Enhancing Kitchen Layout and Training to Improve Management and Employee Satisfaction at a Multiproduct Japanese Cuisine Restaurant

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Abstract

This study was conducted to improve both management and employee satisfaction (ES) at multiproduct Japanese cuisine restaurants. Conventionally, restaurant industry research has emphasized the improvement of management satisfaction. However, restaurants must improve employee satisfaction because it deeply affects labor productivity and food quality. For this study, the kitchen layout was remodelled, a cell production system was introduced to a multiproduct Japanese cuisine restaurant, and the kitchen was designed using a kitchen simulator to enhance cooking time and to improve the working environment of staff members. Salary and promotion systems were changed to encourage staff members to adopt the cell production system. Cooking times were measured (existing layout, immediately after remodel, and 2 months after remodel) as KPI to confirm the efficacy of the redesigned kitchen. Questionnaires were administered to confirm employee satisfaction (as same times as measuring cooking speed). Results show that (1) remodelling of the kitchen layout using a kitchen simulator is useful to enhance the food preparation rate of a multiproduct Japanese cuisine restaurant, (2) the rate worsens immediately after remodelling because staff members are not accustomed with new kitchen layout, and (3) employees estimate that the remodelled kitchen layout is better than the existing kitchen and that the new salary system is reasonable for them, but they do not want to advance their skills because of their age and difficulty (some are already multiskilled workers).

Keywords

Restaurant • Simulation • Cooking operation • Employee satisfaction

1 Introduction

In the 1970s, the Japanese restaurant industry introduced chain store operation systems to reduce the price of dishes and to expand the market scale. The purpose of the system was to minimize labor costs to realize a low-price strategy because dining out was a leisure activity [1, 2].

Restaurants reduced the menu item number to reduce operations at restaurant kitchens. Furthermore, food factory systems were introduced, with a central kitchen, to limit restaurant kitchen cooking staffs. The restaurant industry realized low-price restaurants: the industry rapidly expanded

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sales revenue. In the 1990s, the restaurant industry became a key Japanese industry [2].

As the Japanese restaurant market has matured, customer preferences have diversified [3]. In the 1970s, dining out was a novel leisure activity for Japanese consumers. Therefore, simple and low-price menus fit customer requirements because customers valued the dining experience itself. However, as customers experienced various restaurants, they started to demand unique dishes they had never experienced. A critical gap arose, separating customer needs and restaurant operation systems, simultaneously requiring diversification and simplification. The restaurant industry must introduce a new operation system to realize both multiple menus and reasonable prices.

Dinner restaurants, which mainly present dishes prepared by chefs, are adequate operation systems for today's restaurant market. Such restaurants provide various dishes because chefs master a variety of cooking skills. Moreover, chefs can adjust the taste, texture, and temperature of dishes based on customer requirements. Recently, dinner restaurants have a growing market share in the Japanese restaurant market [4].

However, dinner restaurant labor productivity is low compared to other restaurant categories because a chef-based operation system requires numerous chefs. Especially, restaurants should hire salaried master chefs with experience, thereby differentiating themselves from competitors. Dinner restaurants should evolve operation systems to resolve productivity problems. Nevertheless, dinner restaurants hesitate to change operation systems because they regard traditional operation systems as superior to new cooking and operation systems [4].

The authors have continually introduced new operation systems and methods to enhance the productivity of Japanese cuisine dinner restaurants. Process management systems were introduced to realize both cooking time reduction and the adoption of customer requirements for dishes [5]. In addition, cell production systems are introduced to reduce labor input and to improve labor elasticity in the kitchen [4]. Moreover, a kitchen operation simulator was developed to design an efficient kitchen layout with adequate capacity of cooking devices [6].

Although some challenging studies are practiced, some problems remain. First, the introduction of cell production systems does not focus on improving employee satisfaction. The quality of dishes deeply depends on a chef's skill. Dinner restaurants cannot provide fine dishes if the chef motivation is low. Improving the operation system can be expected to improve ES, as well as management satisfaction. Second, a kitchen simulation system must be applicable to an actual restaurant. In a conventional study, the kitchen layout was redesigned and the cooking time was simulated on a computer. The study did not apply a redesigned kitchen layout for an actual restaurant. To confirm the simulation effectiveness, the kitchen layout designed by simulation should be applied to an actual restaurant.

To resolve problems, a remodelled kitchen layout was formulated based on the kitchen simulator results. It included a cell production system and was introduced in an actual restaurant to improve the cooking time and working environment for staff members. In addition, the salary and promotion system was replaced to improve the motivation of kitchen staff members.

