Expert Systems with Applications 36 (2009) 5393–5401

Contents lists available at ScienceDirect

Expert Systems with Applications

journal homepage: www.elsevier.com/locate/eswa

Development of a marketing information system for supporting sales in a Tea-beverage market

Chinho Lin [a,*], Chienwen Hong [b,c,1]

[a] Department of Industrial Management Science, Institute of Information Management, National Cheng Kung University, Tainan 701, Taiwan, ROC
[b] Department of Industrial and Information Management, College of Management, National Cheng Kung University, Tainan, Taiwan, ROC
[c] Department of Information Management, Chia-Nan University of Pharmacy and Science, Tainan, Taiwan, ROC

ARTICLE INFO

Keywords:
Marketing information system
Tea-beverage
Sales information system
Marketing strategies

ABSTRACT

In this paper, we propose a marketing information system for a Tea-beverage manufacturing firm for supporting sales management. The marketing information system aims at providing assistance in (1) performing efficient dissemination and management of information and sales documents, and (2) improving marketing and promotion processes. The framework is examined and explained in the context of a case study. The results show that it provides better support for managers as a result of improved communication and monitoring.

1. Introduction

Marketing information systems (MKIS) enable marketing and sales managers to identify, interpret, and react to competitive signals (Montgomery & Weinberg, 2002; Prabhu & Stewart, 2005) and are key elements leading to efficient marketing strategies and sales promotion strategies. As a global concept, marketing information can best be understood by its decomposition into marketing research and marketing intelligence. Both activities aim at collecting and providing information to management for the purpose of better and more timely decision-making. The marketing information system is a set of procedures and sources used to obtain everyday information about pertinent developments in the marketing environment (Kotler, 2002). Therefore, marketing information systems provide a continuous flow of information about very diverse market events that might affect the company's competitive position.

Marketing information is mainly descriptive, essentially based on observation, and its goal is to provide managers with general enlightenment about an ongoing competitive market situation (Fuld, 1999; Moss, 2006). By contrast, market research activities are devoted to the collection and analysis of data linked to precise research questions such as new product acceptance or advertising effectiveness. Therefore, a piece of market research information corresponds to a defined goal and focused objectives. Collected marketing information must be precise, carefully measured, controlled and analyzed, and the results obtained should enable managers to reduce decision-making uncertainty (Deshpande & Zaltman, 2005).

Salespeople have long been recognized as primary sources of marketing information as their additional efforts to gather environmental information create few additional costs for the company (Webster, 1999). Because of their boundary position, salespeople can offer their company direct access to important marketing information about competitors and customers (Lorge, 2006). Due to their daily presence in the field and favored relationships with customers, salespeople can be exposed to rumors about their customers' or competitors' projects, learn about new product launches before they take place, discover new products in test market areas, gather information about the discount and pricing policies of competitors, note changes in customers' or distributors' policies and behaviors, gather point-of-purchase information on promotional activities and effectiveness, and so forth.

The study describes the research and development of a marketing information system for supporting sales in a Tea-beverage manufacturing firm. The framework is then examined and explained in the context of a case study. Finally, the case study provides better teamwork support as a result of improved communication and monitoring, which reduces sales cycle times. Other industries can use a similar approach to develop marketing information systems that can support the sales of their products or services. An understanding of the marketing information system development life cycle is essential for contemporary manufacturing practitioners, because most organizations need marketing information systems to survive and prosper. We will see from this study that innovative use of IT can help manufacturers gain

* Corresponding author. Tel.: +886 6 2757575x53137; fax: +886 6 2759451.
E-mail addresses: linn@mail.ncku.edu.tw (C. Lin), R38921154@mail.ncku.edu.tw (C. Hong).
[1] Tel.: +886 6 3662019; fax: +886 6 3660607.

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doi:10.1016/j.eswa.2008.06.056

competitive advantage through achieving better quality, greater flexibility, lower cost and higher speed over their competitors.

2. Background

The main objectives of the study are to design and develop a prototype marketing information system to perform efficient dissemination and management of information and sales documents to customers, and order and deliver Tea-beverage in a user friendly way.

A six-stage structured development approach (Fig. 1) for developing marketing information systems includes: (1) marketing systems planning, (2) marketing process analysis, (3) marketing information system architecture development, (4) marketing information system analysis and design, (5) marketing information system building, (6) marketing information system observation.

2.1. Marketing systems planning

Marketing information systems planning can help identify the key entities and attributes of an organization's data (Laudon & Laudon, 2003). To implement any chosen strategy, senior management must have a clear vision of the company strategy needed to deliver the value expected by the customers and desired by the company. Vision is necessary to ensure the consistency of strategic objectives purposes within the firm. In this phase, managers are asked about their sources and uses of information as well as their environment, objectives, decision-making processes and data needs. The outcomes of this phase are identifying the relevant goals, objectives and business areas, and strategies for the company under study (Harris & Goode, 2004).

