Using Cloud Services to Develop Marketing Information System Applications

Chien-Wen Hung

Department of Information Management, Chia-Nan University of Pharmacy & Science, Taiwan
cwhong@mail.cnu.edu.tw

Abstract

This study presents a cloud services customized product information system to enable businesses to provide customized product marketing on the Internet to meet consumer demand for customized products. The cloud service of the information system development strategic framework proposed in this study contains three elements: (1) e-commerce services, (2) promotion type modules, and (3) cloud services customized promotional products. In this study, a mining cloud information system to detect customer behavior is proposed. The association rules from a relational database design are utilized to mine consumer behavior in order to generate cross-selling proposals for customer products and marketing for a retailing mall in Taiwan. The study is composed of several parts, as follows. A market segment and application of association rules in data exploration techniques (Association Rule Mining) and sequence-like exploration (Sequential Pattern Mining), efficient analysis of customers, consumer behavior, identification of candidates for promotional products, as well as using cloud service delivery and evaluation of targets to evaluate candidates for promotional products for production. However, in addition to cloud service customized promotional products, the quantity of promotional products sales varies for different customers. We strive to achieve increased customer loyalty and profits through the use of active cloud service customized promotional products

Keywords: Cloud service customized product promotions, Data mining, Sequential pattern mining, Association rule mining

1 Introduction

In recent years, cloud computing has remained a hot topic in the field of information. Leonard's [18] research pointed out that the world's cloud computing in 2016 reached an output value of 162.1 billion US dollars, compared with 113.6 billion US dollars in 2014, having increased by 29.9%. Cloud computing is expected to have reached 193.2 billion US dollars in 2016. Therefore, in the information industry trends, cloud computing is the primary way to open up new market.

For enterprises, in addition to easy access to data, information technology maintenance costs, such as office software, operating systems, and hardware, can be greatly reduced. Therefore, it is possible to simultaneously reduce running cost and improve industrial competitiveness. Cloud computing represents the advent of a new business era characterized by increased productivity and flexibility in business activities. At the same time, cloud computing analytics tools to meet customer needs are a commercially competitive IT tool [16].

As the Internet environment matured, commercial activities of traditional industries experienced significant changes. Many industries compete to invest in the e-commerce market by making direct contact between customers and enterprises. E-commerce (Electronic Commerce, EC), which comprises a year-round Internet market without geographical border restrictions has created a substantial market opportunity [11, 13, 21]. Doing business over the Internet is a fairly new commercial activity, where customers just move the mouse to go online and shop. Given the rapid development of the technology supporting Internet business transactions, by using the current business model, customer transaction behavior, parity, purchase, payment, and other activities on the Internet can be analyzed faster, more conveniently, more efficiently, and more economical. According to the Institute for Information Industry survey, internet sales of goods gradually increase owing to lower internet transaction prices compared with those of the physical channel. There is a lot of money-saving information that can be shared, which has resulted in the continued growth of internet trading "e-commerce" type of site visitors. The most popular "e-commerce" type websites include music, travel, shopping, computer 3C, and fashion and beauty websites [5, 22, 26].

To enable customers and enterprises to benefit from network marketing, one solution is to provide customized customer service and efficient means of

*Corresponding Author: Chien-Wen Hung; E-mail: cwhong@mail.cnu.edu.tw
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information technology to collect, analyze, and produce to meet customer needs [15, 23, 25]. Therefore, this study proposes a cloud-based customized customer service information technology to help companies to quickly and accurately analyze customers' consumer behavior. The proposed system provides the results of the analysis, thereby helping to generate active promotional products and provide customers with a lower promotional price. The system saves time for customers when buying goods partly because the individual needs are met, thus increasing the probability of turnover for customers and companies, which creates a win–win situation [14].

In this study, a mining Cloud computing system to diagnose customer behavior is proposed. The association rules from relational database design are utilized to mine consumer behavior in order to generate cross-selling proposals for customized product design and marketing for a retailing mall in Taiwan. The other sections of the study are arranged as follows. In Section 2, we present a literature review, the background of the case firm and summarize the goals of the research project of the case firm. Section 3 introduces the proposed Cloud Information data mining system, which contains a system framework and relational database design. Section 4 introduces the data mining process, results analysis, and customized products design. Discussions and conclusions are presented in Section 5.

2 Literature Review

Cloud computing provides the following features [24]:

(1) Cost: Because information infrastructure is usually provided by third-party vendors, there is no need to purchase information devices for one-time or non-intensive information needs.

