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Uncovering Intention to Adopt Self-Checkout Through Technology Readiness: Empirical Study of Retail Customers

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Abstract

Objective: The objective of this study is to examine the factors that influence the intention to adopt self-checkout in a retail context.
Design/Methods/Approach: This study employs the PLS-SEM method, with a total of 356 respondents selected using purposive sampling.
Findings: The dimensions of technology readiness have been shown to have a significant effect on expected ease of use and expected usefulness, except discomfort, which did not affect expected usefulness. In addition, autonomous motivation is proven to have a significant positive effect on expected ease of use and expected usefulness, despite controlled motivation having no impact on either expected ease of use and expected usefulness. Consequently, expected ease of use and expected usefulness significantly improve attitudes toward self-checkout system.
Originality/Value: This research integrates three theories, technology readiness, technology acceptance model, and self-determination theory in predicting self-checkout
Practical/Policy implication: For retailers looking to implement a self-checkout system, our research provides insights into the importance of adequate resources and support to facilitate user adoption. Retailers can leverage these findings to develop effective communication strategies highlighting the benefits of self-checkout through in-store and online advertising, resource updates, and employee training.

Keywords: Self-Checkout; Technology readiness; Retail customers

JEL Classification: D13, I31, J22, K31, M48

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1. Introduction

The rapid development of technology impacted changes in consumer behavior in transactions, prompting businesses to adopt Self-Checkout Technologies (SSTs). In this regard, adopting SSTs has positively affected retail business growth (Collier et al., 2015). Integrating SSTs into business would produce more significant results in two ways: (1) reducing operational cost through work efficiency and (2) enhancing service quality through the favorable experience of SSTs (Saloman, 2006; Leung & Matanda, 2013). On top of that, SSTs have become increasingly relevant as they minimize physical contact, aligning with consumer preferences for safer and more convenient transactions. As technology-driven shopping experiences become the norm, businesses should continuously adapt their strategies by adopting SSTs to remain competitive in the evolving retail landscape.

Self-checkout, a swiftly growing self-service technology (SST), transforms consumer roles by allowing them to scan their product barcode, pay for the product, and place it into the cart themselves without assistance from employees (Meuter et al., 2000; Schliewe & Pezoldt, 2010). This innovation, which relies on barcode scanning and universal product codes (UPCs) introduced in the 1970s (Basker et al., 2012), reshapes retail transactions. By adopting self-checkout, consumers could speed up the payment process to avoid long lines, save time, and obtain a more comfortable shopping experience (Mekruksavanich, 2020; Duarte et al., 2022). In other words, from the consumers' perspective, self-checkout is helpful by offering greater autonomy to consumers in shaping their shopping experience. While SSTs (i.e., self-checkout) provide efficiency and cost savings from the business perspective and convenience from the consumers' perspective, they also introduce risks such as technical failures and consumer frustration due to usability challenges (Thomas-Francois & Somogyi, 2023). In this regard, businesses must understand the factors influencing consumers' adoption of self-checkout technology.

To understand consumer adoption of self-checkout, it is essential to examine key theoretical perspectives that explain how individuals perceive and interact with technology. The Technology Acceptance Model (TAM) by Davis (1989) has been widely utilized to explain technology adoption, emphasizing two critical constructs: perceived usefulness and perceived ease of use (Ahmad et al., 2020). Perceived usefulness refers to the extent to which an individual believes that using a technology will enhance their performance, while perceived ease of use reflects the degree of effort required to use the technology (Davis, 1989). These factors may shape consumer attitudes toward self-checkout and ultimately influence their intention to use such a system. However, while TAM provides valuable insights into technology adoption, it does not fully account for individual differences in consumer readiness and motivation to engage with new technologies.

Integrating the Technology Readiness (TR), which was developed by Parasuraman (2000), allows us to capture a deeper understanding of how consumer perception of readiness toward technology influences their adoption. Technology readiness comprises four key dimensions: optimism, innovation, discomfort, and insecurity (Parasuraman, 2000). Optimism and innovation encourage technology adoption by fostering a willingness to embrace new solutions, whereas discomfort and insecurity may hinder adoption due to concerns over complexity or reliability. By incorporating TR into the study of self-checkout adoption, businesses could position their customers' segment based on their readiness to engage with these systems and develop targeted strategies to encourage adoption.

In addition, Self-Determination Theory (SDT) by Deci & Ryan (1985) offers a complementary perspective by examining the motivational aspects underlying consumer willingness to adopt self-checkout. SDT differentiates between autonomous and controlled motivation, where autonomous motivation enhances positive adoption behaviors, whereas controlled motivation may lead to less favorable experiences (Dubnjakovic, 2017; Meisler, 2020). In other words, SDT complements TAM and TR by examining the motivational factors that influence individuals' intention to adopt self-checkout.

Integrating TAM, TR, and SDT is crucial for capturing the multifaceted nature of consumer adoption of self-checkout technologies in retail. While TAM explains cognitive evaluations of technology, TR accounts for individual readiness to adopt technology, and SDT highlights the role of motivation in shaping adoption behavior. Understanding these interconnections allows businesses to design SSTs that cater to various consumer segments, ensuring a balance between usability, readiness, and motivation. This study aims to bridge these theoretical frameworks to comprehensively explain consumer adoption behavior regarding self-checkout, providing managerial insights for businesses looking to enhance self-checkout implementation strategies.

The adoption of self-checkout in developed countries as the only option in their services is widespread, such as Amazon Go, Kroger, Tesco, Walmart, and so on (Wolniak et al., 2024; Lee & Leonas, 2021; Nusrat & Huang, 2024). On the other hand, prior studies have shown that self-checkout adoption in developing countries is still limited (Lee et al., 2009; Oreal & Kara, 2014). To address the gap, this study focused on unveiling the factors of intention to adopt self-checkout in a developing country. Specifically, we examined whether the cognitive perception of technology acceptance, readiness to embrace technology, and motivational factors affect the intention to adopt self-checkout in retail business within an emerging market setting.

Furthermore, previous studies have shown that technology readiness (Aguzman et al., 2020), ease of use (Aguzman et al., 2020; Cebeci et al., 2020; H. Lee & Leonas, 2021; Safitri et al., 2021), usefulness (Aguzman et al., 2020; Cebeci et al., 2020), dan self-determined motivation (Leung & Matanda, 2013) influence the adoption of self-checkout separately. The three theoretical domains underlying these factors may have stronger interconnections in explaining the

antecedents of intention to adopt self-checkout. We address the gap by capturing a more comprehensive perspective by integrating these three theoretical domains (TAM, TR, SDT) in predicting the intention to adopt self-checkout.

This research contributes to both practical and theoretical perspectives. From a practical perspective, we offer inputs to retail business management regarding the factors that drive and inhibit consumers' intention to adopt self-checkout. Based on theoretical perspectives, we provide a better understanding of the potential adoption of self-checkout in retail business by testing the TAM model, which includes perceived ease of use and usefulness, attitude, and intention to use. Second, to delve deeper into the likelihood of self-checkout adoption in retail business, we consider technology readiness, which involves the drivers and inhibitors of technology readiness. Third, we propose controlled & autonomous motivation as an external variable that also plays a role in influencing perceived ease of use and perceived usefulness, which in turn affects the adoption of self-checkout in the retail business. Lastly, we integrate these three theories to offer a comprehensive perspective determining individuals' intention to adopt self-checkout in the retail industry.

