

***DEVELOPMENT OF DECISION SUPPORT SYSTEM BASED ON CATEGORY
MANAGEMENT CONCEPT TO INCREASE SALES PERFORMANCE OF A
CATEGORY AS A BUSINESS INTELLIGENCE TOOL***

*International Symposium on Competitive Intelligence, Organized by University of Aix
Marseille-3 France, Jakarta, June 23-24, 2004*

Kadarsah Suryadi*
Henri DOU**
Ariawan*

***Laboratory of Information System and Decision Making
Industrial Engineering Department Bandung Institute of Technology
Jl. Ganesa 10 Bandung, Tel:62-22-2508141, kadarsah@bdg.centrin.net.id**

**** Centre de la Recherche de Retrospective de Marseille
Universite d'Aix Marseille 3 - France
henri.dou@wanadoo.fr**

Abstract:

The paper has objective to relate characteristics of a category with certain marketing action, and measuring it with a formula until it generates a meaningful value. The proposed models are combination of Analytic Hierarchy Process (AHP) multi-criteria decision model with some modifications in the weighting at criterias and alternatives level [Kadarsah Suryadi, Sadewo 2003], [Kadarsah Suryadi and Edwin Salim, 2003]; category review methods Nielsen Marketing Research [1992] with some modifications to adapt the data lackness; and category classification methods that were developed by Sanjay K. Dhar et.al [2001]. The proposed models are able to produce a fixed value to measure an effectiveness of a promotion activity, so the user (STORE "X" division) can use that value to support their decision.

Keywords:

Decision Support System, Business Intelligence, Retailer Performance Index, Effectiveness of Promotion, Criteria Weighting.

Development of Decision Support System Based on Category Management Concept to Increase Sales Performance of a Category as a Business Intelligence tool

1) Introduction

This paper describes a study conducted at a one of the world top manufacturer in packages consumer goods product (name withheld by request), to help one division – STORE “X” division – of the manufacturer to identify which marketing actions that have the biggest impact for certain categories. The key question addressed in this paper is how to select the right marketing actions for different categories in different stores and how it can be justified.

Because the nature of this study, STORE “X” division can only provide limited amount of data. Those data are only sales-scan data from retailer that being handled by the STORE “X” division. With this data, we try to develop some decision models that can generate values that can be used as a justification for selecting the right marketing actions. The marketing actions listed in this paper are promotion

activities that already have been used by the STORE “X” division.

The main objective of this paper is to relate characteristics of a category with certain marketing action, and measuring it with a formula until it generates a meaningful value. It is expected that with this value STORE “X” division can understand the impact of its marketing action to the category sales performance. We then implement those formulas or decision models into a decision support system so it can be used by STORE “X” division easily.

2) Literature Review

a. Category Management

Category management is a process that involves managing product categories as business units and customizing them on a store-by-store basis to satisfy customer needs. [Nielsen Marketing Research, 1992]. Category management is a circular process with 5 steps. Those steps are [Nielsen Marketing Research, 1992] :

1. reviewing the category
2. targeting consumer
3. planning merchandising
4. implementing strategy
5. evaluating result

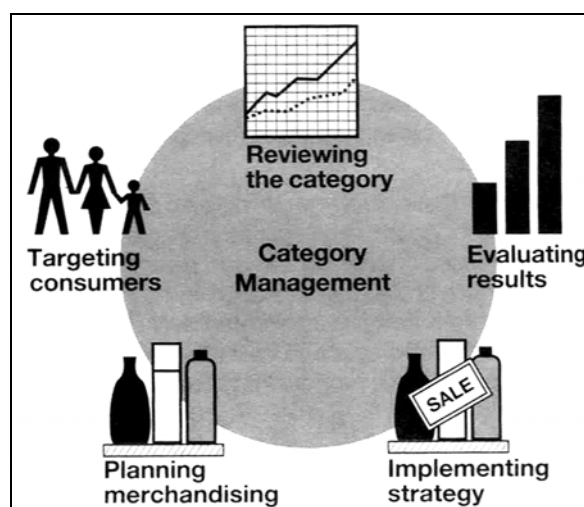


Fig 2.1

Steps in Category Management
[Nielsen Marketing Research, 1992]

The step that is going to be discussed is the 1st steps which is reviewing the category. Basically this 1st step was done to answer these following questions [Nielsen Marketing Research, 1992] :

