EXAMINING PERCEPTION AND ATTITUDE TOWARDS SMART RETAIL TECHNOLOGIES IN THE RETAIL SECTOR

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Abstract— This study was carried out to investigate the relationships between perceived usefulness, perceived ease of use, and perceived novelty on attitudes toward using smart retail technologies. Smart retail technologies (SRT) presented a fresh opportunity to investigate the breadth and depth of retail knowledge, which has the potential to enhance the traditional shopping experience. Since there is still an incomplete landscape regarding the development of smart retail technologies in Malaysia, the researchers aimed to approach the shoppers in Penang, Malaysia who had experiences with using smart retail technologies. Using the mall intercept sampling technique, the study received a total of 115 respondents. SmartPLS 3.0 was the data analysis tool applied in this study. In the measurement model, the reliability analysis showed that each variable has 0.7 Alpha, indicating high reliability. Overall, the results indicated that perceived usefulness and perceived novelty have a relationship with shoppers' attitudes toward smart retailing technologies. This study contributes important implications for both academicians and industry players.

Keywords— attitude, perceived ease of use, perceived novelty, perceived usefulness

I. INTRODUCTION

In the current retail industry, 'smart' has become a new buzzword to strengthen the rapid advancement of communication and interaction technologies seamlessly connecting customers in real-time [29]. Smart retail technology is a general word across many types of technologies that exist in physical retail stores [29]. By 2028, the market of smart retail technologies can reach 134347.9 million USD as the increasing adoption of the latest but growing technologies such as artificial reality, virtual reality, artificial intelligence, and the Internet of Things to enhance in-store shopping experience [4]. From the perspective of shopping progress, SRTs could exist in pre-purchase, purchase and post-purchase stages providing customers with a seamless smart shopping experience. The research expert has disclosed two key factors, the increasing use of data analytics and the explosion of convenience shopping, that could boost the market value of smart retail technologies [19].

Malaysia has great potential for smart retail technology adoption in the retail sector. In line with the ASEAN step, after a little push by the government during Covid 19, Malaysians have a high rate to accept a new payment method or contactless payment in an offline transaction. Also, the nation has launched DuitNow QR to unifies the national QR standard. The Domestic Trade and Consumer Affairs Ministry (KPDNHEP) aimed to expand such payment methods to 15,000 small and micro traders by 2022. This means that not only retailers should accustom the rapid advancement under Industry Revolution 4.0, the customers also be acquainted with the new technologies

Smart retailing is the rising shopping format and retailers are urged to launch technologies that can increase shopping effectiveness among Malaysian shoppers through smart retailing experience. Instead of just physical buildings for shopping, high experiential shopping is the new trend and preference of consumers, said Mark Saw, Penang branch executive director of Knight Frank [32]. Viewing from the macro perspective, the development of smart retailing is still nascent but significantly growing in stores [31],[20]. This implies that the Malaysian customers might have little knowledge or even zero awareness about how easiness and usefulness that the technology can benefit to their shopping experience even though they had such experiences. Instilling some comparative attributes such as high simplicity, and relative advantages of smart technologies in physical store retail might benefit to the adoption rate of smart retailing and increase offline shopping. Therefore, this study is looking to understand the antecedents of the attitude toward using smart retail technologies among psychical store shoppers.

SMART RETAIL TECHNOLOGIES

Smart retailing is a new retail format that emerged from the vision of a smart city [29], [13]. Three fundamental subsects of smart city explicitly implanted into smart retailing operations. The first characteristic of smart retailing is 'instrumented.' Many physical and virtual sensors are established to collect real-world human and environmental data. Second, 'interconnected', standing for the 'co-operation' between front-end and back-end technologies to provide seamless services. This requires a group of technologies to send real time data to a central computing platform and to communicate information among the networked technologies from different places. Third, smart retailing should be more 'intelligent' than previous retailing in brick-and-mortar stores. Therefore, it solves complex analytical tasks during business hours and helps retailers make better operational decisions [13].

In addition, some scholars contended that smart retailing can be considered as an extension of e-tailing [30]. In smart retailing, retailers applied similar features of e-tailing and added some new extensions which may provide retailers with new capabilities to serve customers seamlessly, in on-site and off-site platforms. Therefore, smart retailing is a new solution to the pain point of the physical platform. There are five differences (e.g.: space, core technology, nature of interactivity, nature of experience and service provision) pointed out by previous scholars to distinct smart retailing from the e-tailing, the retail platform that originated online [29]. The value propositions are formulated through the synchronization and connection between the back-end network and front-end objects that allow technologies to sense the environment, responsive deliver services and even consumers' self-service.

As smart retailing is still emerging in physical store shopping, the technology adoption is preferred by those scholars to investigate the initial consumer behavior toward SRT in general [30], [31]. Therefore, investigating the relationship of SRT characteristics from the customers' perspective such as technology usefulness, ease of use and novelty experience in shaping customers' attitudes towards SRT becomes imperative.