2. Literature Review and Hypotheses Development

2.1. Technology Acceptance Model (TAM)

TAM refers to people's behavior in adopting technological innovations (Davis, 1989). This model is widely used by research in various disciplines to explain predictors of human behavior toward the potential acceptance or rejection of technology (Davis, 1989). Furthermore, Davis (1989) said that TAM is a derivative of TRA (Theory of Reasoned Action) and TPB (Theory of Planned Behavior). Moreover, Taylor & Todd (1995) explained that TAM is in the Ease of Use and Usefulness variables in assessing beliefs, while TRA and TPB have many beliefs that are not specific to certain behaviors. In the end, TAM is robust in measuring the behavior of using information technology (Venkatesh et al., 2003). It is hoped that the use of technology can bring performance improvements to individuals or organizations by increasing efficiency, saving costs, improving customer service, enabling simple communication, and encouraging strong collaboration with stakeholders (Rawwash et al., 2020). Expected Usefulness (PU), Expected Ease of Use (PEOU), Attitude (ATT), and Intention to Use (ITU) are strong predictors of usage acceptance of a technology. In recent years, TAM has emerged as a leading paradigm in explaining technology adoption in various fields, such as social media (Zhao et al., 2016), health technology (Rouidi et al., 2022), online banking (M.-C. Lee, 2009), and education (Natasia et al., 2022; Sukendro et al., 2020). The literature above shows the application of TAM, which has been widely used in various fields, including the mobile application domain. However, to the best of the researcher's knowledge, efforts to use TAM concepts to test public acceptance of self-checkout are limited, and this topic deserves further exploration.

The Technology Acceptance Model (TAM) is a theoretical framework that explains how consumers adopt self-checkout technology in retail settings. This model emphasizes that perceived ease of use and usefulness are key factors that shape consumers' intention to use a technology, which drives actual usage (Demoulin & Djelassi, 2016). In the context of self-checkout as a new technology, the constructs within TAM are highly relevant in understanding the factors that influence consumer adoption decisions. Recent studies also show that, besides the two core TAM factors, other elements such as performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, and habit significantly affect individuals' intention to use self-checkout technology (Rashid et al., 2024).

2.2. Technology Readiness

Technology Readiness (TR) refers to how individuals are likely to accept new technology daily (Parasuraman, 2000). This readiness is measured by two types of beliefs: positive and negative. This implies that a person's personality can reflect a person's ability to adopt new technology. There are four main components in TR (Parasuraman, 2000). Optimism and innovation represent positive beliefs. Discomfort and insecurity represent negative beliefs. According to Lin et al. (2016) and Musyaffi et al. (2021), optimism and innovation will be the driving factors. Meanwhile, discomfort and insecurity will be inhibiting factors.

Optimism is related to a customer's positive expectations when using new technology (Musyaffi, Sari, et al., 2021), where these positive expectations exceed negative expectations, making it easier for someone to adopt new technology. While innovation is the extent to which a customer understands and wants new technology. Innovative users will be open to accepting new things. As a result, innovative users will tend to be able to take technology and realize that technology can be helpful for themselves and others in general (Aboelmaged et al., 2022; Liu et al., 2010).

Discomfort describes feelings of discomfort, being overwhelmed, or helplessness when dealing with technology (Colby & Parasuraman, 2001). Discomfort can influence users to adopt technology (Aboelmaged et al., 2022). Sometimes, the customer who is already comfortable with the conditions that have become a habit will find it difficult to use new technology. A customer with this type feels that using technology is too complicated. As a result, they will be afraid and anxious when faced with new technology (Chingarande & Saayman, 2018; Sun & Zhang, 2006). Finally, customer insecurity is most often related to their ability to perform well. Technological uncertainty will cause a pessimistic attitude toward the use of technology, which will then cause feelings of insecurity on the user's side (Chang

et al., 2017); the effect is to make someone look negatively at new technology. On the other hand, the lower the customer's discomfort, the easier it will be for them to use technology (Godoe & Johansen, 2012).

TR becomes essential in adopting new technology, such as self-service technology (SST). Consumers with high TR will tend to view technology as something interesting from a new experience aspect, encouraging consumers to use it. Conversely, consumers with low TR will view new technology as something that can be inhibiting, so consumers will tend to reject it (Mukerjee et al., 2018; Lin & Hsieh, 2006). TR is seen as a relevant theoretical framework in viewing the adoption of self-checkout technology in the retail sector (Mukerjee et al., 2018; Schliewe & Pezoldt, 2010; Siebenaler et al., 2018).

2.2.1 Technology Readiness as The Antecedents of Expected Usefulness

Expected Usefulness (EU) refers to an individual's belief that the use of technology enhances performance and productivity (Marangunić & Granić, 2015). As a central construct in the Technology Acceptance Model (TAM), EU has been identified as a strong predictor of one's intention to adopt a particular technology (Virani et al., 2023). This relationship is often reinforced by Perceived Ease of Use (PEOU), which positively influences performance, collaboration, and operational efficiency. When individuals perceive that a system such as a self-checkout technology has a beneficial impact, it fosters a favorable attitude toward usage, ultimately leading to greater adoption. In turn, this adoption contributes to improved effectiveness and productivity in completing tasks. Perceived usefulness, therefore, reflects the extent to which an individual believes that their performance is enhanced by using technology (Marangunić & Granić, 2015). In line with this, usability can be defined as the degree to which a system provides functional value or benefits to its users. In the context of retail self-service checkout systems, perceived usefulness can be evaluated based on the system's ability to improve consumer efficiency. For example, when self-checkout technology facilitates quicker transactions, reduces wait times, and increases service effectiveness, it is perceived as highly useful (Davis, 1989).

Furthermore, Technology Readiness (TR) is closely associated with perceived usefulness. Individuals with high levels of technology readiness are more likely to adopt emerging technologies, as increased self-efficacy and reduced anxiety enhance their confidence in using new systems. As supported by Mukerjee et al. (2018), consumers with higher TR tend to view retail self-checkout systems as effective and efficient tools for completing transactions, especially when both ease of use and usefulness are perceived positively. As consumers become more familiar with the use of technology, the perception of complexity that often becomes a barrier will decrease. This sense of comfort contributes to greater satisfaction and encourages continued usage. Ultimately, such experiences enhance the likelihood of consumer adoption, particularly when the technology is viewed as beneficial and aligned with users' needs (Rashid et al., 2024). Therefore, the following hypothesis is proposed:

H1: Optimism has a positive effect on expected usefulness
H2: Innovation has a positive effect on expected usefulness
H3: Discomfort has a negative effect on expected usefulness
H4: Insecurity has a negative effect on expected usefulness

2.2.2 Technology Readiness as The Antecedents of Expected Ease of Use

Perceived Ease of Use (PEOU) refers to the degree to which a person believes that using a particular system would require minimal effort (Davis, 1989). This perception plays a critical role in enhancing job performance, as systems that are easier to use tend to be adopted more readily. Segars and Grover (1993) further suggest that PEOU contributes significantly to increasing users' clarity, understanding, and flexibility when engaging with new technologies. In contemporary contexts, such as self-checkout systems, ease of use is closely linked to efficiency and effectiveness, serving as a measure of technological usefulness. When users perceive a system as convenient and easy to navigate, this perception enhances operational effectiveness and shapes user attitudes through heightened awareness and understanding of its benefits (Davis, 1989).

