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The Impact of Digital Self-Checkout Technology on Customers' Intention to Use with The Mediating Role of Trust in Vietnam's Retail Industry

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ABSTRACT

This research centers on exploring the impact of digital self-checkout technology on customers' intention to use, with trust functioning as a mediator within Vietnam's retail sector. Four determinants—Perceived Usefulness (PU), Perceived Ease of Use (PEU), Perceived Security (PS), and Perceived Behavioral Control (PBC)—were investigated using a quantitative approach through online survey responses from 211 Vietnamese customers. The implementation of statistical techniques, including Cronbach's Alpha, EFA and regression analysis via SPSS, led to the confirmation that two out of four hypotheses were supported. The findings reveal that trust significantly mediates the PU, PEU on customers' intention to use self-checkout technology. Notably, PU emerges as the most influential driver of trust and intention to use among the four independent variables. This work makes a contribution to the theoretical foundation by reaffirming the applicability of the Technology Acceptance model (TAM) and the Stimulus-Organism-Response (SOR) framework in describing consumer behaviour. Additionally, this study further provides actionable implications for Vietnam's retail companies, underlining the improvement of self-checkout counters to boost customer experience, trust and wider adoption.

Keywords: Digital technology, self-checkout, customer trust, intention to use, retail industry, technology acceptance model, theory of planned behavior, stimulus-organism-response model.

INTRODUCTION

The continuous evolution and integration of emerging technologies are profoundly transforming industries, redesigning operational processes and altering customer interactions (Brunetti *et al.*, 2020). In the retail sector, digital advancement has facilitated the adoption of self-service technologies, thereby allowing businesses to enhance productivity, reduce labor costs and elevate customer shopping experience (Anitsal & Schumann, 2007; Duarte *et al.*, 2022). Among the most ubiquitous innovations, self-checkout counters stand out as an innovative retail solution, allowing individuals to independently complete their buying transactions while streamlining retail operations (Orel & Kara, 2014). Specifically, self-checkout service is one type of self-service technology that shoppers can process their purchases by scanning, bagging and finalizing their transaction for items without the need for cashier assistance (Meuter *et al.*, 2000; Alpert, 2008; Chan & Petrikat, 2022). According to Meuter *et al.* (2000), shoppers perceive self-service options as providing greater flexibility, offering more control over their interactions and saving more time than conventional approaches. From a business standpoint, integrating self-checkout service can effectively resolve two significant limitations of the traditional service approach (Curran *et al.*, 2003). Firstly, automated checkout systems allow firms to handle more customer demand without the additional expenses of increasing the workforce. Secondly, the standardization of digital technology creates a consistent buying experience by limiting direct human interaction, thus, alleviating the inconsistency in service quality due to staff emotions and behaviors (Curran *et al.*, 2003). Moreover, research indicated that self-checkout machines are capable of completing transactions up to 50 percent faster than regular checkout lanes, resulting in shorter queues and less time spent waiting by customers (Adebakin, 2023). In an era of technological advancement, customer co-production and mutual value creation are likely to become fundamental elements to achieve long-term business growth (Bolton *et al.*, 2007).

In developed nations, the usage of self-checkout counters has gained widespread popularity and is increasingly preferred by a growing segment of customers. This matter can be observed in supermarkets and shopping malls, where it indicates a shift towards automation and technology. As per PYMNTS data (2024), more than 80 percent of U.S shoppers use self-service kiosks, with 66 percent opting for them instead of staffed checkout service. Moreover, the adoption of these technologies has been significantly driven by the COVID-19 pandemic, in response to the requirement of limiting face-to-face interaction (Har *et al.*, 2022). The use of self-checkout cashiers, while prevalent in modern supermarkets globally, faces limited adoption in Vietnam. This is mainly because of the high initial investment cost, traditional consumer habits, security and fraud concerns, and the lack of technological proficiency among some customers (Nguyen *et al.*, 2024). Nonetheless, the engagement of self-checkout cashiers in developing countries, including Vietnam, is predicted to expand in the future as retailers pursue automation and customer convenience. Advancements in artificial intelligence (AI), image recognition and Radio Frequency Identification

(RFID) are becoming increasingly accessible, along with the rising trend of cashless payment methods such as Apple Pay, ZaloPay, VNPAY and QR code, are changing customer behaviors towards independent transactions (PwC, 2021).

In Vietnam, academic exploration of self-checkout technology and its impacts on consumers' intention to use remains underdeveloped, particularly in the retail sector, despite minimal research focus on self-service kiosks in the banking domain (Nguyễn *et al.*, 2023; Nguyen, 2023). Additionally, the majority of existing studies have been conducted in developed nations, encompassing a broader spectrum of industries such as hospitality (Le *et al.*, 2019), aviation (Antwi *et al.*, 2021), retail (Duarte *et al.*, 2022), healthcare (Immonen & Koivuniemi, 2018) and food and beverage (Pai *et al.*, 2022). The disparity underscores the pressing need for further investigation into self-checkout technology's adoption and its potential effects. Additionally, extensive research on self-service technologies has utilized the SSTQUAL model to assess service quality (Ghosh, 2021; Lin & Hsieh, 2011; Iqbal *et al.*, 2018). This model, which was developed by Lin and Hsieh (2011), considers functionality, enjoyment, security, assurance, design, convenience and customization. However, while ideal for post-adoption experiences, this model may not be well-suited for exploring initial adoption. Given that self-checkout technology remains uncommon in Vietnam, models centered on early adoption are more applicable. Therefore, integrating the Technology Acceptance Model (TAM) (Davis, 1989) and the Theory of Planned Behaviour (TPB) (Ajzen, 1991) provides a more accurate theoretical structure for understanding the intent of Vietnamese consumers to adopt self-checkout technology in the retail sector. The TAM model presents PU and PEU as central elements shaping usage intention (King & He, 2006). Meanwhile, the TPB model emphasizes perceived behavioral control, which signifies users' confidence when interacting with new technologies (Taylor & Todd, 1995). Besides, the mediating role of trust has received limited scholarly attention, with no research being found to investigate this dimension in Vietnam.

