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Research on Service Quality Management Evaluation

Taking a Restaurant as an Example

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***Abstract*—Under the modern and fierce competition system, there are many restaurants in the streets and alleys. In order to improve their competitiveness, restaurants should not only consider the price, but also improve their service quality. The paper starts with Six Sigma, a quality management method, and analyzes how to apply it to restaurants from the perspective of process capability index. It is found that applying the process capability index to service quality management is a very good control method. Firstly, this paper introduces the current research status of process capability indices, secondly introduces the basic form of process capability indices. Finally, through case study, the paper analyses how to apply process capability indices to service quality management, and then improve service quality.**

Keywords—process capability indeices; service quality; restaurant

I. INTRODUCTION

The rapid development of the service industry has increased people's unlimited material wealth, but also increased people's employment opportunities, which is conducive to social stability and civilized and harmonious development. More and more enterprises attach importance to the improvement of their service quality. Because good service quality can not only bring pleasure and relaxed experience to consumers in the process of consumption, but also urge enterprises to pay more attention to their own service quality and increase their profits and income. Therefore, if a company wants to be bigger and stronger, it needs more effective service quality management measures. Only when enterprises do well can the whole industry develop healthily and steadily. A restaurant is one of the most popular dining spots near a university. When students leave school or on weekends and holidays, customers come to restaurants one after another, bringing huge profits to restaurants, but also bringing a lot of complaints and bad reviews to restaurants. Because of the inadequate room and location of restaurants, and the service speed of service staff can not catch up with the flow of customers, more and more customers are waiting in restaurants, and the waiting time is getting longer and longer. More and more customers begin to complain. To some extent, this reduces the customers' willingness to eat, destroys the mood of consumers, and also causes losses to restaurants. Nowadays, restaurants play more and more diverse roles and become more important, but customers' waiting time is also prolonged. Today, time is money. How to shorten customer waiting time, reduce customer complaints and improve service quality has become an urgent problem to be solved.

The issue of restaurant service quality management has always been a research hotspot. This can be reflected in the publication of domestic and foreign journal articles. The focus of Yaw Ling Awi's (2014) study is to investigate the differences between the factors that influence Yangon's customers' intention to buy back XYZ restaurants [1]. Hsiang-Fei Luoh (2013) aims to assess the combined effects of physical environment, employee behavior and food quality on service quality, perceived value and satisfaction [2]. Guo Yijing (2011) took a restaurant as an example to construct a conceptual model of the relationship between service quality and customer satisfaction in a restaurant, and empirically studied the relationship between service quality and customer satisfaction [3]. Bao Shoujun (2012) conducted a survey of six representative restaurants using a questionnaire survey method, and empirically analyzed the impact of online reviews of restaurants on customers' willingness to turn back [4]. Zhang Zheng (2013) found out the problems of restaurant marketing strategy in service area, put forward a practical restaurant marketing strategy system, and provided specific operational ideas and framework [5]. Rao Pintong (2008) studied the relationship between customer satisfaction, trust and loyalty with theoretical and practical significance using catering service industry as a sample [6]. Xie Yimin (2008) chooses local flavor restaurants as the research object. Through IPA analysis, the author finds that there is a significant difference between

customer expectation and customer perception, and thus finds out specific aspects for local flavor restaurant operators to improve [7]. Yu Zhihua (2007) studied the role of service recovery paradox in customer relationship quality variables and gave an objective explanation to the conclusion [8]. Based on the SERVQUAL model, Zhu Lin (2017) used the Analytic Hierarchy Process (AHP) to analyze the weights of each index in order to find out the key factors affecting the service quality of chain restaurants, and to conduct an empirical analysis of Hooters restaurant [9]. It can be seen that the improvement of the quality management of restaurant service has never stopped, and it is carried out in various ways. From the perspective of process capability analysis, this paper intends to apply it to the study of restaurant service quality management.

II. PROCESS CAPABILITY ANALYSIS PRINCIPLE

The ability of a process to produce a product that meets quality requirements is known as the process capability (PC) of the process. It refers to process consistency and is the Six Sigma range of process standard deviation. The process capability indices (PCIs) are used to measure the extent to which a process can meet the performance requirements of a product [10]. It is worth noting that the assumption of process capability analysis is that the statistical process is controlled and the output must follow a normal distribution. Otherwise the statistics are meaningless.