Moreover, individuals are more likely to adopt a technology when they perceive it as easy to use (Al-Maroof et al., 2020). Ease of use implies the absence of significant difficulty or effort, making the technology appear more valuable and user-friendly. Davis et al. (1989) emphasize that PEOU encapsulates the ability to interact with a system effortlessly, while Segars and Grover (1993) reaffirm its role in improving users' experience through enhanced clarity and usability. Research also indicates that the ease of learning a technology fosters user confidence, which in turn promotes a positive attitude toward innovation (Popy & Bappy, 2020). Furthermore, PEOU encompasses system accessibility, adaptability, and usability factors that collectively contribute to a favorable user experience. This positive interaction subsequently strengthens users' attitudes toward the continued use of technology. Consistent with this, several empirical studies have demonstrated that perceived ease of use has a significant positive impact on user attitude (Davis, 1989; Lust et al., 2012; Abdullah & Ward, 2016).

High readiness levels will be strongly correlated with increased ease of use of technology. Previous studies show a positive relationship between TR and the intention to use new technology (Aboelmaged et al., 2022). Positive attitudes shown by individuals towards new technology will lead consumers to ease of use (Lai & Lee, 2020). When technology is easy to use, there is a possibility of more sustainable technology adoption (Mukerjee et al., 2018).

Furthermore, user-friendly design and clear instructions make self-checkout viewed as an easy-to-use technology across age demographics (Liang et al., 2021). Therefore, the following hypothesis is proposed:

H5: Optimisme has a positive effect on expected ease of use
H6: Innovation has a positive effect on expected ease of use
H7: Discomfort has a negative effect on expected ease of use
H8: Insecurity has a negative effect on expected ease of use

2.3 Self Determination Theory

Self-Determination Theory (SDT) refers to a theory of motivation regarding a person's ability to make choices and regulate their behavior independently (Sie et al., 2018; Bidee et al., 2017). SDT theory explains that motivation can be seen depending on how much autonomy a person has over their actions. Autonomy relates to the freedom to act according to one's wishes without external pressure. This serves as the basis for a person's motivation to develop. There are three categories in SDT: intrinsic motivation, extrinsic motivation, and motivation (Dubnjakovic, 2017; Meisler, 2020). Intrinsic motivation will arise when a person is involved in an activity that is enjoyable and personally satisfying to them.

In contrast, extrinsic motivation is driven by external goals, such as rewards or recognition, rather than the activity itself (Sie et al., 2018). Extrinsic motivation is further divided into autonomous motivation (driven by self-awareness and personal values) and controlled motivation (driven by pressure or obligation) (Huang et al., 2017). In technology adoption, SDT can serve as a relevant lens. When a person's level of control and freedom is high, they will quickly adopt technology, in this case, self-checkout technology. High autonomy makes the experience feel more personal and comfortable. Research by Widyarini (2021) revealed that self-service technology will inherently support consumer autonomy in managing their purchases. Furthermore, Rashid et al. (2024) found that using self-checkout can reduce technology anxiety and that allowing consumers to try the system can reduce anxiety about complex technology and foster autonomous motivation to use it. These findings support the relevance and application of SDT as a theoretical framework to explain the adoption of self-checkout technology in the retail sector.

2.3.1 The outcome of autonomous motivation

Ryan & Connell (1989) explained that the key concept of self-determination theory is autonomous motivation (AM), which is behavior that realizes a perceived cause or goal. AM will be more effective in initiating individual behavior related to success (Wang & Hou, 2015). Self-motivated individuals tend to be more consistent with their behavior if there are no extrinsic benefits that will produce extrinsic benefits, such as satisfaction and competence (Rodrigues et al., 2023). In their research, Sheldon & Elliot (1998) explained that autonomous motivation consists of two psychological motivations: intrinsic and identified. Intrinsic motivation comes from within the individual (Deci & Ryan, 1985). Identified motivation comes from humans' most profound beliefs and core values . If individuals feel that their behavior provides benefits, then they will feel motivated (Deci & Ryan, 1985; Sheldon & Elliot, 1998). This self-directed engagement generally results in a better user experience when interacting with technology.

Research shows that individuals with higher levels of autonomous motivation tend to approach new technologies with tremendous enthusiasm and confidence, leading to increased adoption of self-checkout systems (Guo, 2022). The study interestingly, found that various motivational factors, including performance expectancy and effort expectancy, influence the adoption of self-checkout systems. These factors are enhanced through autonomous motivation (Rashid et al., 2024). According to their study, motivated customers perceive the technology as helpful and easy to use, which can directly affect their intention to adopt the system (Rashid et al., 2024). Therefore, the following hypothesis is proposed:

H9: Autonomous motivation has a positive effect on expected usefulness
H10: Autonomous motivation has a positive effect on expected ease of use

2.3.2 The outcome of controlled motivation

Controlled Motivation (CM) represents the state of an individual in an environment where the individual is driven by internal and external pressure to perform a task. Controlled motivation refers to the negative consequences of behavior (Wang & Hou, 2015). Individuals who can control motivation will be more consistent in their behavior. Individuals with this type are influenced by external reinforcement, pressure, and obligation (Wu & Li, 2019). Chiu & Cho (2020) explained that CM has similarities in developing individual motivation and can also affect individuals regarding technology adoption. Individuals tend to be able to use technology with mixed feelings and fewer doubts. In this context, even when users may have mixed feelings, controlled motivation can reduce hesitation and encourage them to try using the technology. In the case of technological services such as self-checkout systems, controlled motivation can enhance users' perception of ease of use. When consumers feel pushed by external pressures, such as long queues, the drive for efficiency, or social norms, they are more likely to perceive the system as more straightforward (Sapry et al., 2022). Additionally, technology-related anxiety influences consumers' intention to adopt, where situational pressure becomes a trigger that encourages them to engage with available technological solutions.

Controlled motivation also contributes to shaping perceptions of usefulness. In many cases, consumers view self-checkout technology as efficient because it facilitates faster transactions, especially under pressure to complete purchases quickly (Kazançoğlu & Yarımoğlu, 2018). Esch et al. (2021) found that social expectations can further strengthen consumers' intention to use such technologies, as they associate the systems with convenience and high utility. Thus, there is a feedback loop between controlled motivation, perceived ease of use, and perceived usefulness. When consumers are externally motivated, their interactions with technology tend to be more positive, ultimately reinforcing their perception of its benefits (Lee & Leonas, 2020). Therefore, the following hypothesis is proposed:

H11: Controlled motivation has a positive effect on expected usefulness

H12: Controlled motivation has a positive effect on expected ease of use

2.4 The mediating role of Attitude

Maryam et al. (2022) found that attitude is critical to customers' technology adoption. Attitude shows susceptibility to react favorably or unfavorably to a technology. In another explanation, attitude is also related to likes or dislikes (Schermerhorn et al., 2011). Therefore, individuals' feelings of likes and dislikes are closely related to positive and negative responses. Individuals who have a positive attitude tend to be able to engage with technology. Meanwhile, individuals with a negative attitude tend to avoid technology because they feel it has no benefit to their lives (Abouzeid et al., 2020). Attitudes have properties that can be understood from what is said and what is done by individuals (Yang & Yoo, 2004), shaping a customer's behavior by filtering information and perceptions about the surrounding environment. A positive attitude from a customer will create strong motivation within the individual. So, someone with positive motivation will encourage the individual to behave positively when adopting technology. Several studies have shown that attitude significantly impacts a customer's behavioral intention to embrace technology (Bananuka et al., 2020; Echchabi et al., 2016; Kaawaase, 2017). Therefore, the following hypothesis is proposed:

H13: Expected ease of use to intention to use self-checkout is positively mediated by the attitude

H14: Expected usefulness to intention to use self-checkout is positively mediated by the attitude

The research model illustrated in Figure 1 is based on the formulated hypotheses.