The digital self-checkout technology in Vietnam is still undergoing the initial phase of exploration, especially the role of intervening variable trust in explaining user intention. The gap in both real-world applications and academic research might hinder retailers' ability to develop proper strategies due to an insufficient understanding of customer needs. Therefore, this study seeks to fill the previously mentioned gap and adds value to the domain by exploring four factors, including perceived usefulness (PU), perceived ease of use (PEU), perceived security (PS) and perceived behavioural control (PBC), with trust serving as a mediator and intention to use as a dependent variable. Anchored in the Stimulus-Organism-Response (S-O-R) model, along with the Technology Acceptance Model (TAM) and Theory of Planned Behaviour (TPB), this study develops a research framework to understand technology usage intention. Ultimately, this study provides insightful practical advice for the retail industry by emphasizing how strengthening shoppers' trust in digital retail might increase their desire to utilize self-checkout technology. By showing the importance of self-checkout services, the results and proposed implications offer retail companies strategic direction, especially when it comes to enhancing their technology interactions to enhance consumer engagement and service provision.

Research Aim and Research Questions

This paper endeavors to scrutinise the impact of digital self-checkout technology on customers' intention to use the mediating role of trust within the context of Vietnam's retail sector. The ultimate purpose of this research is to suggest actionable recommendations for Vietnam retailers while simultaneously filling existing gaps in the literature through empirical findings. To reach this aim, the study sets out to address the following questions:

- 1) *What is the association between Perceived Usefulness, Perceived Ease of Use, Perceived Security, Perceived Behavioral Control, customers' trust, and their likelihood of using self-checkout technology?*
- 2) *To what extent do these determinants affect trust and intention to use self-checkout technology?*

Research Objectives

There are four primary objectives this study seeks to accomplish. Firstly, using trust as a mediating element, it first critically assesses the body of research on the usage intention of digital self-checkout, focusing on PU, PEU, PS and PBC. Secondly, it examines the interrelations among these components. Third, it assesses the degree to which these factors affect adoption behavior. Lastly, it gives merchants strategic information to improve service efficiency, encourage the use of technology and boost consumer trust.

LITERATURE REVIEW

Empirical Research

Digital self-checkout technology

The integration of technology into business strategies has substantially influenced global industries in general and the retail industry in particular, with self-checkout technology appearing as a notable advancement. Self-service checkout offers an alternative to traditional cashier-based payment systems, integrating interactive and multi-device systems within physical retail locations (Dean, 2008; Katzan, 2011). Continuous technological innovation remains a key factor in sustaining a competitive advantage for retailers (Inman & Nikolova, 2017). By allowing customers to scan, bag and pay for their purchases independently without staff assistance, the digital self-checkout system offers faster services and reduces waiting times (Orel & Kara, 2014).

Intention to use

Intention to Use (ITU) can be understood as an individual's willingness or readiness to engage in a particular behavior or technology (Fishbein & Ajzen, 1975). In the Technology Acceptance Model (TAM), Davis (1989) framed the ITU as the outcome of how users perceive a system's value, reflecting their behavioral inclination toward it. Ajzen (1991) further defined it as a determinant of actual

usage, driven by attitudes and behavioral control factors. In this study, ITU represents Vietnamese customers' tendency to adopt digital self-checkout technology. Indeed, ITU captures customers' intent to engage with automated retail solutions (Dabholkar & Bagozzi, 2002). Weijters *et al.* (2007) emphasized that ITU in self-checkout service depends on perceived advantages and operational simplicity, as customers must independently operate these systems.

Gefen *et al.* (2003) demonstrated that trust channels usage intention by fostering confidence in system reliability, which is critical for self-system technology adoption. For PU, Davis (1989) and Venkatesh *et al.* (2003) confirmed its effect in directly boosting the intention to use, as users perceiving efficiency gains are more inclined to adopt. Furthermore, perceived behavior control, a crucial determinant in the TPB model, strengthens intention to use by reflecting users' control over technology, as evidenced by Ajzen (1991) and Taylor and Todd (1995) in the self-service technology contexts.

Trust

According to Mayer *et al.* (1995), trust represents the belief in the reliability, competence, and integrity of an entity. Gefen *et al.* (2003) framed it within technology adoption as confidence in a system's consistent performance and risk mitigation. McKnight *et al.* (2002) further categorized it into different aspects, such as predictability and benevolence, which are crucial in user engagement with automation. For self-service technologies such as self-checkout, trust is pivotal as users rely on machines without human oversight (Lee & Lyu, 2019), including certainty in system accuracy (e.g., pricing) and retailer support (Meuter *et al.*, 2005).

Studies highlight trust's mediating role across variables. For PU, Gefen *et al.* (2003) found that trust enhances PU's influence on ITU by validating perceived benefits, a link evident in self-service technology (Pavlou, 2003). PEU fosters trust by reducing complexity, with Lee *et al.* (2011) showing that user-friendly self-service technology builds confidence, thereby driving intention to use. Perceived Security directly impacts trust, as Kim *et al.* (2008) demonstrated that secure systems mitigate risks, strengthening the ITU. PBC interacts with trust; Taylor and Todd (1995) revealed that control perceptions bolster trust in tech reliability, influencing ITU (Ajzen, 1991).

Perceived usefulness

The critical role of Perceived Usefulness (PU) in influencing user behavior has been extensively studied in technology adoption research (Abdullah *et al.*, 2015). Among the key factors influencing technology adoption, PU has been identified as a more powerful predictor of users' acceptance of digital innovations than PEU (Abdullah *et al.*, 2015). Studies have consistently recognized PU as a fundamental determinant in the Technology Acceptance Model (TAM), reflecting users' perception of a technology's function to augment their effectiveness and productivity (Davis, 1989; Marikyan & Papagiannidis, 2024). Lee and Lyu (2019) pointed out that the perception of a system's usefulness is determined by its resulting outcomes, whether positive or negative. In the context of self-checkout, the PU of digital self-checkout systems pertains to their ability to offer convenience, transaction speed, time efficiency and improved shopping experiences. Supporting this view, a system perceived as beneficial encourages a supportive attitude toward its usage, thereby highly fostering customers' intention to use it (Cebeci *et al.*, 2020; Chen *et al.*, 2020). Studies have consistently demonstrated that PU exhibits a notable effect on the intention to use technological innovations, including retail self-service systems (Venkatesh *et al.*, 2003). For instance, Dabholkar and Bagozzi (2002) highlighted that customers who perceived self-checkout as a time-efficient tool were more likely to adopt it. According to Singh & Sinha (2020), the significant effect of PU on ITU is channeled through trust, underscoring its mediating function.

