SEAMLESS CONSUMER EXPERIENCE AS MEDIATOR EFFECTION VENDING MACHINE BUYING BEHAVIOR

RAJALAH, N.[1] – ISA, N. F.[1*] – YUAN, P. W.[1] – ABDUL RAHMAN, A. E.[1] – NGELAMBONG, A.[2] – OSMAN, S.[1]

[1] *Faculty of Hotel & Tourism Management, Universiti Teknologi MARA (UITM), Selangor, Malaysia.*

[2] *Faculty of Hotel & Tourism Management, Universiti Teknologi MARA (UITM) Cawangan Pulau Pinang, Pula Pinang, Malaysia.*

**Corresponding author*
e-mail: ninafarisha[at]uitm.edu.my

(Received 18th October 2025; revised 28th November 2025; accepted 05th December 2025)

Abstract. This study explores the influence of seamless customer experience attributes on vending machine buying behaviour. As digital purchases and cashless transactions become increasingly popular in Malaysia, understanding the factors that drive consumer behavior towards vending machines is essential. The research delves into how seamless consumer experience effect as mediation on vending machine buying behavior. By applying the Technology Acceptance Model (TAM) and Flow Theory, this study aims to elucidate the relationship between digital facilitation and seamless consumer experience attributes on vending machine buying behavior. The present study adopted the Technology Acceptance Model (TAM), Seamless Experience (SE) model and SSTQUAL model as the study framework. This study adopted a quantitative research methodology using a survey questionnaire as the primary data collection method with a cross-sectional time horizon. Data were gathered through a self-administered online survey targeting adults aged 18 to 45 in Klang Valley, Malaysia, who frequently use vending machines. One hundred and forty data was analysed to test the hypotheses and evaluate the model. This study provides valuable insights for vending machine operators, manufacturers, and stakeholders to optimize their services, enhance customer satisfaction, and drive profitability. Additionally, the findings contribute to the academic understanding of technology acceptance and online consumer buying behaviour.
Keywords: *seamless consumer experience, vending machine buying behavior, consumer, behavior*

Introduction

In recent years, vending operators have recognised the potential benefits of incorporating connectivity into their machines. According to the report, the number of connected vending machines is projected to increase from 4.2 million in 2019 to 8.9 million in 2024 globally. This development has transformed the vending machine into a smart vending machine, which now incorporates innovative features such as a touch-screen panel, audio, video, scent, gesture- based interaction and cashless payment. This machine is designed to offer a seamless user experience by facilitating cashless transactions through various payment methods. In Malaysia, the vending machine market size is expected to reach a significant Compound Annual Growth Rate (CAGR) of 8% from 2025 to 2030, according to the report. Additionally, there is a growing demand for cashless payments and on- the-go meal options among Malaysians. Despite the growing market of smart vending machines, it is important to investigate how the digital features of vending machine self-service technology (SST) influence buying behaviour. Previous study, highlighted that Malaysians still rely on traditional payment systems using banknotes. Consequently, it will lead to inconvenience for the consumers

and operators when the issues such as the rejection of banknotes, the inability to refund the balance and the potential of losing sales. Furthermore, Galdolage (2020) coined that although SSTs are designed to provide convenience, the consumers' experience is always seamless due to the payment difficulty and users' frustration. While smart vending machines are known as efficient SSTs, there are limited studies in the Malaysian context that investigate the influence of digital attributes on seamless experience.

Other issues of SSTs' vending machines are related to the inconsistency and inefficiency of navigating the vending machine interface. Based on the study, vending machine users frequently face challenges such as complex navigation, unclear instructions, lagging and technical glitches that lead to frustration. Furthermore, a lack of personalisation and customisation on the vending machine interface often fails to cater to individuals' preferences and needs (Ghosh, 2021). This highlights a mismatch between user expectations and the technology provided. To enhance the consumers' experiences of using the vending machine, operators should improve the usability, functionality and personalised of the interface by creating intuitive and user- friendly features on the touch-screen.

Despite the fact that vending machines have transformed into advanced SSTs with digital features and interactive interfaces, the study on consumer adaptation and usage patterns remains limited in the Malaysian context. Previous researchers emphasised the technological innovation and market growth, but how digital facilitation attributes and seamless experiences shape consumer behaviour are still underexplored. Hence, this study aims to investigate the influence of digital facilitation and seamless experience as a mediating effect on vending machine buying behaviour, focusing on smart vending machines. By examining how consumers perceive and engage with smart vending machines, this study seeks to provide evidence-based insights that can guide operators, suppliers, and policymakers in enhancing customer experiences, satisfaction, and profitability, while contributing to the broader understanding of technology adoption in emerging markets.

Underpinning theory

According to Davis et al. (1989) technology acceptance model (TAM) is an individual's intention to use a system that verified by the perceived usefulness and perceived ease of use of the system. Meanwhile, the extended theory of Reasoned Action (TRA) in 1980 presume that when someone develops an objective to perform, they will be free to execute without restraint. This model implies that when a new software package is given to the users, perceived usefulness and perceived ease of use is the dimensions that determine of the consumer perceived on technology acceptance of new technology. Various studies have been carried out using the TAM to investigate the usage of IT. Davis et al. (1992) examined the Theory of Reasoned Action (TRA) with TAM to find out the "combination factors of the two models to be delivered complete sight of what will determine the users' acceptance." The Technology Acceptance Model (TAM) is widely regarded as the most influential and commonly used for explaining an individual's acceptance of information systems among all the theories. Based on TAM, the researcher proposes a research model that can examine the impact of the perceived ease of use and the perceived usefulness of seamless experience and consumer buying behaviour on vending machines. Furthermore, the perceived ease of use and the

perceived usefulness will be adapted into the study as the independent variable, providing a new contribution to the current study and framework (*Figure 1*).

