited until CR≦0.1.

Grey Relational Analysis (GRA)

Grey System Theory is mainly utilized to study system model uncertainty, analyze relations between systems, establish models, and forecast and make decisions. GRA is used to examine the extent of connections between two digits by applying the methodology of departing and scattering measurement to actual distance measurement (Deng, 1989). Lin and Yang (1999) used GRA to select home mortgage loans, Sun (1999) applied GRA to rank factors influencing economic benefit in hospitals and thus develop economic policies, and Lin and Hsu (2003) used GRA to determine a media agency. The following formula displays the procedures for calculating grey relational grades (Wen, 1999):

1. Calculating grey relational grades

Let x_o denote the referential series with n entities,

$$x_0 = (x_0(1), x_0(2), \cdots, x_0(n)),$$

and let x_i represent the compared series,

$$x_i = (x_i(1), x_i(2), \cdots, x_i(n)), \qquad i = 1,2,\cdots,m$$

The grey relational grade for series x_o to x_i is then given as:

$$\Gamma_{0i} = \frac{\Delta\min + \Delta\max}{\Delta_i' + \Delta\max} \qquad (6)$$

where $\Delta_i' = \sum_{k=1}^{n} w_k \Delta_{0i}(k)$, $\sum_{k=1}^{n} w_k = 1$, w_k is the k-th element's weight, k=1,2,…,n, $\Delta_{0i}(k) = |x_0(k) - x_i(k)|$, and $\Delta\max = \max_i \max_k \Delta_{0i}(k)$, $\Delta\min = \min_i \min_k \Delta_{0i}(k)$.

2. Normalization (or Data dimensionless)

Before the grey relational grades are calculated, the series data can be treated using the following three situations and the linearity of normalization to avoid distorting the normalized data. The following situations arise (Wu & Chen, 1999):

1) Upper-bound effectiveness of measurement (i.e., larger-the-better)

$$x_i^*(k) = \frac{x_i(k) - \min_k x_i(k)}{\max_k x_i(k) - \min_k x_i(k)} \qquad (7)$$

where $\max_k x_i(k)$ is the maximum value of entity k and $\min_k x_i(k)$ is the minimum value of entity k

2) Lower-bound effectiveness of measurement (i.e., smaller-the-better)

$$x_i^*(k) = \frac{\max_k x_i(k) - x_i(k)}{\max_k x_i(k) - \min_k x_i(k)} \qquad (8)$$

3) Moderate effectiveness of measurement (i.e., nominal-the-best)

$$x_i^*(k) = 1 - \frac{|x_i(k) - x_{ob}(k)|}{\max\left\{\max_k x_i(k) - x_{ob}(k), x_{ob}(k) - \min_k x_i(k)\right\}} \quad (9)$$

where $x_{ob}(k)$ is the objective value of entity *k*, $\min_k x_i(k) \leq \chi_{ob}(k) \leq \max_k x_i(k)$.

Model construction

This model is separated into two parts, where the first part uses AHP to weight the evaluative criteria, while the second part applies GRA to select an ideal product selection in the DM. The model is detailed below:

1. Applying AHP for determining relative criteria weightings

This AHP model for determining the relative weights of evaluative criteria involves six steps as follows:

Step 1: Define the evaluative criteria for selecting product mix in the direct mail.

Step 2: Establish a hierarchical structure by breaking the product mix selection problem into a hierarchy of interrelated decision elements, including the ultimate goal, criteria, and sub-criteria.

Step 3: Establish the pairwise comparison matrix using formula (1). Every expert makes a pairwise comparison of the decision elements and gives them relative scores.

Step 4: Calculate the eigenvalue and eigenvector of each pairwise comparison matrix using formulae (2) to (3).

Step 5: Test the consistency of each comparison matrix using formulae (4) to (5).

Step 6: Aggregate the relative scores provided by all experts using the geometric mean method, and estimate the relative weights of the elements of each level.

2. Applying GRA for selecting an ideal product mix in the DM

This GRA model for selecting the ideal product mix in the DM which involves seven steps, as follows:

Step 1: Define the criteria and data treatment.

Step 2: Make the lower, moderate or upper bounds of the objective value sight the referential series.