- How is my brand market share vs its competitors ?
- How is the comparison in term of currency, volume and profit ?
- What is the market leader of the category and how much is the lead ?
- How is my sales trend, across categories and sub categories ?
- How is each performance of my retailer account in term of market share category ?
- How is each account handling product variation, price variation, promotion and shelves allocation for my brands and its category?
- How is one category affect another? And vice versa

- Are there any chances of cross-merchandising or cross promotions on certain category?

b. Category Classification by consumer-based category roles

Retailers influence category volume by taking marketing actions that either: (1) increase store traffic; and/or (2) increase the probability of category purchase by consumers who already are in the store. Sanjay K. Dhar et. al [2001] argue that the retailer's success in generating category demand through either traffic building or in-store tactics depends on the role the category plays in both the consumer's and retailer's portfolio. One popular classification scheme promoted the Food Marketing Institute (FMI) utilizes consumer-based category roles defined according to the percentage of households that buy the category and the frequency with which it is purchased.

		Percent Of Household Buying	
Frequency of Purchase		High Penetration	Low Penetration
High Frequency	STAPLES - Cereal - Coffee	NICHES - Yoghurt - Macaroni & Cheese	
Low Frequency	VARIETY ENHANCERS - Pickles - Rices	FILL-INS - Pancake Mix - Syrup	

Fig. 2.2

Consumer-base Category Roles by Food Marketing Institute [Dhar, Sanjay K. et al , 2001]

Categories are classified into “high” and “low” *penetration* (percentage of households that purchase the category) and *frequency* (average number of times per year category is

purchased) categories and fall into one of four groups: (1) *staples* (high penetration/high frequency); (2) *niches* (low penetration/high frequency); (3) *variety enhancers* (high penetration/low

frequency); and (4) *fill-ins* (low penetration/low frequency). Since consumer motivations to make purchases in staples will necessarily be different than in fill-ins and similarly among other category groups, then the effectiveness of specific marketing actions to differ by category. [Sanjay K. Dhar et. al, 2001]

3) Model Development

The models being developed here are combination of Analytic Hierarchy Process (AHP) multi-criteria decision model with some modifications in the weighting at criterias and alternatives level [Kadarsah Suryadi, Sadewo 2003] and [Kadarsah Suryadi

and Edwin Salim, 2003], a category review methods from Nielsen Marketing Research with some modifications to adapt the data lackness. And category classification methods that were developed by Sanjay K. Dhar et.al [2001].

Some models that were developed based on category management concept, like the one by Sanjay K. Dhar et. al. (2001), Fader dan Lodish (1990), Food Marketing Institute (1995) and Nielsen Marketing Research (1992), all are using national-scale data. While the models in this paper use a local-scale data (only from one retailer). The model structures are as follows :