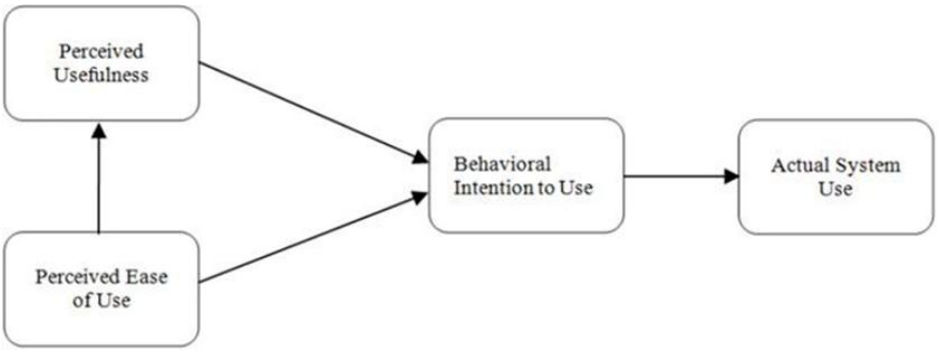

Figure 1. *Technology Acceptance Model (TAM).*
Source: Davis et al. (1989)

Literature review

Prior studies of digital facilitation factor

Perceived usefulness

Perceived usefulness is "the extent to which an individual believes that utilizing a specific system would improve their job performance and assist users in accomplishing tasks (Davis, 1989). It provides users with high usefulness and fulfils the purpose of their behaviors. In vending machine interfaces, perceived usefulness is closely related to users' perceptions of the utility of a specific platform or tool. According to Davis et al. (1989), perceived usefulness is a significant predictor of technology acceptance, and the functionality and capabilities of the tool primarily influence it. Moreover, when users perceive high levels of usefulness within a system, they often believe that using the system will improve their task performance. Particularly in the case of vending machines, when the platforms provide perceived usefulness, users tend to view them as more beneficial for their intended tasks. Perceived usefulness significantly and positively impacts user satisfaction and user experience in the context of vending machines. Consequently, an increased sense of functional affordance positively affects perceptions of usefulness. 14 As stated by Davis (1989), technological advancements have led to the adoption of self-service technology, which has revolutionized service delivery in various industries, including banking, hotels, airlines, and restaurants. The rapid pace of technological development has allowed it to play distinct roles and functions across different sectors. In the context of self-service technology, this concept pertains to how users perceive the benefit of the technology in meeting their needs or efficiently completing tasks. Digital and web experience is another factor that effect on online buying decision behavior. For example, users may consider a self-service vending machine valuable if it saves time, offers convenience, or provides a range of desired products. The scholar further mentioned that the perceived usefulness of a certain factor has a significant impact on buying behavior. This finding is well-supported by a multitude of contemporary studies. In the context of vending machines, the variety of product selections available impacts perceived usefulness and provides significant convenience for consumer buying behavior. Vending machines often have buttons or touchscreens that allow users to choose from the available products. This interface suggests the affordance of selection and choice. Offering a variety of products

in a vending machine allows customers to quickly make purchase decisions. They can easily compare available options and choose what suits them best without the need for prolonged decision-making processes. On top of that, vending machines have interfaces for the cashless payment option that also provide functional affordability. Cashless payment systems are prevalent nowadays and have commenced a new potentiality of payment methods, and customers can buy products by making payments using their digital payment wallet with the help of a mobile application (Alam et al., 2021). These interfaces afford users the ability to pay for products in various ways. Alam et al. (2021) stated that existing digital payment methods for vending machines are online bank transfers, debit cards, credit cards, scanning QR codes, and near-field communication (NFC) like Google Wallet and Apple Pay. (H1): Perceived usefulness has an effect on vending machine buying behavior.

Perceived ease of use

The concept of perceived ease of use refers to an individual's belief that a specific system is user- friendly. It encompasses the user's perception of how convenient it is to utilize the technology. In the case of self-service technology such as vending machines, ease of use includes factors like straightforward product selection, intuitive interface design, and convenient payment processes (Davis et al., 1989). The perceived ease of using vending machines is a key factor influencing consumer buying behavior. The convenience provided by vending machines is also crucial, as it acts as a mediator between perceived ease of use and buying behavior. Many companies recognize the significant impact of convenience, as it leads to customer satisfaction, a seamless customer experience, and business success. When consumers find it easy to use vending machines, they are more likely to experience the convenience they desire, resulting in positive buying behavior. Additionally, in the later stages of the consumer journey, the transaction or payment process is expected to be helpful as consumers perceive a seamless experience and temporarily ignore the burden of payment (Boden et al., 2020). With consumers perceiving vending machines as easy to use, the payment process can be expedited, potentially increasing buying behavior due to the convenience achieved. In the context of vending machines, it has been observed that vending machines have a positive impact on the perceived ease of use. This is due to the diversity of interactive displays or touchscreens, which allow customers to effortlessly browse available products, view detailed product information, and make selections. This interactive interface greatly enhances the customer's ability to explore and select products. Additionally, some vending machines now offer integration with mobile apps, providing customers with the ability to locate nearby machines, check product availability, and even make purchases directly from their smartphones. This integration adds convenience and accessibility to the vending machine experience. According to Alam et al. (2021), customers can also interact with the mobile apps to view the available 16 products, including their price and accompanying images. These features contribute to a more enjoyable user experience and make the process of purchasing items from the vending machine even more user-friendly and easy to use. (H2): Perceived ease of use has an effect on vending machine buying behavior.

Interface design

Accordingly, interface design refers to a purposeful and strategic approach to developing solutions, products, systems, or experiences that considers the needs, limitations, objectives, and aesthetics, with the objective of maximizing functionality, ease of use, visual attractiveness, and the overall user experience. The interface design of self-service technology plays a critical role in shaping customers' service experiences. When a self-service machine is well-designed, it makes the service easier to use and enhances customer satisfaction and the customer experience. It also has a positive impact on the brand's reputation and helps to foster a positive emotional connection with the company. Furthermore, the influence of interface design on buying behavior, which demonstrated the significant effect of product design and visual aesthetics on customers' buying decisions. The study concluded that investing in good interface design can make products or machines more appealing to customers and drive sales. Moreover, interface design is equally important in seamless customer experiences. All users, including those with disabilities, can use vending machines if they are designed with accessible features. Including elements like controls that are easily accessible or alternatives for those with vision problems enhances diversity and increases usage (Caporusso et al., 2020). (H3): Interface design has an effect on vending machine buying behavior.

