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From algorithms to attitudes: AI-driven service quality and sustainable consumer behaviour among millennial customers in quick service restaurants: Evidence from Berhampur City of Odisha

Saroj Kumar Dash [1,*], Sabyasachi Rath [2] and Prafulla Kumar Rath [3]

[1] *Assistant Registrar, Berhampur University, Bhanjabihar, Berhampur, Odisha, India.*
[2] *Professor, School of Management, NIST University, Berhampur, India.*
[3] *Lecturer in Commerce, Science College (Auto), Hinjlicut, Odisha.*

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Abstract

Artificial intelligence (AI) is increasingly reshaping the operational landscape of quick-service restaurants (QSRs) by improving service efficiency and strengthening customer interactions. This study aims to examine the key factors influencing AI-enabled service quality and their impact on customer satisfaction, with particular emphasis on the mediating role of perceived value within the SERVQUAL framework. The research is based on data collected from 459 millennial respondents using a structured questionnaire, with participants selected through simple random sampling. The findings indicate that dimensions such as tangibility, reliability and responsiveness significantly contribute to customer satisfaction, while perceived value serves as an important mediating variable in this relationship.

The results further demonstrate that AI-driven service quality positively influences customers' perceived value, which, in turn, enhances their overall satisfaction. This highlights the critical role of value perception in translating technological advancements into meaningful customer experiences. The study provides practical implications for QSR operators, suggesting that effective integration of AI technologies can streamline service delivery, optimise pricing strategies and improve brand communication, ultimately leading to higher customer satisfaction and loyalty. Additionally, future research may expand the scope by incorporating other SERVQUAL dimensions, such as empathy and assurance, to gain a more comprehensive understanding of AI-driven service quality in the QSR sector.

Keywords: Service Quality; AI Service Quality; Millennials; Quick Service Restaurants; Customer Satisfaction

1. Introduction

Artificial intelligence (AI) has significantly reshaped customer experiences in the Quick Service Restaurant (QSR) sector over the past few years. Beyond improving operational efficiency and enabling personalised services, AI can also encourage more sustainable consumption patterns. From a social psychology standpoint, AI-enabled service quality can influence customer satisfaction through the mediating role of perceived value. Additionally, by integrating environmental prompts and nudging mechanisms, AI systems can guide consumers toward eco-friendly choices. This interdisciplinary perspective connects technological innovation with environmental and behavioural insights, offering a deeper understanding of how to foster sustainable consumer engagement in AI-enabled dining environments.

The food service industry in Odisha, particularly the QSR segment, is experiencing rapid expansion and is estimated to reach approximately ₹9,500–₹11,500 crore by 2026, with projections of around ₹13,000–₹16,000 crore by 2029. This growth is largely driven by urbanisation, increasing disposable income and evolving consumer preferences for

* Corresponding author: Saroj Kumar Dash

convenience-oriented dining. Berhampur (Brahmapur), popularly known as the "Silk City of Odisha," exhibits a semi-urban yet rapidly evolving food service ecosystem. The market is predominantly dominated by unorganised and local restaurants, tiffin centres and small eateries, which together account for nearly 70–80% of the total food service landscape. However, the organised segment, particularly quick-service restaurants (QSRs), is gradually expanding and currently accounts for around 20–30% of the market. A defining feature of Berhampur's food service sector is its hybrid consumption pattern, in which traditional Odia cuisine coexists with Chinese, North Indian, and fast-food offerings, reflecting a blend of cultural preferences and modern influences. Although Berhampur is not as saturated with national and international QSR brands as larger cities like Bhubaneswar, it is steadily adopting the QSR model, particularly in commercially active areas such as Courtpeta, Gajapati Nagar, New Bus Stand Road and the recently emerged Janata City Centre. The presence of café-style outlets, fast-service restaurants and delivery-focused establishments indicates a gradual shift toward organized formats. These establishments often operate on hybrid models combining dine-in, takeaway and online delivery services, thereby aligning with evolving consumer expectations for speed, convenience and affordability.

The food culture of Berhampur plays a significant role in shaping its QSR market dynamics. The city's dietary preferences are largely centred on rice-based meals, seafood, and traditional breakfast combinations such as puri, idli, upma, and bara. Consumers typically prefer affordable, less oily, high-volume meals, which creates strong demand for budget-friendly food options. This cultural inclination has slowed the penetration of premium global QSR brands while simultaneously encouraging the growth of low-cost, high-efficiency local QSR formats that cater to mass consumption. Based on regional consumption trends, population size and the broader growth trajectory of the Odisha QSR sector, the food service market in Berhampur is estimated to have been valued at approximately ₹350–500 crore in 2024. With a projected annual growth rate of 10–12%, the market is expected to reach approximately ₹450–650 crore by 2026 and expand further to around ₹700–1,000 crore by 2029. This growth rate is slightly higher than the state average, driven by increasing urbanisation and rising consumer demand in this Tier-2 city.