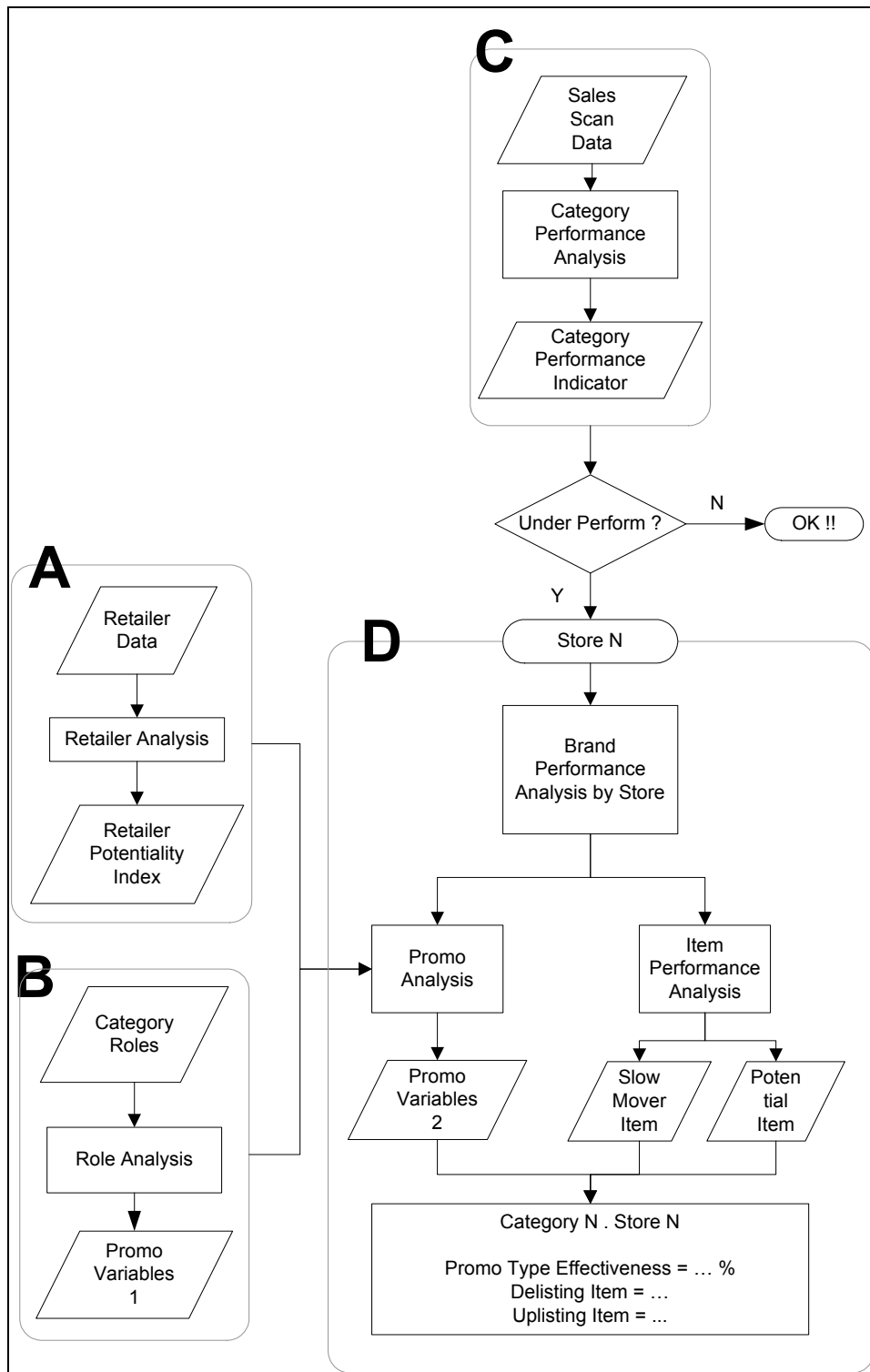


Fig 3.1
Structure of the Decision Models for Measuring the effectiveness of a Promotion Action

As seen on the figure 3.1, the structure of the models that we

developed is divided into 4 sections. Section A, is a multi-criteria decision

model to produce what we called RPI (Retailer Potentiality Index) – a value that representing a supermarket potency in attracting consumers. Section C, adapted from category review methods of Nielsen Marketing Research (1992) [6]. This section is going to analyze each category performance, so that we could get the under-performed category. Section B, is a category classification method to produce promo-type variabls for each category that suits them. This methods was taken from Sanjay K. Dhar et. Al. (2001).

The last section, section D, is a model to analyze for he cause of under-performed category and then find the

solutions. This section is an adaptation from category review methods of Nielsen Marketing Research (1992), the result of this section are promo types and list of potential item and list of slow-mover item for each category on each store.

a. Section A

On this section we used model that developed by Saaty, Analytic Hierarchy Process (AHP), with some modification on the weighting methods. We use AHP because it is fit for decision making process that involves multi-criteria and multi-judgement (multi-user) [Saaty,1980].

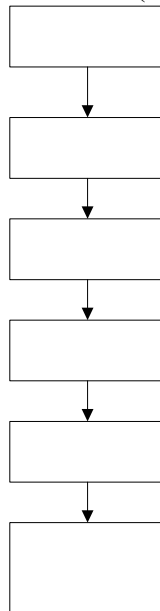


Fig 3.2

Steps for Designing Multi Criteria Decision Model

According to AHP method, the upper level of the hierarchy is the goal of the model, that is Retailer Potentiality Index. This goal needs to be clear to keep the validity of criterias.

The criteria that we used were taken from the research that was done by Doreen Chze Lin Thang and Benjamin Lin Boon Tan (2003). Those criteria are :

1. Merchandising (merchand): merchandise mix, availability

2. Atmosphere (atmosphere): decorations, ease of movement, display of merchandise

3. In-Store Service (inserv): congeniality, advise on purchase, convenience of payment

4. Accessibility (access): location, parking

5. Reputation (repute): value for money, rumors

6. Promotions (promo): advertisement, special event

7. Facilities (facility): wash rooms, cafeteria (refreshment booth), elevator, child care center
8. Post Transaction Service (postserv): warranty, return policy

We were not going to use all 8 criteria, but only the most relevant criteria to the local condition only. To select those relevant criteria, we used method proposed by Tummala [Tam et al., 2001], a questioner of criteria importance. With this method we manage to identified 6 relevant criteria and cut the other 2, by cut-off point method.