Enjoyment

The concept of enjoyment is occasionally used alternatively with happiness, pleasure, flow, utility, or user-friendliness as an important factor. Customers who find pleasure in using technology-based self-service are more willing to use it. As stated, it is highlighted that enjoyment is considered a crucial aspect of any entertainment experience. When customers are satisfied with the pleasure and enjoyment they receive from a company's services, they are more likely to continue using them. Moreover, previous research has shown that individuals motivated by factors such as interest and enjoyment are more likely to continue engaging in the behavior in the future. Furthermore, enjoyment as the level of satisfaction a user perceives in their service experience. Additionally, enjoyment can be seen as a desire-based aspect of value that focuses on how consumers feel and behave based on emotional and multisensory factors. However, prior research found that enjoyment is an internal motivator that directly influences a customer's decision to use a system or service. A vending machine experience that incorporates aspects of entertainment, interaction, or uniqueness tends to capture the attention of users. Including features such as interactive screens, elements of gamification, or personalized recommendations can enhance the enjoyment of the experience. When users have a positive interaction with the vending machine, they may perceive the value of the products as higher. This positive perception could result in a greater willingness to pay more or an increased likelihood of making additional purchases. Thus, this study hypothesize. (H4): enjoyment has an effect on vending machine buying behavior.

Prior studies of online buying behavior

The decision-making process and behaviors that customers exhibit when purchasing and consuming items are referred to as buying behavior. Vending machine characteristics and the seamless experience they provide can have a big impact on how customers behave while making purchases. In modern society, the act of purchasing

goods and services is widespread and plays a significant role in meeting our daily needs. This includes basic necessities such as food, clothing, housing, healthcare, transportation, education, and entertainment. Buying behavior reflects an individual's attitude towards how they allocate their 18 financial resources to fulfill their desires and needs without restraint. As mentioned, consumer buying behavior can be influenced by various factors. These factors encompass cultural, social, personal, and psychological aspects. Cultural factors, such as a consumer's culture, subculture, and social class, can impact their purchasing choices. Social factors also play a significant role in influencing consumer behavior. Individuals tend to be influenced by those around them when making spending decisions. Important social factors include groups, family, roles, and status. Furthermore, personal factors, including age, life cycle stage, lifestyle, occupation, current economic situation, personality, and attitude, can influence consumer buying behavior.

Lastly, psychological factors such as motivation, perception, learning, beliefs, and attitude contribute to how a consumer's buying behavior is shaped. In the context of this study, vending machine buying behavior is classified as part of the psychological factors category, specifically related to repurchase intention. As discussed, repurchase intention refers to the psychological commitment to a product or service that develops after initial use, prompting a desire to purchase again. This highlights the importance of creating positive user experiences that foster loyalty and encourage continued engagement with self-service technologies. Furthermore, analyze consumer behavioral intention toward vending machines, focusing on perceived usefulness, ease of use, compatibility, and satisfaction.

These factors are critical in shaping users' perceptions of vending machine technologies and influencing their likelihood of reusing or repurchasing services offered through these platforms. In the context of vending machines, buying behavior refers to the decision-making process and actions taken by consumers when they interact with vending machines to make purchases. Various factors, including 19 convenience, product variety, pricing, and the availability of cashless payment options shape vending machine customers' behavior. The ability to make quick and easy purchases without human interaction also plays a key role in shaping consumer behavior in this setting. Vending machine buying behavior can be categorized into impulse buying and planned purchases. According to Calder (2022), many vending machine purchases are made on impulse, driven by immediate needs such as hunger or thirst and the convenience of proximity. For example, vending machines placed in high-traffic areas such as train stations, airports, and schools often cater to consumers who seek quick access to snacks and beverages.

This convenience factor is critical in encouraging impulse purchases. Another significant factor influencing vending machine buying behavior is the variety and selection of products offered. Product diversity attracts a broader customer base by providing more options to meet varying tastes and preferences. When vending machines offer a wide range of snack foods and beverages, consumers are more likely to make a purchase, as the variety increases the likelihood of finding a product that meets their needs. This product variety, combined with user-friendly interfaces and cashless payment methods, positively impacts consumer decision-making. Cashless payment systems, including e-wallets, credit cards, and mobile payment options, have also transformed vending machine buying behavior. Research indicates that the availability of digital payment methods increases the likelihood of purchases, as customers are not

limited by the need to have cash on hand. The integration of cashless payments is especially important for younger consumers who prefer digital transactions, further enhancing the overall buying experience. In fact, a seamless payment process has been shown to reduce 20 friction and increase customer satisfaction, leading to repeated usage of vending machines (Boden et al., 2020). Location and accessibility of vending machines are also key determinants of consumer buying behavior.

According to Bavani and Peng (2016), vending machines strategically located in high-demand areas, such as universities, hospitals, and office buildings, experience higher sales due to increased consumer foot traffic. Customers in these areas value the convenience of quick access to snacks and beverages, often opting for vending machines over traditional retail stores. This behavior highlights the importance of immediate product availability in driving vending machine purchases. Moreover, the design and interface of vending machines play a crucial role in consumer interaction. Vending machines with touchscreen interfaces, clear instructions, and easy navigation enhance the user experience, making the purchasing process more enjoyable and efficient. When customers find it easy to navigate and complete transactions on vending machines, they are more likely to engage in repeated purchases. This ease of use, combined with features like interactive displays and cashless payments, contributes to a more seamless customer experience, which has a positive effect on vending machine buying behavior (Alam et al., 2021). (H5): seamless consumer experience has an effect on vending machine buying behavior.

Prior studies of seamless consumer experience as mediator on buying behavior

As stated, a seamless experience refers to a scenario in which the transition or interaction between various elements, processes, or systems occurs smoothly, efficiently, and simply, resulting in an uninterrupted and effortless user or customer experience. Meanwhile, customer experience refers to the internal and subjective responses that customers have when they interact with a company's different touchpoints. It is the outcome of customers' interactions with a brand across various touchpoints, creating a seamless and smooth experience. These touchpoints can be direct, such as speaking with a customer service representative, or indirect, such as viewing an advertisement. 21 Nevertheless, these interactions play a crucial role in influencing the overall customer experience. Each customer's response to these interactions with the service is unique and can shape their perception of the service (Boak, 2021). In the retail industry, customer experience encompasses both transactional and non-transactional interactions between the customer and the retailer, as well as interactions with third parties and other customers. The customer experience is mainly influenced by direct interactions with retail employees or digital service interfaces, as well as indirect communication and the actual usage of the service. In the context of vending machines, a vending machine provides a seamless experience because the purchasing process is quick and straightforward. Customers can select their desired product, make a payment, and retrieve their purchase within a matter of seconds, saving time compared to retail stores. Vending machine facilitation significantly affects how customers behave while making purchases. Vending machine accessibility and transaction speed have an impact on how customers engage with them and their propensity to make purchases. A smooth transaction at a vending machine gives consumers a seamless experience. Customers who are happy with their purchases are more likely to come back and use the same machine or brand again. Apart from that, the

