

The Impact of Self-Checkout Technology Service Quality on Customer Satisfaction in Retail Sector

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ABSTRACT

The rise of self-checkout technology has significantly transformed the retail landscape, offering customers enhanced autonomy and convenience. However, the effectiveness of these systems in driving customer satisfaction depends on key self-checkout technology service quality factors such as speed of service, technology usability, shorter queues, and overall customer experience. Despite the widespread adoption of self-checkout systems, there is limited understanding of how specific service quality factors influence customer satisfaction. Issues such as slow response times, technical malfunctions, and lack of support often hinder the customer experience, which calls for a detailed examination of these factors to improve service quality. The study aims to (1) identify the relationship between self-checkout technology service quality and customer satisfaction and (2) determine the most significant factors that affect customer satisfaction in retail environments. A quantitative research approach was employed, and data was collected through structured questionnaires at the selected supermarket in Malaysia. The data was analyzed using multiple regression analysis to determine the relationship between service quality dimensions and customer satisfaction. The analysis revealed that customer experience was the most significant factor affecting satisfaction, followed by shorter queues, speed of service, and technology. Positive experiences with the system contributed most to higher satisfaction levels, while delays or technical malfunctions negatively impacted satisfaction. The study concludes that improving the customer experience and minimizing queues are crucial to enhancing satisfaction with self-checkout systems. Retailers should design intuitive, user-friendly systems to increase customer retention and satisfaction. These findings provide valuable insights for improving self-checkout systems in retail, promoting greater customer loyalty and operational efficiency.

INTRODUCTION

Technological advancements have revolutionized the retail industry in recent years, particularly with the rise of self-service technologies such as self-checkout systems. These systems allow customers to scan, bag, and pay for their items without the assistance of a cashier, offering a more autonomous shopping experience (Elliott, Meuter, & Bitner, 2013). The increasing adoption of self-service technologies, particularly self-checkout systems, has significantly transformed the retail landscape (Nusrat and Huang, 2021). These technologies are designed to enhance customer experiences by providing more convenience, reducing wait times, and offering greater autonomy in the shopping process. As retail environments continue to evolve, understanding how service quality factors related to self-checkout technology impact customer satisfaction is crucial for retailers seeking to optimize their service offerings (Eid, 2021).

Service quality has long been acknowledged as a key driver of customer satisfaction in various sectors, and with self-checkout technology, this extends to the perceived ease of use, reliability, system performance, and availability of support (Pantano & Priporas, 2016). Previous studies have shown that customers value the speed and convenience of self-checkout systems (Demoulin and Djelassi, 2016). Still, their satisfaction can be significantly influenced by the presence of technical issues or the unavailability of assistance when needed

(Mishra et al., 2021). These factors underscore the importance of robust system performance and user-friendly interfaces to minimize friction in the shopping experience (Moghadam et al., 2022).

Despite the widespread adoption of self-checkout technology, there remains a limited understanding of how specific service quality factors influence customer satisfaction. Most existing studies have focused on the general benefits and challenges of self-checkout technologies, with fewer studies exploring how service quality dimensions such as system functionality, ease of use, and availability of assistance affect customer perceptions in self-checkout experiences (Shim, Han, & Ha, 2021). Additionally, customer demographics, such as age and technological proficiency, may also shape their experiences and satisfaction levels (Ben Mansour et al., 2022).

This study aims to investigate the impact of key service quality factors on customer satisfaction in the context of self-checkout technology. By examining the relationship between service quality dimensions and customer satisfaction, this research will provide valuable insights for retailers looking to enhance their self-checkout systems and improve customer experiences.

Problem Statement

The rapid adoption of self-checkout systems in retail environments has fundamentally changed how customers engage with technology-driven services. These systems, designed to enhance efficiency and reduce operational costs, aim to offer customers more control and convenience in their shopping experience. However, the success of self-checkout systems is closely tied to the quality of service they provide, directly impacting customer satisfaction (Eid, 2021). Key service quality dimensions such as ease of use, reliability, system speed, and the availability of support are crucial to ensuring a positive customer experience.

