

南華大學九十四學年度 博士班 招生考試試題卷

系所別：管理科學研究所 博士班

科目編號：C2-01-01

科目：管理論文評析(二) 【第二篇 / 共二篇】

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試就 “Impact of process change on customer perception of waiting time : a field study”
論文，回答下列三個問題（共計 50 分，請以中文作答否則不予計分）。

- (1) 根據上述論文簡要說明相關學者對 actual and perceived waiting time 之觀點？(20 分)
- (2) 本篇論文主要探討的內容及其研究成果為何？(20 分)
- (2) 比較本篇論文與相關學者之研究的主要差異。(10 分)

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Impact of process change on customer perception of waiting time: a field study

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Abstract

Studies in process change have focused on the improvement of operational performance measures such as the actual waiting time of a service system. However, process redesign may not only change the actual waiting time but also have significant impact on perceived waiting time. We examine how process changes affect customer perceptions on waiting and customer satisfaction. We describe a field study in which customer waiting times, both actual and perceived, were measured and compared before and after a process change. Our results show that process changes can have significant impact on customer perception of waiting time as well as the actual waiting time. This study illustrates the benefit of piloting a proposed process change and measuring key process performance and customer assessment prior to implementation.

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Keywords: Customer satisfaction; Field study; Perceived waiting time; Process change; Waiting line

1. Introduction

Process changes can bring about improvements in the operational performance measures such as average waiting time. However, customer satisfaction may not be realized from such improvements if they are not perceived by the customers. In this study, we examine the effects of process change on perceived waiting time and customer satisfaction. Our study shows that process changes can have significant impact on customer perception of waiting time.

In any high-contact services where customers must be present, waiting is inevitable due to uncertain and fluctuating demands. Conceivably, service providers can increase capacity by employing more people and investing in more facilities to reduce waiting time but it still would not be economically feasible to completely eliminate waiting. Increased competition in the marketplace, however, demands service providers to continuously improve service quality

and customer satisfaction. The amount of waiting time has been shown to negatively correlate with customer satisfaction [1]. Extended waiting has been cited as an important source of customer dissatisfaction in many service industries [2]. Further, customer evaluation of service quality is partly determined by how long they have waited for the service. As a result, many companies in the airline and restaurant industries have included waiting time as a measure of service quality [3].

Service providers are paying more and more attention to service process design and experimenting with alternative service configurations. For instance, retail stores have widely adopted the express checkout system in which one or more checkout lines, designated as express lines, are converted to serve only those customers with small number of items, typically less than 12 items. The express lines can serve more customers in any given time period than regular checkout lines. By cutting down the waiting time for customers with fewer items, the express checkout system helps to reduce the average waiting time of the system, as well as the average length of the waiting line. The focus of such process redesign has been the reduction of average customer

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waiting time partly because it is relatively easier to measure and model.

Process redesign may not only change the actual waiting time but also have significant impact on perceived waiting time. Recent studies on psychological aspects of waiting line suggest that perceived waiting time is a more accurate predictor of customer satisfaction and it is often quite different from the actual amount of time customers spent in waiting, depending on why, how, and what customers are waiting for [4]. In Disney World, for instance, a number of popular rides make visitors wait for at least 45 min to take a 3-min ride but most visitors are quite satisfied with their experience. This is because the distractions employed by Disney make visitors feel that they did not wait that long.

Researchers have explored various ways of influencing customers' perceived waiting time, including changing service environment [5], engaging customers during the wait [6], and providing feedback about expected waiting time [7]. Process changes such as the deployment of express lines may on the one hand reduce the perceived waiting time by making the waiting environment look less crowded due to reduced average waiting line length. On the other hand, the violation of "first come, first serve" rule may create the perception of "social injustice" [8] and cause perceived waiting time to increase among those customers who are not eligible for the express lines. Thus far, there is no empirical study that has explicitly investigated the impact of process change on perceived waiting time.

In this study, we examine how process enhancements affect customer perceptions on waiting and customer satisfaction. We report a field study in which express lunch service was introduced in a gourmet pizza restaurant to alleviate the lunchtime crowding problem. Customer perceived waiting time and their satisfaction were measured both before and after the process change. Our results show that express lunch service created two distinct groups of customers with very different perceptions on waiting time although the overall customer perceived waiting time and satisfaction were not changed before and after the new service introduction.

