Improving Customer's Subjective Waiting Time Introducing Digital Signage

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1 Introduction

In the 1970s, the Japanese restaurant industry introduced the chain store system, which was later introduced into the retail industry in the USA to enhance productivity [1] [2]. The chain store system was designed to realize "low-cost operations". For instance, chain store restaurants simplify and automate service operations to reduce the number of service staff. Moreover, they standardize service operations by introducing service manuals for use in training part-time staff. Prices of dining decreased throughout chain store systems, and Japanese consumers came to enjoy restaurants casually. Consequently, the market scale of the Japanese restaurant industry expanded from 8 trillion yen to 250 trillion yen during the 1970s to 1990s. Restaurants in Japan numbered approximately 737,000 in 2006 [3].

In the mid-1990s, the Japanese restaurant market ceased its expansion, and gradually shrank. One reason is diversification of customer's preferences. As customers have come to enjoy dining at restaurants, their preferences have become diversified [4]. Moreover, customers' criteria used in selecting restaurants have become extremely well defined. The chain store system can not adapt easily to today's customer requirements for restaurants. A second reason is tough competition among restaurant stores. As restaurant stores have become more numerous, the Japanese restaurant market has become extremely competitive. Therefore, restaurants must add distinguishing and appealing features to their restaurants. Restaurant companies should therefore strive for a "sophisticated and diversified" restaurant store model [5].

In recent years, Service Engineering has been introduced to service industries to enhance service quality and productivity by streamlining service operations, by improving employee skills, and by enhancing customer satisfaction. The Japanese Ministry of Economy, Trade and Industry started a national project promoting service engineering to improve service sector productivity [6] [7]. The Japanese restaurant industry has introduced service engineering to improve service quality and productivity. For example, in the IT field, Process Management Systems based on POS systems have been developed to enhance customer satisfaction and productivity [8]. In the marketing field, new CS examination methods using questionnaires and measure-

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ments of leftovers were incorporated into menu planning [9]. In the IE field, the new worker's operation estimation system is created by measuring flow lines of staff by RFID devices and is replayed using 3D computer graphic technology [10]. Although these methodologies are effective to improve productivity, they mainly address reduction of labor input. The restaurant industry should also create a "customer value based" restaurant management system.

As described in this paper, we present results of recent studies which suggest effective means of enhancing customer satisfaction based on service engineering.

2 Improving customers' subjective waiting times using Information Indication System

2.1 Research Objectives

Food preparation speed is an important parameter for both revenue management of restaurants and customer satisfaction [11]. Traditionally, kitchen staffs prepare dishes manually. Consequently, preparation speed depends deeply on skills of the kitchen staff. The revenue capacity of a restaurant is limited by its food preparation capacity. Moreover, food preparation speed is important for customer satisfaction. If dishes are delayed, customers will become angry. Restaurants must therefore improve food preparation speed to enhance both revenue management and customer satisfaction.

In the middle 20th century, restaurants introduced central kitchens, and limited the variety of menus to improve food preparation speed. Restaurants thereby improved revenue and productivity [1]. Moreover, fast food restaurants introduced POS systems to reduce waiting times and to increase accountability [12]. In fast food restaurants, capabilities of ordering and accounting deeply depend on waiting times. In fact, POS is an effective means to reduce waiting times. Furthermore, industrial engineering methodology is introduced to improve food preparation operations. For instance, simulation systems of restaurant operations are developed to improve food preparation speed and capacity of restaurants [13]. Menu planning methods for fast food service were developed to reduce customer waiting times. Customers who choose a normal menu wait at a cashier queue, and customers who choose an express menu stand in line at another cashier queue. By reducing the total menu items at a cashier queue, staff can minimize food preparation times and customers can reduce waiting times [14].

Although many related technologies have been developed, conventional studies have not addressed problems of customers' subjective sense of time. Conventional methods can improve the waiting times of customer using these methods. However, these methods are intended to improve actual food preparation speed. Customers do not look at a clock to grasp food preparation speeds because they are talking to each other, reading a book, sending email on a mobile phone, and so on while they wait. Restaurants must address the issue of subjective sense of time.

