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Abstract. This study investigates the role of automated barista robots in improving service quality and customer experience in retail businesses. With increasingly sophisticated technology, robotic systems are changing customer interactions. Although automation technology is becoming popular in various countries, most of the research is still limited regarding the use of Barista Robots in influencing customer experience. This research aims to investigate and find out how automated barista robots' supportive interactions affect customer experience (CE) in coffee shop in Business retail, then to find out service delivery (SD) mediates the relationship between service robot quality (SRQ) and perceived quality (PQ). The novelty of this research is customer interaction and customer experience when using Barista Robot services. This research uses a quantitative method where data is collected with a questionnaire survey with statements using a Likert Scale using negative options on one side, neutral, and positive options on the other side. The data collected was then analyzed using SEM-PLS for analysis with mediating variables. The results of the study show that SRQ does not have a significant influence on CE but has an influence through SD, which is customer experience more influenced by customer perceptions of the services delivered by Barista Robots. Then, PQ has a significant influence on CE but does not have a significant influence through SD, meaning that customer perceptions of Barista Robots Technology through brand reputation and customer expectations have a more direct influence than service delivery.

Keywords: Service robot quality, Perceived quality, Service delivery, Customer experience.

1   Introduction

The restaurant business with the incorporation of automation technology has experienced technological developments in recent years[1]. One notable innovation is the use of automated robot baristas in coffee shops, which improve service quality and

efficiency by ensuring consistency[21]. These robots contribute to increasing customer interaction because customers are looking for unique experiences rather than the characteristic of the coffee shop itself [18]. Even though automation is becoming increasingly popular, most research has focused on how well the technology works and how automation leave a gap in influence customer experience [20].

Automated barista robots are already used in coffee businesses, making it essential to explore means these robots need to be explained on how the service robot quality can deliver good service delivery to customers. Thus, the new technology of barista robot needs to be explained about the perceived quality of the new tools to serve, so public would understand the impact of this barista robot to enhance customer experience. Customer experience is very important when the guest experience is positive then the guest will come back to buy the products that we offer so that the business can be sustainable. [21].

Previous studies that analyze the service robots, such as the implementation of robots at Hai Di Lao impact on business sustainability [16], Toyota's Human Support Robot for social interaction and learning [1], and concierge robots in smart spaces for the future of hospitality [20]. This research is made to explore how supportive interaction affects customer experience in coffee shops and how service delivery mediates the relationship between service robot quality and perceived service quality This research is interesting because it takes a comprehensive approach to investigate the psychological and social effects of automated robot baristas in a restaurant environment in addition to its operational features[21].

2 Literature Review

2.1 Retail Business in Coffee Shop Industry

Retail Business in Coffee Shop Industry is the activity of selling coffee ranging from coffee drinks, coffee beans, and products from processed coffee from all channels, including online merchants, specialist stores, and retailers. The industry focuses on creating the coffee experience itself beyond just the coffee bean product such as a cozy atmosphere, or service using technology[5].

2.2 Service Robot Quality

Service Robot Quality is the level quality-of- service robots to meet customer needs and expectations, including functionality, reliability, ease of use, social interaction, security, and design [7]. In the coffee retail business, barista robots are technological innovations that play an important role in improving operational efficiency, customer attraction, and product quality consistency. Robots with good quality can work efficiently and provide satisfactory experience for customers. These Service robots offer personalized service, interactions, and efficiency, which leads to higher customer experience.

Through improved service delivery, service robot quality indirectly boosts customer loyalty and satisfaction [11].