2 Changing the Kitchen Layout and HR

The kitchen layout of Japanese cuisine dinner restaurant A (Osaka, Japan) was redesigned in 2014 using a kitchen simulator. Restaurant A has 2 floors, 264 sheets, and 2 kitchens (sushi and washoku). Around 10–13 staff members work in kitchens, including 4 skilled chefs and 6–9 part-time kitchen staff members.

To simulate restaurant A cooking operations, some databases were produced. The cooking time and position (e.g., fryer, simmer, sushi) of each menu of restaurant A was measured to produce a dish database. The production capacity, size, situation, and direction of cooking machines of restaurant A were measured to produce a machine database. The staff members' cooking skills were evaluated by a supervisor (skill rank = high, middle, low/ability = yes/no) to produce a staff database.

First, the cooking lead time of an existing kitchen layout is simulated as the KPI of efficacy of kitchen because the cooking time deeply depends on labor productivity [7]. The POS data of restaurant A are provided for order information. The work records of staff members are provided for work shift information. Figure 1 shows the existing kitchen layout of restaurant A.

Based on the simulation results, the cooking times of dishes are totaled, followed by calculation of the average, mode, and standard deviation of cooking time position by position. Based on the simulation results, problems of the current kitchen layout of restaurant A are discussed, and the remodelled kitchen layout was designed. The remodelled kitchen is equipped with a cell kitchen module. Figure 2 presents the remodelled kitchen layout of restaurant A.

Second, the cooking time of remodelled kitchen layout is simulated for comparison to that of the existing kitchen. The same POS data and work records are used to unify the simulation conditions. Based on results of the second simulation, the mode and standard deviation of the cooking time are calculated position by position. The final remodelled kitchen layout is designed based on the first simulation results. The remodelled kitchen has one cell module to enhance the cooking idle time [4].