2. Related literature

In this section, we provide a review of studies on the differences between actual and perceived waiting time and the theories on how the perceptions of waiting can be changed.

Reducing customer waiting time has been an important topic of study in disciplines such as management science, operations research, and operations management. The focus of the research was the reduction of actual customer waiting time through modeling various queuing disciplines and optimizing service-queue operations. A comprehensive review can be found in [2].

Another stream of research examines the waiting line problem from a psychological perspective. It suggests that customer service experience is affected not only by the actual

waiting time but also by the perceived waiting time. Hornik [9] explored the relationship between perceived and actual waiting times with different types of waiting lines in various service outlets, including a supermarket, a department store, and a bank. He found that customers tended to overestimate actual waiting time across different types of lines. Personal characteristics such as enjoying shopping and frequency of using a service did not change their perception of waiting.

Maister [10] contended that both customer perception and expectation about a service operation play a role in determining customer satisfaction. Each customer has certain expectation about a service operation. If she perceives the service has exceeded her expectation, then she will be a satisfied customer. Thus, customer satisfaction can be influenced by adjusting customer expectations and/or their perceptions. Following this reasoning, Maister [10] postulated eight principles of waiting psychology. These principles were later used as a basis for a number of empirical studies [11].

In a study of bank branches, Katz et al. [5] found that perceived waiting time and "reasonable" waiting time increased as actual waiting time increased. Their study also showed that overall satisfaction decreased as perceived and actual waiting times increased. Tom and Lucey [12] compared customer perceived waiting time and its impact on satisfaction under different store environment (busy vs. slow) and server quality (faster vs. slower) conditions in a supermarket chain. Consistent with Hornik [9], Tom and Lucey [12] found that customers tended to overestimate the actual waiting time. It showed that customer satisfaction was determined by perceived waiting time not actual waiting time and perceived waiting time influenced satisfaction with the server but not the store.

Customer perceived waiting time is influenced by various factors in a service environment. Baker and Cameron [13] advanced an integrative model that provided a comprehensive list of service environment variables that might affect customer perception of waiting. It was suggested that service environment variables could influence the perception of waiting time by either changing customer perception of time or their perception of queue. They proposed that spatial layout, queuing progress, and social justice were the variables that might impact customer perception of queue. Variables related to time perception included music, lighting, color, employee visibility, filled time, and social interactions. Playing music was found to have positive effects on customer emotional response to the wait and the service organization although positive valenced (mood) music resulted in more positive response than negatively valenced (mood) music [14]. However, playing music did not change customers' perceived waiting duration, which was negatively correlated to customer satisfaction. Katz et al. [5] introduced a clock and a newsboard into a bank branch waiting line. The results showed that neither the newsboard nor the clock significantly changed customer perception of waiting although customers tended to overestimate their wait less when there was a clock.

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After an extensive survey of existing literature, Nie [4] identified five relevant theories that could be used to explain why perceived waiting time would be different from actual waiting time. The assimilation-contrast theory suggests that when people recognize a discrepancy between their perception and expectation, such a discrepancy is often magnified. On the other hand, if people perceive their expectation has been met, then any differences between perception and expectation are minimized. The implication of this theory on waiting line is that there may be an acceptable region in which customers are relatively indifferent in how long they have to wait. However, outside that region, customers may feel they have waited much longer than the actual time.

Hui and Zhou [7] conducted a laboratory experiment in which university students were instructed to use an online course registration system with system delay. Under one condition, students were informed about how long the delay was going to be and under another there was no delay information. The results showed that delay information did not change students' perceived waiting time but students felt they had more control over the wait. Providing delay information also reduced students' dissatisfaction with the delay. However, the effectiveness of delay information is related to the length of the wait [15]. When the wait was very long, the information tended to become less effective because the information appeared to raise students' concern with time loss incurred by the delay. Debe and Schmitt [6] divided a typical waiting experience into preprocess, inprocess, and postprocess phases. They found that customers who encountered an inprocess wait perceived the duration of wait to be significantly longer than those customers who encountered the same length of wait during the preprocess and postprocess phases.

