

Using AI to Control the Cost of a Buffet Restaurant

KAMII Restaurant Example

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1 Abstract

This paper focuses on the application of AI technology to control costs in the buffet industry, using the example of the restaurant KAMII as a case study. Our analysis of KAMII and the buffet industry overall has revealed that a significant proportion of operational issues are related to cost control. Moreover, there is also room to reduce restaurant costs. To address these challenges, we have drawn inspiration from Haidilao’s “Smart Cloud Migration” technology and propose to leverage AI for dish prediction and ingredient usage control. By doing so, we aim to achieve cost control not only for KAMII, but also for the broader buffet industry, as well as the catering industry. Ultimately, the project aims to generate practical solutions for real-world problems.

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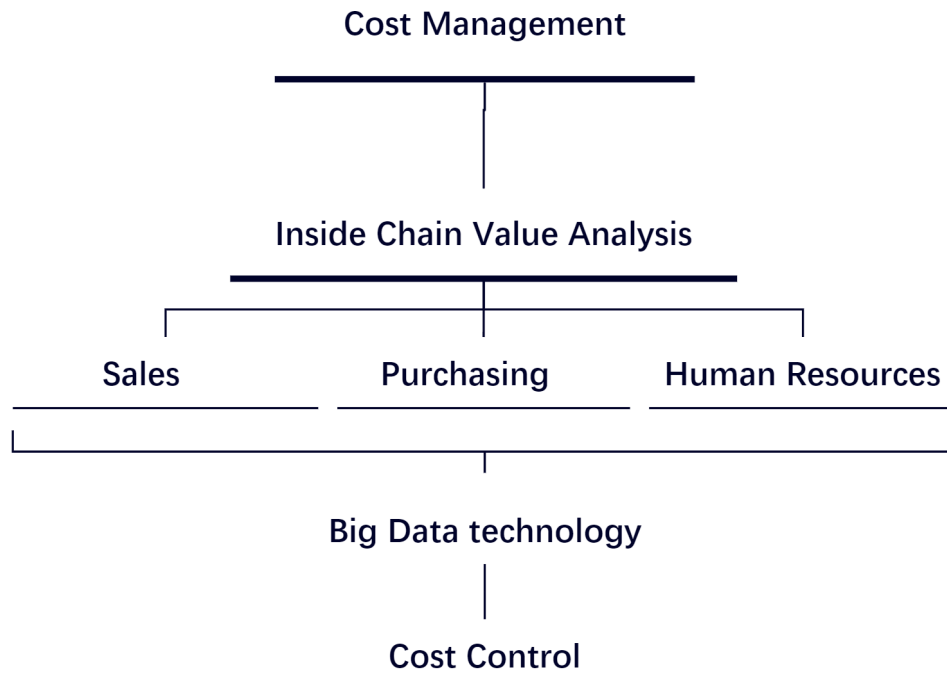


Figure 1

2 Background

2.1 Development status of buffet-style restaurants

After experiencing its heyday in the early 21st century, Jinqianbao, a leading Chinese buffet restaurant, faced problems such as store closures, consumer rights issues, and loan defaults in 2017, highlighting the outdated operational model, unclear positioning, and lack of distinctive features. As a result, the proportion of businesses choosing the business model of buffet-style restaurants in the catering market gradually decreased. Due to changes in the market environment, catering enterprises have been constantly searching for and exploring new growth points, while consumers prefer to obtain better consumption experiences at lower cost. The high cost-effectiveness and variety of dishes offered by buffet-style restaurants perfectly meet this demand for operators. Indeed, the business model of buffet-style restaurants helps to reduce labor costs and increase customer acquisition. This has become an important factor for

many enterprises when entering this industry.

Today, buffet-style restaurants are gradually moving in the direction of product differentiation and operational refinement. However, the product supply chain, restaurant operational efficiency, and product structure are all a drag on buffet-style restaurants, and these also form the challenges that enterprises need to face when planning their business strategies.

2.2 Introduction to KAMII and reasons for its selection

KAMII is a Japanese-style restaurant that specializes in buffet dining. Unlike traditional buffet restaurants, KAMII operates on a Japanese dining model where customers pay a fixed meal fee and can order an unlimited number of dishes from a set menu within a specified time frame. In recent years, the overall development of KAMII has been relatively slow, with declining profitability. Research suggests that high operating costs are a significant contributing factor. Therefore, it was decided to analyze KAMII in the hope that findings could be applied to the broader buffet-style restaurant industry.