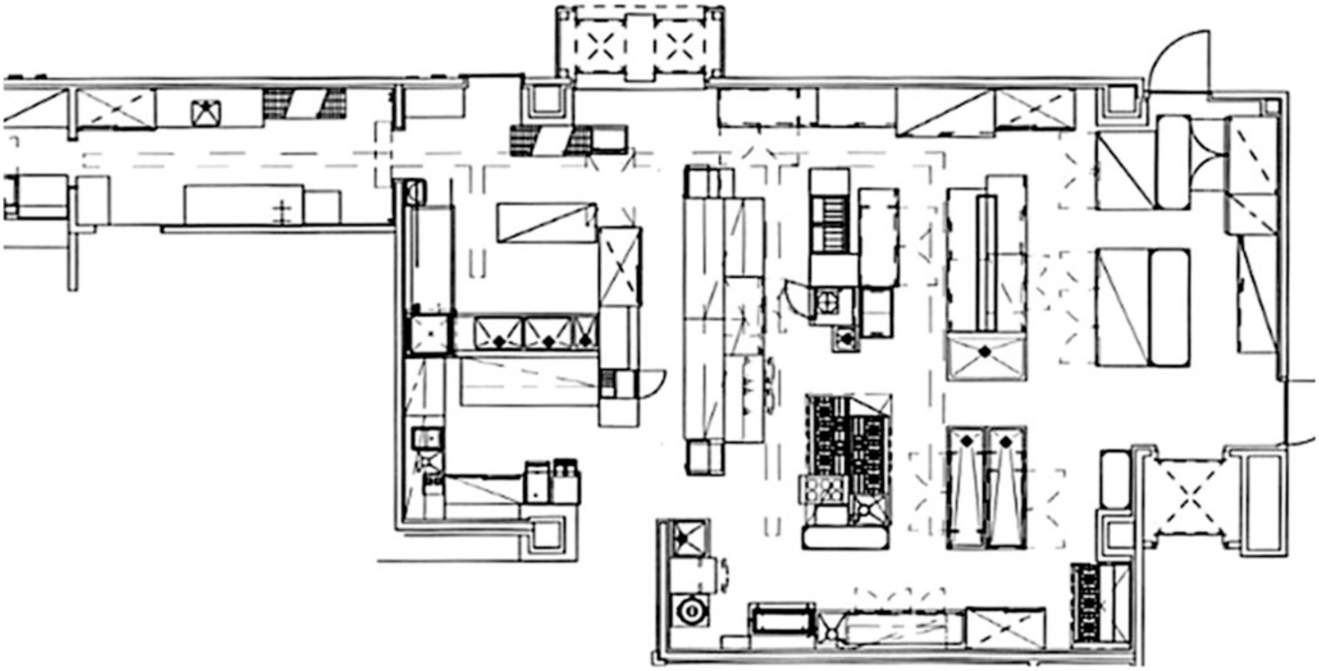

Fig. 1 Prior kitchen layout of restaurant A

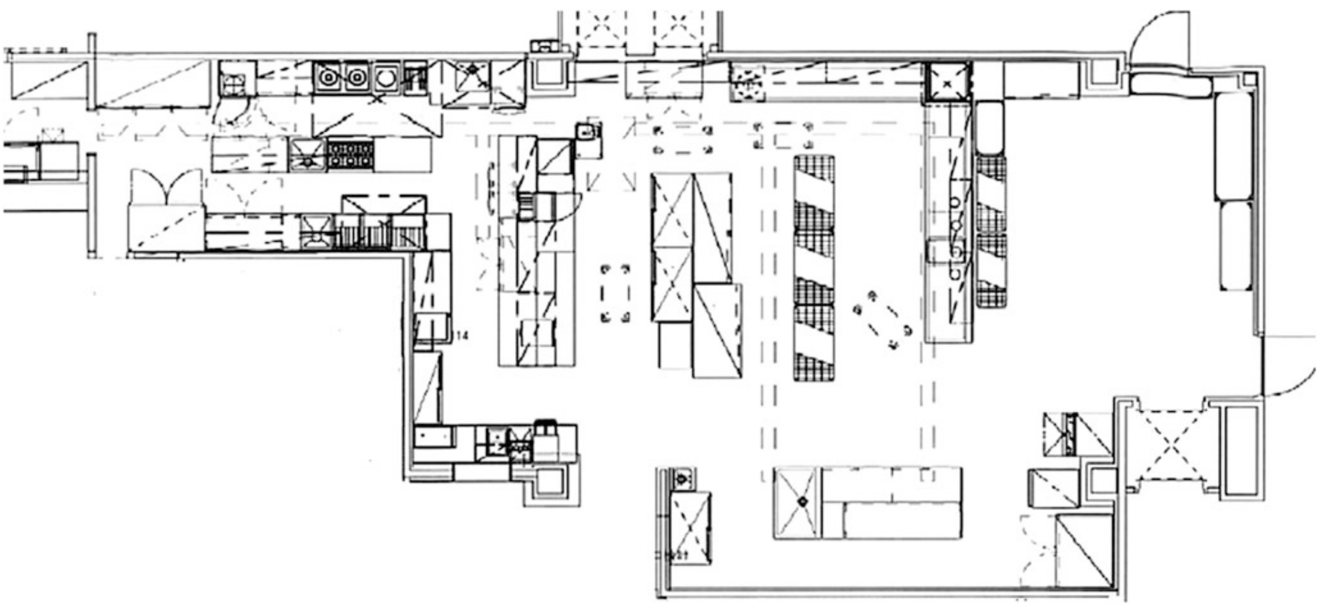

Fig. 2 Remodelled kitchen layout of restaurant A

The kitchen layout of restaurant A, which includes one cell kitchen module, was remodelled actually. To introduce the cell kitchen module, chefs should be trained because chefs are not accustomed with the module. Traditionally, Japanese cuisine chefs cook a particular type of dish each day: if a chef cook simmered foods, the chef does not cook other types of food. In addition, restaurant A also hires part-time workers: they do not master various cooking skills. They should master several cooking skills to operate in the module.

Actual cooking lead times were recorded three times for 1 week each: existing layout, immediately after remodelling, and 2 months after remodelling. The order-received time was recorded and printed using the POS system. The cook-finished time was written by kitchen staff members: they refer to a time-synchronized clock. The lead time was calculated by subtracting the order-finished time from the order-received time.

Based on the results of records, actual cooking times of dishes are totaled. Then the calculated average, mode, and standard deviation of cooking time position by position are used to discuss the utility and problems of simulation and cell production systems.

Restaurant A changed the promotion and salary systems for employee. The existing kitchen layout presumes a single trained worker. By contrast, a cell production system presumes cross-trained workers. It is apparent that adopting a cell production system brings them a higher workload ratio and harder training for obtaining various cooking skills. Motivation of staff members will decrease if they do not receive any incentive. Supervisors explained the new promotion and salary system to restaurant A staff members: a staff member mastering new cooking skills and operating in the cell module can receive a higher salary.