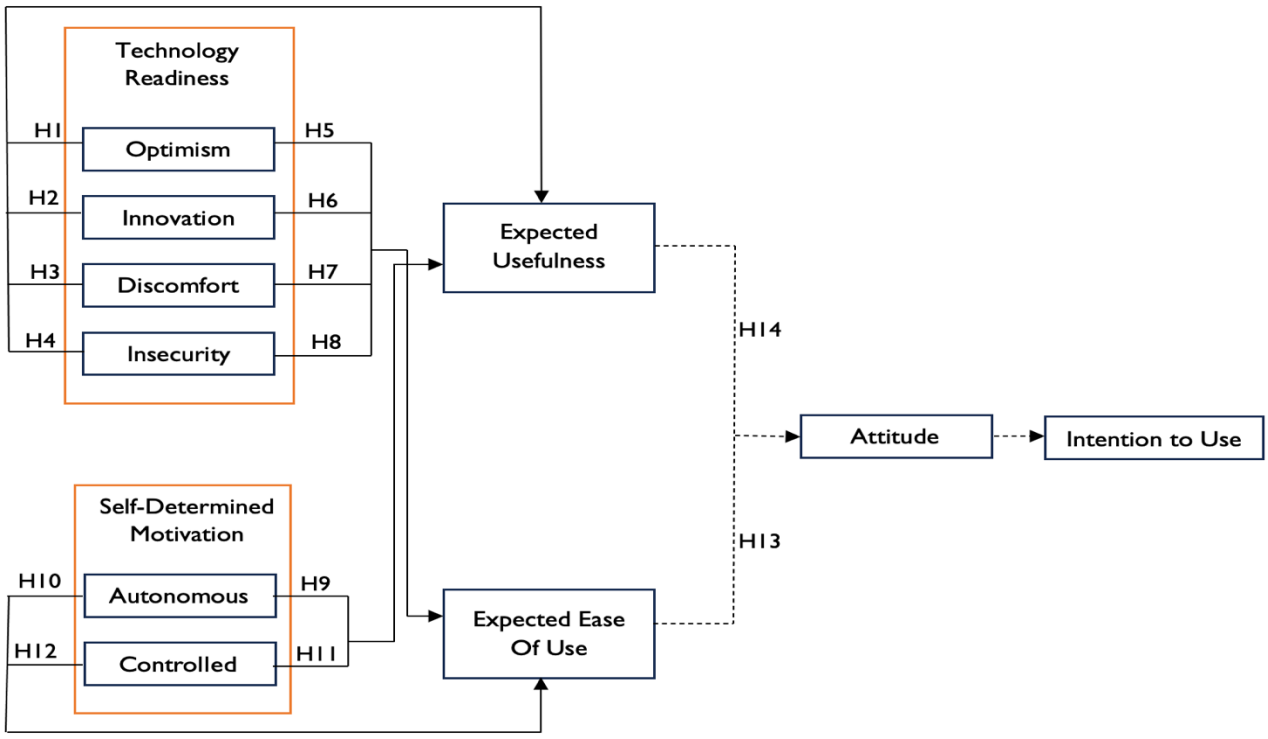

Figure 1. Research Framework

3. Method

This research uses a quantitative approach, collecting respondents by distributing online questionnaires. The focus is the Indonesian public, and this specification was chosen because, especially in Indonesia, there are not many retailers that use self-checkout systems.

Indonesia will be an interesting setting in which to study the adoption of self-checkout technology. First, self-checkout systems are becoming popular and showing an increasing trend so that consumers will be more free to scan products with their smartphones. Indonesia offers a promising opportunity to explore the acceptance and effectiveness of self-checkout technology systems because the penetration of smartphone use in Indonesia is increasing from year to year (Liang et al., 2021). Second, from the retail sector, Indonesia shows significant growth. This is indicated by the increasing number of international brands entering Indonesia, which will expand more modern retail formats. With increasing competition between industry players in Indonesia, it will also increase technological competition in retail operations. This will encourage the use of self-checkout technology because it has been proven to save time and costs and also improve customer privacy; this aspect is important for countries with dense populations (Cebeci et al., 2020).

Third, demographically, Indonesia excels in terms of technology literacy. This is because the majority of the population in Indonesia are young, tech-savvy consumers. However, psychological factors such as technology anxiety and individual innovativeness influence consumers' intention to use self-checkout systems (Sapry et al., 2022). Given the increasing penetration of mobile technology, wider adoption may be possible if these psychological barriers can be minimized (Lee & Leonas, 2020). Fourth, unlike Western countries where self-service technology is widely accepted, Indonesian consumers often expect face-to-face interactions in physical stores. Therefore, perceptions of service quality significantly influence the acceptance of self-service technology (Park et al., 2020). Understanding local cultural nuances is essential to ensure service design aligns with Indonesian consumer preferences (Rashid et al., 2024). Fifth, technological advances such as Artificial Intelligence (AI) and Radio Frequency Identification (RFID) create new opportunities for innovation in self-service systems. The integration of these technologies has the potential to improve customer experience and operational efficiency. Further research on the adoption of self-service systems can help address local challenges such as theft and high operational costs (Abana et al., 2019; Jie & Kamsin, 2021).

Furthermore, this research uses non-probability with a purposive sampling technique as a reference for data collection design. The criteria used include Indonesian people over 17 years old who have never used a self-checkout technology system. The questionnaire began with a confirmation question to screen respondents. Only individuals who had never used self-checkout services were eligible to continue filling out the questionnaire, so this study was specifically aimed at exploring the adoption intentions of potential technology users.

This research model consists of 10 latent variables with 35 manifest variables and uses a 5-point Likert scale (i.e., one strongly disagree to 5 strongly agree). In addition, this study also adapted questionnaire questions from previous studies that have been tested for validity and reliability, including technology readiness dimensions (namely optimism, innovation, discomfort, and insecurity) adapted from (McNamara et al., 2022), autonomous motivation and controlled motivation adapted from (Ryan & Connell, 1989), expected usefulness adapted from (Joo et al., 2018), expected ease of use adapted from (Lu et al., 2009), attitude adapted from (Wang et al., 2023). Previous research highlights that primary data using a questionnaire approach has been proven and logically used to measure technology adoption (Bananuka et al., 2020; Echchabi et al., 2016). See Table 1. This study uses an online questionnaire distributed via Google Forms. The number of respondents who were successfully collected amounted to 356 responses. PLS PLS-SEM was used to test this research model because PLS-SEM is suitable for complex models with relatively small samples and can also identify the primary "driving" constructs (Hair et al., 2021). The sample adequacy is felt to be sufficient to fulfill the procedure, where the minimum sample in the study amounted to 350 respondents, according to the advice from Hair et al. (2019), which states that the minimum sample size in PLS-SEM research is 10 times the number of measuring instrument indicators.