II. LITERATURE REVIEW

Attitude towards SRT

Attitude is important in the formation of consumers' behavioral intentions and actual behaviour [8], [2]. It's a more enduring evaluation of technology by end-users on new innovations. In fact, some well-known theories of information systems, such as Theory of Reasoned Action [11], Technology Acceptance Model [8] and Theory of Planned Behaviour [2], they included attitude as mediator to predict the relationship between multiple constructs and behavioural intentions. To elaborate, the individual attitude is linked tightly with beliefs and contend that once a positive belief is in the people's minds, they also simultaneously create positive attitudes towards a technology which in turn to derive behavioural intentions and actual behaviour. The assumption was proven by many recent information literatures. This was applied in consumers using chatbots for mobile shopping[14]. In smart retailing, this also has been asserted by many studies that once customers have positive attitudes, they would perform favourable behavioural intentions towards smart retail technologies [20], [30], [31]. On the other hand, negative attitudes might create preventive behaviour in adopting smart retailing. Hence, the attitude plays its role between personal beliefs and behavioural intentions. For this reason, the authors adapted the definition of attitude from [14], to define the variable as positive or negative feelings by consumers regarding smart retail technologies for the shopping process.

The research model presented in study proposes the role of customers' perception in shaping the attitude towards the smart retail technologies in retail shopping behaviour. This study investigate the role of….

Perceived usefulness

In the study of information systems, perceived usefulness was widely applied by previous authors in different research contexts. The construct of perceived usefulness can be considered the principal variable related to influencing users to keep long-lasting usage patterns or attract new users. The relationship of customer and technological innovations was promised when such system-benefit continuously manipulate their personal performance [30]. This implies that the higher perceived

usefulness, the more readily consumer acceptance towards technology. This forecast also has been asserted properly in studying either individual or general use of smart retail technologies [5], [21], [23], [25], [30].

Originally, perceived usefulness was first initially proposed by [7] to measure whether people believe that using a particular technology innovation would boost their job performance. Perceived usefulness can be defined as the prospective users think that using the target technology will increase their job performance [8]. The author applied this construct to measure new end-users about using computer-based information systems. This represents it initially was proposed for the pre-acceptance stage in technology adoption to justify whether technology innovations met the users' expectations. Afterward, perceived usefulness has widely been used to measure in pre-acceptance and even post-acceptance technology usage. Hence, this study uses perceived usefulness as one of the factors that influence the shoppers' attitude towards SRT in general. The definition of perceived usefulness can be well-defined as "the end-users perceived using smart retail technology(s) would boost their personal performance in the shopping process."

Perceived usefulness is the important determinant in TAM and it represents the positive evaluation of personal toward a technology. Extant literature has been proven that the increasing of end-users' performance was one of the stimuluses to encourage them embracing smart retail technology [20], [30]. The perceived usefulness is likely to be the focal determinant that increase customers' propensity to accept the assistance of smart technologies in their shopping moments. As well, a new technology is more likely to be prevalent if the end-users' task can be completed in an efficiency solution [9]. The preceding studies have conducted research on the relationship between perceived usefulness and attitude in the context of cashless payment [15], [24], [26]. By extending the existing body of knowledge on smart retail technologies, perceived usefulness is expected as the important cognition to derive a favourable and positive consumers' attitude in using smart retail technologies. Therefore, the first hypothesis is postulated as the following sentence:

H1: Perceived usefulness positively influences consumers' attitudes towards SRT

Perceived ease of use

In most cases, technology easiness is critical because this technology usage experience related to consumers frequent or even daily technology usage. Particularly, it led new users in their adoption and use of technologies as the service providers lowering the learning cost. This experience must be taken into the considerations by service providers in designing new technology otherwise the new users will keep away themselves from using smart retail technologies in offline shopping activities. Smart retail technologies have high sustainability when that can allow shoppers to feel free of effort, no matter mental or physical [(30].

As similar to perceived usefulness, perceived ease of use was also one of the determinants in TAM to influence computer-based technology acceptance [8]. Perceived ease of use originally defined as the prospective users expect the target technology will be free of effort [8]. However, the latter researchers had made it suitable for studying technology post-acceptance among end-users [23], [25], [30]. To study the Malaysian shoppers towards smart retail technologies, perceived ease of use can be defined as "the end-users perceived using smart retail technology(s) can lighten the effort they paid in shopping process."

