

# *Design of Cloud Payment Management System for Campus Catering Sales*

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**Abstract:** As society advances and the pace of life quickens, managers are continually exploring innovative management strategies for the catering industry. One particular pain point for university catering services is how to attract students to their “Internet +” catering services, while also improving the quality of food and service. To address this issue of cloud payment for campus catering consumption, we propose a design scheme for a cloud payment management system for campus catering sales. The system comprises of a cloud server, various cloud payment sales points, a logistics catering sales management office terminal, and smartphones, among other components. Each catering sales window can identify the type of student consumption based on the student’s username and consumption habits as indicated on the cloud payment bill of the respective cloud payment sales point. This enables real-time and accurate understanding of student customer trends, timely assessment of the business status of each sales window, adoption of corresponding strategies, and ultimately improvement of catering quality, adjustment of catering varieties, and targeted adjustments, among other strategies. The design of this system has significant practical significance for the effective management of cloud payment for campus catering sales.

## **1. Introduction**

Catering services are a fundamental aspect of student life in higher education institutions, which play a crucial role in facilitating academic success and inculcating a culture of service among students. The success and development of these institutions are closely linked to the quality of their catering services and management practices [1-2]. To remain competitive in the market, the catering departments of these institutions must enhance their overall competitiveness by adopting new management models, improving operational efficiency, and enhancing the quality of their services to meet the growing demands of students and faculty [3]. Since the mid-1980s, with the deepening of reforms in the catering services provided by higher education institutions, there have been notable improvements in the quality of service, operational efficiency, and economic performance

of these departments. However, several challenges still persist in these institutions, including outdated management practices, weak service culture, inadequate attention to hygiene and nutrition, low production and service efficiency, low levels of student satisfaction, and insufficiently skilled employees [4-8]. In contrast to traditional management approaches, lean management practices can improve production efficiency and flexibility, by producing high-quality products with minimal defects, while minimizing the consumption of labor, space, capital, and time. This approach can facilitate a rapid response to market demands and better meet the needs of students [9-12]. The prevailing mode of campus catering sales usually involves students and merchants scanning codes for cloud-based payments. Most merchants only concern themselves with the number of catering products sold and the amount of revenue generated. Few merchants or catering sales management departments delve deeper into the data obtained through cloud payments, such as whether today's student customers are new or repeat customers, and the precise increase or decrease in the number of new and returning student customers compared to the previous month, quarter, or year. How can student customers be classified? What discount strategies can be used? How can catering taste be improved with targeted efforts? How can the catering sales management department of the logistics and catering service division accurately and timely grasp the sales situation of each catering merchant? What is the situation with the increase of new student customers and the return of old student customers to merchants? These are all first-hand materials that merchants and the logistics and catering sales management department need to master. For merchants, it is important to promptly and accurately grasp the trend of catering business development based on the patronage of student customers, and to improve catering quality, adjust the variety of catering products [13], and carry out targeted improvements in catering varieties. For the logistics and catering sales service department, how to timely deploy business strategies based on real-time and accurate data on the number of new and old customers of each merchant, and to adjust the management rights of each merchant in a timely manner, so as to anticipate the strategic development of the logistics group. This forward-looking statistical work presents both challenges and opportunities for merchants and logistics service departments alike [14], and holds significant practical significance for innovative research on campus dining services [15].

## **2. Overall Structure Design of the System**

The campus catering sales cloud payment management system is designed to include a cloud server, various cloud payment sales points, a catering sales management department office terminal, and smartphones. The system framework diagram is illustrated in Figure 1.

Specifically, the cloud server is deployed in the machine room of the catering sales management department office, comprising various modules such as registration and login, customer data reception, data processing, data storage, notification response, report generation, and display.

## **3. Structural Design of the Cloud Server**

The software structure of the cloud server in the system is shown in Figure 2.

The registration and login module receives registration applications from various cloud payment sales point merchants. After network review by the catering sales group personnel, the salespersons of each cloud payment sales point can log in to the cloud server.

Furthermore, the customer data reception module automatically receives the operational data of the merchants from various cloud payment sales points.

The customer operational data includes the user sales serial number, username (customer's cloud payment account username), sales time, purchase category, consumption amount, and customer type flag (set by the salesperson when the customer buys).

The data processing module records, accumulates, and statistically processes the data received by the customer data reception module.