Based on the explanation, the hypothesis are.
H1: Service Robot Quality (SRQ) has a positive impact on Service delivery (SD).
H4: Service Robot Quality (SRQ) has a positive impact on Customer Experience (CE)
H6: Service Robot Quality (SRQ) has a positive impact on Customer Experience (CE) through Service Delivery (SD)

2.3   Perceived Quality

Perceived Quality refers to the customer's evaluation of food and beverage quality, shaped by their subjective expectations, experiences, and impressions of the robot's physical attributes [4]. This includes how well the robot meets customer needs, provides satisfying experiences, and demonstrates expertise in service and interaction t[9] In Retail Business in Coffee Shop Industry, customers evaluate the use of Automated Barista Robots in taking orders and serving beverage. Robots play a role in creating customer service in terms of accuracy, time efficiency, similarity to human baristas, and interactions with customers [3]. The relationship between perceived quality and service delivery emerges with the concept of "Theory of Mind" which is an understanding of the mental and emotional states that affect perceived quality depends on the ability to empathically adjust customers and customer expectations[20]. The concept of "Theory of mind" also related to customer experience where Barista Robots through interaction with customers in understanding customer needs which has a positive influence on long-term customer loyalty. Perceived quality is the initial assessment of service quality according to expectations and experiences through service delivery that delivered by Barista Robots to create experiences such as speed; efficiency; personalization, and customer experience[8].

Based on the explanation, the hypothesis are.
H2: Perceived Quality (PQ) has a positive impact on Service Delivery (SD).
H5: Perceived Quality (PQ) has a positive impact on Customer Experience (CE)
H7: Perceived Quality (PQ) has a positive impact on Customer Experience (CE) through Service Delivery (SD

2.4   Service Delivery

Service Delivery is the process of providing services to customers with the focus for customers to get services according to their needs and expectations. The service delivery process is very important to create customer satisfaction and maintain service quality in the restaurant business[15]. Technology can be implemented for service delivery using robots such as Barista Robots. Retail Business in Coffee Shop Industry adopts service technology using Barista Robots to serve drinks while ensuring consistent quality, speed, and efficiency especially during peak hours[16]. Service delivery is the process of delivering services that can use innovations such as technology or personalizing

services to customer needs that enable service providers to meet customer expectations and create customer satisfaction and experience.

Based on the explanation, the hypothesis is.
H3: Service Delivery (SD) has a positive impact on Customer Experience (CE)

2.5   Customer Experience

Customer Experience is the understanding and perception of customers based on all their interactions in accordance with their experiences[6]. In the retail business sector of the coffee shop industry, Customer Experience maintains a crucial role in attracting and retaining customers based on product quality, such as consistent coffee flavors and interesting menu options. In addition, the design and atmosphere of the place, such as comfort, the lighting, the music, and the smell of the coffee, have a significant impact on customer impressions[2]. Customer service that is prompt, courteous, and capable of offering advice, is also crucial in creating positive outcomes. By creating positive outcomes in various areas, the retail business sector of the coffee shop industry can build satisfactory experiences for customers and achieve success[20].
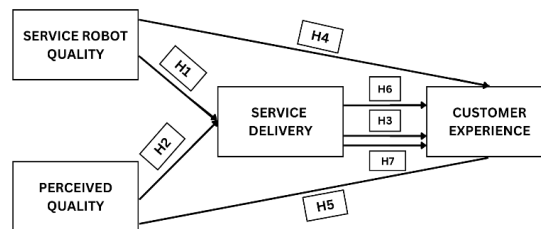

Fig. 1. Research Framework

3   Research Methodology

The appropriate approach is quantitative because the purpose of this study is to use objectively measured data from customer experiences in the use of Robot Barista by Retail Business in the Coffee Shop industry. Quantitative methods allow researchers to analyze data in the form of numbers objectively[11]. The appropriate population for this study is customers who have direct experience interacting with and using Automated Barista Robot at least once. This population is expected to provide a comprehensive view of their experiences and responses to this innovation. This research uses the Simple Random Sampling technique which aims to take random samples from a population. Total sample decided through Hair's Formula; total item equals 10 = 15 x10 = 150 samples[1]. The data collection method in this study will use a questionnaire survey. For this study, measurement will be using the Likert Scale that used to measure

customer preferences or experiences by assessing statements with scale 1 is very disagree, scale 2 is disagree, scale 3 is neutral, scale 4 is agree, and scale 5 is agree. And for 4 Variables, we have a total of 15 Indicators; For Service Robot Quality, the indicators are Reliability, Efficiency, Customization, and Appearance. For Perceived Quality, the indicators are Performance and Perceived Value. For Service Delivery, the indicators are Responsiveness, Consistency, and Accuracy. And for Customer Experience, the indicators are Emotional Response, Perceived Value, Service Quality, Overall Satisfaction, Convenience, and Loyalty [25][3]. Since this study includes a mediating variable—Service Delivery—, SEM-PLS (Structural Equation Modelling-Partial Least Squares) was the chosen data analysis method[17]. This method is highly effective in analyzing complex interactions when mediating or moderating variables are included in the model.