Urban cities such as Berhampur are witnessing a surge in demand, especially among younger consumers who favour fast food for its affordability and time-saving nature. Popular QSR brands like KFC, Rolls Mania, Domino's and Pizza Hut dominate the market, reflecting the rising acceptance of organised fast-food chains. The growing competition in Berhampur, a densely populated urban hub, has intensified pressure on QSR operators to meet changing customer expectations, particularly those of millennials, who constitute a substantial share of the consumer base.

In this competitive environment, AI-driven service quality plays a crucial role in shaping customer satisfaction and perceived value. Service quality dimensions such as tangibility, reliability and responsiveness significantly influence customer perceptions and loyalty in the QSR sector. Tangibility relates to the physical ambience and consistency of food quality, while reliability refers to service providers' ability to deliver promised services accurately. Responsiveness captures how quickly and effectively customer needs are addressed. Any shortcomings in these areas can lead to dissatisfaction and negative behavioural outcomes. Perceived value, defined as the trade-off between benefits and costs, acts as a key link between service quality and customer satisfaction. As these service dimensions improve, customers tend to perceive greater value, thereby strengthening brand image and loyalty. However, existing research has not sufficiently examined the mediating role of perceived value in the relationship between AI-driven service quality and customer satisfaction, thereby creating a gap that this study seeks to address.

2. Literature review

2.1. Framework

This study is grounded in the SERVQUAL model developed by Parasuraman, Zeithaml, and Berry, which conceptualises service quality as a set of dimensions that influence customers' overall perceptions. With the increasing integration of artificial intelligence in service delivery, the present study extends the traditional SERVQUAL framework by focusing on key dimensions such as tangibility, reliability and responsiveness, which remain highly relevant in technology-enabled service environments. However, unlike the original model that primarily emphasized human interactions, this study incorporates AI-driven service elements, including automated systems, self-service kiosks and chatbots, reflecting the evolving nature of customer–service interactions.

Furthermore, the study proposes that perceived value acts as a mediating variable between AI-based service quality dimensions and customer satisfaction, offering a more comprehensive explanation of how AI influences consumer perceptions and attitudes. By integrating perceived value into the framework, the model captures how customers evaluate the benefits and costs of AI-enabled services. As illustrated in Figure 1, AI-driven service quality dimensions

influence perceived value, which, in turn, shapes overall customer satisfaction, thereby providing a deeper understanding of the customer experience in modern QSR settings.