Despite the growing prevalence of self-checkout technology, many challenges persist. Customers frequently encounter technical issues, slow system responses, and a lack of immediate assistance when required, all contributing to negative customer experiences (Moghadam, Chung, & Moon, 2022). These service quality issues can lead to customer frustration, abandonment of the system, or reluctance to use self-checkout in future visits (Ben Mansour et al., 2022). Furthermore, while many studies (Dabholkar, Bobbitt, & Lee, 2003; Hisham, Kumar, & Hussain, 2016; Rajeswari, Srinivasulu, & Thiyagarajan, 2024) have examined service quality in traditional service settings, a limited body of research specifically addresses how these factors impact customer satisfaction in self-checkout systems (Yuen et al., 2020).

Retailers in this study focusing on supermarkets in Malaysia are now facing the challenge of optimizing self-checkout systems to meet customer expectations better. Without a comprehensive understanding of key service quality factors influencing customer satisfaction, retailers may struggle to address these systems' shortcomings effectively. Thus, it is essential to investigate how service quality dimensions such as system functionality, ease of use, and support availability affect customer satisfaction. This study seeks to fill this gap by examining the factors of self-checkout technology influencing customer satisfaction with self-checkout technology to provide actionable insights to improve the customer experience in retail settings.

Purpose of the Study

This study aims to assess the impact of factors related to self-checkout technology on customer satisfaction in retail environments. As self-service technologies continue to gain traction, understanding the specific service quality dimensions that contribute to or detract from customer satisfaction is crucial for retailers aiming to improve customer experiences and operational efficiency. This study examines key service quality factors, such as speed of service, technology, shorter queues, and customer experience, to determine their influence on customer satisfaction levels.

By identifying the service quality factors that significantly impact customer satisfaction, this research aims to provide retailers with actionable insights for enhancing their self-checkout systems, leading to higher customer

retention, improved user experiences, and increased operational success. Additionally, this study sought to address the current gap in the literature regarding self-checkout service quality by offering an empirical analysis based on the latest data and customer feedback. Two objectives have been set to attain the goal and to define the scope of this research more precisely, which are:

RO1: To identify the relationship between the self-checkout factors and customer satisfaction.

RO2: To determine the most significant self-checkout factors that affect customer satisfaction.

Research Questions

RQ1: What is the relationship between the self-checkout factors and customer satisfaction?

RQ2: What is the most significant self-checkout factor that affects customer satisfaction?

LITERATURE REVIEW

The rise of self-checkout technologies in retail has brought about a major shift in how customers experience shopping, with a focus on enhancing convenience, efficiency, and overall satisfaction. Several key factors significantly influence customer perceptions of self-checkout services, including speed of service, technology, shorter queues, and the broader customer experience. This literature review explores each of these factors in detail, drawing on recent studies to understand their impact on customer satisfaction and engagement with self-checkout systems.

Customer Satisfaction

Customer satisfaction continues to be a multifaceted concept. According to Parasuraman, Zeithaml, and Berry (1988), the quality of service delivered is a primary driver of customer satisfaction, which aligns with earlier findings by Lee and Lin (2005), who emphasized the subjective nature of the experience. Parasuraman, Zeithaml, and Berry's (1988) SERVQUAL model remains relevant, emphasizing the gap between customer expectations and perceptions. In more recent literature, Boukis et al. (2021) highlight that customer satisfaction is influenced by both cognitive and emotional responses to service delivery, suggesting it involves an intricate interplay of rational judgments and emotional reactions. Moreover, the study by Klaus and Maklan (2012) and Wang et al. (2020) mentioned customer satisfaction is significantly influenced by perceived service quality, emotional responses, and prior experiences.

Speed of Service

Speed of service is one of the most critical factors influencing customer satisfaction with self-checkout systems. Customers using self-checkout technology expect the process to be quicker than traditional cashier-assisted checkouts. Several studies have demonstrated that speed is a primary driver of customer satisfaction in self-service environments (Moghadam et al., 2022; Yuen et al., 2020). Faster service not only enhances the shopping experience by saving time but also reduces the perceived effort required to complete a transaction.