The attribution theory argues that people want to know the reasons or the causes for any undesirable events. So, if customers know and understand why they are waiting, they tend to accept the wait. Similarly, customers are willing to tolerate longer waits if the service is significant and important to them. Hui et al. [16] distinguished service delay into two types: procedural and correctional. Procedural delays were part of the normal service operation and would not threaten the completion of service. For example, customers had to wait because there were other customers in line ahead of them. Correctional delays referred to unusual events that might prevent customers to reach their service goal. A broken cash register in a supermarket would be an example of the correctional delay. Hui et al. [16] found that the further away a procedural or unknown delay occurred from the goal state of the service, the longer customers' perceived waiting time would be. However, the closer a correctional delay occurred from the goal state, the longer customers' perceived waiting time would be.

Meyer [17] assessed the impact of goal attractiveness and distance from the goal on waiting time perception. The study found that customers who regarded the goal as very important estimated their distance from the goal to be shorter

than the distance estimated by those customers who did not regard the goal as important. Customers with low goal orientation underestimated the time it would take to reach the goal when away from the goal and to overestimated it when they came closer.

Stress management theory suggests that people under physical and/or emotional stress tend to feel any wait to be longer than usual. Several studies have included stress level as a potential mediating factor between perceived waiting and customer satisfaction [5]. However, its impact on perceived waiting has not been conclusive. Finally, since a waiting line may be viewed as a social system, social injustice may have effects on customer perception of waiting [8]. Social injustice in waiting is defined as any violation of the first-in and first-out rule. A customer skips in line when he receives service in front of those arrived before him. Such skips are often viewed as unfair and causes resentment among other waiting customers. Unless it is explained and justified, customers are likely to feel their wait has been unnecessarily extended by the violations of the First-in-first-out (FIFO) rule.

3. Service process design and perceived waiting time

Service process design is an important way that businesses use to improve service operations and reduce customer waiting [3]. Process design decisions such as the number of lines to be formed, how customers join waiting lines, and how each line is served play a major role in determining how long customers have to wait for service and consequently its service quality [2]. For each service, there are some alternative process designs that can be used to deliver the service. Different service process designs may exhibit varying abilities of dealing with server flexibility, demand fluctuation, and customer arriving patterns [3].

In addition to waiting time, it is also conceivable that service process designs may have an impact on customer expected and perceived waiting time. Thus, when considering service process change, we should not only evaluate its effect on actual average waiting time but also consider its impact on customer perceived waiting time.

In this paper, we report the results of a study that compared customer perceived waiting time and their satisfaction before and after a process change in a gourmet pizza restaurant. This restaurant has a limited menu that focuses on serving a variety of gourmet pizza, primarily by the slice. We hypothesized that the new service process would alter the expected and perceived waiting times and customer satisfactions levels. The old and new processes are described below.

3.1. Old process

The old service process required customers to wait in a FIFO line to place an order for the pizza slices desired.

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Customers could choose from among the variety of pre-cooked pizzas that were on display. Once the order was placed, the selected slices of pizza were put in an oven to be reheated. The customer then continued to move along the line and waited to pay for the order. While waiting for the pizza, the customer could obtain a drink through self-service. Once the pizza slices are finished heating, they are placed on the counter for pickup and then the customer either exits the restaurant or finds an available table. There is usually one person working the register and either one or two employees taking orders.

3.2. New process

With the permission of the manager, an "Express Lunch" was instituted that is similar to the value meals that many fast food restaurant chains offer. Four express meal options were available: one slice of a regular pizza and a drink, two slices of a regular pizza and a drink, one slice of a gourmet pizza and a drink, and two slices of a gourmet pizza and a drink. On any given day, the choices of regular and gourmet pizzas offered as part of the express lunch were limited to the most popular varieties. In addition, a small discount was given if an express lunch option was ordered. The introduction of the express lunch required certain process changes. Express Lunch customers were routed to a separate line where they placed and paid for their order. An employee with access to a second cash register staffed this line. For those customers who remained in the original line and did not order an Express Lunch, the process described in phase 1 was followed.