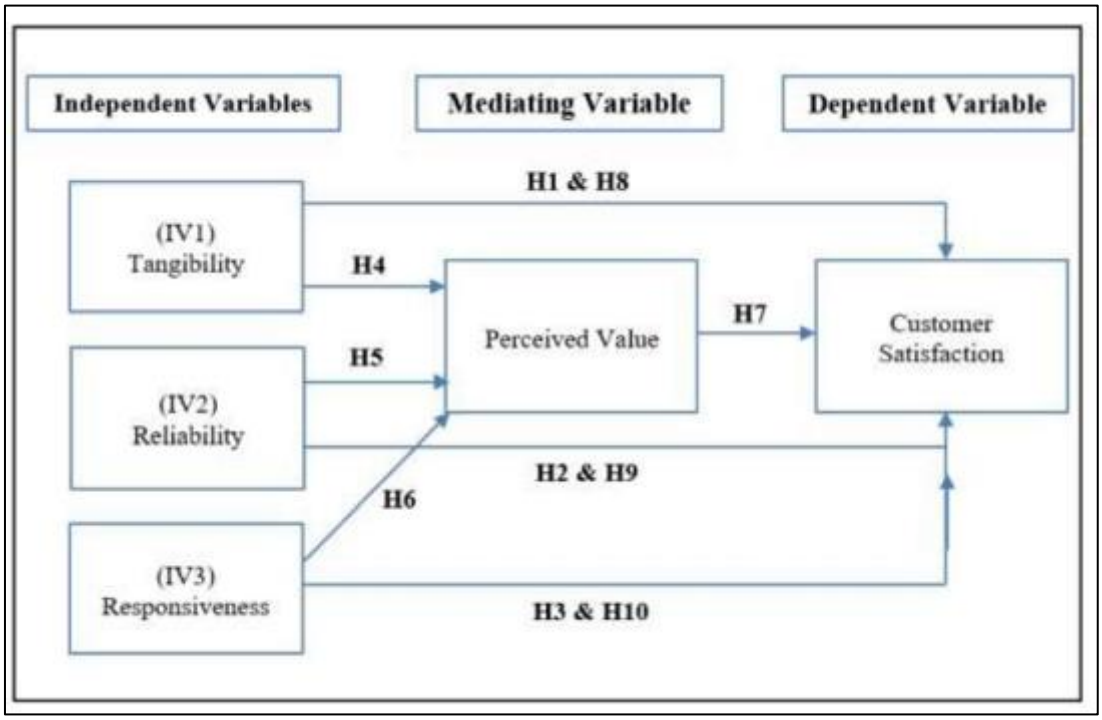

Figure 1 Conceptual framework

2.2. Service quality

Service quality can be understood as the extent to which a service offering aligns with and fulfils customer expectations. The SERVQUAL framework conceptualises service quality through five core dimensions tangibility, reliability, responsiveness, assurance and empathy. In the restaurant industry, integrating artificial intelligence (AI) can strengthen these dimensions, thereby improving customer satisfaction and overall well-being.

Tangibility encompasses both the physical setting and the digital interface through which food and services are presented. Reliability refers to a service provider's ability to deliver accurate, consistent performance over time. Responsiveness denotes the promptness and effectiveness with which customer needs and requests are addressed. In AI-enabled quick service restaurants (QSRs), these dimensions are increasingly supported and managed through a range of digital technologies.

AI-driven tools such as chatbots, self-service kiosks, augmented reality (AR) menus and facial-recognition payment systems are transforming traditional notions of tangibility by creating integrated “phygital” environments that blend physical and digital experiences. Reliability, often described as performing services correctly on the first attempt and maintaining consistency, is enhanced by AI applications such as automated ordering systems and predictive analytics. These technologies reduce errors in order processing, improve demand forecasting and minimise stockouts.

Additionally, AI-powered kitchen management systems contribute to operational efficiency by streamlining food preparation processes, ensuring timely service and maintaining food quality and safety standards. Chatbots and kiosks further improve reliability by limiting human errors in order-taking and offering immediate assistance when needed. Service robots, designed to replicate human interaction patterns, also help enhance customer engagement.

AI-enabled responsiveness significantly accelerates service delivery and enables more interactive customer experiences. This not only elevates satisfaction levels but also encourages positive word of mouth and brand advocacy, particularly among younger consumers.

2.3. Customer satisfaction

Customer satisfaction is commonly described as a consumer's evaluative response following the use of a product or service, indicating the degree to which expectations have been met, surpassed, or unmet. In the restaurant context, satisfaction is shaped by both functional and experiential factors, including tangible aspects such as physical infrastructure, employee presentation, interior design and other visible service cues. In quick-service restaurants (QSRs), integrating AI-enabled technologies such as smart kiosks, automated kitchen equipment, visually appealing store layouts and digital menu systems can significantly enrich the dining experience. These elements enhance perceived service quality and contribute to higher levels of customer satisfaction by creating a more efficient and engaging service environment.

Reliability also plays a crucial role in determining satisfaction levels. When QSRs consistently deliver accurate and dependable service that meets or exceeds customer expectations, perceived value increases, encouraging repeat patronage. AI-driven solutions, including online ordering platforms, automated food preparation systems and service robots, support this consistency by minimising errors and ensuring timely order fulfilment. As a result, the dependable performance facilitated by AI technologies strengthens customer trust and reinforces overall satisfaction.

2.4. Perceived value

Perceived value represents a customer's overall evaluation of the benefits received from a product or service relative to the costs incurred, including monetary expenditure, time and effort. Prior research suggests that a higher level of perceived value positively influences both customer satisfaction and loyalty. In the context of quick service restaurants (QSRs), perceived value is shaped by multiple factors, including pricing strategies, food and service quality and the convenience offered to customers.

The integration of AI-driven services, such as personalised recommendations, faster order processing and real-time order tracking, can enhance perceived value by delivering a more efficient and engaging customer experience without necessarily increasing costs. When these technologies meet or exceed customer expectations, consumers tend to perceive greater benefits relative to their investment, thereby strengthening satisfaction levels. Moreover, AI-enabled service quality can build trust and encourage repeat patronage by ensuring consistency, convenience and improved service delivery.