implementation of smart vending machines can offer customers a more efficient and convenient buying experience. Advanced technologies, such as touch screens and internet connectivity, allow customers to quickly browse products and complete transactions. Additionally, vending machines offer several potential benefits. One notable advantage is the improved customer experience they provide. By incorporating innovative technology, these machines offer a more convenient and seamless experience. For instance, customers can browse and purchase items directly from a touch screen on the machine. Alternatively, they can use a mobile app to remotely browse and purchase items, which can then be 22 obtained from the machine. Moreover, smart vending machines can offer personalized product recommendations based on customers' past purchases or preferences, potentially motivating them to make additional purchases. Introducing a seamless experience as a mediator in this study is crucial for enhancing user satisfaction, trust, and repurchase intention. Several studies shed light on the importance of a seamless experience in driving positive user outcomes and influencing repurchase behavior. Ginting et al. (2023) explore the impact of e-service quality, customer trust, and satisfaction on repurchase intention in e-commerce. A seamless experience characterized by high service quality and trustworthiness can enhance customer satisfaction and loyalty, positively influencing repurchase intention. Additionally, the Seamless experience encapsulates users' perceptions of the entire vending machine transaction process, including user interface design, transaction speed, and enjoyment. By introducing seamless experience as a mediator, the study incorporates a holistic perspective on user perception and its role in shaping buying behavior. Thus, this study hypothesize (H6): seamless consumer experience has a mediator effect between perceived usefulness and vending machine buying behavior; (H7): Seamless consumer experience has a mediator effect between ease of use and vending machine buying behavior; (H8): seamless consumer experience has a mediator effect between enjoyment and vending machine buying behavior; (H9): seamless consumer experience has a mediator effect between interface design and vending machine buying behavior.

Research proposed

The proposed research model is adapted from the research model. The framework shows the assessment of the influence of digital facilitation attributes on the seamless experience of vending machine buying behavior. The conceptual research model is structured to stimulate the very first study of the related relationship between the underlying aspects of independent variables, which are perceived usefulness, perceived ease of use, interface design, and enjoyment, whereby seamless experience is the mediating variable against the dependent variable, which is buying behavior. The formulation of this conceptual model and the theories proposed were drawn from the literature review.

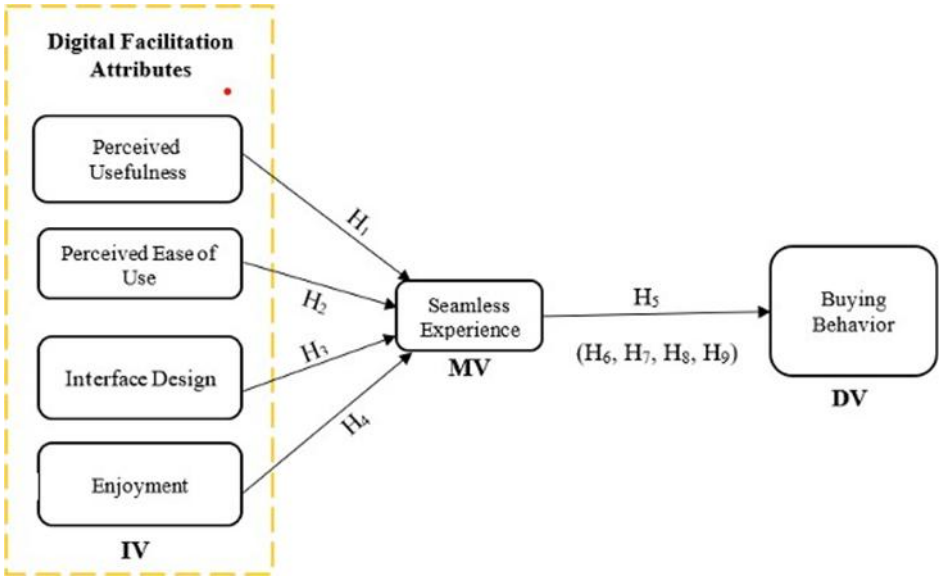

Figure 2. *The research framework.*

Materials and Methods

Research design

As for the data collection process, it was collected in the Klang Valley, and the target sample is adult individuals aged 18 and above. They are required to have experience using and purchasing products from the vending machine. The reason why Klang Valley has been targeted for data collection is because it will be easy for the researcher to gain more information about user vending machines (Ahmad and Juhdi, 2010). Furthermore, the researcher is collaborating with SpaceX to streamline the data collection process. Accordingly, SpaceX is recognized as an industry-leading and innovative company known for its commitment to delivering excellence and providing exceptional value to its customers. With a wide network of over 200 locations throughout the Klang Valley, SpaceX vending machines are proud to serve and meet the diverse needs of their customers. This indicated that this company has many various vending machine interfaces across Klang Valley. Consequently, the researcher has established a partnership with SpaceX and enlisted the company's assistance in gathering data from individuals who have interacted with their vending machine interfaces. These individuals have engaged with the machine's digital interface, such as by using the touchscreen to select products, navigating its menu, or utilizing the available cashless payment options. This interaction suggests that they have firsthand experience with the technological features of the vending machines, including how products are selected and purchased through the machines' user-friendly interface. This collaboration will enhance the accuracy and validity of the information obtained through the questionnaire.

Moreover, the researcher also reached out to acquaintances employed in the Klang Valley area, specifically those who have vending machines in their workplaces or nearby areas. The researcher conducted the survey both in person and online. For the in-person surveys at a university in the Klang Valley, the researcher engaged individuals in conversation about their vending machine usage and provided them with QR code access to the online survey via Google Forms if they met the eligibility criteria.

Additionally, the researcher distributed the questionnaire survey online via Google Forms to a broader audience to gather more responses. The instructions, descriptions of the researcher, the purpose of the sample, and the purpose of the research are all included in the information sheet attached to the questionnaire. It would also state in the information sheet that participation was optional and that the respondents were allowed not to complete or answer any questions in the survey. For the data collection process, the researcher completed the data collection for at least two months, from May until June 2024. This is because May and June align with periods when the targeted participants are more likely to be available and accessible.