H1 Trust mediates the impact of Perceived Usefulness on Intention to Use

Perceived ease of use

Perceived Ease of Use (PEU) is characterised as "the degree to which a person believes using a system is free of effort" (Davis, 1989), reflecting the perceived simplicity of adopting a technology (Forsythe, 2006). Chau and Lai (2003) emphasized that PEU enhances task efficiency, while Lee and Lyu (2019) highlighted its role in user-friendly interfaces and minimal learning effort. Meuter *et al.* (2005) believed that PEU is critical for the adoption of digital self-checkout technology, as intuitive designs reduce frustration, encouraging use in retail markets (Orel & Kara, 2014). For instance, a user-friendly self-checkout interface can minimize errors and expedite transactions, aligning with customers' desire for convenience (Kaushik *et al.*, 2015). The investigation of Venkatesh *et al.* (2012) demonstrated that PEU indirectly shapes intention to use by lowering adoption barriers, ease of navigation is vital.

The research found that PEU affects trust and intention to use. Davis *et al.* (1989) link it to PU, indirectly boosting adoption (Revels *et al.*, 2010). Gefen *et al.* (2003) and Featherman *et al.* (2010) argued that PEU fosters trust in a system's reliability by providing a seamless experience and a well-designed, easy-to-use interface. For the ITU, Lee *et al.* (2011) and Rezaei and Amin (2013) confirm PEU's positive effect through satisfaction.

H2 Trust mediates the impact of Perceived Ease of Use on Intention to Use

Perceived security

Perceived Security (PS) refers to how individuals believe a system protects their personal and financial information from potential risks (Kim *et al.*, 2008). Salisbury *et al.* (2001) described it as a subjective perception of safety during transactions, distinct from objective security features. Flavián *et al.* (2006) highlighted its significance in reducing concerns about data breaches or unauthorized access. In this study, PS reflects Vietnamese customers' confidence in the safety and security of digital self-checkout

systems. In self-service technologies, including self-checkout, PS is critical as users independently process payments and share data without human intervention (Lee & Lyu, 2019). It involves confidence and trust in system integrity-preventing errors or fraudulent activities-while relying on digital platforms (Meuter *et al.*, 2005). Customers assess risks such as fraud or system errors, influencing their adoption (Meuter *et al.*, 2005).

The research underscores PS's relationships with trust and ITU. For Trust, Kim *et al.* (2009) demonstrated that perceptions of security directly enhance trust by reducing risk concerns, a critical factor in self-service technology adoption (Gefen *et al.*, 2003). Trust is strongly tied to PS, as Salisbury *et al.* (2001) and Gefen *et al.* (2003) have shown it fosters trust, mediating ITU in self-service technology (Pavlou, 2003). Supporting this view, Salisbury *et al.* (2001) affirmed that a secure system fosters trust, as users feel confident in its protective measures. Regarding ITU, Flavián *et al.* (2006) found that PS indirectly boosts ITU through trust.

H3 Trust mediates the impact of Perceived Security on Intention to Use

Perceived behavioural control

Perceived Behavioural Control (PBC) is conceptualised as a person's perception of their ability to perform a specific behaviour, shaped by resources, skills and opportunities available to them (Ajzen, 1991). Rooted in the Theory of Planned Behaviour (TPB), it measures confidence in managing challenges and overcoming obstacles (Fishbein & Ajzen, 2010). Taylor and Todd (1995) presented that PBC involves self-efficacy and perceived facilitation, which are critical in technology contexts.

Within digital self-checkout technology, PBC is essential as users must independently operate systems without assistance (Lee & Lyu, 2019). It involves mastering tasks in scanning items, troubleshooting errors and completing transactions often without immediate support (Meuter *et al.*, 2005). The availability of on-site guidance or multilingual interfaces could also enhance users' control perceptions in this retail context (Meuter *et al.*, 2000).

Past research highlighted PBC's relationships between trust and ITU. In terms of trust, Taylor and Todd (1995) suggest that higher PBC strengthens trust by reinforcing perceptions of system reliability, a finding supported by Pavlou and Fygenon (2006) in tech adoption. Le *et al.* (2020) found that PBC in SSTs strengthens trust when users feel in control, supporting Gefen *et al.* (2003). Regarding ITU, Ajzen (1991) established PBC as a fundamental antecedent, with Mathieson (1991) confirming its impacts on technology acceptance. Investigations by Lee and Lyu (2019) revealed that PBC enhances ITU in SSTs by empowering users.

H4 Trust mediates the impact of Perceived Behavioural Control on Intention to Use

Theoretical Framework

TAM model

The Technology Acceptance Model (TAM), proposed by Davis (1989), is a well-known scholarly framework that is frequently used to comprehend how customers embrace technology. PU and PEU are the two major constituents of TAM. While PEU refers to the system's ease of use, PU measures how much a consumer feels that utilizing the technology would improve their purchasing efficiency. TAM is an ideal foundation for this investigation, given its high predictive power in terms of consumer acceptability across different technologies. However, according to the study, TAM may need additional elements based on the situation (Hossain & Silva, 2009).

TPB model

According to Rogers (2003), embracing innovative technology is intricate and influenced by various elements, including human behavior. To supplement the limitations of the TAM model, the PBC component from the Theory of Planned Behavior (TPB) (Ajzen, 1991) is utilized as an element in the theoretical framework of this study. The capacity of the user to interact with technology or the conviction that they can effectively regulate their behavior is highlighted by PBC (Li *et al.*, 2023). Understanding customers' desire to use self-checkout technology, whether they are past users or non-users, necessitates the exploration of their perceived behavior control to successfully use the technology, as this plays a pivotal role in forming their adoption decisions.