(2) Virtual information environment: The Cloud computing environment used in the basic information technology can share the information server and storage function equipment to improve utilization.

(3) A shared information environment: It allows a large number of user groups to share resources and costs, allowing centralized information infrastructures to increase peak load times and information system utilization

(4) Scalability and flexibility: It provides cloud service resource flexibility; the user can load the peak load time engineering design content

(5) Information devices and storage location independence: It supports users through a Web browser from anywhere to access cloud services, regardless of their use of equipment or service network location.

Cloud computing architecture framework is shown in Figure 1.

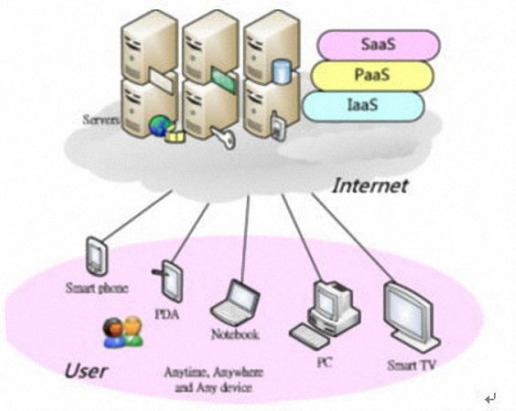

Figure 1. Cloud computing architecture framework [27]

This architectural framework focuses on providing the concepts and functions that are used in cloud computing. This cloud computing architecture is available from the perspective of IT and Information Security Professionals. The cloud architecture framework includes unique cloud features such as virtualization and cloud services, as well as multiple users deploying the cloud services model [27].

Enterprises in a cloud service environment that provide customized customer service have become popular. However, a quick and proper understanding of customer needs to provide customized services should be a priority of companies [19-20]. Therefore, the proposed customer service for customized applications and the use of data mining techniques to collect information from a large number of promotional products to meet customer needs will result in proactive customized information to the customer to save time searching for products. The system can enhance the competitiveness of enterprises and increase corporate profits [17].

SaaS is a model that provides software through the Internet. Instead of purchasing software, users can use the Web-based software to manage their business activities without having to maintain the software. The service provider manages and maintains the software, For many small businesses, SaaS is the best way to adopt advanced technology, as it eliminates the need for companies to buy, build and maintain infrastructure and applications. In recent years, the rise of SaaS has given traditional packaged software vendors real competitive pressure [10].

PaaS is a platform as a service (Platform as a Service). Platform as a service is a cloud computing service that provides a computing platform and a solution stack as a service. At the typical level of cloud computing, the platform as a service layer is between software as a service and infrastructure as a service.

Platform-as-a-Service provides the ability for users to deploy and create cloud infrastructure to clients, or to use programming languages, libraries, and services. Users do not need to manage and control the cloud infrastructure, including the network, servers, operating systems or storage; they only need to control

the upper application deployment and application hosting environment.

PaaS takes the software development platform as a service and delivers it to the user as a software-as-a-service (SaaS) model. Therefore, PaaS is also an application of the SaaS model. However, the emergence of PaaS can accelerate the development of SaaS, especially to accelerate the development of SaaS application speed.

Infrastructure as a Service (IaaS) is the software that consumers use to process, store, and network various basic computing resources, deploy and execute operating systems or applications, and so on. Clients can deploy and run processing, storage, networking, and other basic computing resources at will, without the need to purchase network devices such as servers and software. They cannot control the underlying infrastructure, but can control operating systems, storage devices, and deployment applications

This paper uses PaaS architecture to collect customer consumption data and to analyze the interactions of purchased goods. This study aims to construct a cloud service customized product selection information system to provide a reference to the industry.

This study is composed of the following:

(1) Using relevant literature examples, the collection and collation of cloud computing services for customized selection of merchandise subject to a business or organization are discussed to create an application of cloud computing services.

(2) Using relevant literature examples, the selected cloud computing services customized commodity index is collected and collated. Using questionnaire results from experts after the screening, the effect of cloud services customized commodity indices and the construction of a cloud computing services customized selection of merchandise information system architecture are summarized using factor analysis with association rules and the neural network approach.

(3) Cloud services customized product selection system development and empirical analysis are used to strengthen the plan of the proposed cloud computing services customized merchandise selection of models, and analyze the practicality of the system to provide a cloud computing services model that enables corporate information.