Table 1. Definition and Measurement

Variable	Definition	Item	Statement	Reference
Optimism	The degree to which an individual believes that technology offers increased efficiency, bleakness, and control over their lives.	OPT 1	Self-checkout system contributes to the quality of the shopping experience	(McNamara et al., 2022)
		OPT 2	The self-checkout system provides customers with flexibility in shopping mobility	
		OPT 3	Self-checkout system allows consumers more control over shopping time	
		OPT 4	The self-checkout system makes customers more productive in utilizing time	

Variable	Definition	Item	Statement	Reference
Innovation	The level of openness and tendency of individuals to be pioneers in trying and using new technologies.	INN 1	Other customers could potentially come to me to ask about the self-checkout system	(McNamara et al., 2022)
		INN 2	I could potentially be the first customer in my immediate neighborhood to try the check-out system in the future	
		INN 3	I potentially understand the system of checking out without the help of others	
		INN 4	I could potentially be the first in the immediate environment to update on technological developments	
Discomfort	The degree to which an individual feels uncomfortable, overwhelmed, or lack of control when dealing with technology.	DISC 1	When I get tech support from retailers, I sometimes feel taken advantage of by people who know better	(McNamara et al., 2022)
		DISC 2	I felt the technical support staff was not helpful because they didn't explain in a context that I understood	
		DISC 3	Sometimes I think the self-checkout system is not designed for the layman	
Insecurity	The level of distrust or concern an individual has about technology, particularly regarding the reliability and potential risks posed by the use of the technology.	ISC 1	Customers potentially rely on self-checkout systems	(McNamara et al., 2022)
		ISC 2	The use of self-check-out systems has the potential to reduce the quality of relationships through decreased customer interaction	
		ISC 3	I potentially have no confidence in being able to learn the self-checkout system	
Autonomous Motivation	Self-motivation, where an individual performs an action for internal reasons such as interest, personal values, or a sense of responsibility, rather than because of external pressure.	AM 1	I could potentially use the self-checkout system because I think it's important to me	(Ryan & Connell, 1989)
		AM 2	I could potentially use the self-checkout system because I think it's meaningful	
		AM 3	I could potentially use a self check out system because I think it helps to manage time	
		AM 4	I could potentially use the self check out system because I think it makes it easier for me to wait in line for too long	
		AM 5	I could potentially use the self check out system because it's fun	
Controlled Motivation	Motivation that comes from external pressures, such as the desire to	CM 1	I could potentially use a self-checkout system because that's what I have to do	(Ryan & Connell, 1989)
		CM 2	I could potentially use a self-checkout system because my immediate environment is doing it	

Variable	Definition	Item	Statement	Reference
	receive rewards, avoid punishment, or meet the expectations of others, rather than from personal desire or free choice.	CM 3	I could potentially use a self-checkout system because I feel pressure from my immediate environment	
		CM 4	I could potentially use the self-checkout system because I feel embarrassed if I don't use it in the future	
Expected Usefulness	The extent to which a person believes that using a system or technology will improve performance or effectiveness in an activity.	EU 1	I think the self check out system is beneficial for me	(Joo et al., 2018)
		EU 2	I think using a self-checkout system can improve the ease of transactions.	
		EU 3	I think that using a self-checkout system can increase my effectiveness in transactions	
Expected Ease of Use	The extent to which a person believes that using a system or technology will be free of heavy effort or hassle.	EEOU 1	I believe it's easy to learn the self-checkout system	(Lu et al., 2009)
		EEOU 2	I believe it is easy to find information related to the self-checkout system	
		EEOU 3	I believe it might be easy to use a self-checkout system	
		EEOU 4	I believe using a self-checkout system might create a positive experience	
Attitude	The extent to which a person has a positive or negative evaluation of the use of a particular technology.	ATT 1	Using a self-checkout system is a great idea	(Wang et al., 2023)
		ATT 2	Using a self-checkout system is a wise idea	
		ATT 3	I am confident in the self-checkout system	
Intention to Use	The extent to which a person has a conscious desire or inclination to use a technology in the near future.	ITU 1	In the future, I will use the self-checkout system	(Gu et al., 2009)
		ITU 2	In the future, I will recommend the self-checkout system to my friend	
		ITU 3	In the future, I will share my experience related to using the self-checkout system with friends	

4. Result and Discussion

4.1. Characteristic Respondent

The total final sample analyzed in this study amounted to 356 respondents, with various spectra based on gender, age, domicile, education, occupation, income, average shopping expenditure, frequent shopping, and places. In addition, the spectrum of respondents was dominated by gender (73.3% of females), age (< 20 years by 75.6%), domicile (Java by 63.5%), education (senior high school by 47.8%), occupation (student by 46.9%), income (Rp. < 1,000,000 by 46.9%),

average shopping expenditure (Rp. 50,001 - 200,000 by 38.8%), frequent shopping (Sometimes 3-4 times per month by 38.8%), and places (Indomaret by 38.5%). Table 2 provides detailed information regarding the demographics of respondents in this study.

Table 2. Respondent's Characteristics

User Characteristics	Description	Frequency	Percentage (%)
Gender	Male	95	26.7
	Female	261	73.3
Age	< 20 years	269	75.6
	21-30 years	71	19.9
	31-40 years	13	3.7
	> 40 years	3	0.8
Domicile	Sumatera	71	19.9
	Java	226	63.5
	Kalimantan	13	3.7
	Sulawesi and Maluku	27	7.6
	Nusa Tenggara dan Bali	13	3.7
	Papua	6	1.7
Education	Elementary School	0	0
	Junior High School	10	2.8
	Senior High School	170	47.8
	Bachelor	149	41.9
	Master	26	7.3
	Doctor	1	0.3
Occupation	Student	167	46.9
	Operational Employee	70	19.7
	Managerial Employee	8	2.2
	Entrepreneur	15	4.2
	Professional	13	3.7
	Housewife	18	5.1
	Others	65	18.3
Income	Rp. < 1.000.000	167	46.9
	Rp.1.000.000 – 2.500.000	87	24.4
	Rp. 2.500.001 – 5.000.000	64	18.0
	Rp. 5.000.001 – 10.000.000	31	8.7
	Rp. > 10.000.000	7	2.0
Average Shopping Expenditure	Rp. < 50.000	32	9.0
	Rp. 50.001 – 200.000	138	38.8
	Rp. 200.000 – 350.000	99	27.8
	Rp. 350.001 – 500.000	52	14.6
	Rp. > 500.000	35	9.8
Time Shopping	< 15 minutes	56	15.7
	16 – 30 minutes	170	47.8
	31 – 45 minutes	72	20.2
	> 45 minutes	58	16.3
Frequent Shopping	Rarely (1-2 times per month)	136	38.3
	Sometimes (3-4 times per month)	138	38.8
	Routine (1-2 times per week)	48	13.5
	Often (3-4 times per week)	22	6.2
	Very Often (> 4 times per week)	12	3.4
Places	Super Indo	36	10.1
	Carrefour	11	3.1
	Hypermart	24	6.7

User Characteristics	Description	Frequency	Percentage (%)
	Lotte Mart	8	2.2
	Farmer's Market	4	1.1
	Giant	3	0.8
	Indomaret	137	38.5
	Alfamart	71	19.9
	Others	62	17.4

4.2. Data screening

Common Method Bias (CMB) was used in this study. CMB ensures that there are no missing values or straight-line patterns in the data collected by the researcher. This is important because CMB is generally more widely accepted as a threat that can affect the validity of research constructs (Juneman, 2013; Podsakoff et al., 2003). Harman's single-factor test was used in this study to verify the potential presence of CMB. Factor analysis showed all ten construct factors (eigenvalues more than 1), and the maximum variance by one factor was 37.774%, where each factor was less than 50%, which proved that the test results verified no potential CMB in the data used (Khan et al., 2020; Rodríguez-Ardura & Meseguer-Artola, 2020).