SOR model

According to Armitage & Conner (2001) and Venkatesh & Bala (2008), despite the extensive use of TAM and TPB, they do not adequately capture the intricacies of behavior. Hence, the study this research employs the Stimulus-Organism-Response (S-O-R) framework to examine how external triggers internal emotional states and drive resulting behaviors. The decision to choose the SOR model is based on its compatibility with the behavioral outcome (ITU) and its potential to investigate trust as a mediator, meaning that the role of emotions before the final response will be considered. This model provides a comprehensive insight from different theoretical frameworks. Besides, this model has also been widely used to study consumer behavior, especially when it comes to ICT adoption, new technologies, and impulsive purchases (Chen & Yao, 2018)

Conceptual Framework

Building on existing literature and foundational theory, the authors propose the following conceptual framework:

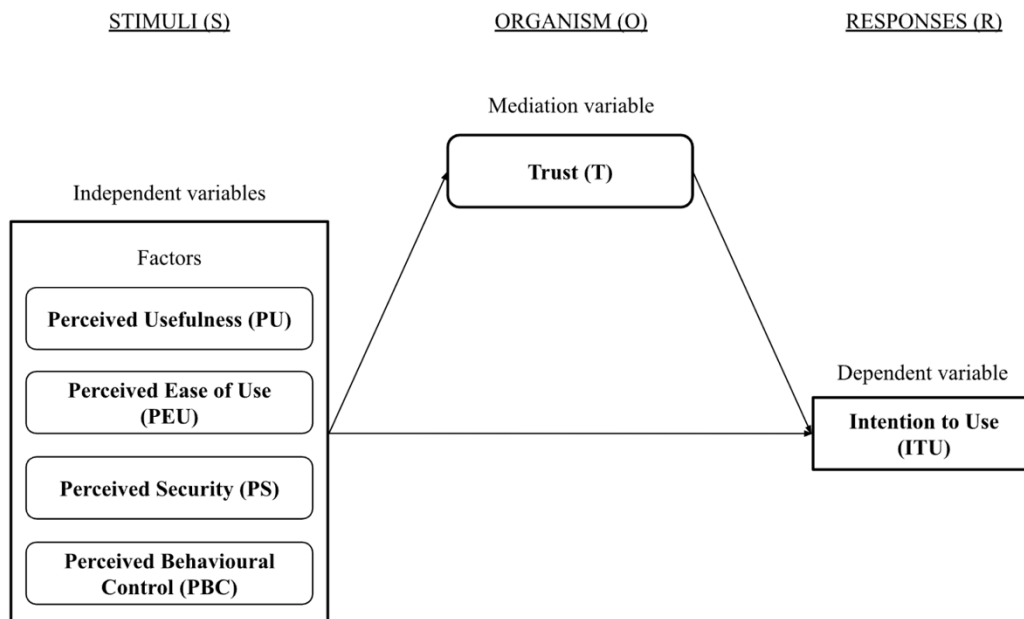


Figure 1: Proposed Research Model

METHODOLOGY

Research method

A quantitative research approach was chosen for this research, given its suitability for identifying the correlations between controlled factors (PU, PEU, PS, PBC) and measured outcome (ITU). This research utilizes a web-based questionnaire as the primary source of data acquisition from participants. Before officially distributing the form, a pilot was undertaken on a small group of contributors to detect and resolve any unclear and complex words that could lead to confusion among respondents.

Research scope and sampling method

Given time and resource limitations, the authors employed a convenience sampling method, approaching participants who were easily reachable voluntarily agreed to join the survey. While this non-random sampling method is efficient and simple to execute, it may carry the risk of bias in selection, potentially impacting the generalization of the results (Goodman & Blum, 1996). In an effort to counteract this issue, questions related to gender, age and education were strategically included. The distribution of the survey occurred via the authors' personal connections and media tools. Within the collected responses, only those fulfilling validity requirements were selected for analysis.

Questionnaire design and instrument measures

Regarding survey design, the questionnaire was constructed into two distinct sections. The first part gathered profile details of the sample, while the next part examined the research hypotheses. In the demographic section, individuals were asked about their age, gender, level of education and whether they had ever experienced self-checkout technology or not.

The measuring items applied in this study were sourced and amended from pre-validated scales published in journal articles. The scale construction consists of 21 measurement items in total, including 5 for PU, 4 for PEU, 3 for PS, 3 for PBC, 3 for T and 3 for ITU. A detailed breakdown of cited items is shown in the following table:

Table 1: Instrument Measures

Variables	Definitions of variable	Items	Derived and modified from journals
Perceived Usefulness (PU)	The degree to which a person believes that using a particular system would enhance his or her job performance	PU1. Using self-checkout cashier saves me time PU2. Self-checkout cashier enables me to accomplish tasks more quickly PU3. Using self-checkout cashier would enhance my productivity PU4. Using self-checkout cashier is more convenient than traditional-staffed cashier PU5. Overall, I find the self-checkout cashier is useful	Davis (1989) Legramante et al., (2023)
Perceived Ease of Use (PEU)	The degree to which a person believes that using a particular system would be free of effort	PEU1. My interaction with self-checkout cashier is clear and understandable PEU2. It is easy for me to remember how to perform tasks using self-checkout cashier PEU3. Using self-checkout cashier does not require a lot of mental effort PEU4. Overall, I find self-checkout cashier easy to use	Davis (1989) Venkatesh and Davis (2000) Legramante et al., (2023)
Perceived Security (PS)	The level of trust a user has in the security of a specific service	PS1. The risk associated with using self-checkout cashier is low PS2. I feel safe using self-checkout cashier PS3. I think self-checkout cashier has enough measures to protect my personal and financial information	Zapan et al., (2018)
Perceived Bahaviorial Control (PBC)	Refer to people's perceptions of their ability to perform a given behaviour	PBC1. I have the necessary resources, knowledge, and ability to use self-checkout cashier PBC2. Using self-checkout cashier is entirely within my control PBC4. I feel confident in using self-checkout cashier without assistance	Nik Mat & Sentosa (2008)
Trust (T)	Defined as customer confidence in the quality and reliability of the services offered by the organization	T1. Self-checkout cashier is trustworthy T2. I do not doubt the honesty of self-checkout cashier T3. I feel safe in my transactions with self-checkout cashier	Ling et al., (2011) Zhang (2024) Iqbal et al., (2018)
Intention to Use (ITU)	Refer to the probability or a measure of strength of one's intention to perform a specific behaviour	ITU1. I plan to use self-checkout cashier in the future ITU2. If I have the chance to access self-checkout cashier, I will likely use it ITU3. I intend to use self-checkout cashier whenever it is available	Amoroso and Hunsinger (2009) Yu et al., (2021)