The cloud services customized catalog is better than the traditional catalog, and has two basic benefits [18]:

(1) The cloud services customized catalog offers a wide range of information, and possesses more in-depth content. The amount of information it can provide is far greater than the traditional catalog, and does not suffer from traditional catalog layout space limitations.

(2) The cloud services customized catalog has better timeliness. The content of the e-catalog can be immediate or frequently updated, providing consumers with the latest information. In contrast, the traditional catalog update takes a year or a few months below the content cycle.

3 Methodology

The customized products framework of the system is shown in Figure. 2,

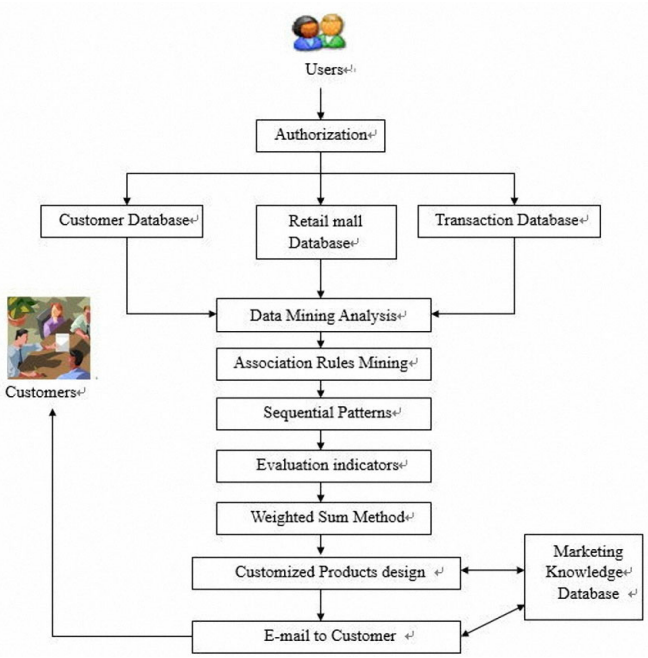

Figure 2. Customized Products Cloud Information System

The relational database management system is used to conduct the data mining, which consists of four steps:

Step 1: Input the system code by certification and open the databases, which comprise the customer database, the retail mall database, and the transaction database.

Step 2: Analyze the data according to the database.

Step 3: Design the customized products according to the analysis results.

Step 4: E-mail the customized products electronic catalog to the relevant branches and to the customers.

3.1 Association Rule Mining

The association rules were proposed by Agrawal and Srikant (1995). Association rule mining is widely used for analyzing the product items purchased by consumers. It is also used to support sales promotion and marketing segmentation [7-8]. The association rule is represented by X➔Y where X and Y are a set of items. This rule means that the transaction records in a business database that contain X tend to contain Y. A large number of valid algorithms for mining association rules have been proposed [2-4].

In this study, a mining system to detect customer behavior is proposed. The association rules from

relational database design are utilized to mine consumer behavior.

In the consumer purchase of computers and memory, for example, the association rule is as follows: Computer ➔ Memory [support = 20%, confidence = 80%]

The formula shows that 20% of the entire transaction database will buy a computer and memory, while 80% of the total customers who purchase computers will buy them together with memory. The following steps are used to determine the association rules:

(1) First, find a collection of high-frequency items (Large Item set). This collection of support must be greater than the user customized minimum support (Minimum Support).

(2) Second, use a collection of items produced by high-frequency generating association rules.

Currently, many algorithms can identify the high-frequency items associated with a collection of rules, such as Apriori [1, 18]. Apriori is the most commonly used and best-known algorithm; therefore, its data analysis will be used in this study.

The following rules apply to the association rule:

(1) Define the minimum support set for the minimum trust.

(2) The Apriori algorithm uses the concept of a Candidate Item set, which is a collection of large items if the support of the candidate items is greater than, or equal to, the minimum support.

(3) Read all the transactions from the database, get the support of the Candidate 1-itemset; C1, find the high-frequency single item set (Large 1-itemset; L1) and use it. The combination of high frequency single items produces candidate 2 items (Candidate 2-itemset; C2).

(4) Re-scan the database to obtain the support of the candidate 2 project set, and then find the high-frequency 2 project set L2, and use the high-frequency 2 project set of combinations to produce the candidate 3 project collection.

(5) Repeat the database scan, and compare with the minimum support, resulting in high-frequency project set Lk, combined with the next generation of candidate sets, until there are no longer combinations to produce a new candidate collection.