2.3 Background information on AI-specific implementation models

2.3.1 Reduce unnecessary costs based on the conditions of online ordering

By using a SaaS system to establish an intelligent membership service management mode, the enterprise can identify customers' needs in a timely way and evaluate whether their reserves are sufficient. Through data integration in the entire platform, specific information on the current storage situation, material quantities, and other aspects of a particular store can be fed back to the distribution center, and distance calculation and analysis used to adjust the distribution plan, greatly reducing logistics costs [1].

2.3.2 Warehouse cost management

After the application of the Kingdee ERP system, the enterprise gradually established standardized management of inventory warehousing and flexible inventory counting methods. Strict inventory warehousing management was implemented, and an inventory management plan was

put into place on a cloud computing platform, calculating the usage of ordinary food and fresh food based on the number of days in storage. By using scientific management to improve food quality and rationally selecting the distribution of various foods, the enterprise has achieved better inventory control.

2.3.3 Material Processing Cost Management

By moving all restaurant systems to the cloud, the entire back-end process has achieved intelligent management. The system monitors the internet, big data, intelligent devices, and products in real-time, enabling real-time monitoring of the overall operation status, production status, inventory status, and shelf life status of the Haidilao kitchen [2]. The kitchen at each store classifies the raw materials received and processes them into dishes. The water and electricity consumption during the processing process is monitored in real time, and each dish has a Radio Frequency Identity (RFID), so the serving time and quantity are also monitored in real time.

2.3.4 Purchasing cost management

Through a large-scale intelligent modern logistics mode, goods are first called from the nearest warehouse. When materials are insufficient at the store, the “Smart Cloud Migration” mobile internet platform is used to transmit the order information to the nearest distribution center, which will then quickly deliver the materials to the store [3]. This not only effectively reduces store operating costs but also reduces the cost of subsequent purchases through centralized distribution management.

3 Division of roles & responsibilities

Roles	Names
Submitter	Lexie
Searching	Absinthe, Lulu, Suki
Classifying	Absinthe, Lulu, Suki
Inspecting	Lexie
Data analyst	Alice, Belinda

4 Application mode

From the analysis of KAMII's value chain, it can be seen that the company's main raw material procurement cost, labour cost and sales cost are its key links, and in the following section, the cost control achieved in these three links by means of big data technology will be examined.

4.1 Sales forecasting system

- i. Forecasting overall sales for the next time period based on current sales data and market conditions (large market events, competitors' sales activities, etc.).
- ii. An initial forecast for the dishes based on the sales volume of each dish over the last few time periods.
- iii. Comprehensive analysis of the historical sales data of each dish, seasonal factors, promotional activities, and other influencing factors to adjust the sales forecast value of each dish so that the total sales forecast of all dishes and the overall sales obtained in the first step are consistent.
- iv. Using the standard Bill of Materials (BOM) for each dish maintained within the enterprise resource planning (ERP) system, the Flat BOM required for the next time cycle of operation is automatically derived, i.e. the full forecast demand for raw materials.

The new adjusted sales forecasting system not only improved the accuracy and precision of forecasts but also the standardization of dishes and greatly enhanced management refinement and level of the enterprise. For the purchasing department in particular, the aim of unblocking the supply chain information flow, reducing inventory, reducing out-of-stock goods, and improving purchasing operational efficiency was achieved. When the purchasing analysis engineer receives the sales forecast, the BOM of the dishes is decomposed through the ERP system to obtain the Flat BOM, and the final order quantity is calculated by combining the standard loss data and the stock quantity, which greatly saves on the purchasing cost.