Despite the extensive literature on service quality and customer satisfaction in QSRs, several research gaps remain, particularly regarding AI-driven service dimensions and millennial consumer perspectives. Much of the existing research has focused on conventional determinants such as food quality, pricing and ambience, with limited attention to AI-related dimensions such as tangibility, reliability, responsiveness, assurance and empathy. Additionally, the mediating role of perceived value in the relationship between AI-driven service quality and customer satisfaction has not been sufficiently examined. There is also a lack of focused studies exploring millennial consumers' perceptions of AI-enabled services in specific regional contexts, such as Berhampur.

Addressing these gaps, the present study examines the impact of AI-enhanced service quality on customer satisfaction, with perceived value as a mediating variable and with particular emphasis on millennial consumers in Berhampur.

2.5. Research questions

- RQ1: How do the key dimensions of AI-enabled service quality—namely tangibility, reliability and responsiveness—affect customers' perceived value and their overall satisfaction?
- RQ2: To what degree does perceived value contribute to shaping customer satisfaction?
- RQ3: Does perceived value act as a mediating mechanism in the relationship between AI-enabled service quality dimensions and customer satisfaction?

3. Methodology

3.1. Research design

A quantitative research approach was adopted for this study. This method focuses on the collection and analysis of numerical data, employing statistical techniques to examine relationships and address the research problem systematically.

3.2. Population and sampling

The study primarily focuses on the millennial population in Berhampur. Millennials are commonly defined as individuals born between 1981 and 1996, corresponding to an age range of approximately 28 to 43 years. This cohort represents a substantial share of the city's population and constitutes a key consumer segment with considerable market influence.

A simple random sampling (SRS) technique was employed for data collection. This method ensures that each member of the population has an equal probability of selection, thereby reducing the likelihood of sampling bias and enhancing the representativeness of the sample.

To determine the sample size, a standard sample size estimation approach was adopted, which recommends a sample of 384 for populations exceeding one million. To address potential non-response or incomplete data, an additional 10% was included as a contingency measure. Accordingly, the final sample size for the study was fixed at 459 respondents.

3.3. Survey instrument

Data for the study were collected using a structured questionnaire. The measurement items were developed by adapting and adopting validated scales from prior research to ensure content validity and reliability. The questionnaire was organised into four sections: Section A captured the demographic profile of the respondents; Section B measured AI-driven service quality, encompassing the dimensions of tangibility, reliability and responsiveness; Section C assessed customer satisfaction and Section D evaluated perceived value.

3.4. Data collection

The questionnaire was administered to respondents via Google Forms, an online survey tool. Upon completion of data collection, the responses were exported to a spreadsheet for further analysis. The entire data collection phase spanned approximately four weeks. The selection of this period was carefully planned, taking into account factors such as major holidays and promotional events that could potentially influence consumer behavior and response patterns.

3.5. Data analysis

Descriptive statistics were employed to analyze the demographic characteristics of the respondents. Prior to conducting multiple regression analysis, the reliability and validity of the constructs were assessed by examining the internal consistency of their measurement items. Correlation analysis was subsequently performed to explore the relationships among the study variables. This technique enables the assessment of both the strength and direction of associations between variables, thereby providing insights into how variations in one variable may correspond with changes in another.

3.6. Research ethics

The study adhered to established ethical standards for research involving human participants. Informed consent was obtained from all respondents prior to data collection and their anonymity and confidentiality were strictly maintained throughout the study. Participants were also informed of their right to withdraw at any stage without any consequences. All collected data were securely stored to ensure privacy and prevent unauthorised access. The research was conducted with a strong commitment to ethical principles, ensuring integrity, accountability and transparency at every stage.

4. Results

4.1. Descriptive statistics

A total of 459 completed questionnaires were well-received. The demographic profile of survey participants is shown in Table 1 below.

Table 1 Demographic profile of the respondents: n=459

Variables	Parameter	N=459	Percentage (%)
Gender	Female	241	52.5
	Male	218	47.5

Qualification	HSC or below	122	26.6
	Graduate	250	54.5
	Post Graduate	50	10.9
	Others	37	8.9
Age Group	29-32 years	175	38.1
	33-37 years	126	27.5
	38-44 years	158	10.9
Frequency of Visiting QSR	More than four times per month	51	11.1
	Four times per month	99	21.6
	Thrice per month	110	24
	Twice per month	119	25.9
	Once per month	80	17.4
Income Level per Month	Below ₹10,000	34	7.4
	₹10,000–₹15,000	108	23.5
	₹15,000–₹20,000	118	25.7
	₹20,000–₹25,000	131	28.5
	Above ₹25,000	68	14.8
The Most Preferred QSR	Rolls Mania	77	16.8
	KFC	78	17
	Domino's Pizza	121	26.4
	Pizza Hut	74	16.1
	Wow! Momo	68	14.8
	Others	41	8.9