Mishra et al. (2021) found that the speed of self-checkout systems significantly influences customer perceptions of service quality. When the process is seamless and quick, customers are more likely to have a positive experience and express greater satisfaction with the service. Conversely, any delays, such as slow system performance or technical malfunctions, can frustrate customers and lead to negative perceptions of the self-checkout experience. As speed directly correlates with convenience, retail stores that offer faster self-checkout services are often seen as more efficient, which can result in increased customer loyalty (Moghadam et al., 2022).

Technology and Usability

The underlying technology and its usability are crucial elements of self-checkout systems. The effectiveness of the technology, including hardware reliability, software functionality, and user interface design, plays a major role in shaping the customer experience. Research shows that when the technology is easy to use and functions reliably, customers have a higher level of satisfaction (Mishra et al., 2021). On the other hand, technical issues such as system crashes, unresponsive touchscreens, or scanner malfunctions can detract from the experience and diminish customer trust in the system (Eid, 2021).

Technological advancements have played a pivotal role in shaping customer satisfaction with self-checkout systems over the last five years. According to Ozkan and Karayormuk (2021), ease of use, perceived usefulness, and system reliability are critical components that influence how customers perceive self-checkout technology. Their research indicates that customers appreciate when the technology is intuitive and easy to navigate. On the other hand, any technical difficulties, such as system crashes or scanning issues, can negatively affect satisfaction. Additionally, Fernandes and Oliveira (2022) identified that personalization features, such as the ability to use loyalty programs or digital wallets, enhance the technology experience, leading to higher levels of customer satisfaction. The increasing integration of AI and machine learning into self-checkout technologies also provides more accurate and efficient services, further improving the customer experience.

Moreover, advancements in technology such as contactless payment, voice assistance, and real-time support tools have further improved the usability of self-checkout systems, enhancing the overall customer experience. However, challenges remain, particularly in ensuring that these technologies are accessible to customers of varying technological proficiencies (Ben Mansour et al., 2022).

Shorter Queues

One of the key advantages of self-checkout systems is their potential to reduce queue times, an essential factor that improves the customer experience. Studies have shown that customers who use self-checkout systems often perceive shorter queues as a significant benefit, especially in comparison to traditional cashier lines (Yuen et al., 2020). The ability to bypass long lines and complete transactions quickly is a major appeal of self-service technologies.

Research by Ben Mansour et al. (2022) highlights that shorter queues contribute to a more efficient shopping process and significantly improve customer satisfaction. Customers appreciate the autonomy and control provided by self-checkout systems, which allows them to avoid waiting for a cashier and reduce their overall time spent in the store. However, if queues form at the self-checkout stations due to technical issues or system overload, the perceived advantage of shorter queues is diminished, leading to frustration.

Moghadam et al. (2022) emphasize that managing customer flow and optimizing the number of self-checkout stations available can further reduce queue times. Additionally, the strategic placement of self-checkout kiosks within the store can help alleviate congestion, contributing to a smoother and faster customer checkout experience.

Customer Experience

Customer experience is a broad concept that encompasses various factors such as ease of use, convenience, speed, and overall satisfaction with the service. In the context of self-checkout systems, customer experience is shaped by how well the technology meets customer expectations for efficiency and convenience. Positive experiences with self-checkout systems lead to greater satisfaction, which can result in increased usage and customer loyalty (Mishra et al., 2021).

Pantano and Priporas (2016) argue that customer experience is not solely dependent on the speed or efficiency of the system but also on how well the technology integrates into the broader retail environment. For example,

the availability of assistance when needed, the simplicity of the process, and the reliability of the system are key elements that enhance customer experiences. Furthermore, customers who perceive self-checkout systems as empowering and offering greater control over their shopping experience tend to report higher levels of satisfaction (Yuen et al., 2020).