Data analysis plan

SPSS is used in four steps for statistical analysis in this study. Firstly, demographics were examined using descriptive statistics. Secondly, reliability was assessed using Cronbach's alpha, with scores over 0.7 regarded as high (Nunnally, 1978). Thirdly, factor analysis suitability was guaranteed by KMO, Bartlett's test, and EFA (Field, 2006; Shrestha, 2021). Lastly, four independent factors, one mediator and one dependent variable were assessed across four models using linear regression analysis. By assessing the degree, direction and significance of variable interactions, this study provides insight into how they affect results.

RESULTS AND FINDINGS

Descriptive Analysis

Table 1: Sample Characteristics

	N= 211		Categories	Frequency	Percent
	Demographic information	Gender		<i>Female</i>	137
			<i>Male</i>	74	35.1
Age			<i>18 - 20</i>	55	26.1
			<i>21 - 30</i>	104	49.3
			<i>31 - 40</i>	34	16.1
			<i>41 - 50</i>	13	6.2
			<i>Over 50</i>	5	2.4
Educational Status			<i>College</i>	34	16.1
			<i>Undergraduate</i>	155	73.5
			<i>Postgraduate</i>	18	8.5
		<i>PhD or higher</i>	4	1.9	
	Customer experience	Customer experience	<i>Experienced Self-Checkout Customer</i>	77	36.5
<i>Non-Experienced Self-Checkout Customer</i>			134	63.5	

Given is the table demonstrating the customer profile and customer experience of survey participants, categorized into four aspects: gender, age, educational background and customer experience at the self-checkout counter. The dataset consists of 211 recorded responses, with 137 known as female and 74 as male. The 21-30 age group is the most prevalent, accounting for 49.3% of the total sample. The second and third largest groups are those aged 18-20 and 31-40, constituting 26.1% and 16.1% respectively. Regarding academic qualification, the proportion of undergraduate students takes the lead, making up 73.5% of the total responses. In contrast, only 4 respondents have obtained a PhD or higher qualification, making this the smallest group in the sample. In terms of self-checkout usage, a substantial majority of surveyors (63.5%) do not have prior experience with self-checkout machines. Meanwhile, 36.5% of respondents have previously used self-checkout systems.

Reliability and Validity Test

Cronbach's alpha

Table 2: Construct Reliability Results

Factor and Indicator	Code	Mean	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Perceived Usefulness (Alpha = 0.871)				
Using self-checkout cashier saves me time	PU1	3.9	0.721	0.839
Self-checkout cashier enables me to accomplish tasks more	PU2	3.81	0.725	0.838
Using self-checkout cashier would enhance my productivity	PU3	3.73	0.671	0.851
Using self-checkout cashier is more convenient than traditional-staffed cashier	PU4	3.66	0.651	0.856
Overall, I find the self-checkout cashier is useful	PU5	3.74	0.722	0.838
Perceived Ease of Use (Alpha = 0.865)				
My interaction with self-checkout cashier is clear and understandable	PEU1	3.65	0.709	0.830
It is easy for me to remember how to perform tasks using self-checkout cashier	PEU2	3.66	0.755	0.811
Using self-checkout cashier does not require a lot of mental effort	PEU3	3.67	0.668	0.846
Overall, I find self-checkout cashier easy to use	PEU4	3.69	0.725	0.823
Perceived Security (Alpha = 0.764)				
The risk associated with using self-checkout cashier is low	PS1	3.16	0.579	0.701
I feel safe using self-checkout cashier	PS2	3.24	0.579	0.701
I think self-checkout cashier has enough measures to protect my personal and financial information	PS2	3.22	0.629	0.664
Perceived Behavioral Control (Alpha = 0.837)				
I have the necessary resources, knowledge, and ability to use self-checkout cashier	PBC1	3.37	0.739	0.734
Using self-checkout cashier is entirely within my control	PBC2	3.34	0.737	0.735
I feel confident in using self-checkout cashier without assistance	PBC3	3.25	0.627	0.841
Trust (Alpha = 0.821)				
Self-checkout cashier is trustworthy	T1	3.63	0.698	0.731
I do not doubt the honesty of self-checkout cashier	T2	3.58	0.655	0.774
I feel safe in my transactions with self-checkout cashier	T3	3.55	0.673	0.756
Intention to Use (Alpha = 0.828)				
I plan to use self-checkout cashier in the future	ITU1	3.75	0.682	0.765
If I have the chance to access self-checkout cashier, I will likely use it	ITU2	3.91	0.670	0.777
I intend to use self-checkout cashier whenever it is available	ITU3	3.78	0.705	0.742

The inter-item consistency of the measurement statements was examined by using Cronbach's Alpha (Hair *et al.*, 2009), with the findings presented in the upper tables. The figures reveal that Cronbach's Alpha figures for PU, PEU, PS, PBC, T and ITU all meet the standard threshold of 0.7, with outputs falling between 0.764 (PS) and 0.871 (PU). Besides, the data for the Corrected Item-Total Correlation remains consistently higher than 0.3 for all measured items, reinforcing their association with the overall construction. As both criteria were met, 21 items were retained and this dataset was made to enable the next phase of analysis.