For example, D is a collection of transactions, and can also be considered as a specific database, where each transaction T is a collection of items; each transaction has a transaction number Tid as identification. The steps to generate a high frequency item set are as follows:

(1) Define the minimum support of 60%.

(2) Scan the database D, calculate the number of times each project appears in the database, obtain the support of each item in C1; if less than the minimum support level defined, the project will be deleted; otherwise, it will be retained as L1. Thereafter, a table of C2 is generated by combining each item in L1.

(3) Re-scan database D, get the support of each item in C1; if less than the minimum support of the definition, the project will be deleted; otherwise, it will be retained as L2. Next, a table of C3 is generated by a combination of each item set in L2.

(4) Repeat the scan database, compare with the minimum support, generate high-frequency items set, and combine with the next generation of candidate sets, until no more combinations produce a new candidate collection.

(5) The results are as follows:

D

Tid	Items
1	acd
2	bce
3	abce
4	bc
5	be

Scan D →

C_1

Itemset	Sup
{a}	2
{b}	4
{c}	4
{d}	1
{e}	3

→

L_1

Itemset	Sup
{a}	2
{b}	4
{c}	4
{e}	3

D

Items
{ab}
{ac}
{ae}
{bc}
{be}
{ce }

Scan D →

C_2

Itemset	Sup
{ab}	1
{ac}	2
{ae}	1
{bc}	3
{be}	3
{ce }	2

→

L_2

Itemset	Sup
{ac}	2
{bc}	3
{be}	3
{ce }	2

D

Items
{bce}

Scan D →

C_3

Itemset	Sup
{bce}	2

→

L_3

Itemset	Sup
{bce}	2

3.2 Sequential Patterns

Sequential patterns were proposed by Agrawal and Srikant (1995). The algorithm of the association rules has a similar concept, mainly using items to identify the order of occurrence of the information hidden in the data. The same customer at different points in time has many transaction records, which form a sequence. Each sequence set for the project forms an ordered set (Order Set). The sequential patterns are expressed as: A ➔ B; where A and B are arbitrary database collection items, and $A \cap B = \varphi$. The conditions for the establishment of sequential patterns as association rules comprise two kinds of parameter values: support and confidence. Support represents some entries in the database that appear to scale. Reliability is the extent of the credibility of this sequence [9]. Therefore, meaningful sequence patterns are greater than the degree of support and confidence threshold values set by the user.

For example, consumers have to buy notebooks and color laser printers, The sequential pattern can be expressed as follows: Notebook ➔ color laser printer [support = 15%, confidence = 60%]. The formula shows that 15% of the entire transaction database of customers who buy the notebook will buy a color laser printer after a period of time; the 60% denotes the

customers that will buy the notebook and then buy a color laser printer.

The identification of sequential patterns with the same association rules comprises the following two steps:

(1) First, find a collection of high-frequency items. This collection of support must be greater than the user-customized minimum support.

(2) Second, using step (1), the resulting collection of high-frequency items generates sequential patterns.

Currently, many algorithms can identify high-frequency sequential pattern collections of items, such as Apriori [1, 12, 29], and other algorithms. Apriori is the best known and most commonly used algorithm.

This study will use its data analysis. The concept of association rules with similar processing steps is as follows:

(1) First, find the database linked to the customer number (Customer_id) primary key and the transaction time for the second sort key.

(2) Identify all projects that meet the minimum support set in the known collection of high-frequency items. This item set corresponds to a set of consecutive integers for subsequent comparison.

(3) Find the use of high-frequency items by the Apriori algorithm collections. The minimum support to find a sequence, i.e. Large Sequence, must be met.

(4) High-frequency items from the collections are used to find the longest sequence.

3.3 Evaluation Indicators

To assess the candidate promotional products, we propose the following three evaluation indicators: profit targets, customer satisfaction index, and turnover rate indicators. All index values must be planned after being dropped to a lesser extent.

(1) Profit targets: According to the sales of goods reached by the proportion of the target content, through the administrator, enter the appropriate average as a target value.

(2) Customer satisfaction indicators: In addition to the considerations outside the business perspective, customer relationship management must also be given importance. If only corporate interests are considered, it is likely to cause bias; therefore, the customer's point of view, such as the customer satisfaction index, must also be considered. The customer can have the right not to be satisfied, which is in the target range of −1.0 to 1.0.

(3) Turnover rate indicator: This indicator is used to assess the extent of acceptance of the promotional products. The turnover rate is defined as follows. In the range 0.0 to 1.0, Turnover rate = number of promotional products accepted / Promotion Views.