4.3. Measurement model assessment (outer model)

The measures used in this study were subjected to validity and reliability tests. Cronbach's Alpha is used in this study as a reliability test. Internal consistency has been examined using Cronbach's Alpha, which considers the outer loadings of the variable indicators; scores above 0.7 indicate high reliability (Hair et al., 2019). The factor loading scores of the indicator were then used to calculate the convergent validity. While outer loading was more significant than 0.5, no indicators should be removed (Hair et al., 2019). However, ISC3 was omitted since its value was less than the threshold. In addition, the convergent validity was investigated using average variance extracted (AVE). According to Hair et al. (2019), the AVE values in this study are over 0.5 and are considered acceptable. Cross-loading was carried out to assess discriminant validity, with each item having the most significant load on its related construct but not relying on any other constructs of relevance (Henseler et al., 2015). The assigned constructs have the most significant factor loadings, as shown in Table 3, and as a result, the constructs differ from one another. As indicated in Table 4, this study employed the Heterotrait-Monotrait Ratio (HTMT) to examine discriminant validity further. Each construct was assessed using the HTMT ratio; the findings indicated HTMT values below the 0.9 cut-offs, indicating that every construct differs from the others (Henseler et al., 2015).

Table 3. Validity and Reliability Test

Variable	Outer Loading	AVE	Composite Reliability
Technology Readiness			
OPT1	0.821	0.674	0.909
OPT2	0.820		
OPT3	0.810		
OPT4	0.832		
INN1	0.691	0.605	0.859
INN2	0.785		
INN3	0.751		
INN4	0.873		
DISC1	0.826	0.644	
DISC2	0.832		0.844
DISC3	0.747		
ISC1	0.930	0.717	0.834
ISC2	0.754		
Self-Determined Motivation			
AM1	0.822	0.666	
AM2	0.813		0.909
AM3	0.850		
AM4	0.821		
AM5	0.774		
CM1	0.818	0.529	0.814
CM2	0.837		
CM3	0.641		
CM4	0.578		

Variable	Outer Loading	AVE	Composite Reliability
Expected Ease of Use			
EEOU1	0.847	0.679	0.894
EEOU2	0.846		
EEOU3	0.836		
EEOU4	0.764		
Expected Usefulness			
EU1	0.883	0.799	
EU2	0.901		0.923
EU3	0.897		
Attitude			
ATT1	0.883	0.798	
ATT2	0.907		0.922
ATT3	0.890		
Intention to Use			
ITU1	0.895	0.888	
ITU2	0.919		0.930
ITU3	0.896		

Table 4. Heterotrait-monotrait ratio

	AM	ATT	CM	DISC	EEOU	EU	INN	ISC	ITU	OPT
AM										
ATT	0.829									
CM	0.685	0.691								
DISC	0.237	0.220	0.586							
EEOU	0.851	0.730	0.643	0.297						
EU	0.782	0.706	0.480	0.153	0.859					
INN	0.674	0.625	0.718	0.454	0.744	0.634				
ISC	0.463	0.391	0.659	0.864	0.527	0.426	0.587			
ITU	0.766	0.876	0.588	0.196	0.788	0.688	0.700	0.407		
OPT	0.689	0.672	0.496	0.197	0.724	0.796	0.620	0.420	0.611	

Note: AM = Autonomous Motivation; ATT = Attitude; CM = Controlled Motivation; DISC = Discomfort; EEOU = Expected Ease of Use; EU = Expected Usefulness; INN = Innovation; ISC = Insecurity; ITU = Intention to Use; OPT = Optimism

4.4. Structural model assessment (inner model)

Before hypothesis testing, multicollinearity indicators were assessed using the variance inflation factor (VIF). The threshold value is VIF less than five (Sarstedt et al., 2017). The VIF values showed the expected results, with the lowest being 1.000 and the highest being 2.173. After all assumptions are met, the structural model is tested using the t and p values (t => 1.96 and p = <0.05) by the recommendations of Hair et al. (2018). Furthermore, this study used a bootstrap approach of 5.000 (resampling) with corrected and accelerated confidence intervals (BCCI) with p values for two-way significance (*p: 0.05, ** p: 0.01, *** p: 0,001).

Tables 5 and 6 show the findings using path analysis. As a result, five hypotheses are not supported (i.e., H5, H7, H8, H11, H12). Technology readiness, optimism, and innovation are significantly and positively related to expected ease of use and usefulness. Therefore, H1, H2, H3, and H4 are supported. Meanwhile, Discomfort has no significant effect on Expected Ease of Use but is significantly related to Expected Usefulness. However, insecurity has no significant relationship with expected ease of use or usefulness. Therefore, H5, H7, H8 are not supported, while H6 Otherwise, H6 is supported. Shifting to self-determined motivation, Autonomous Motivation directly impacts Expected Ease of Use and Expected Usefulness (H9: $\beta = 0.407$; $p = 0.000$; H10: $\beta = 0.381$; $p = 0.000$). Therefore, H9 and H10 are supported. Otherwise, Controlled Motivation has no significant impact on Expected Ease of Use, nor Expected Usefulness (H11: $\beta = 0.124$; $p = 0.070$; H12: $\beta = -0,009$; $p = 0.891$), hence H11 and H12 are not supported. In the end, Expected Usefulness and Expected Ease of Use positively impact Attitude as mediating variables, so H13 and H14 are supported.

Table 5. Direct Effect

Hypothesis	β	t-value	P-Values	95% BCCI	Result
H1. Optimism → Expected Ease of Use	0.207	3.948	0.000	(0.103; 0.307)	Supported
H2. Optimism → Expected Usefulness	0.389	6.671	0.000	(0.272; 0.498)	Supported
H3. Innovation → Expected Ease of Use	0.187	3.683	0.000	(0.086; 0.285)	Supported
H4. Innovation → Expected Usefulness	0.126	2.202	0.031	(0.013; 0.235)	Supported
H5. Discomfort → Expected Ease of Use	-0.011	0.252	0.805	(-0.097; 0.080)	Not Supported
H6. Discomfort → Expected Usefulness	-0.090	2.251	0.028	(-0.016; -0.009)	Supported
H7. Insecurity → Expected Ease of Use	0.050	1.148	0.245	(-0.039; 0.131)	Not Supported
H8. Insecurity → Expected Usefulness	0.074	1.405	0.165	(-0.030; 0.175)	Not Supported
H9: Autonomous Motivation → Expected Ease of Use	0.407	7.076	0.000	(0.295; 0.521)	Supported
H10. Autonomous Motivation → Expected Usefulness	0.381	5.715	0.000	(0.250; 0.513)	Supported
H11. Controlled Motivation → Expected Ease of Use	0.124	1.822	0.070	(-0.008; 0.261)	Not Supported
H12. Controlled Motivation → Expected Usefulness	-0.009	0.133	0.891	(-0.135; 0.135)	Not Supported

Table 6. Indirect Effect

Hypothesis	β	t-value	P-Values	95% BCCI	Result
H13. Expected Usefulness → Attitude → Intention to Use	0.264	4.322	0.000	(0.152; 0.390)	Supported
H14. Expected Ease of Use → Attitude → Intention to Use	0.296	4.971	0.000	(0.178; 0.409)	Supported

Assessment of the coefficient of determination of the ITU construct shows a moderate value (R^2 = 0.605, R^2 Adjusted = 0.604). It can be concluded that 60.4% of ITU variation is explained by TR, AM, CM, EEOU, EU, and ATT. However, the R2 value only provides in-sample explanations and does not provide out of sample explanatory factors. Subsequently, a predictive PLS approach was applied (Shmueli et al., 2019). This approach uses the recommendations (Shmueli et al., 2019), while the indicator (minority/same) in the PLS-SEM > linear naive model (benchmark) shows moderate predictive power. Furthermore, predictive relevance analysis is applied using Stone-Geisser's Q^2. The Q^2 value of the INV variable was 0.502, which is above the minimum threshold value of 0. This indicates that the model has high predictive accuracy (Hair et al., 2019). Finally, Cohen's f^2 is used to identify the effect between variables in the model, which indicates a change in the value of R^2 when one of the exogenous constructs is removed from the model. Cohen's f2 of 0.02 (small), 0.15 (medium), and 0.35 (large) can be a measure of the predictor effect (Hair et al., 2017). Table 7 explains that the overall f^2 is in the range of 0.009 to 0.029.