By using those 6 criteria that survived the cut-off point, we set the hierarchy structure. There are 3 levels, 1st level is the goal, which is Retailer Potentiality Index. 2nd level is the criteria: Merchandising, Atmosphere, In-Store Service, Accesibility, Facilities and Post Transaction Service. 3rd level is using Liberatore methods [Liberatore, 1987], a 5 point rating scale, and 4th level is the store. The complete structure can be seen in figure 3.3 below.

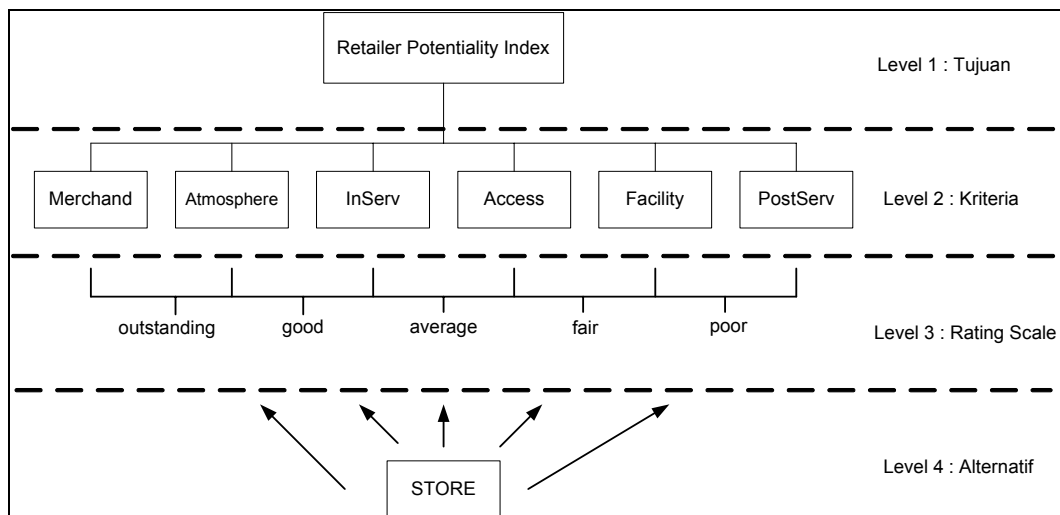


Fig 3.3
Hierarchy Structure of Retailer Potentiality Index

To determine the weight of the criteria, we used Borda method [Kadarsah Suryadi and Sadewo 2003], [Kadarsah Suryadi and Salim 2003]. And for the rating scale we use Liberatore rating scale, a 5 point scale : Outstanding (O), Good (G), Average (A), Fair (F), and Poor (P). The final models are layout as follows :

$$RPI_n = \frac{\text{model's value}(C4_n)}{\sum_1^n \text{model's value}(C4_n)} \times 100\% \quad (11)$$

And the formula's for the model's value are :

$$\text{model's value}(C4_n) = (0,2619 \cdot \text{merchand}) + (0,2024 \cdot (0,131 \cdot \text{inserv}) + (0,2381 \cdot \text{access}) + (0,119 \cdot \text{facility}) + (0,476 \cdot \text{postserve}))$$

..... (12)

Where the value input for each of those criteria (merchand, atmosphere etc) are :

Outstanding	= 0,513
Good	= 0,261
Average	= 0,129
Fair	= 0,063
Poor	= 0,034

[Sanjay K. Dhar et.al, 2001]: (1) staples (high penetration, high frequency) , (2) niches (low penetration, low frequency) , (3) variety enhancers (high penetration, low frequency), atau (4) fill-ins (low penetration, low frequency).

b. Section B

In this section we classify categories into 4 groups, so that we can identify the right promo variabel that have direct effect to each categorie performance. Those 4 groups are