Questionnaires were administered three times to confirm motivation for getting skills and satisfaction for the new work environment: before introducing the system, immediately after remodelling, and 2 months after remodelling. The questionnaires assess two factors: A = evaluation for kitchen equipment and operation system, B = motivation for job and satisfaction for HR system (Table 1). Staff members respond to the survey on a six-response Likert scale (most positive = 1, most negative = 6). Answers were classified into three categories: positive, neutral, and negative.

Table 1 Questionnaire

A-1	Kitchen equipment and utensils for smooth cooking operations
A-2	Working environment for smooth cooking operations
A-3	Work scheduling for smooth cooking operations
A-4	Efficiency of cooking operations
A-5	Understanding the purposes of cell production systems
A-6	Understanding the importance of collaboration
B-1	Satisfaction with skill evaluation and salary level
B-2	Understanding the salary promotion system
B-3	Motivation for enhancing existing cooking skills
B-4	Motivation for mastering other cooking skills
B-5	Interests of multiskilled workers

Table 2 Results of simulations (cooking time)

	Existing layout			Remodelled layout		
Kind of food	Mean	Mode	SD	Mean	Mode	SD
Fried food	8.48	8.40	2.46	9.05	7.55	3.61
Baked food	8.17	8.18	1.21	7.21	7.73	0.93
Simmered food	7.64	8.00	3.14	7.89	8.00	2.45
Salad	7.37	5.10	4.80	5.81	3.18	3.67
Sushi, sashimi	5.71	4.32	3.05	6.37	4.25	3.78
Total	6.88	7.25	3.30	8.28	4.50	7.38

Unit = minutes

Table 3.1 Cooking times of existing layout

	Cooking time		
Kind of food	Mean	Mode	SD
Fried food	7.35	4.00	0.54
Baked food	9.58	6.00	0.76
Simmered food	12.38	6.00	1.28
Salad	7.53	2.00	0.58
Sushi, sashimi	4.08	0.00	0.32
Total	7.16	5.00	0.16

Unit = minutes

Table 3.2 Cooking times immediately after remodelling

	Cooking time		
Kind of food	Mean	Mode	SD
Fried food	7.84	6.00	0.47
Baked food	10.16	4.00	0.58
Simmered food	11.37	9.00	1.04
Salad	7.56	3.00	0.42
Sushi, sashimi	3.83	0.00	0.28
Total	7.21	5.00	0.15

Unit = minutes

3 Results

Table 2 presents results of the simulation of the existing kitchen layout and those of the remodelled kitchen layout. Table 3.1 shows the actual cooking lead time of existing kitchen layout. Table 3.2 shows that immediately after remodelling of the kitchen layout. Table 3.3 shows that of 2 months after remodelling of the kitchen layout. Table 4 presents questionnaire results.

4 Discussion

4.1 Improving Cooking Time (MS)

First, the results of simulations are discussed. As Table 1 shows, the average cooking time in the remodelled kitchen worsened compared to that of the existing kitchen layout, although the remodelled layout was intended to reduce the cooking time. By contrast, the greatest value of cooking time of remodelled kitchen layout was improved compared to that of the existing kitchen layout. Why did the average cooking time worsen and the best value of cooking time improve?

The standard deviation reveals the reason. Figure 3 shows a distribution of simulated cooking time of fried foods in both existing and remodelled kitchen. As Fig. 3 shows, the remodelled kitchen seemed to reduce the cooking time of fried food. However, the cooking time of remodelled kitchen has a long tail. A worker processes orders one by one if one order is entered. A worker batches the orders if plural orders are entered. If numerous orders are entered, then the simulator batches the orders. Then the worker does not cook another order. Therefore, the cooking time takes a long tail if numerous orders are entered. The long-tail cooking time worsens the average cooking time of fried food.

However, in a practical sense, a worker, especially a skilled chef, prepares plural orders simultaneously. There are two cooking processes: a hands-on process (e.g., muddle, stair, and dish) and a standby process (e.g., heating and cooling). A worker will cook another kind of order using a standby process of order to reduce the lead time. The simulator should be refined to show the simultaneous cooking operations of kitchen staff.

Second, results of actual cooking time are discussed. As compared with Tables 3.1 and 3.2 shows that the cooking times immediately after remodelling worsened compared to those of the existing kitchen layout in general (except that the average cooking times of simmered foods, sushi, and sashimi improved along with the best values of baked foods).