KMO, Barlett's Test and EFA
EFA for independent variables

Table 3: KMO, Barlett's Test for Independent Variables

KMO and Bartlett's Test		
Kaiser-Mayer-Olkin Measure of Sampling Adequacy		0.871
Barlett's Test of Sphericity	Approx. Chi-Square	1544.932
	df	105
	Sig.	0.000

To determine the feasibility of factor analysis, the KMO and Bartlett's Test were employed. The KMO figure approaching 1.0 is ideal, while a figure below 0.6 indicates unsuitability (Kaiser, 1974). The reported KMO value of 0.871 exceeds the minimum requirement of 0.6, signifying the appropriateness of the dataset for factor analysis and supporting meaningful factor extraction. Furthermore, Barlett's Test produced a significance level of 0.000, further strengthening the data's suitability for factor analysis.

Table 4: Factor Loadings of Independent Variables

Independent Variables	Factor Loading			
	1	2	3	4
PU1	0.807			
PU3	0.788			
PU2	0.781			
PU5	0.748			
PU4	0.701			
PEU2		0.813		
PEU3		0.800		
PEU1		0.777		
PEU4		0.770		
PBC1			0.882	
PBC2			0.858	
PBC3			0.765	
PS3				0.854
PS1				0.780
PS2				0.701
Eigenvalue	5.971	1.827	1.448	1.331
Total % variance explained (%)	70.518			

Explanatory Factor Analysis (EFA) was applied to uncover the patterns among observed variables by condensing data into meaningful elements, enabling the researcher to focus on core components while filtering out less significant ones to reduce data complexity. In this research, EFA grouped 15 independent variables into four components, with the Eigenvalue above 1, warranting their retention in further analysis. The total variance explained by these factors reaches 70.518%, exceeding the acceptable threshold of 50%, proving a strong explanatory power. The Rotated Component Matrix achieved stability in a single run with all factors loading over 0.5, ensuring statistical relevance. Therefore, 15 items will be carried forward for the next stage of investigation.

EFA for mediating variable

Table 5: KMO, Barlett's Test for Mediator

KMO and Bartlett's Test		
Kaiser-Mayer-Olkin Measure of Sampling Adequacy		0.717
Barlett's Test of Sphericity	Approx. Chi-Square	222.951
	df	3
	Sig.	0.000

With a KMO score of 0.717 for the mediating variable, well above the 0.6 benchmark, the data is deemed appropriate for factor analysis. Moreover, the significance level of 0.000 from Barlett's Test reinforces the dataset's alignment with factor analysis requirements.

Table 6: Factor Loading for Mediator

Mediating variable	Factor Loading
	1
T1	0.872
T2	0.857
T3	0.846
Eigenvalue	2.210
Total % variance explained (%)	73.661

For the trust dimension, a single factor has been extracted with the eigenvalue of 2.210, which is greater than 1. The mediating variable contributed to 73.661% of the cumulative variance, which is above the 50% benchmark. Each of the three items has a factor loading above 0.5, meeting the required standard.

EFA for dependent variable

Table 7: KMO, Barlett's Test for Dependent Variable

KMO and Bartlett's Test		
Kaiser-Mayer-Olkin Measure of Sampling Adequacy		0.721
Barlett's Test of Sphericity	Approx. Chi-Square	232.152
	df	3
	Sig.	0.000

With a KMO score of 0.721 for the dependent variable, well above the 0.6 benchmark, the data is deemed appropriate for factor analysis. Moreover, the significance level of 0.000 from Barlett's Test reinforces the dataset's alignment with factor analysis requirements.

Table 8: Factor Loading for Dependent Variable

Dependent variable	Factor Loading
	1
ITU3	0.874
ITU1	0.860
ITU2	0.853
Eigenvalue	2.232
Total % variance explained (%)	74.385

For the dependent dimension, a single factor has been extracted with the eigenvalue of 2.232, which is greater than 1. The dependent variable contributed to 74.385% of the cumulative variance, which is above the 50% benchmark. Each of the three items has a factor loading above 0.5, meeting the required standard.

Hypothesis Testing

Independent variables on dependent variable

Table 9: First Regression Model

Independent variables	Dependent variable		
	Intention to Use		
	β (Unstandardised)	β (Standardised)	Sig. (p-value)
(Constant)			
Perceived Usefulness (PU)	0.381	0.358	0.000
Perceived Ease of Use (PEU)	0.244	0.233	0.000
Perceived Security (PS)	0.118	0.096	0.082
Perceived Bahaviorial Control (PBC)	0.238	0.227	0.000
R Square	0.535		
Adjusted R Square	0.562		
F	59.330		
Sig.	0.000		

Note: with $p < 0.01^{***}$, $p < 0.05^{**}$, $p < 0.1^*$ (the confidence interval a being 95 percent)

The first regression model between the independent variable and dependent variable was found to be statistically significant, as evidenced by the F value of 59.330 and P value of 0.000. The R-square value of 0.535 suggests that 53.5% of the variance in ITU can be attributed to predictor variables. Additionally, three out of four predictor variables significantly influence ITU, given the p-values are lower than 0.05. Notably, PU has the greatest effect ($\beta = 0.358$), followed by PEU ($\beta = 0.233$) and PBC ($\beta = 0.227$). Conversely, PS does not impact ITU as its p-value exceeds 0.05. The regression equation is given by:

$$\text{Intention to Use} = 0.358 * \text{Perceived Usefulness} + 0.233 * \text{Perceived Ease of Use} + 0.227 * \text{Perceived Bahaviorial Control}$$

Independent variables on mediating variable

Table 10: Second Regression Model

Independent variables	Mediating variable		
	Trust		
	β (Unstandardised)	β (Standardised)	Sig. (p-value)
(Constant)			
Perceived Usefulness (PU)	0.289	0.285	0.000
Perceived Ease of Use (PEU)	0.203	0.203	0.003
Perceived Security (PS)	0.288	0.245	0.000
Perceived Bahaviorial Control (PBC)	0.073	0.089	0.142
R Square	0.394		
Adjusted R Square	0.382		
F	33.509		
Sig.	0.000		

Note: with $p < 0.01^{***}$, $p < 0.05^{**}$, $p < 0.1^*$ (the confidence interval a being 95 percent)