4   Results and Discussion

This research's target consists of 150 respondents, with a breakdown of 55.1% of female and 44.9% of male. The respondents were further divided based on occupation and age, where 50.3% student/college had the largest percentage, 21.6% private employee jobs, 12% entrepreneurs, 8.4% of civil servants, and 7.8% housewives. Then the respondents based on age where the largest percentage is owned by respondents aged 18-25 years at 59.9%, then 20.4% for respondents aged 26-33 years, 9.6% for respondents aged 34-41 years, then 7.8% for respondents aged 42-49 years, and the last is respondents aged 50 and 50 years and above with a percentage of 2.4%. The respondents also divided by how often they purchase coffee with Barista Robot service, where 41.9% are 1-2 times a week, 18% are 3-4 times a week, 13.8 % are 5-6 times a week and more than 6 times a week, and 12.6% are never purchase any coffee from Barista Robot service.

4.1   Measurement Model

Measurement model evaluations are used to measure unidentified latent constructs through observable indicators. Table 1 shows that Composite Reliability values ranging from 0.961 to 0.898, while the Average Variance Extracted (AVE) values range from 0.803 to 0.815, and the Cronbach's Alpha values range from 0.950 to 0.775. This shows that Composite Reliability and Cronbach's Alpha are > 0.7, it means all the variables are reliability and valid. This also shows the Average Variance Extracted (AVE) is > 0.5 means all the variables are valid[24]

Table 1. Validity Result

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
CE	0,950	0,961	0,803
PQ	0,775	0,898	0,815
SD	0,905	0,941	0,841
SRQ	0,884	0,921	0,744

4.2 Structural Model

The structural model evaluation used to measure the latent construct relationship that connects the cause and the effect of the relationship between variables.

Table II. Results of R2, F2, and Q2

PATH		F2	R2	Q2
PQ		0.516		
SP	CE	0.124	0.863	
SRQ		0.046		0.968
PQ	SD	0.115	0.770	
SRQ		0.445		
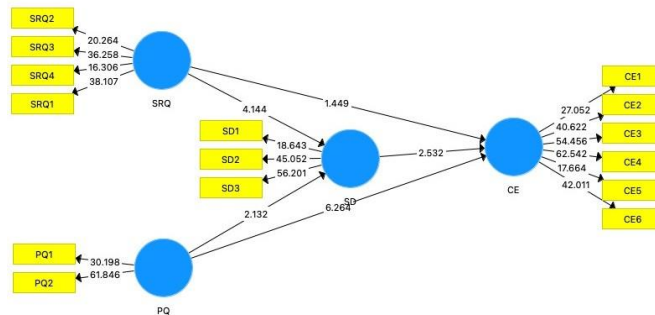
Fig. 2. Path Diagram

In SEM-PLS (Structural Equating Model - Partial Least Squares), effect size is used to measure the effect and contribution of variables with variables in the model that are influenced by one or more other variables and can be interpreted with 0> 0.02 is a small effect, 0> 0.15 is a medium effect, and 0> 0.35 is a large effect[23].

Table 2 content an effect size (F2). PQ has a large effect on structural model of CE as the value on PQ -> CE are 0.516 > 0.35, SD and SRQ has small effect to structural model CE as the value on SD -> CE are 0.124 > 0.02 and SRQ -> CE are 0.046 > 0.02. PQ has a small effect to structural model of SD as the value on PQ -> SD are 0.115 > 0.02 and SRQ -> SD are 0.445 > 0.35 has a large effect. The coefficient of determination (R Square) shows the variance in the dependent variable attributed to the two independent variables [18]. In this research, the coefficient of determination (R Square) is 0.863, which means representing three independent variables contribute to 86.3% of the variance in one dependent variable.