Table 3.3 Cooking times 2 months after remodelling

	Cooking time		
Kind of food	Mean	Mode	SD
Fried food	7.16	4.00	0.52
Baked food	7.28	8.00	0.40
Simmered food	7.79	5.00	0.67
Salad	5.37	1.00	0.47
Sushi, sashimi	5.18	0.00	0.54
Total	6.53	5.00	0.14

Unit = Minutes

Cooking times depend greatly on the placement of cooking utensils and ingredients, not only on the kitchen layout. Immediately after remodelling, staff members chose the placement of kitchen utensils and ingredients for new layouts based on their hypotheses. The placements were not the best places. Therefore, they removed places continuously to improve the placement. Staff members should look around to find out ingredients and cooking utensils for cooking. Consequently, the search time prevented them from reducing the cooking time.

The cooking time depends closely on the habituation of staff members. They have probably been cooking at the existing kitchen layout for years. Naturally, they have become accustomed to the existing kitchen layout. Although the remodelled kitchen layout is better than the existing layout, cooking time worsened under this unfamiliar layout.

By contrast, cooking times of all cooking positions, except for sushi and sashimi, had improved at 2 months after remodelling, compared to those of the existing layout. The greatest values of fried food, simmered food, and salad

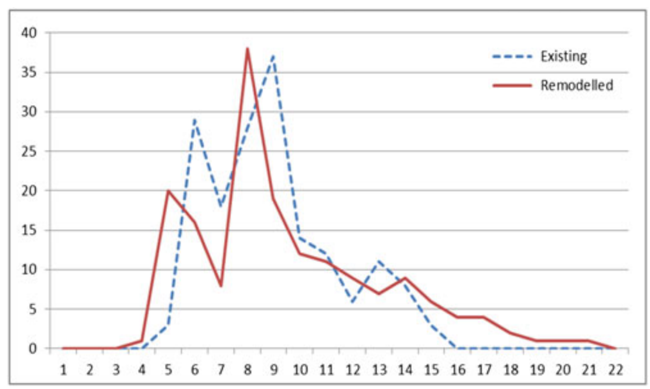

Fig. 3 Simulated cooking times of fried foods (*horizontal*, minutes; *vertical*, number of dishes)

Table 4 Results of questionnaires (percentage)

	Before (N = 13)			Immed. after (N = 9)			2 months after (N = 10)		
	P	–	N	P	–	N	P	–	N
A-1	0 %	100 %	0 %	0 %	100 %	0 %	60 %	40 %	0 %
A-2	15 %	69 %	15 %	11 %	56 %	33 %	40 %	60 %	0 %
A-3	46 %	46 %	8 %	33 %	44 %	22 %	40 %	50 %	10 %
A-4	23 %	54 %	23 %	33 %	22 %	44 %	40 %	60 %	0 %
A-5	0 %	100 %	0 %	0 %	100 %	0 %	40 %	60 %	0 %
A-6	0 %	100 %	0 %	0 %	100 %	0 %	50 %	50 %	0 %
B-1	0 %	100 %	0 %	0 %	100 %	0 %	40 %	60 %	0 %
B-2	0 %	100 %	0 %	0 %	100 %	0 %	40 %	60 %	0 %
B-3	85 %	15 %	0 %	67 %	33 %	0 %	60 %	40 %	0 %
B-4	77 %	23 %	0 %	67 %	33 %	0 %	60 %	40 %	0 %
B-5	85 %	15 %	0 %	67 %	33 %	0 %	70 %	30 %	0 %

P positive, – neutral, *N* negative

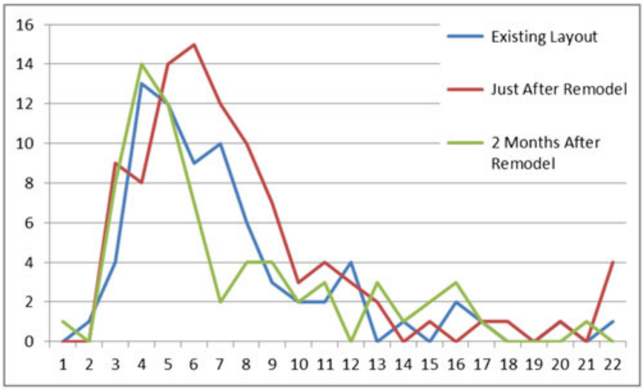

Fig. 4 Actual cooking times of fried foods (*horizontal*, minutes; *vertical*, number of dishes)

improved. However, the greatest values of baked foods, sushi, and sashimi did not improve.