Statistical significance is demonstrated in the second regression model, which focuses on examining how the four independent variables affect the mediator, trust, as shown by an F value of 33.509 and a P-value of 0.000. With an R-Square value of 0.394, the model accounts for 39.4% of the variance in T. While PU, PEU, and PS have significant predictive power on trust (p-value < 0.05), PBC does not (p-value > 0.05). The most influential factor is PU ($\beta = 0.285$), followed by PS ($\beta = 0.245$) and PEU ($\beta = 0.203$). The regression equation is given by:

$$\text{Trust} = 0.285 * \text{Perceived Usefulness} + 0.245 * \text{Perceived Security} + 0.203 * \text{Perceived Ease of Use}$$

Mediating variable on dependent variable

Table 11: Third Regression Model

Mediating variables	Dependent variable		
	Intention to Use		
	β (Unstandardised)	β (Standardised)	Sig. (p-value)
(Constant)			
Trust (T)	0.578	0.552	0.000
R Square	0.305		
Adjusted R Square	0.302		
F	91.718		
Sig.	0.000		

Note: with $p < 0.01^{***}$, $p < 0.05^{**}$, $p < 0.1^*$ (the confidence interval a being 95 percent)

The third regression model evaluates the relationship between T and ITU. With an F value of 91.718 and a P value of 0.000, the model proves to be a strong fit for the data. According to the model, trust has a moderate explanatory power, accounting for 30.5% of the shift in intention to use ($R^2 = 0.305$). Given the p-value being smaller than 0.05, the observed relationship is deemed statistically significant. The regression equation is given by:

$$\text{Intention to Use} = 0.552 * \text{Trust}$$

Independent variables, mediating variable on dependent variable

Table 12: Fourth Regression Model

Independent variables	Dependent variable		
	Intention to Use		
	β (Unstandardised)	β (Standardised)	Sig. (p-value)
(Constant)			
Perceived Usefulness (PU)	0.324	0.305	0.000
Perceived Ease of Use (PEU)	0.204	0.195	0.001
Perceived Security (PS)	0.062	0.050	0.370
Perceived Bahaviorial Control (PBC)	0.224	0.261	0.000
Trust (T)	0.196	0.187	0.002
R Square	0.556		
Adjusted R Square	0.546		
F	51.441		
Sig.	0.000		

Note: with $p < 0.01^{***}$, $p < 0.05^{**}$, $p < 0.1^*$ (the confidence interval a being 95 percent)

The final regression analysis simultaneously incorporates all independent and mediating variables on the dependent variable. This approach helps establish whether trust plays a full, partial, or non-existent mediating role in the interaction between causal factors and target variables. Observing changes in Beta values is pivotal, as it sheds light on how significantly the mediator influences this relationship.

The regression model illustrates statistical significance ($F = 51.441$, $p = 0.000$) with an R-squared value of 0.556, meaning 55.6% of ITU's variation is accounted for by included variables. Significant impacts were identified in the relationships between PU, PEU, PBC, T and ITU as the p-values of these variables are less than 0.05. Conversely, PS does not exhibit statistical significance, with p-values exceeding 0.05. After integrating T into the model, PU still exerts the strongest impact on ITU ($\beta = 0.305$).

Mediating test

Baron and Kenny (1986) propose that Full Mediation takes place when the independent variable no longer affects the dependent variable after the mediator is introduced. Meanwhile, Partial Mediation is recognized by the reduction in the Beta value of the independent variables' impact on the dependent variable when the mediator is added. The P-value and shifts in Beta value serve as key indicators in distinguishing mediation types.

The four regression analyses reveal two distinct results. Partial Mediation is found for PU and PEU as their effects on ITU remain significant but lose their strength when T is included. Specifically, the Beta coefficient for PU drops from 0.358 to 0.305 and that of PEU declines from 0.233 to 0.195. In contrast, no mediation occurs for PS, as its link to ITU remains statistically insignificant when T is considered. Similarly, despite PBC being statistically significant with a p-value under 0.05, prior regression analysis shows that it has no substantial effect on T. Therefore, it confirms that T does not serve as a mediator in this connection. Full Mediation was absent in any of the relationships.

Summary table

Table 13: Summary Table

Hypotheses	Conclusion
H1 Trust mediates the impact of Perceived Usefulness on Intention to Use	Supported (Partial mediation)
H2 Trust mediates the impact of Perceived Ease of Use on Intention to Use	Supported (Partial mediation)
H3 Trust mediates the impact of Perceived Security on Intention to Use	Not supported
H4 Trust mediates the impact of Perceived Behavioural Control on Intention to Use	Not supported

DISCUSSION

This research explores how digital self-checkout technology influences intention to use among Vietnamese shoppers, considering trust as a mediating factor in the retail industry. To achieve this, a dataset underwent an in-depth analysis using Cronbach's Alpha, EFA and four linear regressions. Although some results are in line with the previous studies, some differences have also been recognized, which will be discussed in this section.

This research identifies PU and PEU as two out of four independent variables that exert a meaningful impact on the ITU of digital self-checkout technology. Concerning the first independent variable, the outcomes confirm that PU has a notable positive impact on ITU via trust and the bond was partially mediated by trust, consistent with the earlier observations of Singh & Sinha (2020) and Su *et al.* (2013). The findings of this study highlight that PU is the core factor affecting shoppers' intention to use, supporting the earlier works by Hamid *et al.* (2015), Marie *et al.* (2023), Abdullah *et al.* (2015) and Siagian *et al.* (2022). Thus, there is evidence that Vietnamese customers perceive self-checkout counters as a way to enhance buying convenience, which contributes to their likelihood of using this technological system. PEU, as the second influencing variable, has been empirically demonstrated to have a substantial influence on trust and ITU. These insights are in agreement with previous scholars such as Chawla & Joshi, (2023), Widiar *et al.* (2023) and Revels *et al.* (2010). It is plausible to believe that even if users find self-checkout technology to be easy to understand and do not require extensive effort to navigate, a lack of trust could result in limited intention and a hesitant attitude toward adoption.