The Q square is a method for measuring the predictive relevance of an inner model. The assessment is based on a sample re-use technique in which it skips over a portion of the data matrix, evaluates the model's parameters, and predicts the missed element using estimates. The smaller the difference between projected and original values, the higher the model's Q square and, as a result, prediction accuracy[13]. This predictive relevant (Q2) indicates a relevant value with 0.968 > 0, as a result the structural model is effective in predicting Customer Experience (CE) and Service Delivery (SD). The result of path coefficient along with T-Statistics and P-Values is a relationship between variables in SEM-PLS model is presented in Table 3. The evaluation of significance is conducted through T statistics > 1.96 for confidence interval and P Value < 0.05 which indicates a significant relationship. From the table, we can conclude that H1, H2, H3, H5, and H6 is supported because T statistics > 1.96 and P Value < 0.05. While H4 and H7 are not supported because their T statistics are not > 1.96 and P Value is not < 0.05.

Table III. Path Analysis

	T Statistic (|O/STDEV|)	P Values	Result
H1: SRQ -> SD	4.144	0.000	Supported
H2: PQ -> SD	2.132	0.034	Supported
H3: SD -> CE	2.532	0.012	Supported
H4: SRQ -> CE	1.449	0.148	Not Supported
H5: PQ -> CE	6.264	0.000	Supported
H6: SRQ -> SD -> CE	2.746	0.006	Supported
H7: PQ -> SD -> CE	1.300	0.194	Not Supported

Based on Table 3, H1 shows that SRQ has a supported relationship with SD with T Statistic are 4.144 and P Value are 0.000, shows that advanced features, service speed, and consistency can influence service delivery and customer experience. While H2 shows that PQ has a supported relationship with SD with T Statistic are 2.132 and P Value are 0.034, indicate that customer perceptions of the quality of service provided will affect the overall quality of service delivery.

H3 shows that SD has a supported relationship with CE with the value of T Statistics are 2.132 and P Value 0.012, indicates that effective, consistent, and accurate service delivery can influence customer experience. Then H5 shows that PQ has a supported

relationship with CE with T Statistic are 6.264 and P Value are 0.000, shows that customer perception can involve customer engagement in recommendation on social media. H6 shows that SRQ has a supported relationship with CE through SD with T Statistic are 2.746 and P Value are 0.006, shows that the higher the service robot quality, the better the service delivery can influence the customer experience. Conversely, the lower the service robot quality, the lower the perceived service delivery.

4.3 Discussion

The results show that the measurement model has a high reliability, with construct values are higher than 0.7, and all variables are valid. Perceived Quality (PQ) has significant impact on customer experience (CE), which has more impact than service robot quality (SRQ), indicates an importance of customer perception in influencing their experience. The coefficient of determination shows both CE and SD are substantial which the results are 86.3% and 77% variability in SD explaining the effect of independent variables to customer experience. The predictive relevance (0.968) indicates a strong and reliable prediction. The previous research shows a different result in the relationship between servicescape and experiencescape in the service industry (Kandampully, 2023)[13] and the influence of perceived quality on customer experience across various industries (Xie, 2021)[24], this study shows that SRQ has a positive influence on CE through service delivery quality. The mediation results show that SD is not a mediating variable on PQ and CE which indicates that customer perceptions determine the customer experience without the need to go through the actual service delivery experience. Therefore, future strategies for enhancing customer experience in coffee shops should focus not only on technology but also on the service provided by that technology.

5 Conclusion

This research is made to find out how the supportive interaction of automated barista robots affects customer experience at coffee shop retail business, then find out service delivery mediates the relationship between service robot quality and perceived quality. This study found that customer experience is not only influenced by technology but also by the quality-of-service delivery and customer perceptions of Barista Robots' services. The limitation in this study is that there are variables that are aligned with Service Robot Quality but are not included in the model, namely Technology Acceptance (TA). With these limitations, future research is expected to use a larger and more diverse sample, as well as further research for coffee shops that also implement the use of Barista Robot technology. The author suggests that coffee shops in Business retail can be more detailed to maintain preventive equipment to avoid malfunctions in the service system that can create poor customer experience.

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