Results and Discussion

Demographic profiles of respondents

From the *Table 1*, illustrates male respondents exceed the number of peers quite comprehensively. Of the 140 total respondents, 62.1 % (n=87) were men. Female respondents are less than male respondents with a noticeably slight margin. This can show that male respondents are much easier to approach and responded to surveys distributed through online mediums compared to female respondents. Meanwhile, the respondents' age, shows that large number of respondents in the age range of 21 to 25 years old, taking 35.7% (N=50), and followed closely by the respondents from age 26 to 35 years old with 34.3% (N=48). The 18-20-year-old group makes up 26.4% (N=37) of the total, while the least respondents come from the age range of 36 to 45 years old, with only 3.6% (N=5) respondents. For education, level qualification of Diploma is 30.7% Bachelor's degree 37.9% and Master's degree 31.4%. Based on the above figure, it can be assumed that most respondents in this survey had at least a Bachelor's degree, indicating that this group of people is open to interest in buying vending machine products. Most of the respondent had a an average of monthly income RM3001-RM4000. In addition, 4.3% of the respondents earned between RM 2001 to RM 3000 per month, 29.3% earned RM 3001 to RM 4000 monthly, and earned RM4001 and above monthly. Lastly for employment status shows most of the respondents who buying online thru vending machine were students and working adults with 61.4% and 35% of the respondents. Thus, this results show that students and working adults like to buy online using vending machine because it saves cost, save times and convenience to their working environment.

Table 1. *Demographic profile.*

Demographic Variable	Category	Number of Online Consumers	Percentage (%)
Age	18–20	37	26.4
	21–25	50	35.7
	26–35	48	34.3
	36–45	5	3.6
Gender	Male	87	62.1
	Female	53	37.9
Education Level	Diploma	43	30.7
	Degree	53	37.9
	Doctorate	44	31.4
Monthly Income	RM500–RM2,000	86	61.4
	RM2,001–RM3,000	6	4.3
	RM3,001–RM4,000	41	29.3
	RM4,001 and above	7	5.0
Employment Status	Working adults	49	35.0
	Full-time students	86	61.4
	Part-time students	3	2.1

Foreign workers	1	0.7
Expatriates	1	0.7

Research findings

Outer Loadings *Table 2* presents the outer loadings of various indicators for six constructs: BB (Buying Behavior), ENJ (Enjoyment), ID (Interface Design), PEOU (Perceived Ease of Use), PU (Perceived Usefulness), and SE (Seamless experience). Using the rule of thumb that outer loadings ≥ 0.70 indicate good indicator reliability, this can assess the reliability of the indicators for each latent construct. For the construct Buying Behavior (BB), all indicators exceed the threshold of 0.70, indicating good indicator reliability. Therefore, the indicators for BB reliably measure the construct. For the construct Enjoyment (ENJ), Most of the indicators for ENJ demonstrate acceptable reliability, with four indicators (ENJ1, ENJ2, ENJ4, and ENJ5) having loadings close to or exceeding the threshold of 0.70. However, ENJ3 has a loading of 0.634, which falls below the recommended threshold. For the construct Interface Design (ID), three of the five indicators (ID1, ID2, and ID4) have loadings above 0.70, indicating good reliability. However, ID3 (loading = 0.600) and ID5 (loading = 0.643) do not meet the 0.70 threshold. Depending on their theoretical significance to the construct, these indicators may need to be reviewed or removed. The perceived ease of use (PEOU) construct showed mixed results. Three of the five indicators (PEOU1, PEOU2, and PEOU4) exhibit good reliability with loadings exceeding 0.70. PEOU3 has a loading of 0.622, below the threshold, and PEOU5 has a loading of 0.680, which is close to but slightly below the threshold. For Perceived Usefulness (PU), four of the five indicators Exceed the 0.70 threshold, indicating good reliability for most indicators. However, PU1 has a loading of 0.662, slightly below the threshold. Lastly, the Seamless Experience (SE) construct had mixed results. Three of the five indicators (SE1, SE2, and SE4) have good reliability with loadings exceeding 0.70.

However, SE3(loading = 0.674) and SE5 (loading = 0.681) fall slightly below the threshold, indicating that these indicators may not be as vital in measuring the Seamless Experience construct. 67 Internal Consistency Reliability The next step of model assessment is to assess the model's internal consistency reliability using composite reliability (CR). When CR has a greater value, it will signify a better reliability level, and when values are marked between 0.70 and 0.90, they are labelled as “satisfactory to good” (Diamantopoulos et al., 2012). Based on *Table 7*, the CR value for the six constructs was between 0.783 and 0.887, exceeding the acceptable value of 0.7. The Cronbach Alpha value for all constructs was between 0.766 and 0.856 which also exceeds the recommended value of 0.7. Thus, the internal consistency of the items used in this study was adequate and confirmed (Bagozzi and Yi, 1988). Convergent Validity The next step requires assessing the convergent validity of each construct measure, and the Average Variance Extracted (AVE) was used for every item on each construct. Convergent validity is the extent to which a construct is related to other construct design to explain and measure its items' variance. For AVE, any value of 0.50 or higher is seen as the minimum acceptable value, and it means that the construct can explain 50 per cent or more of the item variance that builds the construct (Bagozzi and Yi, 1988).

As illustrated in *Table 2*, the AVE scores were between 0.520 and 0.628, slightly higher than the minimum acceptable AVE of 0.50, indicating a satisfactory convergent validity. Discriminant Validity Subsequently, the discriminant validity needs to be assessed to ensure the construct does not correlate with other constructs. This study used

the Fornell-Larcker criteria to examine construct- level validity. It suggests that each construct's AVE should be compared to the squared inter-construct correlation of that same construct and should not be larger than their AVEs (Fornell and Larcker, 1981). *Table 3* below shows the results of the analysis. As displayed in *Table 3* below, the AVE's square roots are shown on the diagonal and printed in bold, while the non-bold values represent the 68 69 value of intercorrelation between constructs. The AVE's square roots should be higher than the off- diagonal components. The results ranging between 0.721 and 0.793 meet the criteria stipulated by Fornell and Larcker (1981). Hence, the results indicate that all latent variables exhibit adequate discriminant validity as their square roots of AVE are more significant than the correlations with other latent variables.