This redesigned process was selected because it was thought to offer the following benefits:

1. Reduced waiting times for all customers due to shorter lines and less time spent deciding on which pizza to order,
2. An improved match between the production and demand of pizzas, and
3. The possibility that additional sales volume would be generated because of the reduced waiting time, and that the added revenue would likely more than compensate for the added labor cost.

4. Data collection method

The data for this study was collected during weekday lunch periods (approximately, 11:30 AM to 1:30 PM) over 2 months. There was a gap of several weeks between collecting data for the old and new processes in an attempt to mitigate the Hawthorne effect. Research assistants took part in the data collection. One research assistant unobtrusively recorded on a card the actual time a customer entered the line to place an order. This card was then passed to one of several other research assistants. When the customer received his/her order, the research assistant recorded that time and then approached the customer to ask several questions

about the perceptions of waiting. The following questions were used for that purpose.

1. How much time did you expect to wait upon entering the line?
2. How long did you think that you waited in line?
3. On a scale of 0-100, how satisfied are you with the amount of time that you waited in line?

Customer answers were recorded on the card. We define customer's waiting time as the gap between the point when a customer enters the queue and the moment the order is received. Alternatively, it would also be plausible to measure the waiting time in two segments by separately tracking the waiting time to place order and the waiting time to pick up the order. In this study, we chose to measure the overall waiting time. For the customer satisfaction measure, we used a 0-100 scale instead of Likert scale so that it is consistent with other performance measures that are based on cardinal scales. This allows us to directly calculate the means and to perform statistical analysis. Data were collected for 81 customers for the old process and 125 customers for the new process. Of the 125 customers for the new process, 64 used the regular service and 61 were Express Lunch customers.

5. Results

This section presents the results of statistical analysis. Table 1 shows the means and standard deviations of actual waiting time, perceived waiting time, expected waiting time, and satisfaction by service processes. Within the new service process, we further divide customers into two groups; those went through the express lunch line and those went through the regular line. On average, customer perceived waiting times were less than the actual waiting time across service processes. Customer expected waiting time were higher than both the actual waiting time and perceived waiting time. The average scores of customer satisfaction were over 90 out of 100, which is rather high.

Pearson correlation coefficients between the performance measures are presented in Table 2. As expected, actual waiting times were found positively correlated with perceived waiting time in the old process ($r = 0.39$) as well as in the new process ($r = 0.48$). Customer satisfaction was found negatively correlated with actual waiting time and perceived waiting time in both old and new processes. Also, for both processes, expected waiting time was correlated with perceived waiting time but was not correlated with actual waiting time. The latter result might be interpreted as follows. The expected and perceived waiting times were both subjective estimates of the actual service time, differing only in that one was made at the start of the process and the other at the end. Therefore, the lack of significant correlation between actual and expected time might be due to the fact that the expected waiting time estimate was made without the experience of the service process.

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Table 1
Means and standard deviations of the four measures

	Old process		New process				Overall	
	<i>n</i> = 81		Express line <i>n</i> = 61		Regular line <i>n</i> = 64		<i>n</i> = 125	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Actual waiting time (min)	5.32	2.08	4.68	1.56	4.66	2.09	4.67	1.84
Perceived waiting time (min)	4.11	2.01	3.21	1.70	3.95	2.43	3.59	2.13
Expected waiting time (min)	6.10	4.29	6.28	3.81	6.38	3.88	6.33	3.83
Satisfaction (0-100)	90.27	9.65	92.34	7.99	89.21	11.77	90.91	10.14

Table 2
Pearson correlation coefficients between measures

	Old process				New process			
	A	P	E	S	A	P	E	S
A	1.000	0.390 ^a <i>p</i> = 0.000	0.098 <i>p</i> = 0.385	-0.327 ^a <i>p</i> = 0.003	1.000	0.480 ^a <i>p</i> = 0.000	0.106 <i>p</i> = 0.239	-0.255 ^a <i>p</i> = 0.004
P		1.000	0.510 ^a <i>p</i> = 0.000	-0.295 ^a <i>p</i> = 0.008		1.000	0.275 ^a <i>p</i> = 0.002	-0.396 ^a <i>p</i> = 0.000
E			1.000	0.072 <i>p</i> = 0.526			1.000	-0.005 <i>p</i> = 0.957
S				1.000				1.000

A: actual waiting time, P: perceived waiting time, E: expected waiting time, S: satisfaction.
^aCorrelation is significant at the 0.01 level (2-tailed).