The data storage module saves the data received by the customer data reception module and the processing results of the data processing module on the cloud server.

The notification response module responds to the request information from the information sending and receiving module of the collection device and also publishes relevant notifications to various merchant cloud payment sales points.

The report printing module is used to print various data on the cloud server in report form.

The display module is used to display the output on the cloud server.

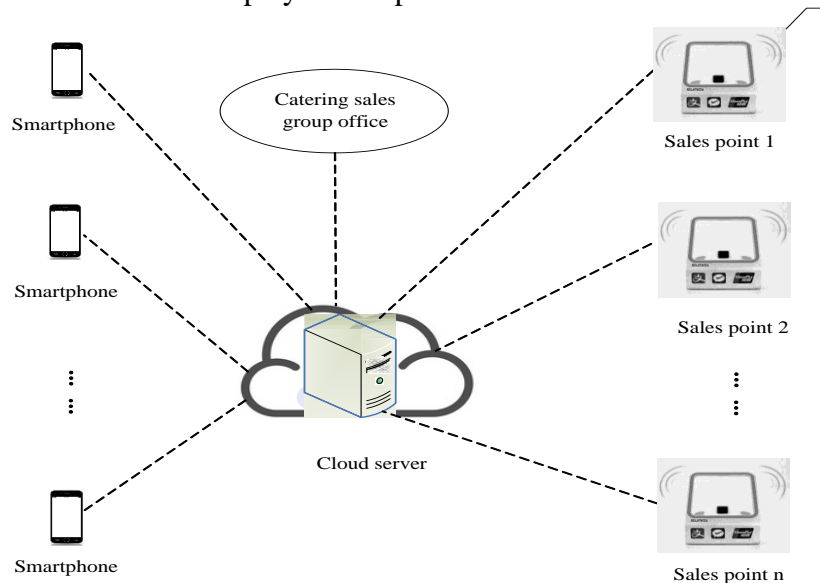


Figure 1: Schematic diagram of the system framework

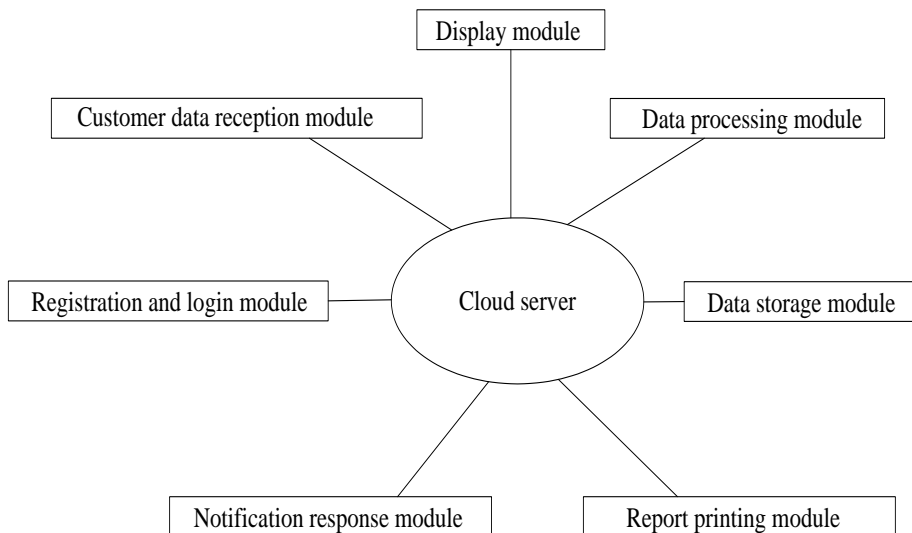


Figure 2: Software structure in the cloud server

#### 4. Structure Design of Payment Device

The campus catering cloud payment management system comprises various cloud payment sales points, each equipped with a payment device that includes the original cloud payment device, a voice playback device, a keyboard module, a local data aggregation module, an information

exchange module, a local report printing module, and a display module. The structure of these payment devices is illustrated in Figure 3.