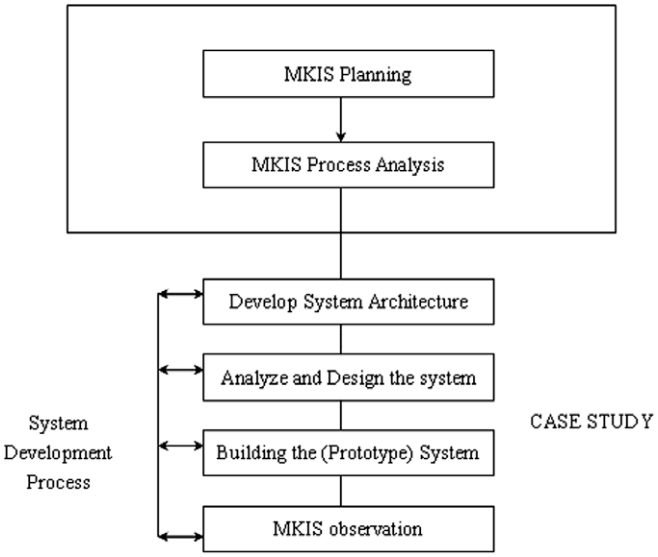

Fig. 1. Six-stage structured development methodology.

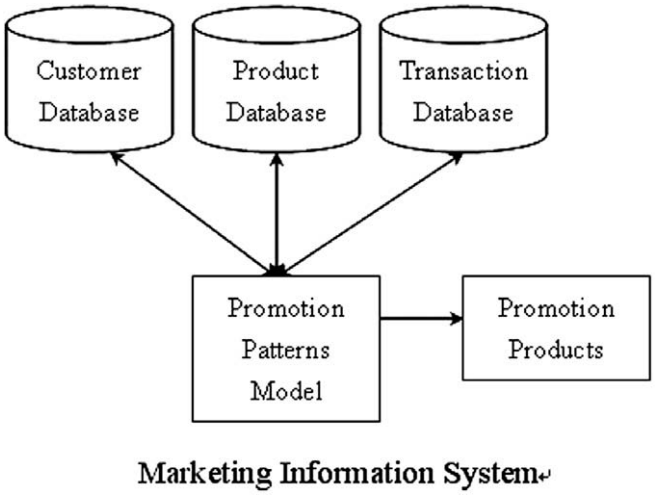

Fig. 2. Marketing information system framework.

2.2. Marketing process analysis

Automating business processes requires careful analysis and planning. Business processes refer to how a particular business is conducted and how it is related to the business rules, strategies and unique ways in which an organization coordinates work, information, and knowledge, and to the ways in which management chooses to coordinate work (Laudon & Laudon, 2003). The choice of a business process for improvement or redesign is critical. Our first task is to select the correct set of business processes for improvement or redesign, and to identify the areas of improvement that require automation. The acquisition of business process knowledge is typically accomplished through interviews or questionnaire surveys (Herbst & Karagiannis, 2006). One of the most time-consuming activities for process engineers is the acquisition of the necessary business process knowledge for process analysis and redesign (Gopal, Pathak, Tripathi, & Yin, 2006).

2.3. Marketing information system architecture development

A well-designed system architecture provides a road map for system building process. It puts the system components into perspective, defines the functionalities of the system components and delineates how they interact with one another.

2.4. Marketing information system analysis and design

The focus of system analysis is on determining the requirements for a new system. In the system design phase, a new or alternative information system is crafted and software and hardware are acquired and tested. Design involves an understanding of the domain being studied. Design specifications will be used as a blueprint for the implementation of the system (Nunamaker, Chen, & Purdin, 1990).

2.5. Marketing information system prototype building

By building a prototype system, various issues that have arisen can be addressed. For instance, new concepts of user interface design can be evaluated. The prototype can be used to clear up a variety of problems and to learn more about the concepts, framework and design through the system building process.

2.6. Marketing information system observation and evaluation

The use of the prototype system can be observed through case studies. Once the prototype system is built, testing and evaluation can be performed. It is checked to see if the system works correctly and meets specified requirements. Researchers can capture information on what users like and dislike, and what the system does or does not do to meet those users needs. Its impact on individuals and the organization can be observed through detailed documented case studies (Chen & Chen, 2005).

3. Marketing Information System framework

3.1. Marketing information system design

Fig. 2 illustrates the framework of an MKIS. Three input subsystems gather data and information from the firm's operations and its environment, and enter them into the database. The database contents are made available to company that have a processing capability of transforming the data into information for marketing managers.

The marketing information system contains sales promotion strategies and pricing strategies. Promotion patterns are generated according to various sales promotion strategies, and proposed prices for these promotion products are generated by considering the current stages of both the business life cycle and product life cycle (Chen & Chen, 2005).

3.2. Sales promotion strategies

Most scholars believe that sales promotions can give the promoted objects immediate incentives and excite customers' interest. Davis (2001) suggests that sales promotion strengthens the marketing effectiveness and increases the sales volume in the short-term. Other scholars (DelVecchio, Henard, & Freling, 2006) subsume the objects of sales promotion under the definition of promotion activities. In general, promotion activities include customer promotion, trade promotion, and sales-force promotion (DelVecchio et al., 2006). In this study, we focus on customer promotion in the Tea-beverage market. According to the marketing information system classification sales promotion models consist of cash discounts, commodity presentations, and reward drawing activities as listed in Table 1.

In our proposed marketing information system, two sales promotion strategies are considered for implementation: general promotion and cross-selling strategies as shown in Table 2.

Through associated techniques, the two strategies carry out two sales promotion models, a cash discount and a commodity presentation.