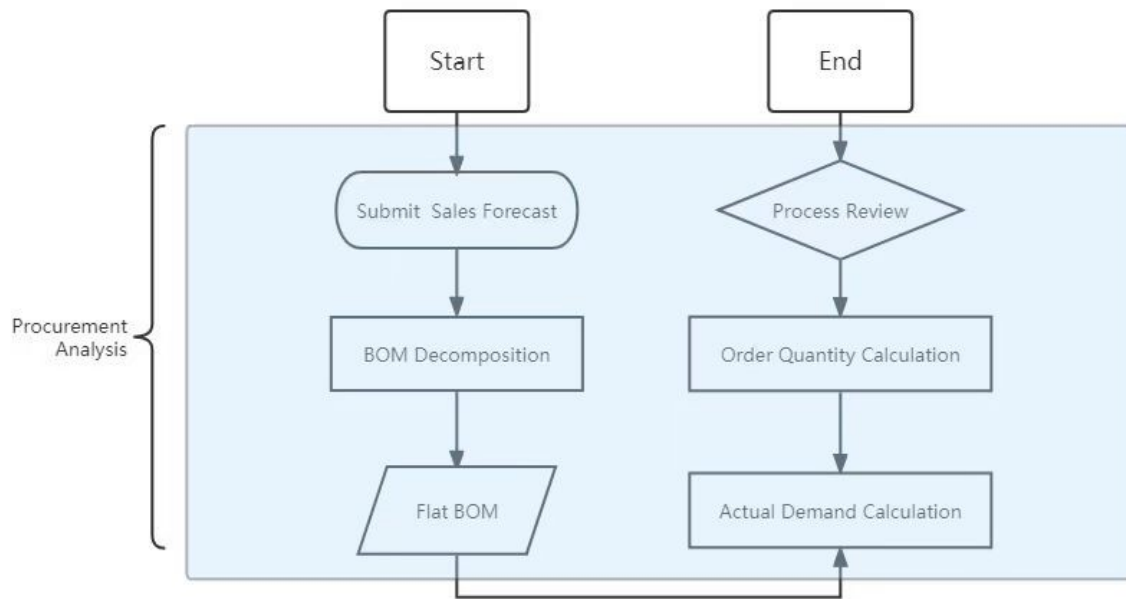


Figure 2

4.2 Introduction of a CRM customer management system

When customers are screened and managed through a customer relationship management (CRM) system, it can help companies achieve stable and sustainable long-term value, thus contributing to current business strategies.

The CRM system designed for KAMII is shown below:

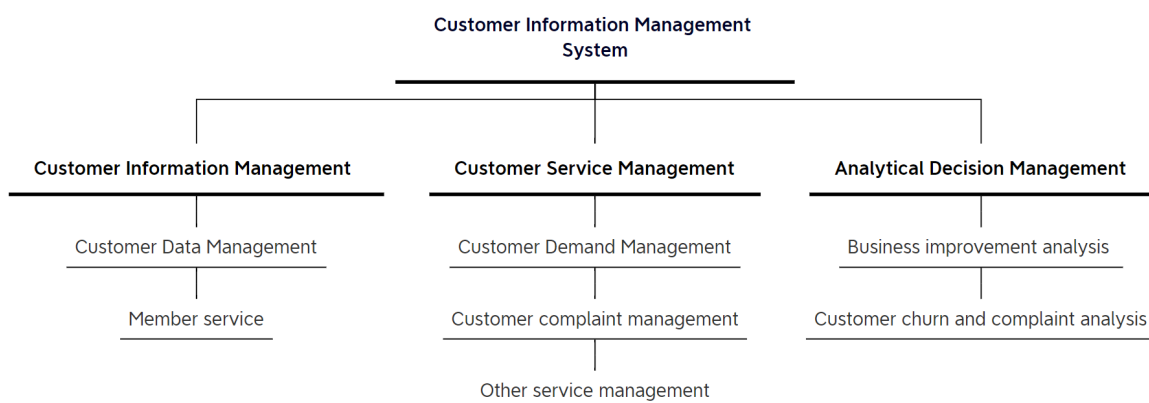


Figure 3

i. Customer Information Management System

This system mainly integrates and manages fragmented customer and membership information and encourages customers to apply for restaurant membership with the benefits of membership points or discount coupons. Basic customer information is thereby obtained, including customer name, gender, age range, contact details, and preferences, and this information can be managed by means of the CRM system.

ii. Customer service system

This module mainly includes three sub-modules: customer demand management, customer complaint management, and other service management. Through the registration, query, and processing functions, other service management modules include customer order management, meal time management, and takeaway management.

iii. Analysis and decision management system

This is the core function of the whole CRM system. The daily sales order data of the restaurant can be directly entered into the CRM system. Based on the classification of each dish, including daily consumption, overall consumption, unit price, discount (whether it is a recommended dish), quantity, how it tastes and other information, the system uses artificial intelligence technology and self-learning to send regular reports on dish optimization and provide optimization solutions, such as whether to carry out promotional activities, whether to adjust the taste, whether to delete a particular dish, and others. Externally, when facing customers, the system can recommend dishes and services for customers according to their age, gender, consumption times, and historical consumption records. Additionally, when customers enter the shop, different forms of coupons are pushed out for different customer consumption frequencies to stimulate their consumption desire to the greatest extent. Internally, feedback is collected from customers to improve the quality of dishes, services, and dining environment to enhance customer satisfaction.