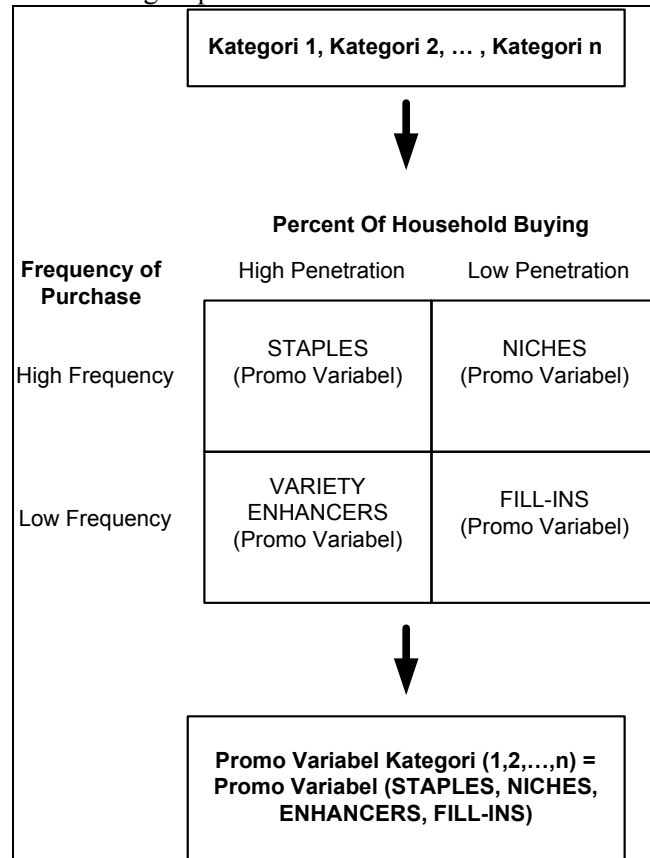


Fig 3.4
Category Classification Method / Role Analysis

There are also 4 promo variabels :

Table 3.1
Promo Variabel and its component

Promo Variabel / Promo Type	Code	Component
Temporary Shelf-Price Reduction	TPR	price discount
Display	DISP	raiser/poster
		product demo
		free-floor display/gondola
Feature Advertising	FEAT	extra bonus + mailer
Assortment	ASSORT	item variation (packsize & type) for a brand

Those promo variabels are the result of cross-breed between promo variabels used by Sanjay K. Dhar et. al. (2001) and promotion activities by STORE “X” division. On his research

Sanjay K. Dhar et. al. found that the effectiveness of a promo variabel to increase category performance depends on the roles of the category.

Table 3.2
Promo Variabel Effect on The Roles of a Category [S. K. Dhar et. al., 2001]

Promo Variabel	The effect on			
	staples	enhancers	niches	fill-ins
TPR	+	+	-	-
DISP	-	+	+	++
FEAT	++	+	++	+
ASSORT	-	+	+	+

On table 3.2, plus (+) means that those variables have a positive effect for increasing the market share, while the double-plus (++) sign have a very effective impact for increasing the market share. While the minus sign (-) does not mean that those variables decreasing the market share, but those variables does not have any effect at all,

or worse that it will only add extra cost while giving no extra return, so it will be decreasing the return. To make those variables and their sign meaningful, so it can be used as a formula in the model. The sign needed to be converted into a value. We used a conversion scale 0, 0.5 and 1.

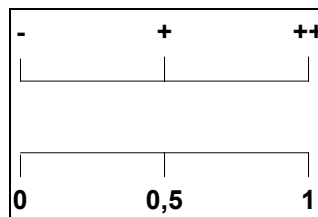


Fig 3.5
Conversion Scale

Table 3.3
The Conversion Result

Promo Variabel	The effect on			
	staples	enhancers	niches	fill-ins
TPR	0.5	0.5	0	0
DISP	0	0.5	0.5	1
FEAT	1	0.5	1	0.5
ASSORT	0	0.5	0.5	0.5

c. Section C

We called this section Category Performance Analysis. The goal of this model is to identify the under-performed categories. To judge whether a category is under-performed or not, we used a standard parameter, that is a market share. And we called this parameter as Category Performance Indicator (CPI).

How is the model work is like as follow : Compares the share value of category X_n with share value of $(PT. X)_n$, if share value of $(PT. X)_n$ is larger than that category is an under-performed one. (see figure 3.6)