Table 7. VIF and F^2 results

Latent Variables	VIF			F^2		
	ATT	EEOU	EU	ATT	EEOU	EU
AM	-	2.173	2.173	-	0.207	0.168
CM	-	2.159	2.159	-	0.019	0.023
DISC	-	1.503	1.503	-	0.009	0.013
EEOU	2.191	-	-	0.121	-	-
EU	2.191	-	-	0.096	-	-
INN	-	1.933	1.933	-	0.049	0.021
ISC	-	1.708	1.708	-	0.004	0.008
OPT	-	1.666	1.666	-	0.070	0.229

Table 8. Q^2 and R^2 Results

Latent Variables	Q^2	R^2	R^2 Adjusted
ATT	0.525	0.451	0.448
EEOU	0.610	0.633	0.626
EU	0.577	0.604	0.597
ITU	0.434	0.605	0.604

4.5. Discussion

This study shows that optimistic people see technology as an opportunity to improve their performance. Therefore, H1 is supported. This attitude can increase motivation to learn and adapt to new systems (Venkatesh & Davis, 2000), which indirectly ignores the potential challenges and risks associated with them (Carver et al., 2010). According to previous research, optimism positively affects expected ease of use, which means that people who feel optimistic tend to be confident when using self-checkout technology. They focus on the benefits and opportunities that exist in it, not on the potential difficulties. This belief makes individuals feel that the self-checkout system is easy to use and can help improve their work efficiency. This finding is consistent with previous research, which shows that optimism is positively related to expected ease of use (Colby & Parasuraman, 2001; Tsikriktsis, 2004).

This study found that optimism has a positive impact on expected usefulness. Therefore, H2 is supported. Optimistic individuals tend to have positive expectations of the potential benefits of self-checkout and are motivated to take beneficial actions in the future (Musyaffi et al., 2021). They can also see potential benefits behind obstacles and challenges, making it easier to process valuable information in the future (Lin et al., 2016). This study's results align with previous research that found that people's perspectives on self-checkout are beneficial because they facilitate the transaction process (Lai & Lee, 2020).

Innovation has a significant positive effect on expected ease of use. Therefore, H3 is supported. This is in line with previous research, which implied that innovation positively affects ease of use (Erdoğmuş & Esen, 2011; Seong & Hong, 2022). This suggests that the extent to which popular and practical self-checkout technology facilitates openness to innovation leads to increased expected ease of use. The system's convenience makes consumers feel comfortable, which will then make consumers willing to use the technology (Godoe & Johansen, 2012). In addition, more incredible innovation has been shown to increase the value viewed (Li et al., 2023).

This study also found that innovation positively affects expected usefulness, so H4 is supported. This result aligns with research by Erdogmus & Esen (2011), who discovered that innovation positively affected expected usefulness. Our finding implied that increased eagerness for innovation fosters benefits that customers hoped for. Furthermore, Wang & Hou (2015) explained that the benefits of technology, such as improving performance and increasing happiness, make consumers confident in adopting a self-checkout system. Innovation has been identified as one of the best predictors of technology readiness, increasing expected usefulness significantly (Leung & Chen, 2019).

The negative impact of discomfort on expected ease of use is not well-supported by data. Therefore, H5 is not supported. Nevertheless, previous research (Martens et al., 2017; Ramos de Luna et al., 2016; Walczuch et al., 2007) found that discomfort negatively affects the expected ease of use. When people feel less control over technology and believe that they cannot overcome it will lead to pain (Colby & Parasuraman, 2001). As a result, individuals who feel discomfort have a sense that new technology controls them, and some of these new technologies may not be suitable for ordinary people (Parasuraman, 2000).

Discomfort has a significant negative effect on expected usefulness. Therefore, H6 is supported. This finding aligns with recent studies by (Lai and Lee, 2020 Nugroho and Fajar, 2017 and Yusuf et al., 2021). This suggests that individuals may feel uncomfortable with technology but are still willing to adopt it. In addition, the more pain they think, the more confident they are in the ease of use of the technology (Panday, 2015). People who think intensely uncomfortable evaluate technology usage as both unappealing and depressing, so they try to avoid using that technology. Therefore, discomfort with adopting technology negatively influences these apps' perceived usefulness (Eksioglu & Ural, 2022).

Data do not support the negative impact of insecurity on expected ease of use, so H7 is not supported. Nevertheless, insecurity is negatively correlated with expected ease of use (Martens et al., 2017; Ramos de Luna et al., 2016; Walczuch et al., 2007). This result may occur because consumers feel afraid and anxious about using new technology, which will cause them discomfort. Consumers who feel uncomfortable think technology is not easy to use.

Insecurity occurs when there is a perception that technology does not work correctly and worries about possible negative consequences (Parasuraman, 2000). Insecurity does not significantly affect expected usefulness based on data. Therefore, H8 is not supported. However, literature has shown that insecurity negatively affects expected usefulness (Martens et al., 2017; Ramos de Luna et al., 2016; Walczuch et al., 2007). Blut & Wang (2020) stated that skeptical people are inherently insecure about technology. They show little interest in using technology and, therefore,

find it difficult to use. Thus, insecurity may negatively impact the ease of self-checkout usage. Some individuals do not trust new technology and reject it because of their privacy and security issues (Eksioglu & Ural, 2022)

It has been found that autonomous motivation (AM) plays a vital role in determining the expected ease of use of a technology. This supports hypothesis H9. AM is closely related to the successful adoption of a technology, indicating that people are more likely to use a technology if they are highly motivated (Wang & Hou, 2015). Motivation arises when people believe a technology can be easily used (Chen & Zhao, 2022). In the context of self-checkout, we assume that self-checkout systems are easy to use. People tend to find self-service meaningful and intrinsically satisfying, which gives them internal satisfaction. These positive experiences lead to high expectations that the self-checkout system will be easy. This finding further strengthens the research from Chen & Zhao (2022) and Smith & Sivo (2012), which state that autonomous motivation positively impacts expected ease of use.

The concept of autonomous motivation (AM) positively impacts the expected usefulness of technology, thus supporting hypothesis H10. When perceived as valuable, technology is expected to improve performance and help achieve personal goals (Marangunic & Granic, 2015). This perceived usefulness is related to individuals' perceptions that the technology can be helpful in their lives and line with their personal goals and aspirations (Laumer et al., 2012; Roca & Gagné, 2008; Yi & Hwang, 2003). The term "autonomous" is often associated with high control, and people who feel in control of their actions tend to believe they can also control the outcomes and effectiveness of self-checkout. This perception of control leads to an increase in expected benefits. This finding supports previous research by Chen & Zhao (2022) and Sun & Zhang (2006), which showed that autonomous motivation positively impacts the expected usefulness of technology.

According to H11, controlled motivation doesn't affect expected ease of use, indicating that H11 is unsupported. However, previous research conducted by Chen & Zhao (2022) found that controlled motivation positively affects expected ease of use. This study found that controlled motivation does not significantly affect expected usefulness, implying that H12 is unsupported. Regardless, the study conducted by Chen & Zhao (2022) implied that controlled motivation has a positive effect on expected usefulnessThe reason behind this may be because the assessment of comfort and the assessment of the usefulness of using the self-checkout system is based on the individual's perception of the self-checkout system, where this perception comes from within the consumer, not the influence of the consumer's external environment, such as receiving rewards or avoiding punishment (Deci & Ryan, 1985).