Table 1
Promotion mode

Promotion model	Promotion manner	
Cash discount	Universal price discount	Price-offs
	Differential price discount	Total discount
Commodity presentation	Same commodity	Bonus packs
	Different commodity	Premiums or bundling
Reward drawing activities		Trading stamps and sweepstakes

Table 2
Two sales promotion strategies implemented in the proposed MKIS

Strategy	Product categories	Promotion condition	Price manner	Applied techniques
General promotion	Best-selling	Purchased quantity	Price discount	Cross analysis
	Worst-selling	Purchased total amount		Statistical analysis
Cross-selling	Association product	Bundling		Association mining
	Sequential product	Purchased total amount		Sequential mining

3.2.1. Pricing strategies

Pricing strategies can be divided into general pricing, new product pricing, and life cycle pricing (Lai & Ng, 2005). Generally speaking, general pricing is a method which uses cost plus a standard or fixed profit to decide a product price. There are three methods used to set prices: demand-backward pricing, discriminatory pricing, competition-oriented pricing (McWilliams & Gerstner, 2006; Biswas et al., 2006).

For the pricing strategy, from the interviews with company supervisors, we define the promotion price based on two factors. One is the pricing strategy for each stage in the business life cycle, and the second is the pricing strategy for each stage in the product life cycle. In addition, the promotion price will be adjusted dynamically over time; that is to say, when the business situation or the product life cycle stage changes, the system will automatically, on the basis of the two factors, update all products' promotion prices.

Firstly, according to the methods presented by Chow (1998) and Smith, Mitchell, and Summer (1985), an approach is proposed to set up pricing strategies that assesses the business life cycle and product life cycle based on the capital growth ratio, employee growth ratio, and sales volume growth ratio. The pricing strategy is shown in Table 3.

This approach divides the business life cycle and product life cycle into four stages including introduction, growth, maturity, and decline. The value of the growth ratio differs at each stage. The growth ratio defined by Chow is described by the following formula (Chow, 1998): $R_i^b = \frac{G_i^b}{|R_{i-1}^b|}$, $G_i^b = \frac{S_i^b - S_{i-1}^b}{S_{i-1}^b} \times 100\%$.

Where R_i^b is the ith period growth ratio, G_i^b is the ith period growth rate, and S_i^b is the ith period value of capital, employee and sales volume. In the same way, R_i^p represents the ith period growth ratio for the product life cycle and is defined as follows: $R_i^p = \frac{G_i^p}{|R_{i-1}^p|}$, $G_i^p = \frac{S_i^p - S_{i-1}^p}{S_{i-1}^p} \times 100\%$.

Where R_i^p represents the ith period growth ratio, G_i^p is the ith period growth rate, and S_i^p is the ith period value of sales volume.

Secondly, the two factors are considered to help the business decide the final prices for promotion products. Generally, the product price is set depending on the desired business profit. Let the final profit be P; the cost be C; and the final promotion price be PP, then $PP = C(1 + P)$. As shown in Table 3, the words 'Low', 'Medium', and 'High' are semantic terms which cannot be directly processed in quantifying the final profit, and the overlapping periods between every two neighboring life cycle stages are not reflected. In this study, fuzzy theory is used to determine the final profit.

Fuzzy set theory was first introduced by Zadeh paper in 1965 (Zadeh, 1965). This theory, which deals with uncertain values, is suitable for processing human expressions and is primarily concerned with quantifying and reasoning words that have ambiguous meanings, such as small, medium, or high. The theory has been widely extended and applied to many fields, including control, engineering, economics, and literature.

Table 3
Pricing strategy

Characteristic	Life cycle stage			
	Introduction	Growth	Maturity	Decline
Business life cycle growth ratio	$R_i^b \geqslant 2$	$2 > R_i^b \geqslant 1$	$1 > R_i^b \geqslant 0$	$R_i^b < 0$
Pricing strategy for each business stage	Low	Highest	High	Medium
Product life cycle growth ratio	$R_i^b \geqslant 2$	$2 > R_i^b \geqslant 1$	$1 > R_i^b \geqslant 0$	$R_i^b < 0$
Pricing strategy for each product stage	Highest	High	Low	Medium

In obtaining the final promotion price for each promotion product, fuzzy membership functions need to be defined first and profits according to both current business life cycle and product life cycle stages are considered.

3.3. Define membership functions

In fuzzy logic, a fuzzy set A on universe X is defined by the ordered pair $(x, u_A(x))$, where x is the object on X; and $u_A(x)$ is the membership function of A. The membership function can be any value in the range of [0.0, 1.0]. Here, we define the membership function $u_L(x) \rightarrow [0,1]$ for various stages of the business and product life cycles and $u_p(x) \rightarrow [0,1]$ for levels of profit as shown in Figs. 3 and 4, respectively.

3.4. Compute the promotion price

Profit is based on the current business life cycle stage. Suppose that the value R for the business life cycle is presently -0.2 (as shown in Fig. 5).

Therefore, the product is in the decline stage and maturity stage at the degrees of 0.75 and 0.25, respectively, since the corresponding pricing strategies for the decline stage and maturity stage are medium and high (as shown in Table 3).

The range of fuzzy numbers for profit based on the current business life cycle stage is 0.75 (the range of fuzzy numbers for 'Medium') + 0.25 (the range of fuzzy numbers for 'High') = 0.75(−10,10,30) + 0.25(10,30,50) = (−7.5,7.5,22.5) + (2.5,7.5,12.5) = (−5,5,5).