The process capability indices are usually expressed in terms of C_p and C_{pk}. The formula for calculating C_p is as follows: $C_p = \frac{T}{6\sigma}$

Where T_U is the upper tolerance limit and T_L is the lower tolerance limit. $T = T_U - T_L$. It can be seen from the formula that the smaller the σ is, the larger C_p is, and the corresponding process capability is better.

The evaluation criteria of C_p is: when $C_p < 1$, indicating that the process capability is insufficient, improvement measures should be formulated to relax the tolerance and strengthen the inspection; when $1 \le C_p < 1.33$, the process capability is acceptable, we should use the control chart or other methods to monitor; when $1.33 \le C_{pk} < 1.67$, indicating that the process capacity is sufficient, the requirements for raw materials should be appropriately reduced, and the inspection work should be simplified; when $C_p > 1.67$, the process capability is too high, the inspection work should be simplified, and the equipment with lower precision grade should be appropriately considered, or the tolerance range should be reduced.

And C_{pk} represents the offset value generated by the process mean and specification standards. The formula for C_{pk} is as follows:

$$C_{pk} = \frac{\min\{T_U - \mu, \mu - T_L\}}{3\sigma} \quad \text{or} \quad C_{pk} = (1 - \frac{2\varepsilon}{T})C_p$$

The corresponding evaluation criteria of C_{pk} are: when $C_{pk} < 0.67$, indicating that the process capability is too bad, it is necessary to consider the redesign of the process; when $0.67 \le C_{pk} < 1.0$, it indicates that the process capability must be improved; when $1.0 \le C_{pk} < 1.67$, the process capability is in a good state and stable; When $1.67 \le C_{pk} < 2.0$, it means that the existing process capability can be maintained; when $C_{pk} \ge 2.0$, it means that the cost needs to be reduced.

Note: C_p and C_{pk} are determined by the magnitude and mean deviation of the process fluctuations under statistically controlled conditions. The difference between C_p and C_{pk} is that C_{pk} is a process capability index indicating an offset.

The steps of process capability analysis are roughly divided into the following steps:

- Develop a sampling plan to verify whether the process is stable;
- If the process is stable, test whether the data obeys a normal distribution;
- If the data obeys a normal distribution, calculate its process capability. If the data does not obey the normal distribution, see if it can be converted into a normal distribution, and then calculate the process capability index value.
- Evaluate process capability, identify process bottlenecks, and continually improve.

III. CASE ANALYSIS

According to the investigation, when a restaurant near a university is operating after class and during the weekend holiday, the waiting time of the customer is at least 10 minutes. The restaurant draws on various suggestions and promises customers a maximum of 16 minutes for waiting customers to eat. According to the survey, the average waiting time for customers to come to the restaurant is about 13 minutes. During a certain period of time, the restaurant received a total of 60 customers who came to eat. The waiting time of each customer is shown in “Table I”, where 0.5 in the table indicates half a minute. Please analyze the service quality of the restaurant from the perspective of process capability. And according to the results, please put forward the countermeasures which are beneficial to the operation of restaurants.

TABLE I. DATA TABLE

	Waiting time			$\overline{X}$	R
	X_1	X_2	X_3		
1	10.0	11.5	12.5	11.3	2.5
2	11.5	13.0	14.0	12.8	2.5
3	12.0	14.5	13.0	13.2	2.5
4	16.0	13.0	10.0	13.0	6.0
5	14.5	11.5	12.0	12.7	3.0
6	11.0	14.0	12.5	12.5	3.0
7	12.5	15.5	11.0	13.0	4.5
8	10.5	14.0	14.5	13.0	4.0
9	13.0	14.0	13.0	13.3	1.0
10	11.5	14.0	13.5	13.0	2.5
11	15.5	11.0	13.0	13.2	4.5
12	10.5	11.5	11.0	11.0	1.0
13	15.0	12.0	11.5	12.8	3.5
14	12.5	11.5	10.0	11.3	2.5
15	10.5	14.0	12.0	12.2	3.5
16	11.0	12.5	14.0	12.5	3.0
17	12.0	13.5	11.0	12.2	2.5
18	16.0	11.5	12.0	13.2	4.5
19	12.5	13.0	14.5	13.3	2.0
20	15.0	12.0	13.5	13.5	3.0

The first step is to determine if the process is controlled. The MINITAB software is used to draw the control chart to determine the fluctuation of the waiting time of its service and determine whether the process is stable. As shown in "Fig. 1".