***Table 2**. The reflective measurement model assessment.*

LV	Code	Items	OL	CA	CR	AVE
Perceived Usefulness	PU1	Vending machines have improved my ability to assist me in choosing products.	0.662			
	PU2	Vending machine provides the features that meet my needs.	0.766			
	PU3	The vending machine has assisted me by providing a clear view to select products.	0.796	0.816	0.817	0.572
	PU4	Using vending machine has improved my ability to use the machine easily.	0.796			
	PU5	Vending machine has made it easier to purchase product through different payment method.	0.755			
Perceived Ease of Use	PEOU1	I found the vending machine is user-friendly.	0.721			
	PEOU2	Vending machine is simple to use.	0.834	0.772	0.784	0.525
	PEOU3	I found the vending machine is easy to understand.	0.622			
	PEOU4	I felt comfortable using the vending machine after only a short period.	0.747			
	PEOU5	It only takes a few steps to accomplish the purchase with the vending machine.	0.680			
Interface Design	ID1	The interface design of vending machine is aesthetically appealing.	0.736			
	ID2	The vending machine interface appears to use up-to-date technology.	0.839	0.766	0.783	0.520
	ID3	The user interface of vending machine has a well-organized appearance.	0.600			
	ID4	I find the interface of vending machine (i.e., colors, menus, navigation tools, etc.) is harmonious.	0.763			
	ID5	I can clearly see the product visual in the vending machine interface.	0.643			
Enjoyment	ENJ1	The operation of the vending machine is interesting.	0.736			
	ENJ2	I feel good being to use the vending machine.	0.866			
	ENJ3	The vending machine has interesting additional functions.	0.634	0.794	0.808	0.550
	ENJ4	I enjoy buying things at the vending machine.	0.754			
	ENJ5	I enjoy browsing products on the vending machine.	0.699			
Seamless Experience	SE1	I can get product information visibility conveniently.	0.739			
	SE2	Vending machine technologies enable me to buy with less hassles.	0.812			
	SE3	Vending machine technologies provided a seamless experience for me to order service on the spot.	0.674	0.784	0.793	0.537
	SE4	The vending machine interface provides a simple mode of payment.	0.749			
	SE5	Vending machine technologies improved my learning experience.	0.681			
Buying Behavior	BB1	I intend to continue purchasing products in the vending machine in the future.	0.847			
	BB2	I am likely to choose these vending machines	0.775			

	over alternatives in the future.				
BB3	I look forward to buy new products launched by vending machines.	0.828	0.856	0.887	0.628
BB4	I would continuously use the vending machine in the future.	0.722			
BB5	I consider this vending machine as my first choice for buying products.	0.785			

Note: LV=Latent Variable; OL=Outer Loading; CA=Cronbach Alpha; CR=Composit Reliability; AVE=Average Variance Extracted.

***Table 3**. Latent Variables Correlation Using the Fornell-Larcker Criteria.*

Latent Variable	BB	ENJ	ID	PEOU	PU	SE
BB	0.793					
ENJ	0.653	0.742				
ID	0.652	0.987	0.721			
PEOU	0.662	0.985	0.974	0.724		
PU	0.595	0.946	0.934	0.929	0.756	
SE	0.654	0.969	0.957	0.953	0.900	0.733

Cross Loadings Cross-loadings is another way to check the discriminant validity at the indicator stage. The loading of each indicator should be higher on the construct it is intended to measure. *Table 4* shows all indicators was higher than other construct's indicators. Thus, the loading confirms that the discriminant validity of the model has been attained. The present study's results showed that all path model measurements are valid and reliable; proceeding to the next step is appropriate. This involves assessing the structural model to determine the significance of the relationships and the developed hypotheses. Additionally, no item was dropped as the values exceeded the recommended minimum. From the HTMT results seen in Table 6 above, the results indicate that several HTMT values exceeded the conservative threshold of 0.90, suggesting potential issues with discriminant validity between certain constructs. Specifically, the HTMT value between Enjoyment (ENJ) and Interface Design (ID) was 1.265, indicating that these constructs are not sufficiently distinct from one another. Similarly, the HTMT values between Perceived Ease of Use (PEOU) and Interface Design (ID) (1.266), as well as between Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (1.161), also exceeded the threshold. Furthermore, the HTMT values between Seamless Experience (SE) and Enjoyment (ENJ) (1.222) and between Seamless Experience (SE) and Interface Design (ID) (1.228) raise similar concerns. In contrast, the HTMT values between Buying Behaviour (BB) and other constructs were generally below the threshold, such as the relationships between BB and Perceived Usefulness (PU) (0.641), BB and Enjoyment (ENJ) (0.742), and BB and Interface Design (ID) (0.756), indicating good discriminant validity for these relationships. Overall, the HTMT analysis suggests that while Buying Behavior shows adequate discriminant validity with other constructs, there are issues between other pairs of constructs, particularly involving Enjoyment, Interface Design, Perceived Ease of Use, and Seamless Experience.

***Table 4**. Results Cross Loadings.*

Item	BB	ENJ	ID	PEOU	PU	SE
BB1	0.847	0.670	0.662	0.684	0.604	0.688
BB2	0.775	0.409	0.415	0.409	0.382	0.400
BB3	0.828	0.551	0.538	0.559	0.491	0.557
BB4	0.722	0.450	0.465	0.456	0.391	0.458
BB5	0.785	0.416	0.416	0.418	0.420	0.376
ENJ1	0.724	0.736	0.730	0.750	0.677	0.757
ENJ2	0.552	0.866	0.859	0.848	0.777	0.835
ENJ3	0.255	0.634	0.611	0.614	0.809	0.550

ENJ4	0.475	0.754	0.767	0.749	0.548	0.757
ENJ5	0.348	0.699	0.666	0.667	0.754	0.655
ID1	0.686	0.714	0.736	0.721	0.645	0.727
ID2	0.541	0.829	0.839	0.810	0.742	0.800
ID3	0.247	0.604	0.600	0.591	0.770	0.522
ID4	0.472	0.741	0.763	0.736	0.533	0.745
ID5	0.337	0.651	0.643	0.634	0.741	0.620
PEOU1	0.704	0.693	0.684	0.721	0.631	0.714
PEOU2	0.556	0.821	0.816	0.834	0.729	0.792
PEOU3	0.263	0.620	0.595	0.622	0.783	0.538
PEOU4	0.481	0.737	0.750	0.747	0.534	0.737
PEOU5	0.334	0.682	0.662	0.680	0.744	0.639
PU1	0.714	0.721	0.722	0.735	0.662	0.742
PU2	0.545	0.855	0.853	0.837	0.766	0.825
PU3	0.251	0.613	0.588	0.593	0.796	0.537
PU4	0.251	0.619	0.605	0.599	0.796	0.536
PU5	0.337	0.664	0.650	0.640	0.755	0.633
SE1	0.680	0.697	0.690	0.709	0.642	0.739
SE2	0.502	0.777	0.773	0.758	0.676	0.812
SE3	0.338	0.682	0.658	0.646	0.777	0.674
SE4	0.481	0.737	0.750	0.731	0.534	0.749
SE5	0.335	0.652	0.627	0.636	0.715	0.681

***Table 5**. Heterotrait-Monotrait Ratio of Correlations (HTMT) Results.*

Latent Variable	BB	ENJ	ID	PEOU	PU	SE
ENJ	0.742					
ID	0.756	1.265				
PEOU	0.763	1.258	1.266			
PU	0.641	1.168	1.176	1.161		
SE	0.742	1.222	1.228	1.217	1.101	

Structural model assessment

The next step in PLS-SEM results evaluation is assessing the structural model, which involves testing all the hypotheses to identify the effect of the exogenous variables on the endogenous variables to answer the research question as described in Chapter 1. The structural model has four main criteria used in the evaluation, including i) estimation of path coefficient (β), ii) determination coefficient (R2), iii) effect size (f 2), and iv) predictive relevance (Q2) (Chin, 1998).