4.3 Purchasing

Develop a standard purchasing cost for dishes.

- i. The BOM of the dish is actively updated, the R&D Department must formally submit the process in the office automation system copied to the Finance Department, and the Finance Department is required to complete the standard cost update maintenance of the dish within three working days after receiving the process data. If it is found that there is a huge difference in the cost change, the Finance Department has the right to return the process data and request the R&D Department to submit a description of the change. After the process has been approved by the Finance Department, it is sent to management for approval. Once the process has been signed, the process sponsor is required to send the change note, together with the results of the process sign off, to other relevant departments in the form of a formal notice. The process is shown in the diagram below:

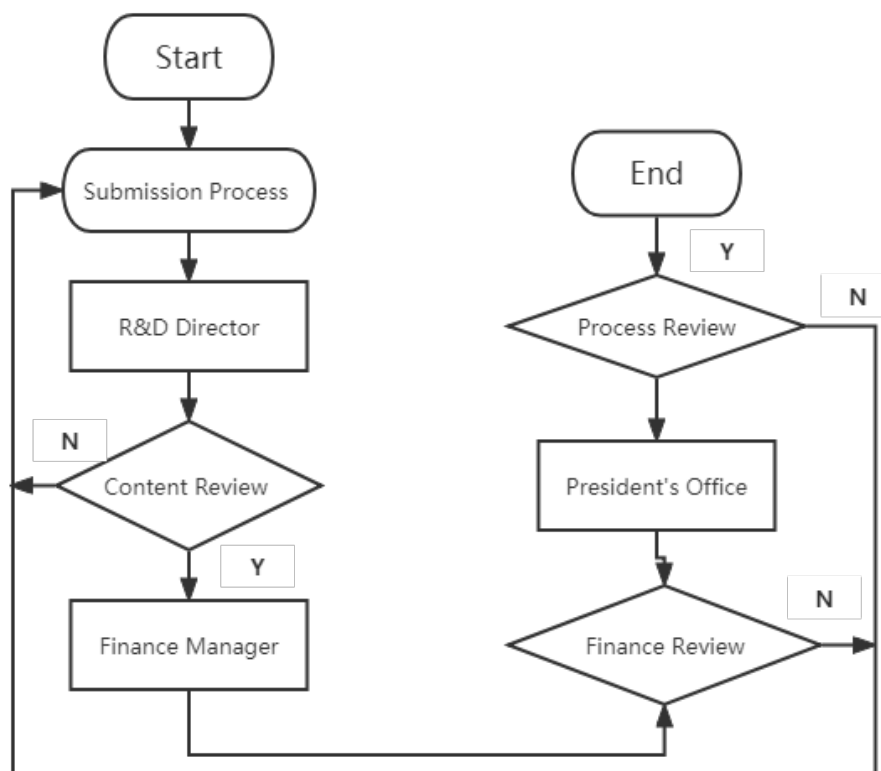


Figure 4

- ii. At the end of each quarter, the Finance Department routinely updates the standard costs of the top 20 selling dishes based on the average purchase price for the quarter, based on the sales report submitted by the Sales Department. At the end of each financial year,

standard costs are updated for all dishes.

4.4 Human Resources

Adopt an eHR human resource management system

i. Organizational structure

Set up departmental levels and organization maintenance; define each job grade, job establishment, job description; establish job posting and duty conditions; display information on job staffing and shortages; provide query tools, and statistical analysis reports on various dimensions of organizational structure.

ii. Maintain personnel information platform

Keep records of basic employee information (including name, gender, education, profession, household registration information, family information, and emergency contact details) and personnel information (including contract information, probationary management, job title and level, job change history, organizational reporting relationship), and extract the employee enquiry history, information reminders, and report queries.

iii. Efficient time management

Provide easy-to-use automated tools to set up work calendars and staff scheduling plans; manage employee daily attendance, leave, overtime and other employment information, and provide feedback on various charts and history tracing; set up various leave categories and record information on various absences and overtime work.

iv. scientific salary management

According to the company's salary management system and salary budget, as well as different types of employees, set salary categories and calculation methods, and provide the basic functions of salary item setting, automatic salary calculation, salary adjustment, salary structure design and salary analysis; perform automatic calculation of employee social security, income tax and tax declaration generation, through batch import

and management of salary item information, and flexible setting of payroll. The format is user-friendly for employees to manage a self-service payroll.