(Source: Collected through Primary Data)

4.2. Analysis of AI-driven service quality

A total of 241 respondents indicated that customers find it easy to navigate and place orders using AI-based digital menus in quick service restaurants. Additionally, 231 respondents agreed that these restaurants employ self-service ordering kiosks equipped with visually appealing digital interfaces. Moreover, 207 respondents strongly agreed that AI-integrated payment systems facilitate fast and error-free transactions.

4.3. Analysis of customer satisfaction

A total of 249 respondents reported that the level of service delivered through self-service kiosks or food delivery platforms meets their expectations. In addition, 241 respondents agreed that the presence of AI-enabled self-ordering kiosks or service robots enhances the overall dining experience and contributes positively to their enjoyment.

4.4. Perceived value

A total of 236 respondents reported that quick service restaurants incorporating AI technologies deliver enhanced value. Furthermore, 235 participants reported that engaging with AI-based services, such as self-service kiosks and chatbots for ordering, is an enjoyable experience. Table 2 summarises the coefficients of the principal constructs—namely, AI-driven service quality dimensions (tangibility, reliability and responsiveness), perceived value and customer satisfaction—derived from the empirical data.

Table 2 Coefficient of AI: AI-driven service quality components, perceived value and customer satisfaction for actual data collection

Variables	Case Processing Summary	N	%	Cronbach's Alpha	No. of Statements
Independent Variables					
Tangibility	Valid	459	100.0	0.876	7
	Excluded	0	0.0		
	Total	459	100.0		
Reliability	Valid	459	100.0	0.883	7
	Excluded	0	0.0		
	Total	459	100.0		
Responsiveness	Valid	459	100.0	0.874	7
	Excluded	0	0.0		
	Total	459	100.0		
Mediating Variable					
Perceived Value	Valid	459	100.0	0.895	7
	Excluded	0	0.0		
	Total	459	100.0		
Dependent Variable					
Customer Satisfaction	Valid	459	100.0	0.874	7
	Excluded	0	0.0		
	Total	459	100.0		

(Source: Collected through Primary Data)

4.5. Hypothesis Testing (Correlation Analysis)

H1: There is a significant relationship between AI-driven tangibility in Service Quality and Customer Satisfaction.

The Pearson correlation coefficient between AI-driven tangibility and customer satisfaction is r = 0.852, significant at the 0.01 level. Since the p-value is below 0.05, this indicates a strong and statistically significant positive relationship between AI-driven tangibility and customer satisfaction. Therefore, the first alternative hypothesis is accepted.

H2: There is a significant relationship between AI-driven reliability in Service Quality and Customer Satisfaction.

The Pearson correlation coefficient between AI-driven reliability and customer satisfaction is r = 0.888, significant at the 0.01 level. As the p-value is below 0.05, this indicates a strong, statistically significant positive association between AI-driven reliability and customer satisfaction. Accordingly, the second alternative hypothesis is accepted.

H3: There is a significant relationship between AI-driven responsiveness in service quality and customer satisfaction.

The Pearson correlation coefficient between AI-driven responsiveness and customer satisfaction is r = 0.873, significant at the 0.01 level. As the p-value is below 0.05, this indicates a strong and statistically significant positive relationship between AI-driven responsiveness and customer satisfaction. Therefore, the third alternative hypothesis is accepted.

H4: There is a significant relationship between AI-driven tangibility in service quality and perceived value.

The Pearson correlation coefficient between perceived value and AI-driven tangibility is r = 0.884, significant at the 0.01 level. Since the p-value is below 0.05, this indicates a strong, statistically significant positive relationship between AI-driven tangibility and perceived value. Accordingly, the fourth alternative hypothesis is accepted.

H5: There is a significant relationship between AI-driven reliability in service quality and perceived value.

The Pearson correlation coefficient between perceived value and AI-driven reliability is r = 0.914, significant at the 0.01 level. As the p-value is below 0.05, this indicates a very strong and statistically significant positive relationship between perceived value and AI-driven reliability. Therefore, the fifth alternative hypothesis is accepted.

H6: There is a significant relationship between AI-driven responsiveness in service quality and perceived value.