For the two remaining variables, PS and PBC, trust did not emerge as an intermediary variable, depicting that the presence of a mediator may not be universally applicable across all antecedents of ITU. Additionally, this study also uncovers other noteworthy insights that enrich the practical knowledge of customer adoption behavior. In the case of PS, this factor was not found to affect ITU which contradicts the conclusions drawn by Siagian *et al.* (2022), Chiu *et al.* (2009), Kim *et al.* (2008) and Mombeuil and Uhde (2021), but was found to significantly and directly impact trust. One possible explanation is that customers tend to consider security a standard aspect of modern technology systems. As such, even though strong security may foster trust in the system or provider, it may not substantially affect their intention to use the system-particularly in low-risk, task-oriented settings like retail. This suggests that security concerns contribute more to fostering trust than to influencing direct adoption decisions. Moreover, trust does not intervene in the relationship between PS and ITU, according to this study, which runs counter to the findings of Chawla and Joshi (2023). PBC, in contrast to PS, directly influences ITU without the aid of any mediating variable, confirming that trust does not serve as a bridging component in this interaction. This conclusion presents a similar viewpoint to the findings reported by Ajzen and Madden (1986) and Tian *et al.* (2023). This result substantiates the idea that regardless of a person's degree of system certainty, individuals' level of control over their ability to operate self-checkout technology is a critical factor in predicting their embracement. Additionally, in high-volume and fast-moving retail environments where speed is prioritised, users may care more about task completion and ease of use than how much they trust the platform.

The results underscore the mediating role of trust in the connection. Not only does this matter validate the relevance of the TAM model but it also extends its scope by introducing trust as a key mediator. Additionally, this study advances the Stimulus-Organism-Response (SOR) theory by offering empirical support for its use in the domain of self-service technology. By connecting the gaps between theoretical understanding and practical implementation, the study uncovers certain aspects of self-checkout technology as vital drivers of consumer trust, which in turn encourages consumer desire to use.

CONCLUSION AND RECOMMENDATION

Conclusion

Innovation is becoming a driving force in all industries due to the swift growth of technological advances and the groundbreaking implications of Industry 4.0, with automated service becoming increasingly prevalent in the marketplace. While still evolving, Vietnam is actively updating and keeping pace with worldwide trends. Acknowledging that matter, this aims to examine the association between digital self-checkout technology dimensions and Vietnamese customers' usage intention in retail through the role of trust. The foundation of this research stems from the TAM, part of the TBP and SOR models. Utilizing SPSS, this study analyses 211 survey responses from Vietnamese buyers. Among input factors, perceived usefulness and perceived ease of use become the dominant predictors of customers' acceptance of digital self-checkout technology. This potentially indicates that in the Vietnam context, usability and convenience seem to outweigh security-related concerns and perceived behavioral control when considering the adoption of new technology solutions.

This research contributes to the literature in several ways. Firstly, this study tackles the understudied topic of digital self-checkout uptake in Vietnam, a developing nation with few empirical studies, the study provides context-specific views on customer behavior. Secondly, by incorporating trust as a mediator and differentiating between elements that are mediated and those that are not, it expands on the TAM model and gives it more depth than its predecessors. Thirdly, by utilising the SOR model, the research emphasises the crucial role that trust plays in connecting system aspects to usage intention. Finally, it indicates that in low-risk retail contexts, usability and convenience surpass security and control concerns, providing useful information for retailers, in contrast to research carried out in high-risk industries like banking and healthcare. These discoveries hope to enrich the body of knowledge on technology adoption in emerging regions while providing practical recommendations for businesses that intend to integrate digital self-checkout systems.

Implications

There are some imperative suggestions for retailers when it comes to implementing digital self-checkout technology. Store owners can leverage this chance to improve their operational processes and marketing strategies. By bypassing generalized strategies, they may craft focused messaging that emphasizes the direct advantages of digital self-checkout technology, such as their practicality and simplicity of execution. Merchants may introduce shoppers to digital self-checkout systems through interactive displays or in-store trials. They may alleviate accessibility and usability concerns by providing hands-on instruction. Moreover, the self-checkout experience may be considerably enhanced by combining the touchscreen interface with an easy-to-use layout. Efficiency may be increased by cutting out unnecessary steps, putting in place straightforward-to-use navigation and providing single-click payment choices. In addition, a potential idea to facilitate customer engagement with digital self-checkout technology instead of traditional one is by informing shoppers of the benefits of loyalty programs linked to the system. This enables customers to seamlessly collect points or access exclusive discounts through this feature. As a result, consumer satisfaction and customer reuse intention could be augmented by customizing discounts to match historical buying patterns. Moreover, customers may feel more in control if multilingual interfaces along with real-time assistance are offered, especially for first-time users. Likewise, integrating advanced security such as data protection and encryption might not directly boost intention to use, yet it can enhance a favorable impression among newcomers.

Research Limitations And Suggestions For Future Studies

Several limitations are found in this research, including limited sample size, sample demographics and dependence on convenience sampling. Regarding the first constraint, 211 survey responses were collected, while sufficient for analysis, but remains relatively small to fully encompass the opinions of the Vietnamese population. Given this limitation, future studies should consider conducting surveys on a larger scale to better represent a broader demographic or exploring the usage of self-checkout across developed and emerging markets. Secondly, selection bias may be introduced by the sampling strategy used in the study, which mostly used social media to poll Vietnamese people. This approach could exclude older generations or those who are less engaged online, skewing the sample towards a younger, knowledgeable group about technology. Because of this, the results may offer a skewed or inadequate representation, making it difficult to fully comprehend how the Vietnamese public as a whole feels about the use of digital self-checkout. Thirdly, the study carries the risk of under-representing certain communities and over-representing others by using convenience sampling. The dataset may become unbalanced as a result, which would restrict its generalisability. To mitigate this shortcoming, researchers are encouraged to employ rigorous sampling approaches such as stratified or random sampling to achieve greater representativeness. Finally, the study overlooks the possible influence of the COVID-19 pandemic on consumer behavior. Future research should investigate how such events affect attitudes towards this innovation, especially in relation to health and safety concerns.

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