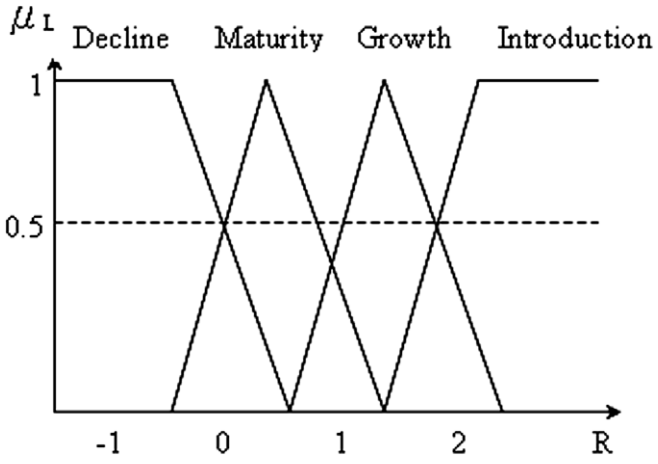

Fig. 3. Membership function for various stages.

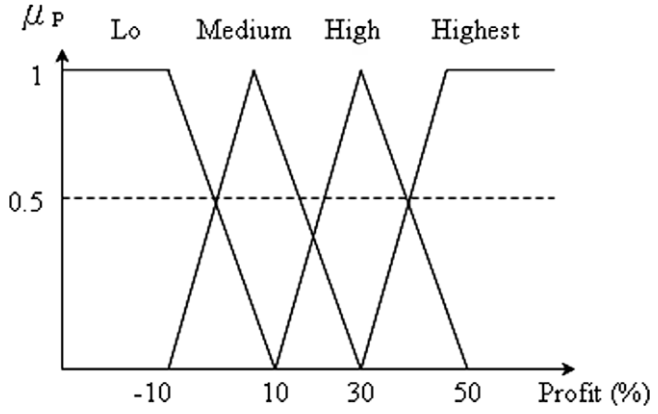

Fig. 4. Membership function for levels of profit.

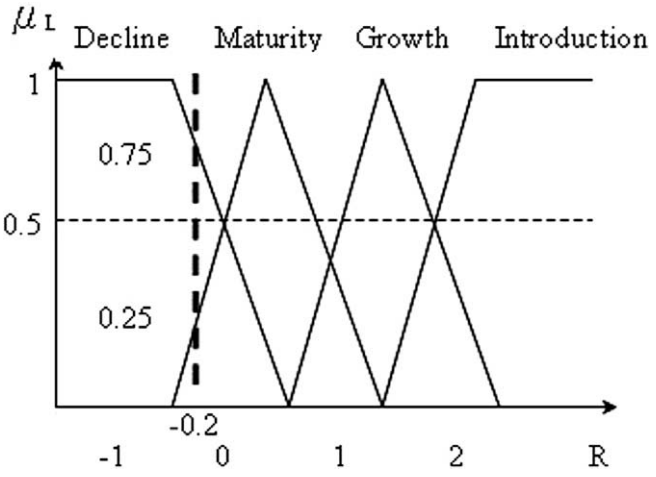

Fig. 5. Fuzzy degree of business life cycle.

To derive a discrete value, we apply one of the defuzzication methods, center of gravity method (Han & Kamber, 2001), to transform the fuzzy number to an unfuzzy number. The formula is as follows:

$$DF_i = \frac{[(UR_i - LR_i) + (MR_i - LR_i)]}{3} + LR_i, \quad \forall_i,$$

where DF_i is an unfuzzy value, UR_i is the maximum for the trigonometric fuzzy number, MR_i is the medium for the trigonometric fuzzy number, and LR_i is the minimum for the trigonometric fuzzy number. Accordingly, the fuzzy number (−3,21,42) can be transformed into an unfuzzy value 14; that is 14% business profit.

Assume that now the original expected profit for product X based on the list price is 20%, and the value R for the present life cycle stage of product X is 1.5, and its degree conforming to the growth stage is 1.0. The corresponding pricing strategy for growth stage is high (Table 3). The range of fuzzy numbers for the product' profit is then computed as: 1.0 (the range of fuzzy numbers for 'High') + 0.3(the range of fuzzy number for 'High') = 1.0(10,30,50) = (10,30,50). After performing defuzzication, the unfuzzy value for required profit based on current life cycle stage of product X is 30%. By increasing the profit of product X by 30%, the required profit based on present product life cycle stage becomes 50%.

The final profit of product X is defined as the average of the expected business profit and product profit, where FP is the final profit in percentage, product profit is profit based on product life cycle stage, and business profit is the profit based on business life cycle stage. The average of 14% from business profit plus 50% from product profit equals 32%. Hence, in this example, the final promotion price for product X is PP = C(1 + 32%), where PP is the promotion price and C is the cost of the product.

3.5. Promotion patterns model

The promotion patterns model as shown in Fig. 6 will be described in this section. It utilizes data mining techniques (Boginski, Butenko, & Pardalos, 2006), statistical analysis (Brodie & Danaher, 2000), and cross analysis (Russell & Petersen, 2000) to generate various promotion products according to the two sales promotion strategies and pricing strategies.