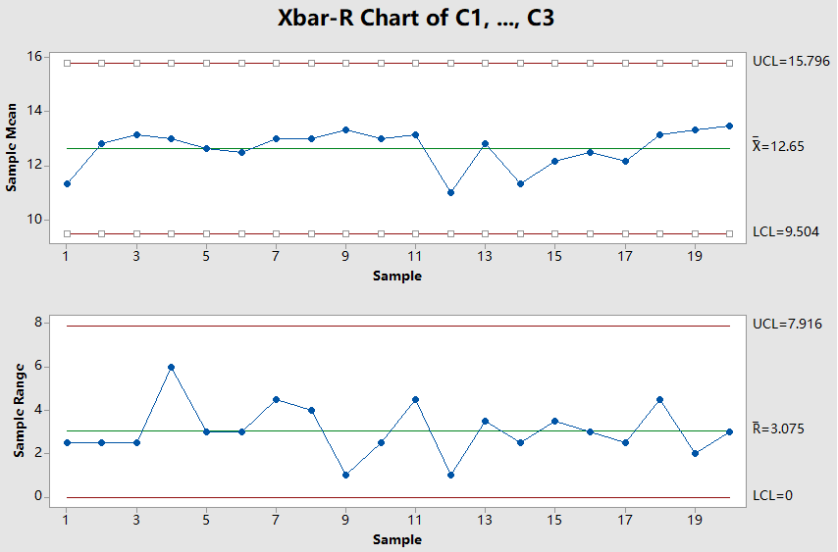

Fig. 1. Mean range control chart.

The range chart shows the fluctuations in the subgroup, reflecting the degree of fluctuation of the process under investigation. It can be seen from "Fig. 1" that the range of fluctuations of the customer waiting time is within the upper and lower control limits of the range chart; the mean graph shows fluctuations between subgroups and indicates the stability of the process. As can be seen from the above figure, the customer's waiting time does not exceed the specified range, and the mean is equal to 12.65. Therefore, the process is stable and controlled.

The second step is to judge whether the process conforms to the normal distribution. Use MINITAB software to make a histogram to judge the data distribution, and make a normal probability map to verify that the data obeys the normal distribution. As shown in "Fig. 2" and "Fig. 3".

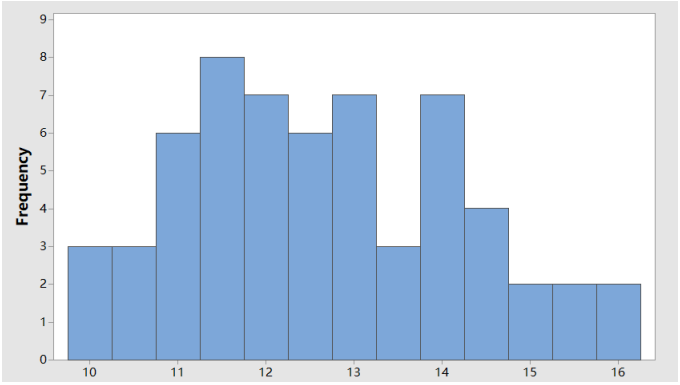

Fig. 2. Histogram.

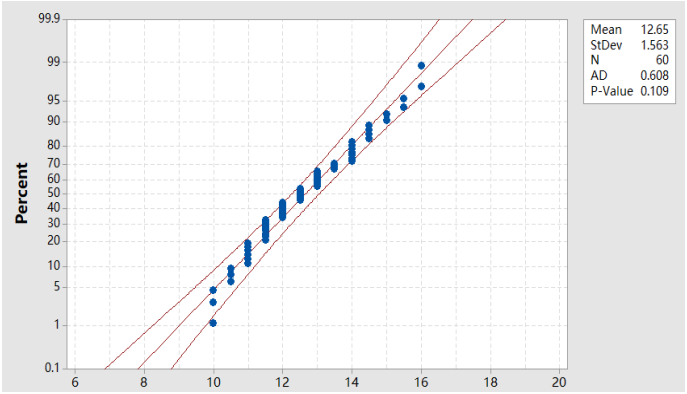

Fig. 3. Normal probability graph.

According to the histogram and the distribution of the normal probability map, it can be judged that the data is normally distributed.

In summary, the process is statistically controlled and the output follows a normal distribution, so process capability analysis can be performed. As shown in “Fig. 4”.