However, challenges remain in delivering consistently positive customer experiences with self-checkout systems. Research indicates that demographic factors, such as age and technological proficiency, can significantly influence how customers experience and perceive the service (Ben Mansour et al., 2022). Older customers or those less familiar with technology may struggle with the system, leading to frustration and dissatisfaction. Therefore, retailers must consider inclusivity and design self-checkout systems that cater to a diverse customer base, ensuring that all customers can easily navigate and benefit from the service.

Hypotheses

H1: Speed of service of self-checkout technology service positively influences customer satisfaction.

H2. The technology aspect of self-checkout technology service positively influences customer satisfaction.

H3. Shorter queues of self-checkout technology services positively influence customer satisfaction.

H4. Customer experience of self-checkout technology services positively influences customer satisfaction.

METHODOLOGY

Research Design

The research design fosters communication and collaboration between the researcher and participants, positioning both as co-creators of data and knowledge. It places a strong emphasis on critical reflexivity, requiring careful consideration throughout the processes of data collection and analysis. The design clearly outlines its key components, including the goals, conceptual framework, research questions, methodology, and measures for ensuring trustworthiness. It highlights the relationships between these components and encourages self-reflection on various aspects of the design. The aim of this study is to explore the impact of self-checkout technology service on customer satisfaction. The research design includes the proposed methods for data collection and analysis. Research designs can be exploratory or explanatory, and this study adopts an explanatory approach to produce accurate and relevant data.

Data Collection Techniques and Instruments

This research employed a quantitative methodology to collect primary data using a questionnaire. A standardized set of survey questions was distributed to a large group of targeted respondents for quantitative analysis. According to Bell et al. (2022), the data collection process is often facilitated by distributing questionnaires to various respondents, thereby enabling easy comparison across responses. The questionnaire was designed using Google Forms, which provided a cost-effective and user-friendly platform for disseminating the survey via a URL or link. This method allowed the researcher to distribute the survey online, including social media and email. Respondents accessed the questionnaire conveniently using various electronic devices, such as smartphones, tablets, and computers, ensuring efficient data collection.

The researcher employed structured questions in this study. The questionnaire was divided into three distinct sections. Section A focused on the respondents' profiles and demographic information. Section B addressed the independent variables, including aspects such as the speed of service, the technology aspect, shorter queue, and customer experience of the self-checkout technology service. Lastly, Section C concentrated on the dependent variable, specifically measuring customer satisfaction concerning the usage of self-checkout technology service.

Data analysis

Data analysis plays a vital role in any research endeavor. In today's technological landscape, a widely used software system called the Statistical Package for Social Sciences (SPSS) has emerged. This software significantly aids in analyzing and interpreting the data collected for this research. This study employs a quantitative methodology, so using SPSS is highly appropriate. SPSS is particularly effective in managing large datasets and streamlining the processes of data evaluation and tabulation. Additionally, survey data can be advantageous by helping researchers summarize their findings efficiently. This study has employed multiple regression analysis. Multiple regression analysis was used to examine the relationship between one dependent variable and multiple independent variables, allowing for the assessment of how various factors simultaneously influenced the outcome. The assumptions of linearity, independence of observations, homoscedasticity, no multicollinearity, and normality of residuals were checked and met during the analysis (Tabachnick & Fidell, 2019). This method was applied across various domains, providing insights into how the predictors explained the variability in the outcome and facilitating data-driven decision-making (Hair, Black, Babin, & Anderson, 2018). Despite the robustness of the model, diagnostic checks were performed to address potential issues such as multicollinearity and heteroscedasticity, ensuring the reliability of the results (Field, 2013). Moreover, the sign of the regression coefficients tells you if the relationship is positive or negative.

RESULT AND DISCUSSION

Research Question 1

What is the relationship between the self-checkout factors and customer satisfaction?

Data were gathered, and customer satisfaction was measured alongside each of these independent variables (time window, return authorization, and terms and conditions). A Multiple Regression Model was used where customer satisfaction is the dependent variable, and the four factors are the independent variables.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$$

- Y: Customer satisfaction
- X1: Speed of service
- X2: Technology aspects
- X3: Queue length
- X4: Customer experience
- $\beta_1, \beta_2, \beta_3, \beta_4$: Coefficients representing the effect of each independent variable

Furthermore, the hypotheses testing also were used to answer Research Question 1.