3.6. Mining the customer database

Cluster analysis is one of the frequently used methods for segmenting a market (Chang Chien & Lu, 2006). Cluster analysis is to identify clusters embedded in the data where a cluster is a col-

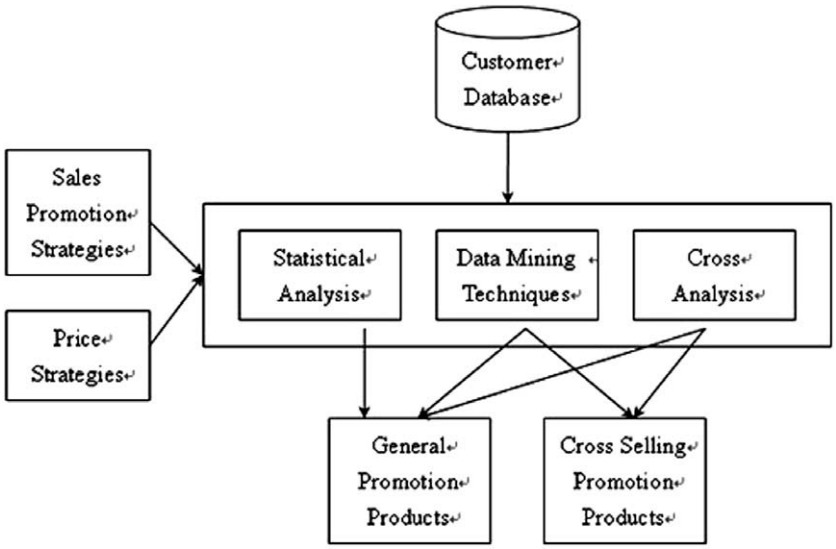

Fig. 6. Promotion pattern model.

lection of data objects that are 'similar' to one another. Similarity can be expressed by distance functions, specified by users or experts.

3.7. Mining the transaction database

The business divides customers into several different clusters based on a clustering technique. We can use that as a basis for providing different promotion products for different customer clusters. In this section, we will proceed towards data analysis of the transaction database through the use of data mining and cross analysis in order to identify suitable promotion products, out of a great number of products, for each different customer cluster (Potvin, Soriano, & Valle, 2004).

3.8. Data mining for cross-selling

To promote products by cross-selling, the correlation among products should be analyzed. The correlation among products could be either product association within a transaction or product sequence from sequential transactions over a period of time. The proposed marketing information system will discover the cross-selling opportunities by mining product correlations from customers' purchase information in the transaction database (Kamakura, Wedel, de Rosa, & Mazzon, 2003).

Association mining, sequential patterns mining, self-organizing map (SOM) and weighted sum model (WSM) techniques will be conducted to discover product associations and product sequences, respectively, for promotion by cross-selling.

3.8.1. Association mining

It is intuitive that association mining can extract which products are purchased together. In previous research, an association mining method (Agrawal & Srikant, 1998) was used to retrieve the affinity of products purchased together from the transaction data of all customers. Furthermore, it can also be applied to each customer cluster and individual customer to discover the purchasing patterns for each customer cluster and each individual customer, respectively (Boone & Roehm, 2002).

3.8.2. Sequential pattern mining

The sequence of products purchased over a period of time reveals another important correlation of products, which can be explored through sequential pattern mining. In past research, a sequential pattern mining method (Agrawal & Srikant, 1994) was used to uncover products which were frequently purchased in sequence over time from transaction data acquired from three different data sets: all customers, each customer cluster, and each individual customer (Dolen, Dabholkar, & de Ruyter, 2007).

3.8.3. Self-organizing map (SOM)

The Kohonen self-organizing map (SOM) is an unsupervised competitive neural network learning model proposed by Kohonen (Kohonen, Hynninen, Kangas, & Laaksonen, 1996). By nature, it is more difficult than the K-means approach. It can cluster all input data points into mutually exclusive groups and thus, can display the relationship between clusters in a high dimensional space. SOM usually has two layers consisting of an input layer and an output layer. Each of the variables in the input neuron are linked with every output neuron by use of weighted connection. Every output neuron competes with the others to become the winning neuron. When SOM is employed to judge which cluster a new input point belongs to, the point is assigned to the cluster of the winning neuron (Melody, Michael, & Dorothy, 2006).

3.8.4. Weighted sum model

The predicted utility rating of the user of item j, $P_{a,j}$ is a weighted sum of the utility ratings of the other users

$$P_{a,j} = \bar{v}_a + k \sum_{i-1}^{n} w(a,i)(v_{i,j} - \bar{v}_i)$$

where n is the number of users in the collaborative filtering database with nonzero weights. The weight $w(a,i)$ can reflect the distance, correlation, or similarity between each user i and user a. This equation is calculated with utility ratings. Meanwhile, k is a normalizing factor such that the absolute values of the weights to a sum of unity.

3.9. Cross analysis for general promotion

Cross analysis is applied for implementing the best-selling and worst-selling strategies. The best-selling and worst-selling products can be found directly based on statistical analysis of the sales records, and then product upgrades can be found in conjunction with product associations, sequences, and best-selling products (Verhoef, Langerak, & Donkers, 2007).

3.9.1. General promotion

For each product class, cross analysis is firstly carried out on product data (as shown in Table 4) and transaction data (as shown in Table 5) of each customer category for acquiring the best-selling (e.g. the percentage of transactions containing the item is greater than or equal to 55%) and worst-selling (e.g. the percentage of transactions containing the item is less than 5%) products.