3.4 Weighted Sum Method

We use multiple criteria decision analysis methods in the basic weighted sum method to calculate the final assessment score of the promotional products [28]. Findings that show poor sorting and reporting are excluded. Suppose there are m candidate promotional products and n evaluation indicators; each candidate Promotional Products weighted total score is calculated using the following formula:

$$A_{WSM-score} = \max_i \sum_{j=i}^{n} a_{ij} w_j \text{ , for } i = 1, 2, \ldots, m,$$

where a_{ij} is the i-th candidate promotional products, j is the index value of the actual indicators, and wj is the j-th index value of importance [6].

4 Customized Product Analysis

Profile of the case: The retail mall, established in 2000, specializes in daily life products. It has been a leading provider of personalized daily life products and related products for consumers. In the past decade, the firm has been proud of the quality its products and the value expected by customers. The retail mall's main customers are females.

From our interviews with the company marketing managers, the customized products design is the fundamental promotional tool for the firm. The customized products are designed by the marketing office, based on decisions made at department meetings. According to the promotion schedule, approximately three months are required for the marketing office to design and produce customized products. Furthermore, the customized products are redesigned seasonally. For example, more customized products are dedicated to facial care and decorations. Hence, at the beginning, the customized products would contain a hundred kinds of facial care products and 60 types of decoration products. Upon the completion of the customized products catalog, copies of the customized products catalog are delivered to each branch five days before it is released to the public.

The customized products catalog is designed and produced by the marketing office based on aggregated information from the head office, but the branch offices lack the authority to make decisions on the customized products catalog content. Hence the customized products catalog contents cannot provide a customer-oriented segmentation service for the different branch office needs. Furthermore, the cross selling customized products promotion is still neglected in the current promotion policy. In addition to the traditional electronic catalog, they have another promotion mode: making advertisements for electronic magazines and electronic newspapers for the Branch Anniversary.

The data collected were from June 2015 to May 2016. The database of the system consists of three major parts: customer data, product data, and transaction data.

In this study, we propose a cloud service information system prototype using data mining techniques to help enterprises find suitable promotional products for each customer in the cloud customer database. The customized products cloud service information system architecture diagram is shown in Figure 3.

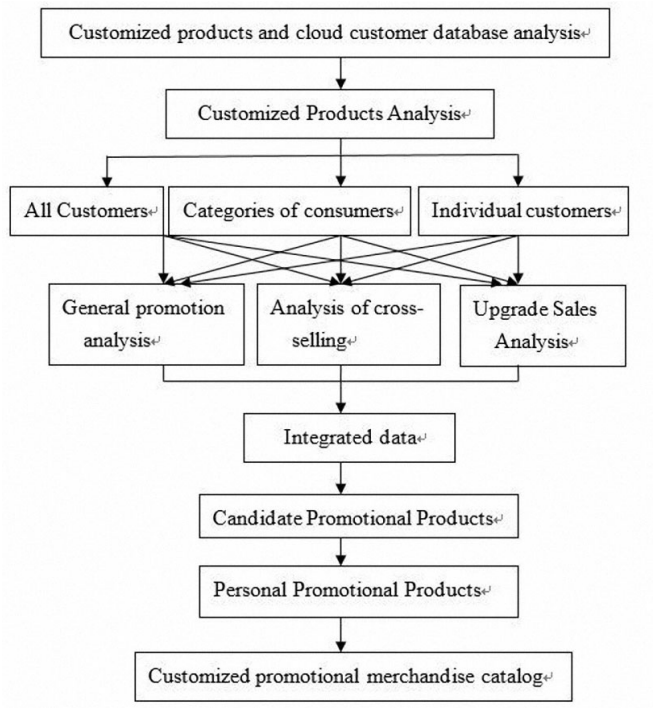

Figure 3. Customized products Cloud Service Information System Architecture Diagram

Each step is detailed as follows.

Step 1: Create a basic cloud customer database: This step is the main characteristic attribute in the collection of user data. It records all possible influential factors of the customer buying behavior attribute data. In this study, the cloud customer database is composed of two parts: basic information and preference category. C1 to Ci-1 are the basic properties of the cloud customer information, such as gender, education, salary, etc. Ci records the user's preferences for product categories, such as facial cleanser, shampoo, and so on.