Step 3: Transform the data obtained by arranging the criteria for product mix selection into a compared series.

Step 4: Normalize individual criteria values using formulae (7) to (9) to obtain $x_i^*(k)$, before calculating grey relational grades, in case of differences among individual criteria units.

Step 5: Calculate difference series $\Delta_{0i}(k)$.

Step 6: Enter the weights of twenty sub-criteria in the first part into formula (6) and then, calculate the Δ'_i and grey relational grades Γ_{0i} of each compared series.

Step 7: Select the top grey relational grades Γ_{0i}, which is the ideal product mix.

Model application

The decision model is constructed based on the selection of product mix illustrated in the DM and adopted by the department stores in Taiwan. DM is widely used by to attract customers' attentions and their purchase intentions. For marketers, DM is very effective during the discount campaign where it not only presents the discount information with respect to the exclusive merchandizes, promotions, and customer services, but also plays a critical role in the communication and persuasion with their customers. Hence, this research aims to apply this model to verify the optimized product mixed judged by a list of experts from the department stores. Three persons formed a decision team, which included the business director, manager from the department of female apparel, and marketing manager. The product mix in the DM was initially divided by two categories: new and discount merchandizes. The decision team members then selected twenty merchandizes and each merchandize was judged by a score based on the evaluation criteria. The evaluative figures obtained from these criteria are thus verified, as outlined below:

First part: Apply modified Delphi method to form the criteria and use AHP to determine the relative criteria weight.

Step 1. Define the evaluative criteria for selecting product mix in the DM

This research applies the modified Delphi method to define the evaluation criteria by inviting nine experts who are experienced in the business or marketing sectors for over ten years. After two rounds of expert questionnaires, the experts' opinions reached the consensus and determine the hierarchy of evaluative criteria.

1. Product: five criteria of evaluating the product mix in the DM were formed based on the reviews of prior literature which includes brand awareness (Dodds, Monroe, & Grewal, 1991; Hoyer & Brown, 1990; Kamins & Marks, 1991), fashion style (Sproles, 1979), new merchandize, word-of-mouth, and unique style. The last three criteria were suggested by experts in the query of Delphi survey.
2. Promotion: four criteria were identified include the depth of discount (Bell, Chiang, & Padmanabhan, 1999; Fry & McDougall, 1974; Grewal & Krishnan, 1998), scarcity of

merchandize (Brannon & McCabe, 2001; Suri, Kohli, & Monroe, 2007), and campaign activities as suggested by experts.

3. Layout design: two criteria were defined include the color coordination and the variety of merchandize.
4. Revenue generation: two criteria were identified include the revenue stem from in-store sales and the flexibility of suppliers' collaboration with respect to the quantity of merchandize, as suggested by experts.

Step 2. Establish a hierarchical structure

The selection of product mix in the DM is divided into three levels. The first level is the ultimate goal in selecting the optimized product mix in the DM, followed by the four evaluation criteria, and finally the 13 sub-criteria. The hierarchical structure is illustrated in Figure 1, on page 11.

Step 3. Establishing the pairwise comparison matrix

Nine expert respondents make a pairwise comparison of the decision criteria and assign relative scores based on 1 to 9 scales. The relative score provided by experts are aggregated using the geometric mean method, and the aggregate pairwise comparison matrix for the criteria is listed in Table 1, while that for the sub-criteria are listed in Table 2.