The Pearson correlation coefficient between perceived value and AI-driven responsiveness is r = 0.884, significant at the 0.01 level. As the p-value is below 0.05, this indicates a strong and statistically significant positive relationship between perceived value and AI-driven responsiveness. Accordingly, the sixth alternative hypothesis is accepted.

H7: There is a significant relationship between perceived value and customer satisfaction.

The Pearson correlation between perceived value and customer satisfaction is r =.899 at the significant level (0.01). Since the significance criterion is smaller than 0.05, perceived value and customer satisfaction are fully correlated. The seventh alternative hypothesis is thus accepted.

H8: There is a mediating effect of perceived value on the significant relationship between AI- driven tangibility in service quality and customer satisfaction.

The Pearson correlation coefficient between perceived value and customer satisfaction is r = 0.899, significant at the 0.01 level. The p-value is below 0.05, indicating a strong, statistically significant positive relationship between perceived value and customer satisfaction. Therefore, the seventh alternative hypothesis is accepted.

H9: There is a mediating effect of perceived value on the significant relationship between AI- driven reliability in service quality and customer satisfaction.

The reported Pearson correlation coefficient among AI-driven reliability, perceived value and customer satisfaction is r = 0.899, significant at the 0.01 level. As the p-value is below 0.05, this indicates a strong and statistically significant association among the variables. The findings suggest that perceived value plays an important role in linking AI-driven reliability with customer satisfaction. Therefore, the ninth alternative hypothesis is accepted.

H10: There is a mediating effect of perceived value on the significant relationship between AI- driven responsiveness in service quality and customer satisfaction.

The Pearson correlation coefficient among AI-driven responsiveness, perceived value and customer satisfaction is r = 0.899, significant at the 0.01 level. As the p-value is below 0.05, this reflects a strong and statistically significant association among the variables. The results indicate that perceived value plays a meaningful role in the relationship between AI-driven responsiveness and customer satisfaction. Therefore, the tenth alternative hypothesis is accepted.

4.6. Mediation analysis, Regression Analysis

The study used Hayes' PROCESS macro to determine the direct and indirect effects. Before accounting for mediation (Table 3), all three IVs (tangibility, reliability and responsiveness) showed a significant positive impact (tangibility, β=0.186, t = 4.125, p= 0.001) (reliability, β=0.420, t = 7.342, p= 0.001) (responsiveness, β=0.317, t = 6.600, p= 0.001) on customer satisfaction, indicating a direct effect.

Table 3 Regression Analysis of AI-driven service quality (tangibility, reliability and responsiveness) and customer satisfaction

Direct effect of IV on DV					
Predictor (IV)	Dependent Variable (DV)	Coefficient β (Beta)	t-value	p-value	Significance
Tangibility	Customer Satisfaction	0.186	4.125	0.001	Significant
Reliability	Customer Satisfaction	0.420	7.342	0.001	Significant
Responsiveness	Customer Satisfaction	0.317	6.600	0.001	Significant

(Source: Collected through Primary Data)

The proposition that perceived value may shape the relationship between the independent and dependent variables is reinforced by the finding that all independent variables significantly and strongly predict perceived value, as evidenced in Table 4.

Table 4 Regression analysis of AI-driven service quality and perceived value

Direct effect of IV on MV					
Predictor (IV)	Dependent Variable (DV)	Coefficient β (Beta)	t-value	p-value	Significance
Tangibility	Perceived Value	0.210	3.980	0.001	Significant
Reliability	Perceived Value	0.385	6.789	0.001	Significant
Responsiveness	Perceived Value	0.295	5.950	0.001	Significant

(Source: Collected through Primary Data)

Table 5 presents a regression model in which the independent variables (IVs) and the mediating variable (MV) are entered simultaneously to predict the dependent variable (DV). The results suggest partial mediation, as perceived value (MV) remains statistically significant, while the IV coefficients decline relative to those reported in Table 3. Although the effects of tangibility, reliability and responsiveness on customer satisfaction (DV) are attenuated, they remain significant even after accounting for perceived value. This pattern indicates that perceived value partially mediates these relationships, implying that tangibility, reliability and responsiveness influence customer satisfaction both directly and indirectly through perceived value.