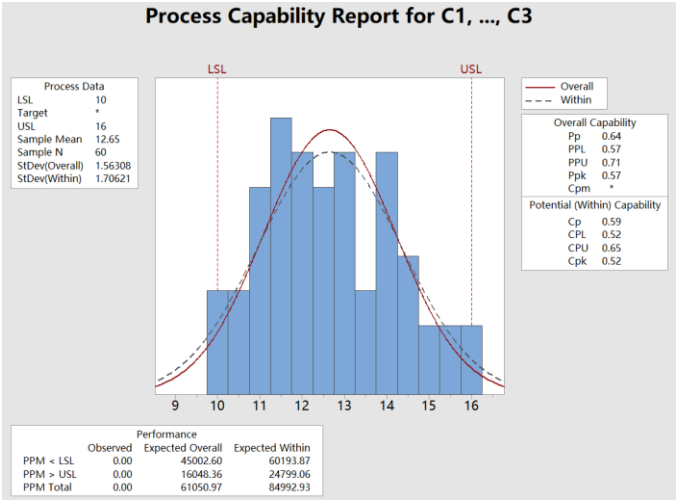

Fig. 4. Process capability diagram.

By the formula $C_p = \frac{T}{6\sigma}$ and $C_{pk} = \frac{\min\{T_U - \mu, \mu - T_L\}}{3\sigma}$, and contact case can know:

T_u = upper Specification limit= 16 minutes;

T_L = Lower specification limit=10 minutes;

μ = average value=12.65 minutes.

$\sigma = \sqrt{\sum_{i=1}^{n} (x_i - \bar{x})^2 / (n-1)}$

x_i is the individual measured value, $\bar{x}$ is the mean of all measured values, $\bar{x}$ and μ are equal, and n is the total

number of all measured values. In this case, σ reflects the volatility of the wait time of the restaurant customer. If the volatility is too large and exceeds the statistical control state, it may cause customer dissatisfaction and complaints. The smaller the σ, the better it is. The smaller σ, Indicates that the difference between the data is smaller, and the data is more concentrated. According to the software calculation, σ is about 1.5.

$Cp = 0.59$, and $Cpk = 0.52$, with reference to the C_p and C_{pk} evaluation criteria, it can be seen that both are small and the difference between the two is small, indicating that the main problem of customer waiting time is that the standard deviation is too large, and the improvement process should focus on reducing the process fluctuation. Therefore, restaurants want to improve their process capability and quality of service, need to improve the problem of waiting too long, reduce the average waiting time, and reduce the fluctuation of waiting time.

In response to this problem, this paper specifically proposes the following countermeasures:

- According to the operating efficiency and popularity, restaurants should consider adding branches. In the vicinity of the University city, managers should choose a good location, provide the same food tastes or develop new tastes as the old ones, attract new and old customers, and divert the meal rate of the old shops to a certain extent.
- Restaurants should open online booking service, once full, the booking service is closed. As the saying goes, wine is not afraid of deep lanes. In today's society, although this proverb has its inappropriateness, it also has its own reasons. As long as the taste is good, there will be an endless stream of customers coming to dinner. In the long run, it will be beneficial to the development and growth of restaurants. But it would be unwise to blindly pursue traffic to increase restaurant revenue.
- Do a statistical analysis of the previous meal data and summarize the rule of passenger flow. Taking advantage of the location of the restaurant and hiring hourly workers, to a certain extent, this will not only reduce the pressure of poor students, but also reduce the waiting time of customers during peak hours.
- Use regular free time to strengthen employee training and improve employee productivity. The efficiency of employees directly affects the waiting time of customers, and employees with high efficiency can greatly reduce the waiting time of customers. Therefore, the restaurant should often organize employee training activities to enhance the employee's business proficiency.

IV. CONCLUSION

Through a more scientific approach, the restaurant manager discovered important issues in the quality of the restaurant's services. Through the discovery of the problem, combined with the specific conditions of the restaurant, managers choose specific and targeted measures to improve, which greatly shortens the waiting time of customers, reduces the probability of customer complaints, and improves the quality of service and satisfaction. This is conducive to the stable and healthy development of restaurants. As the main monitoring index in statistical process control, process capability index is becoming more and more important in actual production and service. This paper applies process capability indices to the study of service quality in restaurant field. Of course, it can also be applied to more service areas and problems to promote the development of this field.

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