Table 3
Statistical results (*F* and *p* values) of ANOVA comparing old and new service processes

	Old process vs. new process (express)	Old process vs. new process (regular)	Old process vs. new process (overall)
Actual waiting time (min)	<i>F</i> = 4.008 <i>p</i> = 0.047 ^b	<i>F</i> = 3.555 <i>p</i> = 0.061 ^a	<i>F</i> = 5.473 <i>p</i> = 0.020 ^b
Perceived waiting time (min)	<i>F</i> = 7.916 <i>p</i> = 0.005 ^c	<i>F</i> = 0.184 <i>p</i> = 0.668	<i>F</i> = 3.056 <i>p</i> = 0.082 ^a
Expected waiting time (min)	<i>F</i> = 0.067 <i>p</i> = 0.796	<i>F</i> = 0.161 <i>p</i> = 0.689	<i>F</i> = 0.160 <i>p</i> = 0.689
Satisfaction (0-100)	<i>F</i> = 1.856 <i>p</i> = 0.175	<i>F</i> = 0.351 <i>p</i> = 0.554	<i>F</i> = 0.204 <i>p</i> = 0.652

^aSignificant at 0.10 level.
^bSignificant at 0.05 level.
^cSignificant at 0.01 level based on the results of one-way ANOVA.

The relationships between process change and various dependent measures were evaluated using one-way analysis of variance. The ANOVA results show that there were significant differences in actual waiting time between the old process and the new process as a whole (*F* = 5.473, *p* = 0.02), express line customers in the new process (*F* = 4.008, *p* = 0.047), and regular line customers in the new process (*F* = 3.555, *p* = 0.061). In terms of perceived waiting time, there were significant differences between the old process and the new process as a whole (*F* = 3.056, *p* = 0.082) and express

line customers in the new process (*F* = 7.916, *p* = 0.006). However, there was no statistically significant difference between the old process and the regular customers in the new process. No statistically differences were found for expected waiting time and customer satisfaction between the old process and the new process. All ANOVA results are summarized in Table 3.

A one-way analysis of variance was also conducted to evaluate the differences between customers using the express line and those using the regular line in the new process on

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Table 4
Statistical results (F and p values) of ANOVA comparing express line customers and regular line customers in the new process

	Express line vs. regular line
Actual waiting time (min)	$F = 0.004$ $p = 0.949$
Perceived waiting time (min)	$F = 3.859$ $p = 0.052^a$
Expected waiting time (min)	$F = 0.020$ $p = 0.889$
Satisfaction (0-100)	$F = 2.978$ $p = 0.087^a$

^aSignificant at 0.10 level based on the results of one-way ANOVA.

various dependent measures. The results showed that there were no significant differences in actual waiting time and expected waiting time between the two groups. However, customers using the express line perceived their waiting as much shorter than those using the regular line ($F=3.859$, $p=0.052$). At the same time, customers using the express line were more satisfied than those using the regular line in the new process ($F = 2.978$, $p = 0.087$). The complete results are shown in Table 4.

6. Discussions and conclusions

Our study confirmed that the new process improved customer waiting compared to the old process. On average, customers waited less time for service in the new process. This result is not surprising because additional resources, i.e., extra server and cash register, were employed in the new process. Customers in the new process also perceived that they waited less time than those in the old process. Prior studies have suggested that perceived waiting time is generally correlated to the actual waiting time [4]. Our result is consistent with those findings because the actual waiting time for customers in the new process in this study was less than those in the old process and we found a correlation between actual waiting time and perceived waiting time in both processes. However, in our study, the perceived waiting time was less than the actual waiting time for customers in both processes. It is contrary to findings of previous studies where customers tended to overestimate how much time they had waited for service [9,12]. This may be so due to the fact that the actual waiting time for our study was averaging 4-5 min, compared to 15-20 min wait in other studies.