The path coefficients (β)

The study evaluated the statistical significance of the relationships and developed hypotheses. The hypotheses were tested by looking at the path coefficient (β) and the significance level (p-value) generated from the 95 per cent confidence intervals (CI) on the relationships between Perceived usefulness, Perceived ease of use, Interface Design, Enjoyment, Seamless Experience and Buying Behavior. The results for the fourth hypothesis (H4) demonstrate that significant positive relationship between Enjoyment and Seamless Experience (β = 1.114, t-value = 7.526, p = 0.000). This suggests that higher levels of Enjoyment are strongly associated with a more Seamless Experience. On the other hand, the paths result for the third hypothesis (H3), Interface Design did not significantly affect Seamless Experience (β = 0.065, t-value = 0.535, p = 0.593), suggesting that Interface Design does not play a significant role in enhancing Seamless Experience. Similarly, for the second hypothesis (H2), Perceived Ease of Use also did not significantly affect Seamless Experience (β = -0.057, t-value = 0.514, p = 0.607), indicating that perceptions of ease of use do not significantly contribute to a Seamless Experience. Furthermore, the path results for the first hypothesis (H1), the relationship between Perceived Usefulness and Seamless Experience, was 72 significant (β = -0.161, t-value = 2.127, p = 0.033), suggesting that Perceived Usefulness has a significant

influence on Seamless Experience. Lastly, the fifth hypothesis (H5) shows that the relationship between Seamless Experience and Buying Behavior was highly significant (β = 0.654, t-value = 12.228, p = 0.000), indicating that a more Seamless Experience is strongly related to higher Buying Behavior. This result highlights the importance of Seamless Experience in driving consumer Buying Behavior.

***Table 6**. Path Coefficients Result.*

Path Relationship	β	t-value	p-value	Hypothesis Result
Perceived Usefulness → Seamless Experience	1.114	7.526	0.000***	Significant
Perceived Ease of Use → Seamless Experience	0.065	0.535	0.593	Not Significant
Interface Design → Seamless Experience	−0.057	0.514	0.607	Not Significant
Enjoyment → Seamless Experience	−0.161	2.127	0.033**	Significant
Seamless Experience → Buying Behavior	0.654	12.228	0.000***	Significant

Coefficient of determination (R2)

The following assessment analyzed the coefficient of determination (R2) value of the endogenous construct(s). The R2 indicates the extent to which the exogenous construct contributes to explaining the endogenous construct. R2 values fall between 0 and 1, with higher values signifying a stronger explanatory influence. The acceptable R2 values can differ depending on the research context. In studies concerning human attitudes, perceptions, and intentions, R2 values typically tend to be on the lower end, below 50%. Despite this, these values are deemed satisfactory as they are challenging to predict. *Table 7* displays the R^2 values for the endogenous constructs of Buying Behavior and Seamless Experience. The value for Buying Behavior was 0.428, indicating that the exogenous constructs in the model explain 42.8% of the variance in Buying Behavior. This suggests a moderate level of explanatory power, which is deemed acceptable in behavioural studies. On the other hand, for Seamless Experience, the R^2 value was substantially higher at 0.941, meaning that 94.1% of the variance in Seamless Experience is explained by the exogenous constructs in the model. This 73 indicates a very high explanatory power, suggesting that the model effectively captures the factors that influence Seamless Experience. In summary, the R^2 values suggest that while the model provides moderate explanatory power for Buying Behavior, it demonstrates strong predictive power for Seamless Experience, making it a highly reliable construct within the model.

***Table 7**. Coefficient of Determination (R^2).*

Endogenous construct	R^2	R^2 adjusted
Buying Behavior	0.428	0.423
Seamless Experience	0.941	0.939

The effect size (f2)

The change in the R2 value when a certain exogenous variable is included or excluded from the model is known as the effect size (f^2). The effect size (f^2) is used to measure whether changes in a particular exogenous variable have a substantive impact on the endogenous constructs. In general, values higher than 0.02, 0.15, and 0.35 indicate small, medium, and large effect sizes respectively. When f^2 values are less than 0.02, it indicates that there is no significant effect on the changes (Cohen, 1988). *Table 8* presents the effect sizes (f^2) for the relationships between the constructs. A medium effect size for the relationship between Enjoyment and Seamless Experience (f^2 = 0.278), indicating that Enjoyment has a substantive impact on Seamless Experience.

This suggests that changes in Enjoyment notably influence the variance in Seamless Experience. In contrast, both Interface Design ($f^2 = 0.002$) and Perceived Ease of Use ($f^2 = 0.002$) exhibit no significant effect on Seamless Experience, as their f^2 values fall below the 0.02 threshold. These results indicate that changes in Interface Design and Perceived Ease of Use do not meaningfully contribute to explaining the variance in Seamless Experience. Perceived Usefulness, with an f^2 value of 0.046, shows a small effect on Seamless Experience, suggesting that while its influence is present, it is not as strong as that of Enjoyment. Finally, the relationship between Seamless Experience and Buying Behavior demonstrates a large effect size ($f^2 = 0.747$), indicating a substantial and meaningful impact of Seamless Experience on Buying Behavior. *Table 8* highlights the critical role that Seamless Experience plays in influencing consumer buying behavior.