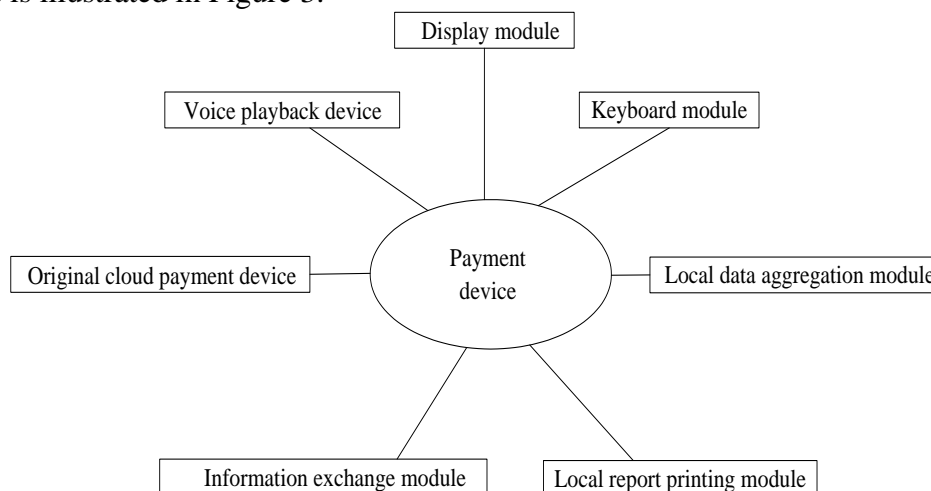


Figure 3: Structure of payment device

The original cloud payment device is the current cloud payment system used for catering sales, which includes functions such as mobile phone scanning, card payment, and facial recognition payment.

The voice playback device is used for voice broadcasting during the catering sales process.

The keyboard module is set as an additional device on the original cloud payment device and is used for local data statistics, local work mode setting, meal setting, customer type flag setting, and other necessary keyboard inputs.

The local data statistics module is used for local merchants to record, accumulate, and statistically process customer data.

The information exchange module is used to send package applications, discount applications, and other business applications to the cloud server, while receiving application information replies and group notifications from the cloud server.

The local report printing module is used to print various data in report form locally.

The display module is used to display output on the local cloud payment sales point terminal.

## 5. Design of Working Mode

The campus catering sales cloud payment management system is designed with three working modes: real-time mode, statistical mode, and routine mode. Among them:

(1) The real-time mode includes voice welcome mode, gift giving mode, payment discount mode, group discount mode, time-limited discount mode, birthday discount mode, holiday discount mode, and other sales modes, etc.

Specifically, the voice welcome mode is used by each cloud payment sales point to play language prompts according to the sales mode during work.

The gift giving mode is used by each cloud payment sales point to give gifts to customers based on their type, either new or old.

The payment discount mode is used by each cloud payment sales point to give different discount modes to customers depending on their habits, rationality, economy, impulsiveness, and randomness.

The type of student customers mentioned above is determined by the salesperson on-site and marked on the sales receipt.

The group discount mode is applied at the cloud payment sales points to provide discounts to customers who are identified as part of a group.

The time-limited discount mode is also used at the cloud payment sales points to offer customers different discounts during specific time periods.

The birthday discount mode is applied when a customer's birthday occurs, providing discounts to customers at the cloud payment sales points.

The holiday discount mode is also implemented at the cloud payment sales points, offering customers discounts during holidays and festivals.

Additionally, other sales modes are provided by the merchants at the cloud payment sales points to offer customers various discounts under different conditions.

(2) The statistical operational mode includes the current month's customer quantity, monthly increased customer quantity, monthly cumulative customer quantity, current quarter's customer quantity, quarterly increased customer quantity, quarterly cumulative customer quantity, current year's customer quantity, annual increased customer quantity, and annual cumulative customer quantity.

This mode can be used to search, summarize, and compile data for a specific cloud payment sales point or for the entire catering group sales unit.

The routine operational mode is used by each cloud payment sales point to conduct cloud payment sales in accordance with the current cloud payment mode.

The workflow of the system is shown in Figure 4.

(3) The routine work mode operates according to the current traditional working mode.