Our study did not show any change in customer satisfaction between the old and new processes overall. Several previous studies have shown that perceived waiting time is negatively associated with customer satisfaction [5,12]. That is, the shorter customers perceive they have waited for service, the higher their satisfaction would be. Given that customers in the new process had lower actual waiting time as well

as perceived waiting time than those in the old process, one would expect customers in the new process would be more satisfied with the waiting. Surprisingly, this is not supported in this study. One possible explanation is that customer satisfaction was already very high with respect to the old process (over 90 on a 0-100 scale). Although the satisfaction score for the new process was slightly higher than the old process (90.91 vs. 90.27), the improvement in the new process was not enough to generate appreciable increase in customer satisfaction. This explanation is supported by the assimilation-contrast theory discussed earlier, which suggests that customers are indifferent about how long they have waited as long as it falls into an acceptable range.

Another possible reason lies with the two distinct groups of customers within the new process. The average actual waiting time for regular line customers in the new process was almost identical to that for express line customers but they perceived that they had waited much longer than express line customers. In other words, the new process improved actual waiting time for both express line and regular line customers. Regular line customers, however, did not perceive the improvement. What is more important is that the difference in perceived waiting time resulted in difference in satisfaction levels between express line and regular line customers. Express line customers might feel they got extra attention from the restaurant or perhaps the term "express line" suggested faster service. On the other hand, regular line customers might not want to take advantage of the express line service but they resented the fact that other customers might have received faster service. In any case, the net effect is that satisfaction level of customers in the new process as a whole was not improved over the old process.

Our study has several implications for managers as well as for future research. First, process improvement that reduces actual waiting time or even perceived waiting time may not lead to increased customer satisfaction. If improving customer satisfaction is the ultimate objective of process change, then it may not be necessary to implement such change, especially when there are significant costs associated with the process change. Therefore, when we evaluate the effects of a process change, we should not just focus on operational measures such as actual waiting time or waiting line length. Psychological measures such as perceived waiting time and customer satisfaction are sometimes more important indicators of process improvement.

Second, although there are several models in the literature that identify the factors that influence perceived waiting time, e.g., [13], there is no comprehensive model that addresses the relationship between perceived waiting time and customer satisfaction. This study did not show a direct link between perceived waiting time and customer satisfaction but we still believe perceived waiting time has an effect on customer satisfaction. It may be just one of the many variables that determine customer satisfaction. Other factors may include the quality of food, frequency of visits, and waiting time at other comparable service outlets. Such a

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model would help us better understand the role of perceived waiting time in process improvement.

Third, our study shows that the new effects of a process change are difficult to anticipate and process change may bring unintended results. In this case, the new process created two distinct groups of customers who had rather different service experiences from their visits. This may be the reason why there was not much improvement in customer satisfaction with respect to the new process. Therefore, it is important for managers to evaluate the effects of process change as thoroughly as possible. This study shows the benefit of piloting the proposed change and measuring key process performance as well as customer assessment prior to implementation.

The results from this study have to be interpreted with caution. As with most field studies, we have little control over the research environment and customer arriving pattern. We assume that customer arriving patterns remained the same before and after the process change. We also attempted to control certain variables, such as collecting data during weekday lunch hours, to maintain consistency between the two processes. The pizza restaurant used in this study is a kind of fast food service outlet. This raises the question whether the results can be generalized to other service operations. However, the methods used to evaluate the effects of process change are applicable to other service environments.

In summary, this study provided a methodology to evaluate the impact of process change on customer waiting time. It demonstrates that we should not only look at the impact of process change on actual waiting time but also its impact on perceived waiting time and customer satisfaction. Future research should involve replicating the method presented here to other service settings to determine the conditions under which the process change would lead to improved customer satisfaction. Another research direction involves developing a comprehensive model of customer satisfaction that includes waiting time as well as other process outcomes. In addition, future research is needed to determine the conditions under which process change is (or is not) more effective than other types of change (waiting line distractions such as music) in improving perceived waiting time and customer satisfaction.

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