***Table 8**. Effect Size (f2) Result.*

Structural Path	f^2	Effect Size
PU → SE	0.278	Medium
PEOU → SE	0.002	No effect
ID → SE	0.002	No effect
ENJ → SE	0.046	Small
SE → BB	0.747	Large

Predictive relevance

Medium No effect No effect Small Large Another method to evaluate the predictive accuracy of the PLS path model is by calculating the Q^2 value (Geisser, 1975). Q^2 values provide an indication of the model's predictive relevance. According to Chin (1998), Q^2 values should be greater than zero to conclude that the PLS path model has predictive relevance. As a rule of thumb, Q^2 values higher than 0, 0.25, and 0.5 depict that an exogenous construct has small, medium, and large predictive accuracy for a certain endogenous construct, respectively. *Table 9* below presents the Q^2 values for the endogenous constructs of Buying Behavior and Seamless Experience. the Q^2 value for Buying Behavior is 0.235, indicating that the model has small predictive relevance for this construct. This suggests that the exogenous constructs have a limited ability to predict the variance in Buying Behavior. For Seamless Experience, the Q^2 value is 0.490, signifying medium predictive relevance. This suggests that the model provides a moderate level of accuracy in predicting the variance in Seamless Experience, highlighting its more substantial predictive power compared to Buying Behavior. Overall, the Q^2 values indicate that while the model has predictive relevance for both constructs, its ability to predict Seamless Experience is more substantial than its ability to predict Buying Behavior.

***Table 9**. Predictive Relevance (Q^2) Results.*

Endogenous Construct	Q^2	Predictive Relevance
Buying Behavior	0.235	Small
Seamless Experience	0.490	Medium

Conclusion

In conclusion, this study has provided valuable insights into the mediating role of seamless experience in the relationship between digital facilitation attributes and vending machine buying behavior in Malaysia. The findings indicate that perceived ease of use significantly mediates this relationship, underscoring the importance of user-friendly technology in enhancing seamless experiences and driving consumer behavior. However, the anticipated mediating effects of perceived usefulness, interface design, and enjoyment were not supported, suggesting that these attributes do not significantly influence buying behavior through seamless experience in the Malaysian context. The study's limitations, including the restricted geographic scope, reliance on self-reported data, and challenges in data collection, highlight the need for future research to adopt a more comprehensive approach. Expanding the study to different regions and including a broader demographic sample could provide a more holistic understanding of consumer interactions with vending machines. Additionally, incorporating longitudinal studies and mixed methods approaches could enhance the robustness of the findings. The practical implications of this research are significant for vending machine operators and manufacturers. Prioritizing ease of use and investing in technologies that simplify the transaction process can enhance customer satisfaction and encourage repeat usage. Policymakers should also consider establishing supportive frameworks to promote the adoption of advanced, user-friendly vending machine technologies. Overall, this study contributes to the academic discourse on technology acceptance and consumer behavior, particularly in the context of self-service technologies. By addressing the limitations and building on the findings, future research can further elucidate the complex dynamics of vending machine usage and provide actionable insights for optimizing consumer experiences in Malaysia.

Acknowledgement

I would like to thank the postgraduate students and all members who review and support in completing this study. This research study is self-funded.

Conflict of interest

The authors confirm that there is no conflict of interest involved with any parties in this research study.

REFERENCES

[1] Ahmad, S.N.B., Juhdi, N. (2010): Organic food: A study on demographic characteristics and factors influencing purchase intentions among consumers in Klang Valley, Malaysia. – International Journal of Business and Management 5(2): 105-118.
[2] Alam, W., Sarma, D., Chakma, R.J., Alam, M.J., Hossain, S. (2021): Internet of things based smart vending machine using digital payment system. – Indonesian Journal of Electrical Engineering and Informatics (IJEEI) 9(3): 719-731.
[3] Bagozzi, R.P., Yi, Y. (1988): On the evaluation of structural equation models. – Journal of the Academy of Marketing Science 16(1): 74-94.
[4] Bavani, S., Peng, C.Y. (2016): An Analysis on the Perception and Situational Factors in Using

[5] Vending Machine among Universities' Students in Malaysia. – Research on Humanities and Social Sciences 6(17): 7p.
[6] Boak, A. (2021): Exploring how Interactions and Responses within the Servicescape combine to form Customer Experience-A Text Mining Approach. – University of Exeter, United Kingdom 433p.
[7] Boden, J., Maier, E., Wilken, R. (2020): The effect of credit card versus mobile payment on convenience and consumers' willingness to pay. – Journal of Retailing and Consumer Services 52: 10p.
[8] Calder, B.J. (2022): Customer interaction strategy, brand purpose and brand communities. – Journal of Service Management 33(4/5): 747-757.
[9] Caporusso, N., Elleman, N., Cho, S.S., Perilli, I. (2020): A Digital platform for improving accessibility in physical user interfaces. – In 2020 6th International Conference on Information Management (ICIM), IEEE 6p.
[10] Chin, W.W. (1998): The partial least squares approach to structural equation modeling. – In Modern Methods for Business Research, Psychology Press 11p.
[11] Cohen, J. (1988): Set correlation and contingency tables. – Applied Psychological Measurement 12(4): 425-434.
[12] Davis, F.D. (1989): Perceived usefulness, perceived ease of use, and user acceptance of information technology. – MIS Quarterly 21p.
[13] Davis, F.D., Bagozzi, R.P., Warshaw, P.R. (1992): Extrinsic and intrinsic motivation to use computers in the workplace 1. – Journal of Applied Social Psychology 22(14): 1111-1132.
[14] Davis, F.D., Bagozzi, R.P., Warshaw, P.R. (1989): User acceptance of computer technology: A comparison of two theoretical models. – Management Science 35(8): 982-1003.
[15] Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P., Kaiser, S. (2012): Guidelines for choosing between multi-item and single-item scales for construct measurement: a predictive validity perspective. – Journal of the Academy of Marketing Science 40(3): 434-449.
[16] Fornell, C., Larcker, D.F. (1981): Structural equation models with unobservable variables and measurement error: Algebra and statistics. – Journal of Marketing Research 18(3): 382-388.
[17] Galdolage, S. (2020): Customer choice of self-service kiosks in service transactions. – South Asian Journal of Marketing 1(2): 123-170.
[18] Geisser, S. (1975): The predictive sample reuse method with applications. – Journal of the American statistical Association 70(350): 320-328.
[19] Ghosh, M. (2021): Understanding the relationship of self-service technology quality with user adoption using SSTQUAL. – The TQM Journal 33(2): 293-314.
[20] Ginting, Y.M., Chandra, T., Miran, I., Yusriadi, Y. (2023): Repurchase intention of e-commerce customers in Indonesia: An overview of the effect of e-service quality, e-word of mouth, customer trust, and customer satisfaction mediation. – International Journal of Data & Network Science 7(1): 329-340.