Step 2: Cloud pre-processing of customer databases and program code conversion: This step is mainly for the removal of any customer purchase records in the cloud and the retrieval of the required fields from the cloud customer database. Then, the cloud customer attribute data are matched with the users to do the attribute coding on the clustering, which is represented as follows:

$$\text{Ci-1} = \{A_1 A_2 \ldots A_K\},\ A_k \in \{0,1\},\ 1 \le k \le K$$

$$\text{If } A_h = 1 \text{ then } A_k = 1, \forall k \le h \text{ and } A_k = 0,\ \forall k > h.$$

Step 3: Association rules: In this study, the most commonly used method of association rules is Apriori. This algorithm searches the entire cloud customer transaction database to identify products that are purchased together. Meanwhile, this approach is also applied to each customer group and individual customer's transaction data to explore the various customer groups and each individual customer's consumption behavior. The transaction data table is shown in Table 1.

Table 1. Transaction data

Project ID	Product project collection	Customer ID
1	{P8, P15, P18}	A105001
2	{P2, P5, P15, P18}	A105001
3	{P3, P8, P9}	A105002
4	{Q8, Q9, Q15}	A105002
5	{Q3, Q5, Q12}	A105003
6	{Q12}	A105005
7	{R6, R18}	A105005
8	{R2, R6, R10}	A105007
9	{Q9, Q17}	A105007
10	{Q5, Q10, Q12, Q20}	A105008
11	{R8, R20}	A105004
12	{R6, R20, R23}	A105004
13	{R23}	A105004
14	{R3, R6, R15}	A105006
15	{R5, R17, R18, R20}	A105006

All the customer correlation patterns for the products {P3, P8} and {P15, P18} are obtained, including all customers who tend to purchase product P3 and product P8, P18, P15 and products purchased together. In addition, Table 2 shows that Customer ID belongs to customer group A. With the association of ethnic A rule mining, we found that this population of customers often purchases products P15 and P18. Similarly, the application of association rules to individual customers (e.g. Customer ID example) identifies which customers would like to buy products P2 and P5.

Table 2. Three kinds of customer type pattern-associated products

Customer Type	Pattern associated products
All customers	{P3, P8}{P15, P18}
A customer groups	{P15, P18}
Individual customers	{P15, P18}

Thus, in this example, a pattern of all associated products for three different types of customers (all customers, customer groups, and individual customers) is discovered and shown in Table 2.

Step 4: Sequential patterns

Sequential patterns can be found after customers buy certain products leading to purchase certain other products. In this study, the use of sequential patterns from all of the customer's transaction database to identify what customers often purchase types of goods. Similarly, this method can also be applied to each customer group and individual customers to explore

the various customer groups and the sequence of individual customer buying patterns.

All the product pattern sequences are shown in Table 3. We acquired all of the customer's sequential patterns of the products {P3, P14} and {P8, P14}. As stated previously, Customer A105001 belongs to customer group A. Using a sequence of ethnic pattern mining, we found that this group of customers often purchases products P5, P8.

Table 3. Three kinds of customer type sequential pattern products

Customer Type	Pattern associated products
All customers	{P3, P14}{P8, P14}
A customer groups	{P8, P5}
Individual customers	–

Step 5: Evaluation Index of promotional products

All products are calculated with a weighted total score. Product promotion can be determined by fractional order. In addition, warning threshold values (ρ) can also be set to remove a low fraction of products. Table 4 shows the candidate promotional products. For example, assume that the threshold value is 0.3; then, the sub-standard promotional products will be excluded. Finally, the price of product promotion order of {P16} > {P3, P9} > {P4, P8} > {P3, P8}; In addition, the product promotion sequence number is {P5} > {P9} > {P3}. In summary, when the quantity of the purchase reaches the threshold set by the policy, it becomes preferential.

Table 4. Various candidate promotional products index score and weighted total score

	Candidate promotional products	Customer satisfaction index	Turnover rate index	Weighted total score
Price of Product	{P3, P8}	0.48	0.58	0.52
	{P15, P18}	0.46	0.52	0.49
	{P4}	0.43	0.28	0.48
	{P9}	0.18	0.53	0.46
	{P4, P8}	0.52	0.61	0.54
	{P3, P9}	0.63	0.65	0.56
	{P4, P9}	0.32	0.46	0.47
	{P16}	0.83	0.66	0.69
	{P16, P18}	0.45	0.35	0.47
Quantity of Product	{P2}	0.36	0.36	0.46
	{P9}	0.65	0.75	0.67
	{P3}	0.48	0.68	0.63
	{P5}	0.83	0.86	0.68
	{P8}	0.46	0.67	0.48
	{P10}	0.42	0.27	0.46

Step 6: Customized promotional merchandise products

If all of the candidate product promotions are sent to customers, it may cause an excessive opposite effect; therefore, not all candidate promotional products are sent to customers. In this system, we use the weighted sum of the three assessment methods and indicators to sort the promotional products, which can be divided into the price of products and the number of products. Figure 4 and Figure 5, shows that policymakers, according to market experience or preference, were given three kinds of indicators with different weights to calculate the sum of the weighted product candidate scores.