Table 5 Regression analysis of AI-driven service quality, customer satisfaction and perceived value

Indirect effect of IV on DV through MV					
Predictor (IV)	Dependent Variable (DV)	Coefficient β (Beta)	t-value	p-value	Significance
Perceived Value (MV)	Customer Satisfaction	0.350	5.900	0.001	Significant
Tangibility	Customer Satisfaction	0.120	2.850	0.005	Significant
Reliability	Customer Satisfaction	0.290	5.400	0.001	Significant
Responsiveness	Customer Satisfaction	0.215	4.750	0.001	Significant

(Source: Collected through Primary Data)

5. Discussion

This study examined the impact of AI-enabled service quality dimensions on customer satisfaction in quick service restaurants (QSRs), considering perceived value as a mediating factor. The empirical results provide strong support for all proposed hypotheses, thereby validating the conceptual framework. The analysis further indicates that the three AI-driven service quality dimensions such as tangibility, reliability and responsiveness are positively and significantly associated with both perceived value and customer satisfaction.

In the Berhampur region, the adoption of AI-based tools such as self-service kiosks, robotic assistants and digital signage was found to substantially enhance perceived value among Millennial consumers, with correlation coefficients of r = 0.884 for perceived value and r = 0.852 for customer satisfaction. These findings suggest that the integration of advanced, visually engaging AI technologies fosters a perception of innovation and functional benefit, which resonates strongly with digitally oriented Generation Y users.

Moreover, the strongest relationships were observed in the domain of reliability, particularly in applications such as order processing and digital payment systems, where high correlations were recorded with perceived value (r = 0.914) and customer satisfaction (r = 0.888). This highlights the critical importance of ensuring trustworthiness and consistency in AI systems to enhance overall customer experience.

The second antecedent, responsiveness, exhibits a strong positive association with both perceived value (r = 0.884) and customer satisfaction (r = 0.873), indicating that consumers place considerable importance on prompt and personalized service delivery. Furthermore, the findings confirm the mediating role of perceived value in the link between AI-driven

service quality and customer satisfaction, as reflected by a high Pearson correlation (r = 0.899). This suggests that Millennial consumers' satisfaction is not driven solely by service quality, but is significantly shaped by how valuable they perceive the service to be. Consequently, AI exerts a dual influence: it enhances customer satisfaction directly while also strengthening it indirectly through increased perceived value.

The conclusions of this study are consistent with and extend, existing research on AI and service quality. Earlier studies have emphasised reliability and responsiveness as key dimensions of service quality and the present findings confirm that these dimensions remain important even when delivered through AI-based interfaces. Additionally, incorporating tangible AI elements creates a contemporary, engaging service environment that enhances overall customer satisfaction. The results on the mediating effect of perceived value further support the view that it is a critical driver of customer satisfaction and loyalty.

Prior research has identified perceived value as a critical pathway through which AI enhances the digital customer experience. Building on this perspective, the present study offers empirical evidence from survey data collected from Millennial consumers in Southeast Asia. The findings extend earlier work by demonstrating that AI's positive influence on perceived value and customer satisfaction is consistent across contexts, particularly among technologically adept Millennials.

Although some studies argue that technology-driven service delivery may lead to depersonalization, the results here indicate that Millennials respond favourably to AI-enabled interactions when they are tailored and visually engaging. These findings challenge the notion that adopting AI necessarily diminishes human-like attributes, such as warmth, in service encounters. Instead, they suggest that for this demographic group, the benefits of efficiency, customisation and innovation can effectively offset such concerns.

The study also yields several practical implications for QSR operators seeking to leverage AI to enhance operations and services. First, firms should prioritize the adoption of tangible AI applications. Tools such as digital kiosks, robotic servers and AI-driven menu systems can create a visible, interactive and contemporary customer interface. These elements not only contribute to a modern service environment but also offer distinctive features that resonate strongly with Millennial consumers.

Second, ensuring system reliability should be a primary objective. AI-enabled systems must operate seamlessly and with minimal technical disruptions. Accurate order processing, dependable payment systems and efficient tracking mechanisms can significantly enhance perceived value while strengthening customer trust.

Third, organizations should focus on improving responsiveness through AI integration. By enabling faster, more adaptive and personalized service interactions, AI can help meet customer expectations for immediacy and customization, thereby further enhancing overall service experience.

AI-enabled features such as automated responses, proactive service notifications and intelligent pop-up recommendations can significantly strengthen customer relationships. For example, using chatbots to address customer queries or AI-driven systems to provide order updates and follow-ups can foster a sense of attentiveness and care among customers.

Fourth, AI adoption should be guided by the principle of value creation. Rather than focusing solely on novelty or technological sophistication, organisations should ensure that AI applications deliver meaningful benefits, including efficiency, convenience and personalisation. Continuous monitoring and refinement of these systems are essential to maintaining a high level of customer-perceived value.