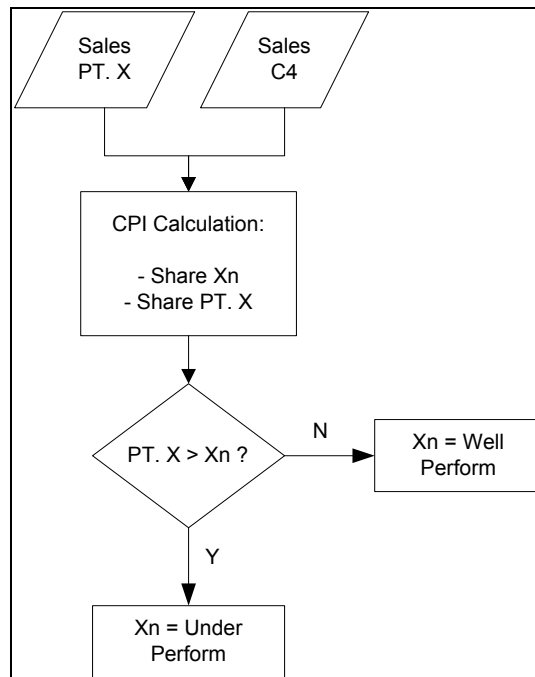


Fig 3.6
Steps of Category Performance Analysis

d. Section D

This consists of 3 models: (1) Brand Performance Analysis, (2) Item Performance Analysis, and (3) Promo Analysis.

1. Brand Performance Analysis

Brand Performance Analysis has purpose to identify what brands who have cause the category to be under-performed, where a category consists of some brands. (see figure 3.7).

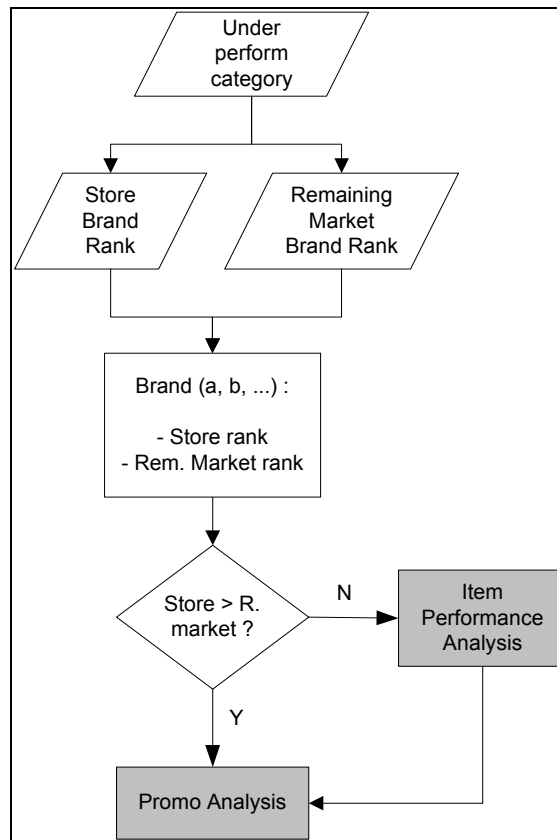


Fig. 3.7
Steps of Brand Performance Analysis

2. Item Performance Analysis

The result of this analysis are 2 lists, which are : uplisting list (list of item that being recommend to be put on

the shelves) and delisting list (list of items that being recommend to be put out from the shelves).