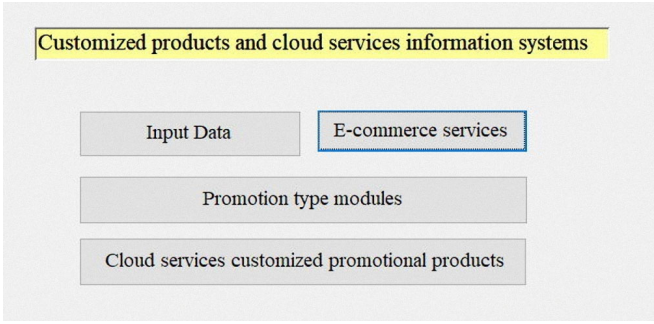

Figure 4. Customized product and cloud services information systems

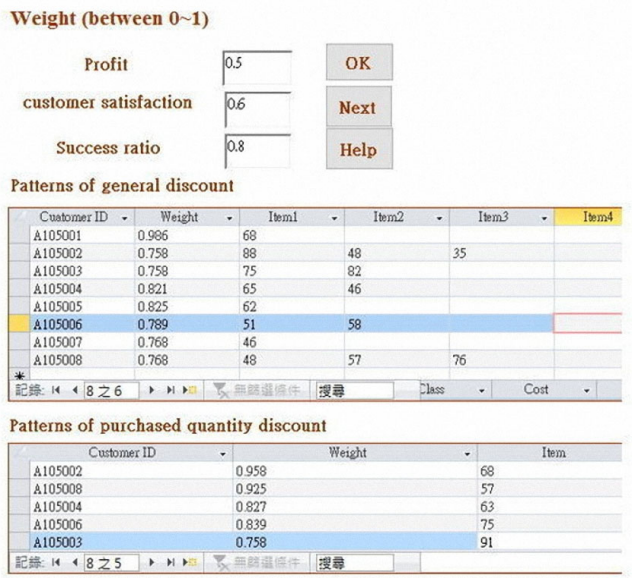

Figure 5. Customized commodity product promotions

Therefore, when these three indicators by policymakers are found, the needs of an individual customer's promotional products shall be considered in the current business situation. The main objective of the promotion is to determine the appropriate weight of each index. The system helps enterprises to efficiently deliver the customized commodity product promotion, as well as meet the business situation and needs.

5 Discussion and Conclusion

The Cloud customer database developed in this research serves as the information system. After importing the benefits that can be found in a number of products imported, we found that the number is high,

due to the adoption of strategic customized services. Product customers must first purchase a lot or a combination. Therefore, after the import volume greatly improves, the total sales and gross profit of the product increases, as shown in Table 5, and Figure 6, Figure 7, Figure 8 and Figure 9.

Table 5. Cloud services information system (CSIS) and improvement rate of the total sales and gross profit

Customized product portfolio ratio		P2	P9	P10	P3t	P4
Before using (CSIS)	Total sales (quantity)	21836	32652	38741	42578	36843
	Gross Profit (Price)	125,635	142,789	227,345	176,285	257,425
After using (CSIS)	Total sales (quantity)	29586	35821	43258	48762	42517
	Improvement rate	*26.19%*	*8.85%*	*10.44%*	*12.68%*	*13.35%*
	Gross Profit (Price)	168,523	182,560	281,405	237,851	316,580
	Improvement In Gross profit rate	*25.45%*	*21.79%*	*19.21%*	*25.88%*	*18.69%*