Overall, QSR operators would benefit from prioritizing the Millennial segment. Technology-enhanced service experiences align well with the preferences of this digitally proficient group. By offering AI-enabled services that match their technological expectations, firms can enhance customer loyalty and increase the likelihood of positive word-of-mouth recommendations.

This study focused on Millennial respondents residing in Berhampur, Odisha. While this segment represents a significant portion of the urban population, the findings may not be readily generalizable to rural contexts or to regions with differing levels of AI adoption. The exclusive emphasis on Millennials also limits the applicability of the results to other generational groups, such as Gen Z or Baby Boomers, who may exhibit different attitudes toward AI-enabled services.

Furthermore, the research adopts a cross-sectional design, relying on data collected at a single point in time. As a result, it does not capture potential changes in consumer behavior over time, including evolving dependence on AI or longer-term technological trends. The use of self-administered questionnaires also introduces certain limitations, particularly the risk of response bias. Participants may be influenced by social desirability or may not accurately recall their service experiences, potentially leading to an overstatement of positive perceptions or an imprecise assessment of satisfaction levels.

This study suggests several directions for future research. Subsequent investigations could include a broader range of generational cohorts—such as Gen Z, Gen X and Baby Boomers—to better understand how different age groups perceive and respond to AI-enabled services in QSR settings. Expanding the scope of service quality dimensions by incorporating elements such as empathy and assurance from the SERVQUAL framework may also provide deeper insights into their relevance within AI-driven environments. For instance, future work could explore whether AI systems can effectively simulate emotional understanding and how this capability influences customer satisfaction.

Longitudinal research designs would be particularly valuable in examining how customer perceptions evolve with repeated exposure to AI technologies, thereby offering a clearer view of their long-term effects on loyalty and continued usage intentions. Additionally, cross-national comparative studies could shed light on the role of sociocultural factors in shaping these relationships. Finally, as many QSRs increasingly integrate technological and human service elements, future research may focus on identifying the optimal balance between AI and human interaction, particularly its impact on perceived value and emotional engagement.

5.1. Growth and Challenges in Berhampur QSR Market

The expansion of the QSR sector in Berhampur is primarily driven by multiple interrelated factors. Rapid urbanisation and the growth of the middle class have led to increased disposable income and a greater inclination toward dining out and convenience-based food consumption. Changing food habits, particularly among younger consumers, have resulted in a shift from traditional home-cooked meals to fast food, snacks and online food ordering. Additionally, the increasing penetration of digital platforms such as food delivery applications has facilitated the rise of cloud kitchens and takeaway-oriented outlets. The presence of educational institutions and coaching centres further sustains demand, as the student population forms a significant consumer base for QSR services. Despite its growth potential, the QSR market in Berhampur faces several challenges. The limited presence of major national and international QSR chains restricts the pace of organised sector expansion. Consumer price sensitivity remains high, making it difficult for premium brands to establish a strong foothold. Furthermore, intense competition from well-established local eateries offering low-cost food continues to dominate the market. Infrastructure limitations and the relatively underdeveloped mall culture also constrain large-scale QSR expansion.

5.2. Managerial implications

Quick Service Restaurant (QSR) operators can utilise AI-based technologies to strengthen overall service quality. To meet the expectations of tech-savvy customers, it is essential to adopt intuitive, easy-to-use tools, such as self-service kiosks and digital signage, to deliver a seamless, engaging user experience. At the same time, AI systems should ensure high reliability and efficiency, particularly in functions such as order handling and payment processing, as these are critical to fostering customer trust and satisfaction. Managers should also aim to enhance perceived value by providing efficient, convenient and tailored services. Nevertheless, integrating human interaction alongside AI remains crucial to preserving emotional connection and achieving comprehensive customer satisfaction.

6. Conclusion

In an increasingly digitalised service environment, AI complements and extends traditional models of service quality. This study integrates AI-driven mechanisms into the SERVQUAL framework, thereby broadening its applicability. While the core dimensions—tangibility, reliability and responsiveness—continue to play a vital role in shaping customer perceptions, the findings also highlight certain challenges associated with AI adoption, particularly in preserving a human-like interface during service interactions.

The study offers practical insights for QSR operators seeking to implement AI to enhance service effectiveness and customer satisfaction. It underscores the importance of ensuring that AI systems are dependable, responsive and aligned with customer needs. Rather than emphasising novelty alone, AI solutions should focus on delivering functional value, including speed, personalisation and operational efficiency. Although the integration of AI into service delivery holds significant promise, further research is needed to assess its long-term implications for customer loyalty and to determine the optimal balance between technological interfaces and human interaction.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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