The best-selling and worst-selling items in this example are shown in Table 6. Here, cross analysis will not be carried out on products with a status labeled as 'new' because no sufficient transaction data can be analyzed for those new products.

3.10. Promotion products

Many candidate promotion products will be generated for a customer. However, it is not practical to offer all of them for promotion. Proper evaluation should be conducted for providing the most suitable personalized promotion products. In this study, a multiple criteria decision-making method WSM (weighted sum model) (Triantaphyllou, 2001) is used for ranking. Fig. 7 shows the promotion products.

For the promotion products, three evaluation indicators are proposed for implementation profit, customer satisfaction, and success ratio. More indicators can be employed according to the marketing concerns of the business. Before applying the WSM method, the values for each of the three indicators need to be normalized.

The success ratio is defined as follows:

Success ratio = number of promotions accepted/number of promotions proposed.

We calculate the score for each promotion product by utilizing the WSM method. If there are m promotion products and n indicators, then the WSM score, the highest promotion potential PP, can be calculated as follows:

$$\mathrm{PP} = \max_i \sum_{j=1}^{n} a_{ij} w_j \quad \text{for } i = 1, 2, 3, \ldots, m$$

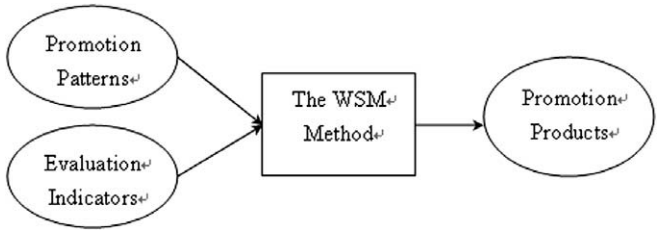

Fig. 7. Promotion products.

Table 4
A sample product table

Item_ID	Class	Brand	Price	Cost	Status
1	A	Uni-president	$90	$65	–
2	A	Weichuan	$86	$61	–
3	B	Uni-president	$58	$42	New
4	B	Uni-president	$60	$46	–
5	B	Heysong	$88	$77	–
6	C	Heysong	$50	$38	–
7	C	Uni-president	$42	$28	–
8	C	Weichuan	$56	$38	New
9	D	Weichuan	$38	$30	–
10	D	Uni-president	$36	$28	–
11	D	Heysong	$62	$50	–
12	E	Weichuan	$35	$27	New
13	E	Uni-president	$15	$8	–
14	E	Uni-president	$72	$61	–
15	E	Heysong	$8	$2	–

Table 5
A sample transaction table

TID	Item set	Customer ID	Cluster
1	{7,11,10}	A96001	A
2	{9,10,11,12}	A96001	A
3	{7,8,13}	A96002	A
4	{1,12,14}	A96002	A
5	{7,8,15}	A96003	A
6	{14}	A96501	B
7	{7,8}	A96501	B
8	{1,8,9}	A96502	B
9	{11,12}	A96502	B
10	{2,5,7,8}	A96503	B
11	{4,5}	A96801	C
12	{8,10,11}	A96802	C
13	{10}	A96802	C
14	{7,8,15}	A96803	C
15	{6,11,13,14}	A96803	C

Table 6
Best-selling and worst-selling items of all product classes

Product class	All customers		Customer cluster A		Individual customer (customer A96001)	
	Best selling	Worst selling	Best selling	Worst selling	Best selling	Worst selling
A	{9}, {15}	–	{9}, {15}	–	{9}	–
B	{8}	–	{8}	{4}, {6}	–	–
C	{12}	–	{12}	–	{12}	–
D	{7}	{3}	{7}	{3}	{7}	–
E	–	–	–	–	{10}, {11}	–

Table 7
Promotion potential for promotion products

Promotion products	Profit	Customer satisfaction	Success ratio	Promotion potential
General discount promotion products				
(7,8)	0.25	0.6	0.8	0.60
(10,11)	0.17	0.6	0.8	0.58
(4)	0.32	0.5	0.4	0.45
(13)	0.5	0.3	0.9	0.48
(4,7)	0.26	0.5	0.8	0.54
(8,13)	0.36	0.6	0.8	0.61
(4,13)	0.39	0.5	0.6	0.51
(5)	0.3	0.8	0.7	0.70
(5,10)	0.25	0.6	0.5	0.52
(8,14)	0.23	0.5	0.6	0.48
(7,14)	0.25	0.3	0.8	0.42
(4,14)	0.26	0.3	0.2	0.27
(13,14)	0.32	0.3	0.3	0.30
(2)	0.16	0.8	0.9	0.73
(7,12)	0.17	0.3	0.7	0.38
(12,13)	0.27	0.9	0.8	0.78
(2,7)	0.18	0.6	0.5	0.51
(2,13)	0.27	0.1	0.6	0.25
Purchased quantity discount promotion products				
(9)	0.33	0.5	0.3	0.42
(15)	0.27	0.7	0.7	0.64
(8)	0.32	0.6	0.8	0.61
(12)	0.12	0.9	0.8	0.76
(7)	0.23	0.6	0.7	0.57
(6)	0.16	0.5	0.4	0.42
(4)	0.36	0.6	0.3	0.49
(3)	0.21	0.3	0.9	0.44
(11)	0.23	0.6	0.3	0.47
(10)	0.12	0.6	0.8	0.58

where a_{ij} is the jth indicator value for the ith promotion product and w_j is the importance of the jth indicator.