- **H1**: Test if $\beta_1 > 0$ (positive relationship between speed of service and customer satisfaction).
- **H2**: Test if $\beta_2 > 0$ (positive relationship between technology aspect and customer satisfaction).
- **H3**: Test if $\beta_3 > 0$ (positive relationship between shorter queues and customer satisfaction).
- **H4**: Test if $\beta_4 > 0$ (positive relationship between customer experience and customer satisfaction).

Table 2. Regression analysis on coefficients

MODEL	Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
(Constant)	.0015	0.156		0.096	.0.13
Speed of service	0.229	0.067	0.201	3.399	<0.01
Technology aspect	0.218	0.073	0.214	3.001	0.003

Shorter queues	0.253	0.060	0.233	4.186	<0.01
Customer experience	0.723	0.075	0.676	9.585	<0.01

Hypothesis 1: Speed of service of self-checkout technology service positively influences customer satisfaction.

Recent studies highlight the importance of speed in self-service technologies. Customers value the convenience and efficiency of faster service, especially in retail settings. According to Safaeimanesh et al. (2021), shorter waiting times significantly enhance the overall customer experience, leading to higher satisfaction levels. Another study by Orel & Kara (2020) found that reducing the time it takes to complete transactions in self-checkout improves customer satisfaction, especially among younger customers who prefer quick interactions.

Hypothesis 2: Technology aspect of self-checkout technology service positively influences customer satisfaction.

Technological factors such as ease of use, reliability, and control are key drivers of customer satisfaction in self-checkout systems. Research by Fernandes & Oliveira (2021) emphasizes that intuitive and user-friendly technology enhances the customer experience, leading to greater satisfaction. Safaeimanesh et al. (2021) also found that when self-checkout systems are reliable and easy to use, they significantly improve customers' perception of service quality and their overall satisfaction.

Hypothesis 3: Shorter queues of self-checkout technology services positively influence customer satisfaction.

Shorter queues increase customer satisfaction by minimizing wait times and enhancing operational efficiency. Recent studies by Sharma et al. (2021) suggest that reducing the length of queues in self-checkout systems leads to a more favourable customer experience, as customers prefer quick and efficient service. The positive impact of shorter queues on satisfaction is well-supported by findings in the retail sector, showing that customers are more likely to return when wait times are reduced.

Hypothesis 4: Customer experience of self-checkout technology services positively influences customer satisfaction.

Customer experience encompasses various aspects such as ease of use, enjoyment, and control, all of which are crucial for satisfaction with self-checkout systems. Studies by Dabholkar et al. (2021) indicate that a positive overall experience with self-checkout systems significantly boosts customer satisfaction and loyalty. Safaeimanesh et al. (2021) further highlight that enjoyable and user-friendly systems increase the likelihood of customers returning to the store.

Table 2: Hypotheses testing table

Hypotheses	B value	Relationship	Accepted/Rejected
Hypothesis 1: Speed of service of self-checkout technology service positively influences customer satisfaction.	0.229	Positive	Accepted
Hypothesis 2: Technology aspect of self-checkout technology service positively influences customer satisfaction.	0.218	Positive	Accepted
Hypothesis 3: Shorter queues of self-checkout technology services positively influence customer satisfaction.	0.253	Positive	Accepted
Hypothesis 4: Customer experience of self-checkout technology services positively influences customer satisfaction.	0.723	Positive	Accepted

All these values suggest that the dependent variable (likely customer satisfaction or a related metric) increases as each independent variable increases.

Research Question 2

What is the most significant self-checkout factor that affects customer satisfaction?

The regression analysis revealed that all three factors, return time window, return authorization, and terms and conditions, were statistically significant in influencing customer satisfaction ($p < 0.01$). However, the relative importance of these factors varied.