Figure 6. Comparison of total sales after the cloud services information system

Figure 7. Comparison of gross profit after the cloud services information system

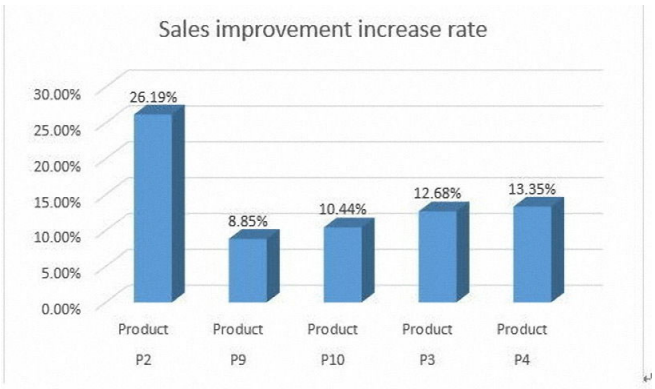

Figure 8. Comparison of sales improvement increase rate after the cloud services information system

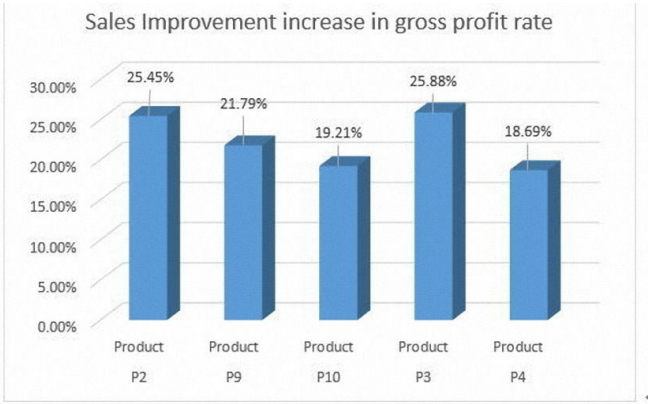

Figure 9. Comparison of sales improvement increase in gross profit rate related to the cloud services information system

The detailed results are shown in Figure 6, the use of cloud services information system customized products: the total sales of its products have increased. Figure 7 shows the use of cloud services information system customized products: the gross profit of its products have increased. Figure 8 shows the use of cloud services information system customized products: the sales improvement rate have increased. Figure 9 shows the use of cloud services information system customized products: the sales improvement increase in gross profit rate have increased.

The results of mining enabled the sales ranking of products as the main promotional products and the designing of the customized products promotional catalog based on combined products. Because some customers had bought two products at the same time, the aim is to encourage customers to purchase a third one, which belongs to the customer product preference list.

This research provides a cloud services information system to enhance the sales of the case firm's products by changing the original promotion method. It helps supervisors and employees make better decisions about promotional activities by providing them with useful knowledge via the new system proposed here. After applying customized products promotional catalogs in

marketing, it will help the company to catch on to the market acceptance of products and to know product sales conditions through the data mining system so as to mend its marketing strategy and achieve the goal of increased product sales.

Besides, the data mining system can also correct the design of customized products catalogs according to market sales data, and design customized products promotional catalogs in different periods. Thus, applying the data mining system effectively can enable an understanding of customers' purchasing behavior, so that the policymaker can make the best policy.

In this paper, we developed a cloud services information system that can detect changes in customer behavior based on customer transaction data and sales products data. The advent of data mining has enhanced the accuracy of predicting customer purchase behavior. Mining for changes in customer purchase behavior is useful for satisfying customer needs in a dynamic internet business environment.

In this study, association rules were used to identify links between customer profiles and products purchased. It provides marketing managers with a useful tool to rapidly search for valuable information based on customer transaction cloud information, and rapidly establish marketing strategies to enhance sales and profit.

For future research directions, such as sales promotion strategy and pricing strategy improvement, customers must be anticipated in different ways for cluster analysis. Considering the quick changes in customer preferences, companies must be able to immediately grasp the change in the customers' needs for customer retention. Therefore, dynamic data mining is essential, that is, the contents of the cloud customer database will enter a transaction when the cloud service information system correctly reflects the new database in the hidden data and reanalyzes the customer's data.

Future studies' focus may include: (1) pricing strategy and (2) dynamic data mining in both directions for further extensions and discussion to meet the business requirements. In the "pricing strategy", the competitor's pricing strategy may be taken into account. As for the "Dynamic Data Mining" in future studies, it can allow enterprises to more securely grasp the customer's status by constant analysis of consumer behavior.

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Biography

Chien-Wen Hung is an Associate Professor in the Information Management Department at Chia-Nan University of Pharmacy & Science, Tainan, Taiwan. His current research interests include strategic information management, knowledge management and technology management, information system and artificial intelligence. He is also a member of the Taiwan Association for Medical Informatics, Chinese Management Association, Chinese Society for Management of Technology, Chinese Enterprise Resource Planning Society, and Chinese Society of Information Management.