## 6. Conclusions

The responsibility of managing campus catering services falls on the shoulders of the administrators who are tasked with implementing sophisticated management applications in order to operate in a more advanced and refined manner, given the unique characteristics of their clientele, which include a large scale, concentrated meal times, and high taste requirements. The campus catering sales cloud payment management system allows for the identification of customer types based on usernames and consumption habits flagged in cloud payment bills, providing real-time and accurate insights into changes in the number of student customers, enabling timely assessments of the operational status of this sales point and the adoption of responsive strategies, such as improving the quality of catering, adjusting food varieties, or targeted improvements, all of which can effectively assist self-managed windows in their operations. In addition, the catering sales department can make use of the big data cumulative from the cloud servers of each sales window to conduct real-time statistics and summarizations, enabling timely assessments of the operational status of each sales point within the department, providing recommendations for business model improvements, and promptly deploying logistics management strategies to proactively anticipate the strategic development of the logistics management department, all of which holds significant practical implications for the development of campus catering management.

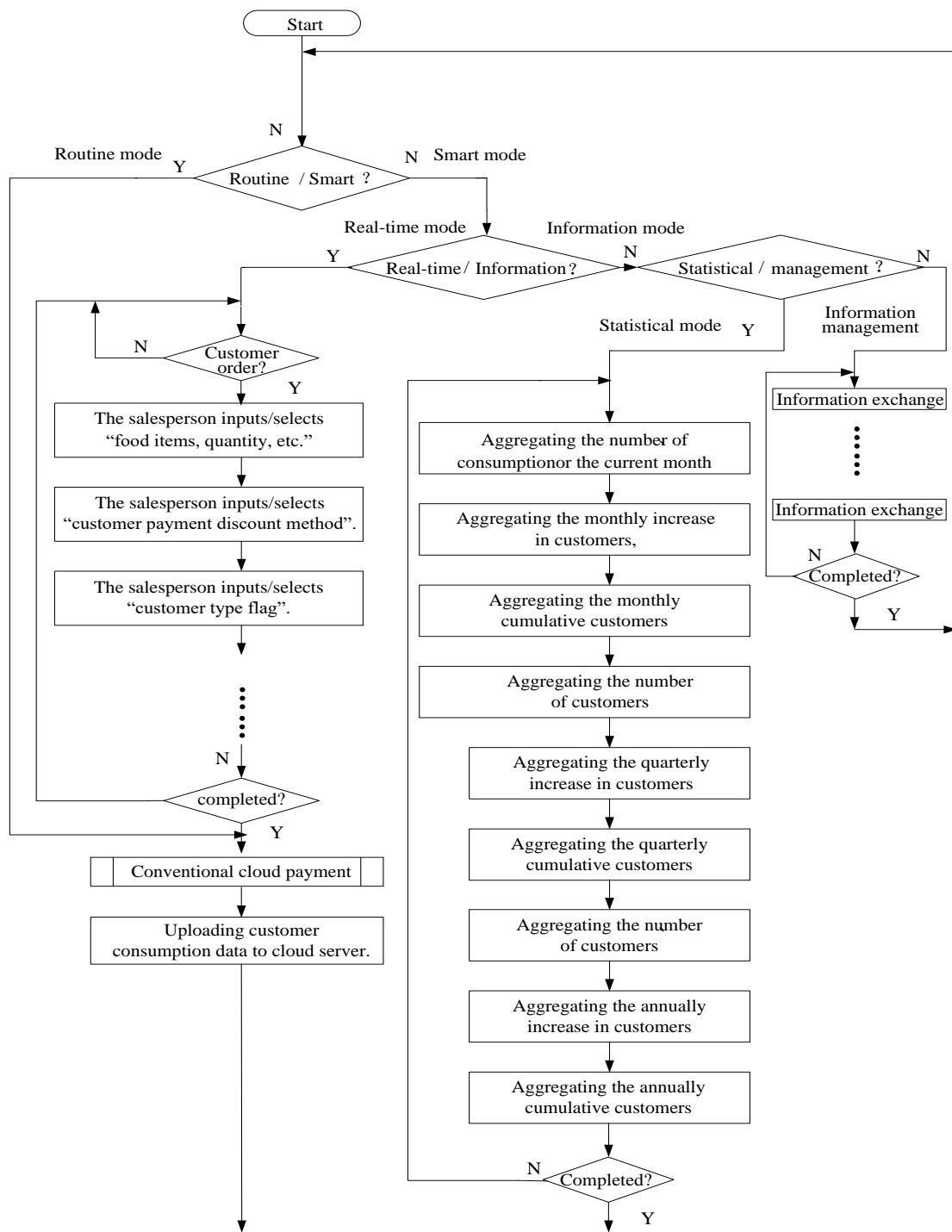


Figure 4: Workflow of the system

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