Expected ease of use indirectly positively affects the intention to use through attitude toward self-checkout. This result is consistent with previous studies (Cebeci et al., 2020). Therefore, H13 is supported. In addition, expected ease of use has been found to affect attitude positively, and attitude in turn positively increases intention to use (Kelly & Palaniappan, 2023), customers are encouraged to use self-checkout when they believe it is easy to learn (Al-Maroof et al., 2020). Consequently, their expectations of self-checkout are based on their belief that it would be user-friendly, which affects their intention to utilize self-checkout for retail transactions (Thomas-Francois & Somogyi, 2023).

Expected usefulness has a significant positive effect on the intention to use self-checkout through attitude toward self-checkout. This result aligns with earlier research (Cebeci et al., 2020). Therefore, H14 is supported. Previous studies emphasize that expected usefulness directly forms attitude (Rejali et al., 2023). Other studies found that expected usefulness contributed significantly to determining intention to use (Rejali et al., 2023; Rosli & Saleh, 2023). Therefore, the increase in attitude due to expected usefulness, in turn, increases the intention to use self-checkout (Cebeci et al., 2020). People who are highly optimistic about the benefits of self-checkout will intend to use it when making retail purchases. As a result, their intention to use self-checkout will depend more on a system that can deliver benefits, including convenience and effectiveness (Lee & Leonas, 2021).

5. Conclusion

This study integrates the Technology Acceptance Model (TAM), Technology Readiness Theory (TRT) (optimism, innovativation, discomfort, and insecurity), and Self-Determination Theory (SDT) (autonomous motivation and control). The results showed that the dimensions of technology readiness significantly influenced perceived ease of use and usefulness, except for discomfort, which did not affect perceived usefulness. In addition, autonomous motivation had a significant positive effect on perceived ease of use and perceived usefulness, while controlled motivation did not affect either. Ultimately, this second factor improved attitudes toward the self-checkout system.

Customers consider self-checkout's positive and negative aspects in determining their readiness to adopt this system. The ease of learning self-checkout without having to set aside special time increases confidence in using it. The convenience of use will be even higher if the retailer provides full support to ensure a smooth experience. The main benefits of this technology, such as reducing queue time and making it easier to manage shopping time, can be the primary motivation for customers to adopt the self-checkout system.

5.1. Theoretical Implication

This study offers an integration of three theories, namely the Technology Acceptance Model (TAM), Technology Readiness Index (TRI), and Self-Determination Theory (SDT), to explain the adoption behaviour of self-checkout technology in developing countries. Integrating the three theories will provide a more comprehensive

understanding of how psychological traits, cognitive evaluations, and motivations together drive the adoption of self-checkout technology. More specifically, this study also expands the TAM framework. This study evaluates that convenience and usefulness factors alone are not enough to explain technology adoption. Still, factors such as consumer psychology from the TR dimension also play an essential role. The findings in this study emphasize that the technology adoption process is not only limited to cognitive processes, but personal characteristic factors in the four TR dimensions are crucial to see technology adoption in developing countries. Thus, the integration of TR in the TAM model helps explain how the internal role of individuals becomes essential in the technology adoption process, which is often overlooked in other studies. Furthermore, the use of SDT theory is also essential to explain how the use of new technology is also influenced by how much autonomous motivation comes from within consumers. The motivational dimension in SDT theory broadens the theoretical scope of TR and TAM, where the focus of both theories is limited to viewing technology adoption in cognitive and dispositional aspects only. Coupled with Indonesia as the research setting, the integration of these three theories is helpful for viewing technology adoption, especially in developing countries.

This study's strength is its integrative approach, which combines TAM, TR, and SDT theories. This approach is also useful for refining existing literature with a more comprehensive explanation. Future research will use this to explore the complex interactions between technological readiness, psychological perceptions, and motivational factors. This approach also provides a strong theoretical foundation for understanding socio-cultural factors and levels of digital maturity, especially in developing countries, on technologies that have previously been developed and tested in developed countries.

5.2. Managerial Implication

This study highlights the factors in the adoption of self-checkout technology. Thus, retailers and policymakers must jointly take strategic actions to accelerate this adoption in developing countries, in this case Indonesia. First, optimism and innovation are closely related to convenience and usability. Retailers need to foster a positive view of self-checkout technology by conducting attractive and educational campaigns. One way to do this is by creating simple digital content but providing efficient steps as an initial way to build trust and increase consumers' curiosity. Second, discomfort and insecurity in this study are considered obstacles. Retailers need to pay attention to both aspects. Several steps can be taken: First, retailers can provide direct technical assistance on the spot, with active staff support and tutorials that can help consumers who are having difficulties. Second, retailers need to ensure data security and reliability of the self-checkout technology system. Thus, consumer privacy will be protected, and transaction transparency will be paid attention to.

Third, the role of autonomous motivation shows that consumers are more likely to adopt self-service when they consider it a personal choice rather than a forced requirement. Thus, promotional efforts should focus on empowerment, not pressure. Retailers can provide options, personalize the user experience, and emphasize convenience without making consumers feel pressured to adopt the technology. Finally, because perceived ease of use and usefulness strongly influence attitudes and behavioural intentions, simplifying system interfaces and improving system reliability should be a top priority. Fast, intuitive, and frictionless experiences will lead to more positive attitudes and encourage continued use. By implementing these strategic steps, both retail managers and policymakers can more effectively drive digital transformation in the retail sector while addressing common challenges in developing countries, such as digital literacy and trust in automation.

5.3. Limitations and Suggestion for further studies

The limitations of this study open up significant opportunities for future research. One of the main limitations is the absence of a specific focus on generational groups. Each generation possesses distinct characteristics, preferences, and attitudes toward technology, including self-checkout services. Exploring intergenerational differences could provide deeper insights into the evolving nature of consumer behavior, allowing marketing strategies and public policies to be better tailored to each group (Twenge & Campbell, 2018). For instance, Generation Z represents a particularly relevant demographic for future exploration. This generation has grown up in a digital environment and prioritizes shopping experiences in their decision-making processes. As such, they are potential users of self-checkout services (Huwaida et al., 2024). However, Generation Z is also known for valuing social interaction during shopping. Since self-checkout services are typically designed for independent use with minimal interaction, this may pose a challenge for some group members. Therefore, understanding their preferences and behavioral tendencies is essential for developing more targeted and effective technology adoption strategies (Hafez, 2023).

Furthermore, since this study was conducted in the context of Indonesia, the generalizability of the findings to other countries may be limited. Future research is encouraged to broaden the geographical scope to test the proposed model's validity and robustness in different settings. Studying other developing countries would be a strategic next step, as significant differences exist between developed and developing nations regarding digital infrastructure readiness, consumer technology literacy, and trust in automated systems. In many developing countries, limited internet connectivity, low digital literacy, and minimal exposure to self-service technologies remain key barriers to

implementation (Barakabitze dkk., 2019; Wafula & Njaramba, 2024). Therefore, expanding the research context to countries with similar challenges could enrich our understanding of the factors influencing technology adoption in the retail sector on a broader, more global scale.

Author Contribution

Author 1: Conceptualization, writing original draft, data curation, formal analysis, investigation, methodology.
Author 2: Assisted in model design, helped determine research ideas, and guided the first author.
Author 3: Review and editing, translating, supervision, and guiding the first author.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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