Many studies of subjective passage of time have been done in the cognitive psychology field. Conventional studies have shown that people feel the passage of time less if they do something, than if they do nothing. As our study described in chapter 2 indicates, customers regard information related to food is important and interesting. A chance exists that the restaurant can improve a customer's subjective waiting time through information presentation.

For this study, we developed an information presentation system to present information related to dishes. The device is displayed at a restaurant to show them to a customer. We measured whether a digital display can reduce a customer's subjective sense of time or not.

2.2 Methodology

This study was conducted at a Japanese restaurant operated by Ganko Food Service Co. Ltd. (Osaka, Japan). The restaurant chain offers Japanese cuisine such as tofu, sushi, and sashimi. Especially, tofu is a popular Japanese food, and the company produces tofu independently of suppliers. Ganko's tofu contains 15% soy milk, which is one of the highest densities in all of Japan.

Conventionally, information related to tofu is shown in a photograph, captions on menus, and item descriptions by service staff members. However, those methods apparently offer insufficient information about the volume of food, compared to video images. It is not easy for customers to understand information related to foods solely through reference to the folding menu.

An information presentation system was created to present tofu-related information. The system equipment consists of a digital display, a small computer server, and a memory chip. The program has four contents. The first content shows a tofu symbol, the method used to make tofu, and health-related tofu information. The second is a questionnaire and game. Three questions are shown: whether customers know Ganko tofu or not, whether they order tofu or not, and whether tofu tastes good or not. Users can try games to receive prizes if customers give correct answers. The third content is a quiz about tofu. Customers learn about tofu in an enjoyable format. The last contents are combinations of tofu dishes and drinks recommended by a sake sommelier. It recommends interesting combinations for customers for example, ice cream made of tofu and plums. Customers can choose combinations by referring to it. Figure 3 portrays the system structure.

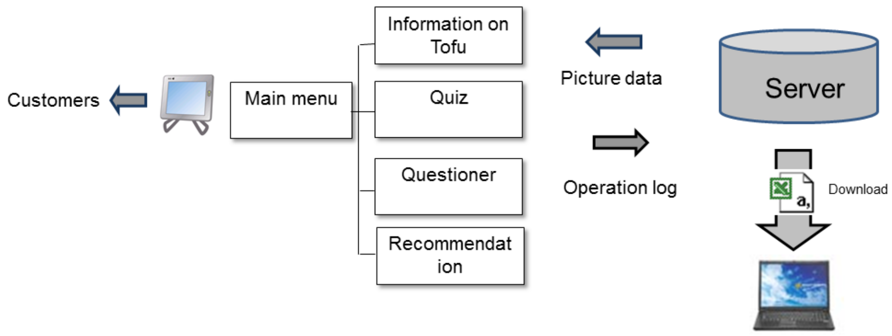

Figure 1: System structure.

The system was installed at a Japanese restaurant: Coms-Kyobashi (Osaka, Japan). For this study, 10 tables were selected. 5 digital displays are placed on 5 tables to show the contents (*display tables*); the other 5 tables had none (*non-display tables*). Tables divided by a wall were selected to prevent non-display table customers from seeing display tables.

Measurements were conducted from 12 Jan. 2011 to 28 Feb. 2011. Waiting times were measured at lunch time because customers typically ordered one dish, and because it is easy to measure the waiting time. In contrast, dinner time data might be difficult to measure because customers ordered several dishes and drank alcohol when dining. Both actual and subjective waiting times were recorded to the minute.

Actual waiting times were measured using the following method. The dish-ordered times were recorded using a clock function display on the POS system. The dish-served times were recorded by service staff members. Staff members wrote dish-served times on paper when referring to a wristwatch. POS and staff watches were synchronized to measure waiting times accurately. The order-received time and dish-served times were merged by a reference ID number assigned by the POS system.

Subjective waiting times were elicited by questionnaire to customers of each table. When a dish was served, the staff member handed a question sheet to the customer. The questionnaire asked “How long do you feel you waited?” and “Do you feel that the waiting time was long or short?”

To grasp a customer’s interest and knowledge related to tofu, answers to questions were recorded to a memory chip when customers replied.

Two databases were produced based on the data. One contained actual waiting times and the display / non-display table parameter. The other contained subjective waiting times, the display / non-display table parameter, and a customer’s statement of “long or short”, in addition to answers for questions. The two databases were used to confirm the efficacy of digital displays.