Customer experience has the highest standardized coefficient ($\beta = 0.676$), making it the most significant predictor of customer satisfaction in this analysis. The large t-value (9.585) and strong significance ($p < 0.01$) reinforce this conclusion. This indicates that factors related to customer interaction with the self-checkout, such as ease of use, clarity of instructions, and overall user-friendliness, are crucial in determining their satisfaction. The importance of customer experience highlights that even if other factors like speed or technology work well, the perception of how enjoyable or hassle-free the process is remains paramount. Retailers should prioritize ensuring that customers find the self-checkout system intuitive and enjoyable.

Shorter queues also have a significant impact on customer satisfaction, with a standardized coefficient of $\beta = 0.233$. The t-value of 4.186 and the p-value of less than 0.01 suggest that reducing wait times is also a key driver of satisfaction. This aligns with general customer expectations of self-checkout services, where one of the primary reasons for their use is to avoid long lines. If the self-checkout option leads to shorter wait times, it can considerably enhance the customer's overall satisfaction.

Speed of service is another significant factor, though with a slightly lower effect compared to shorter queues. The standardized coefficient ($\beta = 0.201$) and the t-value (3.399) still suggest that customers value quick transaction completion. If the self-checkout is fast and efficient, customer satisfaction will likely improve. However, while speed is important, its relatively lower β suggests that it is less critical than the customer's overall experience or queue length.

The technology aspect, which might include things like the reliability, interface design, and hardware quality of the self-checkout systems, also significantly affects customer satisfaction. The β value of 0.214 indicates a moderate impact, with a t-value of 3.001 and a p-value of 0.003, which still reflects significance. While technology performance is important, its slightly lower effect relative to customer experience suggests that while customers appreciate reliable technology, their overall experience with the system (perhaps involving aspects like support and ease of navigation) matters more.

The analysis shows that customer experience is the most significant driver of customer satisfaction in self-checkout services, followed by shorter queues, speed of service, and technology aspects. Retailers must focus on these areas to maximize satisfaction, emphasizing delivering a smooth, user-friendly experience.

CONCLUSION

This study has demonstrated the significant influence of self-checkout technology factors, specifically speed of service, technology functionality, queue management, and overall customer experience, on customer satisfaction with self-checkout systems in retail settings. Among these factors, customer experience emerged as the most critical determinant, emphasizing the importance of designing intuitive, user-friendly interfaces that offer a seamless shopping experience. While shorter queues and faster transaction speeds positively affect satisfaction, their impact is secondary to customers' broader experience with the system. Moreover, the reliability and usability of the technology also play a crucial role in shaping customer perceptions, although the overall user experience somewhat overshadows their influence.

Given the findings of this research, retailers should focus on optimizing the user experience by ensuring their self-checkout systems are efficient and accessible to customers of varying technological competencies. Retailers are encouraged to prioritize system design and reliability to minimize friction and enhance the autonomy of the shopping experience, which can lead to higher customer satisfaction and loyalty.

Based on this study's results, several recommendations can be made for retailers aiming to improve customer satisfaction with self-checkout systems. Retailers may prioritize designing systems that are simple and accessible, even for customers with low-tech skills. Moreover, retailers can invest in reliable and robust technology infrastructure to avoid disruptions that frustrate customers. Regular maintenance and updates help prevent technical issues that can harm the shopping experience. Managing the number of self-checkout stations and their placement is crucial to avoiding long queues. Retailers should also ensure these areas are staffed to address issues, preventing further customer frustration quickly.

Suggestions for Future Research

Future research could expand upon these findings by examining additional factors influencing customer satisfaction in self-checkout systems. For instance, the role of demographic variables, such as age, technological proficiency, and frequency of use, warrants further investigation to better understand how different customer groups interact with and perceive self-service technologies. Additionally, longitudinal studies that track changes in customer satisfaction over time as retailers implement system improvements would provide valuable insights into the long-term effectiveness of self-checkout systems. Furthermore, exploring the impact of emerging technologies, such as artificial intelligence and machine learning, on enhancing the personalization and adaptability of self-checkout systems could offer new perspectives on improving service quality in retail environments.

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