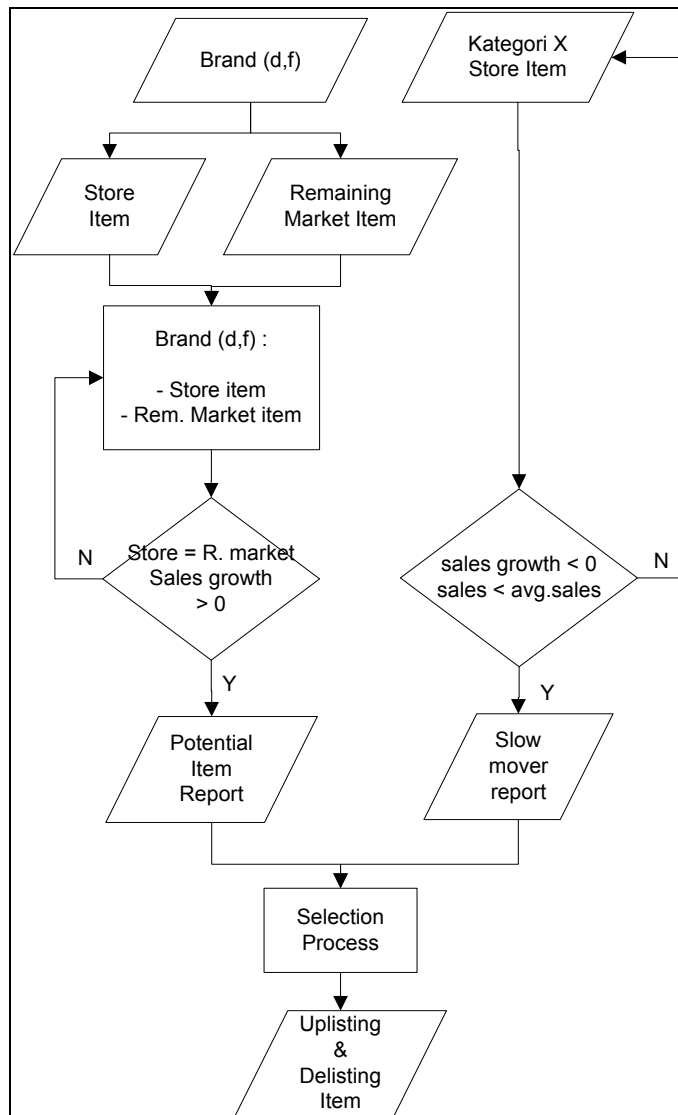


Fig. 3.8
Steps of Item Performance Analysis

3. Promo Analysis

The result of this model is called as promo variable 2, which is: list of promo type and its effectiveness value (Promo Type Effectiveness / PTE).

Input variables of Promo Analysis are coming from previous models, they are :

- *Retailer Potentiality Index* (output from *retailer analysis* – section A)
- Promo Variabel 1 (output from *role analysis* – section B)
- Brand rack of the under-perform category (by store from *brand performance analysis*)
- TPP STORE “X”/Temporary Product Promotion STORE “X” data (frequencies of each promo type that were done by PT. X at its retailer).

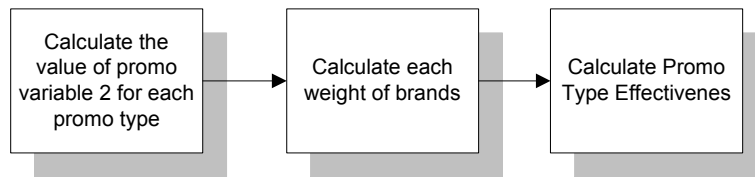


Fig. 3.9
Steps of Promo Analysis

First step is to calculate promo variables 2 (TPR, DISP, FEAT, ASSORT) for a continuation from promo variables

1 (TPR, DISP, FEAT, ASSORT), with formula as follows :

$$PVar 2 (PVar1, category X) = RPI (store N) \times PVar 1 (category X) \times TPP (PVar 1, category X) \dots\dots\dots(13)$$

$$TPP (PVar 1, category X) = \frac{\text{volume growth (category X)}}{\text{frequency TPP (PVar 1, category X)}} \times 100 \dots\dots\dots (14)$$

with,

store N = (store STORE "X" 1, store STORE "X" 2, ... , store STORE "X" 10)
 category X = (under perform category)
 PVar 1 = Promo Variable 1 (TPR, DISP, FEAT, ASSORT)
 frequency TPP (PVar1, category X) = promotion frequency (TPR, DISP, FEAT, ASSORT) for category X

(category X, brand a) = every brand on category X
 rank = brand rank (1,2,3, ...)
 \sum rank = sum of rank (i.e : 3 brand means that sum of rank = 3+2+1)

And then to get *Promo Type Effectiveness* (PTE), do calculation with the following formula :

For each promo variable 1, category X and brand :

Then calculate brand weight,

$$PTE = \frac{PVar 2 \times \text{brand weight}}{\sum (PVar 2 \times \text{brand weight})} \times 100\%$$

$$\text{brand weight (category X, brand a)} = \frac{\text{rank (category X, brand a)}}{\sum \text{brand rank (category X)}} \dots\dots\dots (15)$$

..... (15)

The final result of the PTE, can be seen in the table below.

with,

Tabel 4.16
Example of Output Promo Analysis for Store X

brand	promo type	effectiveness
brand d	TPR	5%
	DISP	20%
	FEAT	13%
	ASSORT	1%
brand f	TPR	25%
	DISP	23%
	FEAT	11%
	ASSORT	2%

The effectiveness value represented the impact of a promotion type in increasing brand performance.

4) Discussion

The models that have been developed in this paper contain many flaws and have not been tested yet. The Promo Type Effectiveness (PTE), the final result, is a tool to help user (STORE “X” division) in arranging its promotion activities. But the nature of PTE values are relatives, they only show the effectiveness comparison between categories that are in the analysis scopes, and they are the under-performed categories.

The basic of the proposed decision models is the category analysis system of STORE “X” division. So we argue that the models in this papers have some advantages compared to the old system, and they are :

- 1) Including the retailer potentiality to attract costumers.
- 2) Having a standard parameter as basic principle in judging performance of a category.
- 3) Producing a list of recommendation for item removal (slow-mover item → delisting item).
- 4) Producing a list of recommendation for potential item (*potential item* → *uplisting item*).