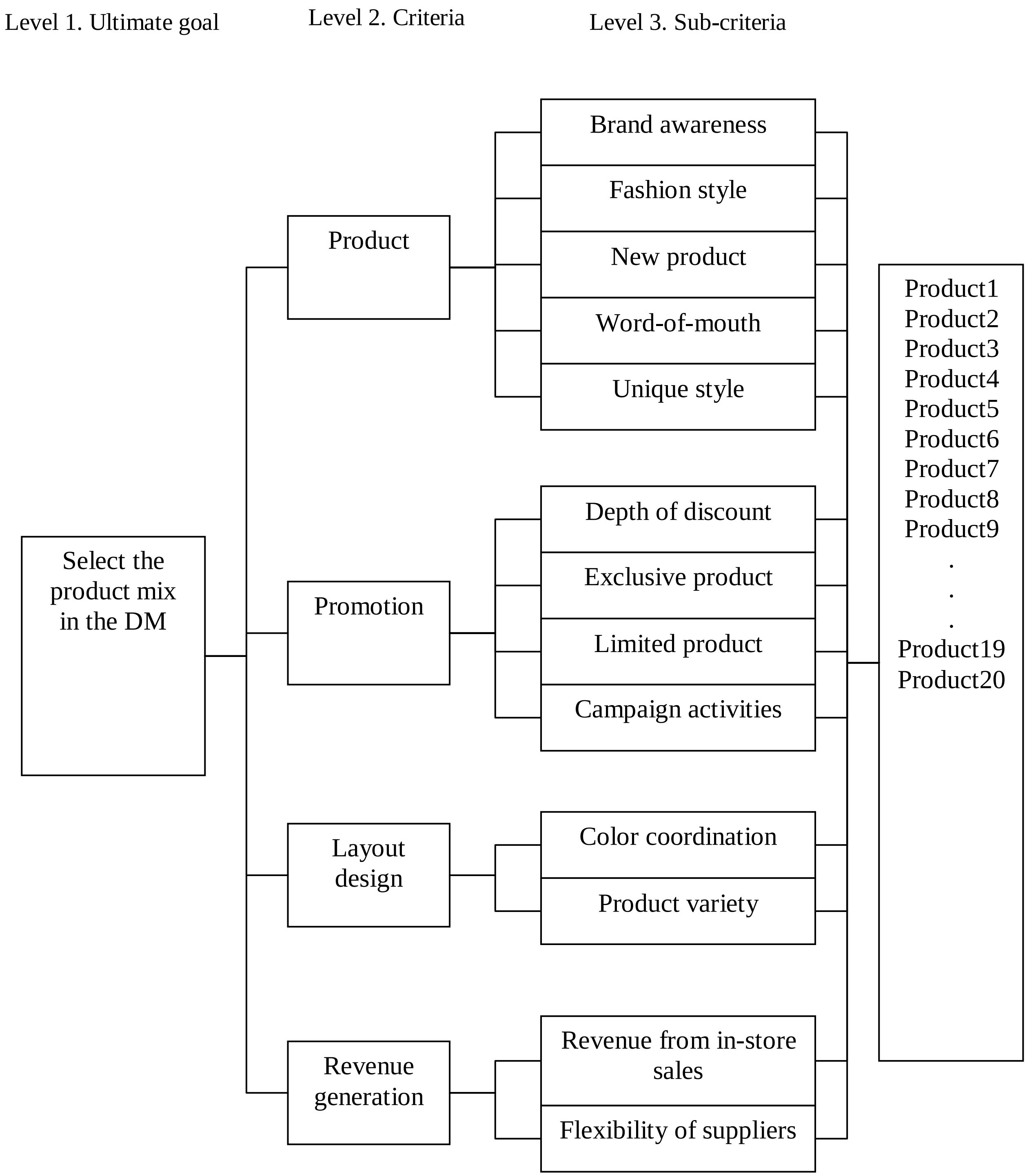
Table 1. Aggregate pairwise comparison matrix for criteria of level 2

	Product	Promotion	Layout design	Revenue generation
Product	1	0.868	4.335	1.313
Promotion	1.152	1	6.674	1.526
Layout design	0.231	0.150	1	0.362
Revenue generation	0.762	0.665	2.762	1
CR-0.008	CI=0.007	λ=4.022		

Table 2. Aggregate pairwise comparison matrix for sub-criteria of level 3

Criteria	Criteria weight	Sub-criteria	Sub-criteria weight	Overall weight	Ranking	Consistency
Product	0.311	Brand awareness	0.339	0.105	5	λ=5.067 CI=0.017 CR=0.015
		Fashion style	0.138	0.043	10	
		New merchandize	0.129	0.040	11	
		Word-of-Mouth	0.269	0.084	6	
		Unique style	0.125	0.039	12	
Promotion	0.388	Depth of discount	0.323	0.125	2	λ=4.100 CI=0.033 CR=0.037
		Exclusive product	0.376	0.146	1	
		Limited product	0.182	0.071	7	
		Campaign activities	0.119	0.046	9	
Layout design	0.068	Color coordination	0.216	0.015	13	λ=2.000 CI=0.000 CR=0.000
		Variety of product	0.784	0.053	8	
Revenue generation	0.323	Revenue from in-store sales	0.476	0.110	4	λ=2.000 CI=0.000 CR=0.000
		Flexibility of product supply	0.533	0.124	3	