We assume the weights of the three indicators (profit, customer satisfaction, and success ratio) are 0.15 0.6, and 0.25, respectively. After applying the WSM method, the promotion potentials are listed in Table 7. Promotion products with good promotion potentials will remain and be ranked. The final ranking of general discount promotion products is: (2), (5), (12,13), (4,7), (8,13), (7,8) and that for purchased quantity discount promotion products is (12), (15), (8).

4. Application example: the case study

The case study company is a food company in Taiwan which provides many kinds of services for daily diets including providing information, community services and a shopping mall.

4.1. Development of the marketing information systems

In the prototype system, the number of products is 56, the number of customers is 5628, and there are 20,000 transaction records in the experimental database. Sections 4.2 and 4.3 describe each of the interfaces for the backend decision maker, and introduce the interface for promotion products.

4.2. Generating promotion products

Customer clustering proceeds the generation of candidate promotion products. The clustering of customers is done using MATLAB, which provides the required SOM algorithm in a user friendly environment. After importing the customer data file, the SOM algorithm divides all customers into many clusters; the number of clusters can be adjusted by the vigilance parameter. In the prototype system, there are 5628 customers and with the vigilance parameter set to 0.45, the customers are separated into 8 clusters.

In the MKIS, two sales promotion strategies are implemented on all customers, each customer cluster and each customer: general promotion and cross-selling strategies. Fig. 8 displays the interface for general promotion, where best-selling products are set as those with the percentage of transactions containing the item greater than or equal to 60% and worst-selling as those with the percentage of transactions containing the item less than or equal to 2%.

Cross-selling analysis is shown in Fig. 9 with setting the minimum support set to 0.015, based on the best-selling products and extracted product association and sequence patterns.

After all the promotion products are generated via the two sales promotion strategies and implemented on all customers, each customer cluster and each customer, they will be ranked in order to recommend the most suitable personalized promotion products for each customer. For instance, for a customer ID which belongs

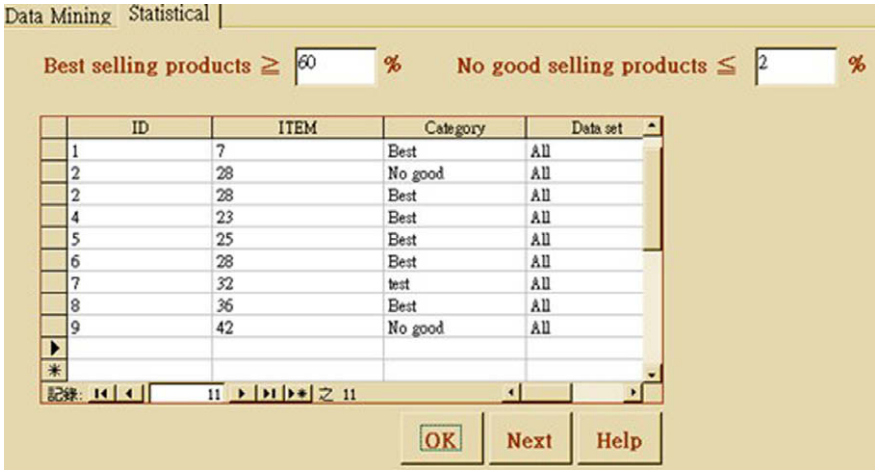

Fig. 8. Interface for general promotion.

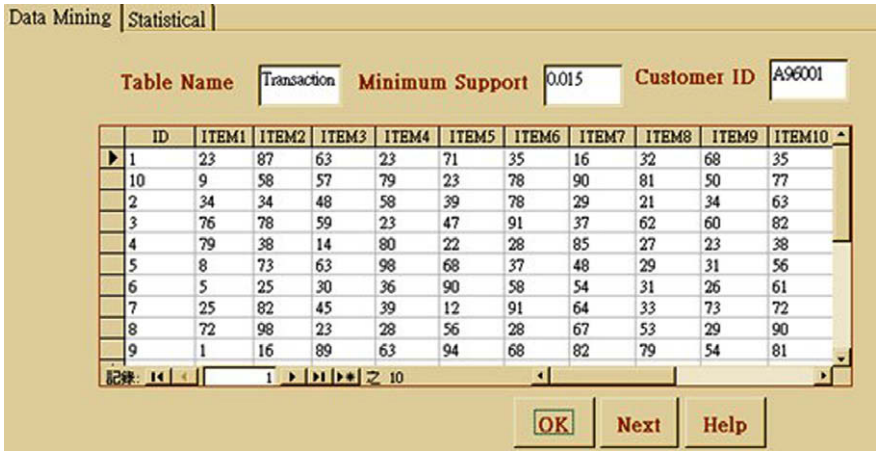

Fig. 9. Interface for cross-selling.