As explained before, staff members continuously change the placement of kitchen utensils and ingredients to better places. It apparently took several weeks to fix their placement. After they were fixed, staff members gradually memorized them and became accustomed with the new placement. Results show that the time for searching was reduced. Eventually, the cooking time improved compared to the existing kitchen layout.

In addition, actual cooking operations do not have a long tail. Figure 4 presents a distribution of actual cooking times of fried foods in the existing layout, immediately after remodelling, and 2 months after kitchen remodelling. As discussed earlier, staff members cook numerous orders simultaneously in an actual kitchen. Therefore, the cooking times of order-rushed dishes do not so differ among the results. Results reflect the standard deviation. The actual standard deviation is less than the simulated value.

Moreover, staff members became accustomed with new kitchen layout. Several weeks were necessary to become accustomed to the new kitchen layout and cooking machines because some were changed for new models. After some time, workers improved the traffic line and reduced operation times for cooking machines. Eventually, the cooking times improved compared to the prior kitchen layout.

However, the sushi and sashimi cooking times were decided by the staff skill. Sushi and sashimi should be prepared one order at a time and manually. The kitchen layout has nothing to do with the cooking time of sushi and sashimi. Therefore, remodelling of the kitchen layout did not reduce the sushi and sashimi cooking time. Apparently, improving the average cooking time immediately after remodelling and that 2 months later are attributable to the skill of the sushi chef.

4.2 Results of Questionnaires (ES)

As Table 3.1 shows for kitchen equipment, responses obtained immediately after remodelling evaluation are worse than those for existing kitchen layouts. As explained in section "Improving cooking time (MS)", kitchen staff members become accustomed to the existing kitchen layout and cannot cook smoothly with the remodelled kitchen layout. Therefore, they did not report that the remodelled kitchen improved cooking operations.

By contrast, kitchen staff members reported that the remodelled kitchen equipment improved cooking operations compared to the existing kitchen layout, 2 months after remodelling. As discussed in section "Improving cooking time (MS)", kitchen staff members gradually became accustomed to the remodelled kitchen. They also continuously improve the placement of kitchen utensils and ingredients. Two months later, they reported that the remodelled kitchen layout improved cooking operations compared to the existing kitchen layout. The facility layout depends closely on workability. It is therefore an important factor for the fatigue burden for kitchen staff members. Improving the kitchen layout also improves employee satisfaction, not only management satisfaction.

As Table 3.1 shows for the job motivation and job satisfaction for the HR system, responses to questions B-1 and B-2 worsen immediately after remodelling and improved 2 months after remodelling. By contrast, answers for B-3, B-4, and B-5 worsen immediately after remodelling and 2 months after remodelling.

Staff members understand the purposes of the salary and promotion system. They feel their salary is reasonable for the skills and job. However, they do not want to master cooking skills of another kind to earn a higher salary. As explained before, four staff members are skilled chefs (full-time workers). Most part-time workers of restaurant A are older staff members.

Promotion and salary systems are important for unskilled workers because, if they master new cooking skills, they can receive a higher salary. It is also important for younger workers because they can master new cooking skills earlier. However, the system is meaningless for skilled workers because they have already mastered a full range of cooking skills. Therefore, they can receive a higher salary. Moreover, it is difficult for older staff members to accept the challenge of gaining new cooking skills. Therefore, responses for B-3, B-4, and B-5 did not improve at restaurant A.

5 Conclusions

This study was conducted to improve both management and employee satisfaction. The restaurant A kitchen was redesigned using a kitchen simulator to enhance cooking time and to improve the staff member working environment. The remodelled kitchen includes a cell module to improve the cooking idle time. Salary and promotion systems are changed to encourage staff members to obtain various cooking skills to adopt new cooking operations (cell module). Cooking times were measured three times (existing layout, immediately after remodel, and 2 months after remodel) as KPI for confirming the efficacy of the redesigned kitchen. Questionnaires were administered to assess employee satisfaction. Results show that the remodelling of the kitchen layout using a kitchen simulator is useful to enhance the cooking speed of a multiproduct Japanese cuisine restaurant. Actually, the cooking speed worsens immediately after remodelling because staff members are not accustomed with the new kitchen layout. Furthermore, employees report that the remodelled kitchen layout is better than that of an existing kitchen and that the new salary system is reasonable for them, but they do not want to improve their skills because of their age and experience (some are already multiskilled workers).

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