Figure. 1 Hierarchical structure required to selecting the product mix in the DM



Step 4. Calculating the eigenvalue and eigenvector

Using the comparison matrix of Table 1 and Table 2, the eigenvectors were then calculated using formulae (2) and (3). Table 3 lists the results of eigenvectors for the thirteen sub-criteria and four criteria.

Step 5. Consistency test

The results of the consistency test, the CR of the comparison matrix from each of the nine experts, are below 0.1, indicating the aggregation of experts' opinions meets the requirement of consistency. Furthermore, the CR of the aggregate matrix is also blow 0.1, again indicating the consistency of this model.

Step 6. Estimating the relative weights of the elements of each level

The relative weights of the elements of each level are estimated from the aggregated values of the nine experts using the eigenvector method, and Table 3 lists the estimated results.

Table 3 The score of product mix based on the evaluation criteria

	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13
P1	6.667	7.000	4.333	7.667	7.667	6.000	5.333	7.667	6.667	7.000	6.000	7.667	5.000
P2	6.333	6.667	6.000	5.667	5.333	3.333	5.333	7.667	4.333	5.000	5.333	6.000	5.000
P3	7.667	7.667	6.667	7.000	6.000	5.000	5.000	4.333	4.667	5.667	5.333	8.000	7.000
P4	6.333	6.667	4.667	6.333	5.667	7.667	4.000	3.000	6.000	6.000	6.000	7.000	7.667
P5	7.000	6.667	5.000	6.000	6.333	7.667	5.000	6.667	6.333	5.000	5.333	6.333	5.333
P6	6.667	5.333	5.333	5.333	6.000	7.333	4.667	6.667	7.000	6.333	5.667	6.000	6.333
P7	6.333	6.333	6.333	6.333	5.333	5.333	4.000	2.667	4.667	3.333	5.333	6.667	7.667
P8	6.000	5.667	6.667	6.667	6.333	5.667	4.000	7.333	5.333	5.667	5.000	6.000	6.000
P9	5.000	7.000	6.333	6.000	6.333	5.000	4.333	8.000	4.667	5.000	5.667	5.000	3.333
P10	7.000	6.333	6.667	5.667	6.333	6.000	4.333	7.667	5.000	4.667	5.333	7.333	4.667
P11	6.000	6.333	6.667	6.000	6.000	5.667	4.333	7.667	5.667	6.000	6.000	6.000	4.667
P12	6.667	7.667	7.000	6.333	7.667	5.333	4.333	3.667	5.667	7.000	7.333	6.000	7.000
P13	7.000	6.333	5.667	6.333	5.667	6.667	4.000	6.667	5.333	6.667	6.667	6.667	5.667
P14	7.000	6.000	6.000	5.333	5.667	6.000	4.333	6.667	4.333	5.333	5.667	5.667	5.667
P15	7.667	6.667	7.000	6.667	7.000	5.333	4.333	6.667	5.000	7.333	7.000	6.667	6.333
P16	6.333	5.333	6.333	5.000	5.333	5.667	4.333	7.667	5.000	4.333	5.333	6.333	4.667
P17	6.333	6.333	6.667	6.000	6.000	6.000	4.667	3.000	4.667	6.333	6.333	6.333	5.667

Second part: Applying GRA for selecting the optimized product mix in the DM among alternative options

Step 1. Define the criteria and data treatment

The experts selected twenty merchandizes. Each merchandize was directly rated by thirteen criteria based on the scales from 1 to 10. The higher value indicates the impression of merchandize based on the criteria. The scores from thirteen criteria are illustrated in Table 2.