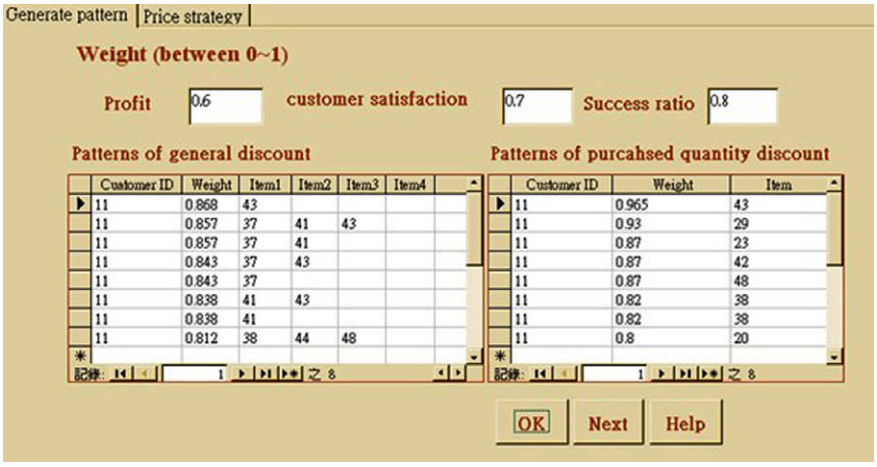

Fig. 10. Interface for generating promotion products.

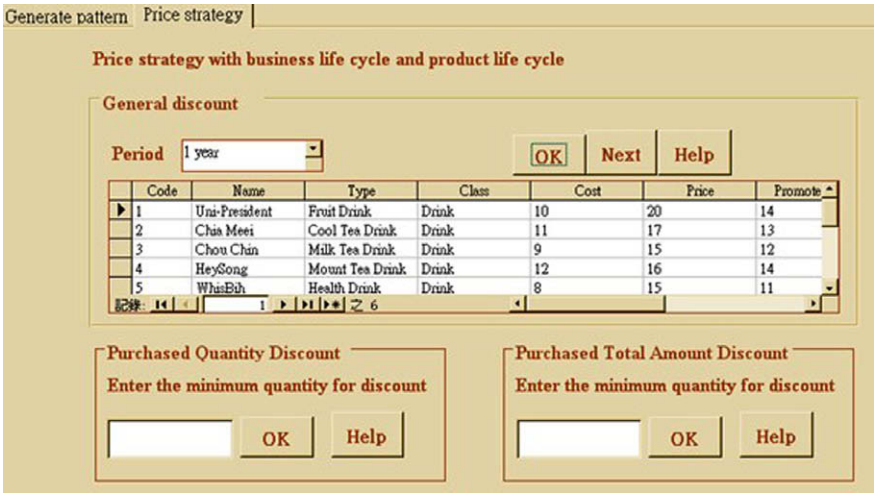

Fig. 11. Pricing strategies with business life cycle and product life cycle.

to customer cluster A; all the promotion products generated for all customers, customer cluster A; and customer ID are candidate promotion products for customer ID. They will be ranked by the WSM method and three evaluation indicators.

Fig. 10 shows the interface in which decision makers can give different weights for the three evaluation indicators according to business current goals. That is to say; the developed MKIS can dynamically modify suggested promotion products on the basis of the business' present situation and the primary purpose of promotion by adjusting the weight for each evaluation indicator. Fig. 10 shows the final promotion products after setting up the indicator weights and pressing the 'OK' button. Take customer ID A96001, for example; the top ranked general discount promotion products include (55), (48,54,55), (48,54), (48,55), and (55), (38), (32), (58), (63) will also be offered at promotion prices.

4.3. Pricing of the promotion products

Fig. 11 displays the interface for pricing strategies for the business life cycle and product life cycle. In this system, there are three opportunities to offer the customers a price discount: general discount, purchased quantity discount, and purchased total amount discount.

For general discounts, the marketing manager should select the period for calculation to obtain the current business life cycle stage and its corresponding pricing strategy. Once upon a determination of the pricing strategy is made, the system calculates the promotion price for the promotion product as shown in Fig. 11.

For the second, purchased quantity discount, the marketing manager should fill in the blank with the minimum quantity eligible for discount at the lower left corner of the interface. Similarly, for the third situation, purchased total amount discount, the marketing manager should fill in the total purchase amount value at the lower right corner of the interface.

In promoting sales products to customers, the MKIS adopts marketing strategies and pricing strategies, and provides the promotion products from the database to customers.

5. Conclusions

This study describes the development of a marketing information system that can effectively support sales management for a Tea-beverage manufacturing firm. A framework for the development of marketing information system workflow systems is proposed. The framework is examined and explained in the context of a case study.

In this paper, promotion products are carefully selected, based on cross analysis from historical transactions, and proposed for

each customer. A marketing information system is developed to assist a business in intelligently developing the promotion products. The main concept of the system is that businesses can utilize data mining techniques to determine effective promotion products based on customers' purchasing behaviors. Then the best promotion products are selected after ranking all candidate promotion products. With promotion products based on significant past customers' purchase patterns; the potential exists to increase the promotion success rate and customer satisfaction and loyalty as well.

Although we have proposed a marketing information system, the proposed methods for clustering customers and dynamic mining can be further enhanced in future studies. In terms of customer clustering, clustering directly based on customers' profiles may not lead to good clustering results. Due to the diversity of individual consumer behavior, cognitive needs, and personality, further research on methods of clustering customers may be quite interesting and helpful. For some professional products, such as Health-Beverage, the professional knowledge and specific needs of the customers need to be included as factors for recommendation. Lastly, since customers change over time, the use of dynamic data mining methods can efficiently analyze and adjust to consumer behaviors dynamically.

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