5 Challenges and solutions

When considering how to apply the KAMII model to other buffet restaurants, we encountered challenges. In the research process, we found that, overall, AI technology has its advantages and disadvantages when applied to different restaurants in the catering industry, but its application in large chain catering enterprises is more effective.

Most small catering enterprises, due to their small scale, limited funds, and reduced personnel, adopt a linear management approach [4]. Sales are the main factor affecting cost ratios for small catering enterprises, while the relative impact of human resources and procurement costs is small. Therefore, the application of AI technology in small catering enterprises is mainly reflected in local links, such as ordering and dish prediction.

Due to their large scale and adequate financial resources, large catering enterprises can adopt the application of full-process AI technology, covering production, warehousing, sales, and service links.

Therefore, for small enterprises, it is more difficult to promote the technology developed for KAMII to achieve cost-effectiveness. However, based on the example of promoting WEB technology from large enterprises to other relatively marginalized enterprises, we propose to try to develop AI technology to be used in a webpage or APP. Sales prediction, warehousing, material processing, and procurement cost management can be divided into four major categories, and companies can register and enter their restaurant information, select the cost management category they want to implement, and pay to use it. Compared with this model, small enterprises do not need to worry about the complexity and cost of AI functions, and can choose the corresponding functions according to their needs.

There are other means of promotion such as outreach and education where the concepts and benefits of AI technology and how to apply are introduced to food and beverage business owners and operators. This can be done through industry events, seminars, and online resources

such as webinars and blog posts. Collaboration between industry leaders such as large catering companies and chain restaurants can help to demonstrate the value of AI technology in the catering industry, and case studies and success stories can help small businesses build trust and credibility in AI technology. AI solutions can be tailored to the specific needs and challenges of the restaurant industry, such as menu optimization, supply chain management and customer service, which should be user-friendly and applicable to businesses of all sizes. Technical support and training can also be provided to businesses interested in adopting AI technologies but who may lack technical expertise. This can include online resources, tutorials and one-to-one support. An AI ecosystem of AI start-ups, vendors and service providers specializing in the food and beverage industry can be fostered. This can create a support network for businesses looking to adopt AI technology and drive innovation and competition in the marketplace.

In general, extending AI technology to the catering industry requires a multi-faceted approach, including education, cooperation, and technical support [5]. By demonstrating the value of AI technology in the catering industry, providing user-friendly solutions, and fostering an AI ecosystem, more businesses can be encouraged to adopt the technology and realize its benefits.

6 Contributions

Under the auspices of China’s “Smart Cloud Migration” policy, and as the nation’s economy enters a “new normal” after the Covid period, traditional enterprise cost management models are being challenged. Simultaneously, the rapid development of the internet, and associated technologies such as big data, the Internet of Things (IOT), and cloud computing, has facilitated the emergence of cost-effective, efficient, and upgradable technologies that can readily interface with external information systems [6]. Given this, the deep integration afforded by “Smart Cloud Migration” has become a vital means by which enterprises can construct cost-integrated management systems across their entire industry chain, enhancing competitiveness and facilitating value-added outcomes. Within the high-cost catering sector, the application of such technology can enable intelligent cost control, while further consolidating cost manage-

ment system development, promoting cost information sharing, and enabling whole-industry-chain cost management implementation [7]. By streamlining cost management processes, and reducing human and material resource utilization, the desired outcome of cost reduction can be realized.

7 Author contributions

Conceptualization: S.W., L.W., Q.L., S.Z., H.L. and S.H.; methodology, validation, analysis: S.W., L.W., Q.L., S.Z., H.L. and S.H.; investigation, resources: S.Z., H.L., S.H., S.W., L.W. and Q.L.; writing original draft preparation, visualization: S.W., L.W., Q.L., S.Z., H.L. and S.H.; writing-review and editing, visualization, supervision: Q.L., S.W., L.W., S.Z., H.L. and S.H.; Project administration: S.W., L.W., Q.L., S.Z., H.L. and S.H. All authors have read and agreed to the published version of the manuscript.

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