2.3 Results

Measurements yielded 491 data for actual waiting times, of which 304 were for non-display tables, and 187 were for display tables. The average waiting time of non-display tables was 9.11 min, with standard deviation of 3.38 min. Those of display tables were 8.94 min and 3.37 min, respectively. Results show no marked difference.

We collected 226 answers for subjective waiting times, of which 105 were for a display tables and 121 were for non-display tables. The average waiting time of display tables was 6.72 min, with standard deviation of 12.30 min. The average waiting time of non-display tables was 5.83 min, with standard deviation of 9.04 min. Subjective waiting times of display tables were shorter by 0.88 min than those of non-display tables.

The result of the customers' estimated waiting times were the following: 82.7% replied that the waiting time was short, 7.3% replied that it was long, and 10.0% did not reply at display tables. Additionally, 79.4% replied that the waiting time was short, 13.0% replied that it was long, and 17.6% did not reply at non-display tables. Table 1 presents results of analyses.

In all, 100 answers of respondents were recorded by the system: 53% of customers knew information related to Ganko tofu and 47% did not; 25% of customers ordered tofu by recommendation, and 75% did not; 96% of customers who ordered tofu felt that the tofu tasted nice, and 4% did not.

Table 1: Average and SD of waiting times

Classification	Display	Average	SD
Actual waiting time	Display	5.83	9.04
	No display	6.72	12.31
Subjective waiting time	Display	9.11	3.38
	No display	8.94	3.37

2.4 Discussion

Results show that the system reduces customers' subjective waiting time. As Table 1 shows, the average subjective waiting time of customer of display tables was shorter by about 1 min than that of non-display tables. Moreover, as answers for the "Do you feel that the time was long or short?" question show, those at display tables felt that the waiting time was shorter than customers at non-display tables did. We infer that the presentation of interesting information improves customers' subjective waiting times.

Some reasons seem readily apparent. First, 95% of customers answered the questions, which indicates that almost all customers use the system to get tofu-related information. Why do so many customers use it even though tofu is already shown on the menu and although staff members have recommended tofu for many years? Tofu has been produced for over a quarter century and the company advertises it. Moreover, the restaurant has many regular customers because it has been managed for over a decade: it is one of the oldest restaurants in the area. Tofu is apparently well known by customers.

However, approximately half of customers replied that they did not know that Ganko produces tofu. Put simply, conventional information presentation methods do not provide information to customers adequately. Naturally, incentives such as presents promote customers' use of the system. In addition, customers use the system ardently to obtain information related to tofu. Actually, 25% of customers ordered tofu, which is a very high ratio of the order number because even the most popular food sold at Ganko was ordered by only 4.6% of customers.

Second, the system provides a reciprocal information loop between the system and customer. Customers only receive information if the restaurant provides it by menu or POP. Communication can occur if staff members offer information. However, if a restaurant is rushed or crowded, staff can not communicate well with customers because they become extremely busy. Consequently, customers can not communicate with them, and customers should refer to the POP system and the menu to get information related to food. Recently, restaurants have introduced digital POP systems to resolve such problems. The system can play video images and sound, not only still images and flash frames. Customers can get the latest information using the system. However, digital POP systems show information unilaterally, and customers only receive information. No cross-interaction occurs between digital POP and customers. Under such circumstances, there is little to distinguish digital POP systems from menus.

However, information presentation systems create a cross-interaction between the device and a customer. Initially, the system shows contents to the customer. Customers must operate it by themselves if they would like to get information. Moreover, information is offered as a quiz, and customers can get information related to food in an amusing and enjoyable format. Furthermore, the system provides incentives such as presents. Therefore, customers are motivated to use the system. Customers positively use the system, and customers feel that the waiting time is short.

2.5 Conclusions

This study shows that restaurants can improve customer's subjective passage of time using an information presentation system. Customers are interested in information about food or dishes, and customers feel that the waiting time is short if they are offered information presentation systems. Moreover, they are more effective for information presentation than folding menus, POP, or oral presentations. Cross-interaction between customers and the information presentation systems is an important factor to achieve improved efficiency and effectiveness in restaurant service.

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