Step 2. Pick out (κ1) the highest value is 7.667, from the brand awareness of the merchandize; (κ 2) the highest value is 7.667 from fashion style; (κ3) the highest value is 7.000 from new merchandize; (κ 4) the highest value is 7.667 from word-of-mouth. All these criteria values are to be considered as referential series χ_0. That is, χ_0 = (7.667, 7.667, 7.000, …, 7.667).

Step 3. Consider the values of κ1, κ 2, …, κ 13 as compared series χ_i =(χ_i (1), χ_i (2), …, χ_i (13)), i=1,2,3.

Step 4. Normalize Table 3 using formulae (7) and (8).

Step 5. Calculate the difference series

Step 6. Calculate of individual compared series and grey relational grades by the formulae (6), as shown in Table 4.

Table 4 Calculation of individual compared series and grey relational grades

	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13	Δ'	Γ_{0i}	Rank
P1	0.040	0.012	0.040	0.000	0.000	0.048	0.000	0.004	0.006	0.001	0.030	0.009	0.076	0.267	0.789	1
P2	0.053	0.018	0.015	0.063	0.039	0.125	0.000	0.004	0.046	0.009	0.046	0.055	0.076	0.549	0.646	14
P3	0.000	0.000	0.005	0.021	0.028	0.077	0.036	0.049	0.040	0.006	0.046	0.000	0.019	0.327	0.754	2
P4	0.053	0.018	0.035	0.042	0.033	0.000	0.146	0.066	0.017	0.005	0.030	0.028	0.000	0.474	0.679	8
P5	0.026	0.018	0.030	0.052	0.022	0.000	0.036	0.018	0.012	0.009	0.046	0.046	0.066	0.382	0.724	4
P6	0.040	0.043	0.025	0.073	0.028	0.010	0.073	0.018	0.000	0.004	0.038	0.055	0.038	0.444	0.693	6
P7	0.053	0.025	0.010	0.042	0.039	0.067	0.146	0.071	0.040	0.015	0.046	0.037	0.000	0.590	0.629	18
P8	0.066	0.037	0.005	0.031	0.022	0.058	0.146	0.009	0.029	0.006	0.053	0.055	0.047	0.565	0.639	16
P9	0.105	0.012	0.010	0.052	0.022	0.077	0.109	0.000	0.040	0.009	0.038	0.083	0.123	0.682	0.595	20
P10	0.026	0.025	0.005	0.063	0.022	0.048	0.109	0.004	0.035	0.010	0.046	0.018	0.085	0.497	0.668	10
P11	0.066	0.025	0.005	0.052	0.028	0.058	0.109	0.004	0.023	0.005	0.030	0.055	0.085	0.546	0.647	13

Step 7. Select 10 merchandizes from the original 20 merchandizes based on grey relational grades in Table 5. The rankings of the first ten merchandizes from applying this approach are illustrated in Table 4. The results indicate the top 10 merchandizes are characterized to have the advantages with more discount than other discount options. The revenues from in-store sales and high brand awareness, high variety of product choices and styles determine the priority of product mix which is thus recommended to highlight in the DM.

CONCLUSION

The selection of an optimized product mix in the DM is a complicated multiple objective decision making process. This study emphasizes on the discount strategy in department store marketing by selecting the product mix to illustrate the depth of discount based on the decision model. The uniqueness and depth of discount in the DM are identified to be the most important criteria that can be used to convert consumers' purchase intentions into sales revenue. To create high volume of sales revenue, it is also important to collaborate with distributors and ensure the supplies and styles of the merchandizes. The weights of selecting product mix of DM in the department stores are considered to be the priority of promotions carried in the discount campaigns. The ranking of criteria are the uniqueness of product mix, depth of discount, flexibility of product supplies, and revenues of the counter, brand awareness and discussion topics. This research provides an objective and systematic approach to evaluate the product mix displayed in the DM. Through the judgment of marketers in the department stores; this framework not only provides valuable information for selecting the ideal product categories for marketers but also facilitates the process for consumers in purchase decisions. Future researchers and practitioners may follow this framework and apply it to various contexts, such as the applications in different department stores or the stores from other industries. In addition, this study assumes the independence of each criterion and eliminates the complexity of considering the relationships among criteria. Future research is recommended to use Analytics Hierarchy Process (ANP) and take the relationships of interdependence of criteria into account.

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