5) Conclusion

Concluding from the result of the model and form the purpose of the model development, we conclude that :

- 1) The models are able to produce a fixed value to measure an effectiveness of a promotion activity, as business intelligence tool.
- 2) The analysis is only based on one retailer only, when it should calculate other retailers. So we find that the value of PTE is only a relative value.
- 3) Sales target should be included in the models, either in form of given value or accomodating forecasting methods.
- 4) The PTE needs to be tested with historical data, so that it can be sure that those values are correct values.

6) References

1. Blattberg, Robert C., Edward J. Fox, and Mary E. Purk (1995). *Category Management: a Series of Implementation Guides*, Food Marketing Institute, Vol. I-IV.
2. Dhar, Sanjay K., Stephen J. Hoch, and Nanda Kumar (2001), *Effective Category Management Depends on The Role of The Category*, Journal of Retailing, Vol. 77, pp. 165-184.
3. Kanuk, Leslie L., and Leon G. Schiffman (2000). *Consumer Behaviour : Seventh Edition*, Prentice-Hall International Inc., New Jersey.

4. Moreau, Page, Aradhna Krishna, and Bari Harlam (2001). *The manufacturer-retailer-consumer triad: Differing perceptions regarding price promotions*, Journal of Retailing, Vol. 77, pp. 547–569.
5. Nielsen Marketing Research (1992). *Nielsen Category Management*, NTC/Contemporary Publishing Group Inc., Northbrook.
6. Ojasalo, Jukka (2000). *Customer Commitment and Key Account Management*, Working Papers, Swedish School of Economics and Business Administration.
7. Ojasalo, Jukka (2002). *Key Account Management in Information-intensive Services*, Journal of Retailing and Consumer Services, Vol. 9, pp. 269-276.
8. Ojasalo, Jukka (2000). *Key Account Management and Quality in Business-to-Business Relationship*, Working Papers, Swedish School of Economics and Business Administration.
9. O'Kelly, Morton (2001). *Retail Market Share and Saturation*, Journal of Retailing and Consumer Services, Vol. 8, pp. 37-45.
10. Runtuwene, Michael (2003). *Perancangan Prototip Sistem Pendukung Keputusan Penentuan Target Karakteristik Teknis Produk Dengan Metode Fuzzy QFD*, Tugas Sarjana Departemen Teknik Industri, ITB, Bandung.
11. Saaty, Thomas L., and Luis G. Vargas (1994). *The AHP Series Vol. VII : Decision Making in Economic, Political, Social and Technological Environments with The Analytic Hierarchy Process*, RWS Publication, Pittsburgh.
12. Salim, Edwin (2003). *Pengembangan Model Keputusan dan Prototip Sistem Pendukung Keputusan Untuk Penentuan Prioritas Penyediaan Material*, Tugas Sarjana Departemen Teknik Industri, ITB, Bandung.
13. Sethuraman, Raj, and Gerard Tellis (2002). *Does Manufacturer Advertising Suppress or Stimulate Retail Price Promotions? Analytical Model and Empirical Analysis*, Journal of Retailing, Vol. 78, pp. 253–263.
14. Sprague, Ralph H., and Hugh J. Watson (1989), *Decision Support Systems : Putting Theory Into Practice*, 2nd ed., Prentice Hall International Inc., London.
15. Suryadi Kadarsah, Sadewo (2002), *Perancangan Prototipe Sistem Pendukung Keputusan Pemenang Tender Telekomunikasi Dengan Menggunakan Metode Analytic Hierarchy Process*, Indonesia Symposium on analytic Hierarchy Process, Surabaya, 2002.
16. Suryadi Kadarsah , Edwin Salim (2003), *Decision Model for "Material Stock vs non Stock" using combination of AHP and Cut off Point Method*, International Symposium on Analytic Hierarchy Process, Denpasar, Bali, 2003.
17. Suryadi, K., dan M.A. Ramdhani (1998). *Sistem Pendukung Keputusan*, PT. Remaja Rosdakarya, Bandung.
18. Thang, Doreen C. L., and Benjamin L. B. Tan (2003). *Linking Consumer*

Perception to Preference of Retail Stores: An Empirical Assessment of The Multi-Attributes of Store Image,
Journal of Retailing and Consumer Services, Vol. 10, pp. 193-200.