Similar to perceived usefulness, the perceived ease of use also originated from the same theory to explain the usage experiences among technology users [8]. The learning cost paid by the end-users will determine whether a new technology will sustain in the marketplace. Free of effort in using smart retail technologies is significantly linked to the prevalent level. Hence, the lower learning costs, the higher customers' propensity to elicit a favourable collective emotion towards smart retail technologies. This has been asserted by previous literature. Roy et al. [30] has confirmed the relationship between perceived ease of use, attitudes and continuance intentions towards smart retail technology. In controversial, Daragmeh et al. [6] rejected the relationship between perceived usefulness and attitudes in studying e-wallet after outbreaking of Covid-19. They argued the mediating roles of attitudes were smaller once the technology users equipped with significant knowledge and experience. Based on the controversial viewpoints above, the influence of perceived

ease of use is expected to create a positive attitude among consumers toward smart retail technologies:

H2: Perceived ease of use positively influences consumers' attitudes towards SRT

Perceived novelty

The attribute of novelty is subjective rather than objectively perceived by customers when a new and unique technology has its identity that can differentiate from the existing devices [31]. The new and refreshing technology may provide a diverse usage pattern compared to existing technologies. Hence, new technology could create curiosity and drive customers to explore more on the features of new technology. Customers are likely to have a positive attitude toward innovation when it provides a more enjoyable manner than existing ones to achieve shopping tasks [1]. Obviously, an enjoyable experience must be backed up by benefits derived from consumers using smart retail technologies [10], [29], [30. Therefore, the affective response heightens the adoption rate of smart retail technologies. In this study, perceived novelty is defined as the degree to which consumers perceive and identify the smart retail technology(s) to be unique and novel in helping them to achieve shopping tasks in a more enjoyable manner than existing retail technologies.

Smart retailing is still a new and nascent shopping method for many shoppers [31]. Therefore, customers may perceive smart retailing is a unique and novel shopping experience even though this perception could be weakened after they familiarized towards smart retail technologies. By now, perceived novelty is still an important external motivation to attract new users and keep existing users stick to smart retail technologies. Of the study by Nikhashemi et al. [22], they asserted that the novelty attribute provided by retailer branded AR apps (e.g., Ikea, Gap or Amazon) influence utilitarian and hedonic benefits among the experienced shoppers in Malaysia. According to the result, the perceived novelty has relationships regarding the personal cognitive and affective state. The present study hypothesizes the influence of perceived novelty on customer attitude toward smart retail technologies as the following sentence:

H3: Perceived novelty positively influences consumers' attitudes toward SRT

III. METHOD

This study is based on the quantitative method, given that intends to examine the role of technology beliefs of perceived usefulness, perceived ease of use, and novelty in determining the attitude of SRT in a retail setting. This study used a survey to collect the data and obtained a close-ended questionnaire. A mall intercept sampling method was applied in this study. A total of 300 questionnaires were distributed at two shopping malls in Penang, namely Gurney Paragon Mall and Queensbay Mall October 2022. The constructs in this study were measured using validated items from previous studies. A 6-item scale for perceived usefulness was developed from [8] and [20] studies. The measurement items for perceived ease of use consisted of six items adapted from [30]. Perceived novelty was measured using six items adapted from [1]. Finally, attitude towards SRT consisted of 7-items adapted from [20] and [24]. Responses to all questions were measured using a 5-point Likert scale ranging from "strongly disagree (1)" to "strongly agree (5)". After absorbing feedback from the pilot study into the questionnaire, the final set of questionnaires was then distributed to actual retail shoppers.

Data collected from the study were analyzed by SPSS and Smart PLS. The study applied the partial least squares (PLS)technique an implementation of structural equation modeling (SEM) with Smart PLS 3.2.7 [27] to examine conceptual model and test the proposed hypotheses. Further demographic items have been analyzed by the descriptive statistical tools

IV RESULTS

In this study, total 115 respondents who had SRT experiences were appointed to answer the questionnaire. This research has applied SmartPLS 3.2.7 as the statistical tool for the data analysis. The reporting flow is started from the measurement model and then followed by the structural model. In the following paragraphs, the specific criteria of each model were discussed.

Measurement model

After initial run data in SmartPLS 3.2.7, all loadings are above 0.5, indicating that the included items can be accepted at all [12],[16]. The composite reliability range between 0.899 and 0.945 indicated the internal consistency reliability of the constructs. All the AVE for perceived usefulness, perceived ease of use, perceived novelty and attitude were above the threshold value (0.5), it was acceptable as an adequate level of composite reliability [12], [16].

Table 1: Measurement model

Latent variable	Items	Loadings	Cronbach's alpha	Composite Reliability	Average Variance
Perceived usefulness	PUI	0.842	0.899	0.899	0.768
	PU4	0.848			
	PU5	0.916			
Perceived ease of use	PEU1	0.906	0.941	0.942	0.808
	PEU2	0.932			
	PEU3	0.907			
	PEU4	0.904			
	PEU6	0.845			
Perceived Novelty	PN1	0.845	0.896	0.912	0.660
	PN2	0.785			
	PN3	0.836			
	PN4	0.701			
	PN5	0.889			
	PN6	0.845			
Attitudes towards SRT	ATD1	0.843	0942	0.945	0.746
	ATD2	0.917			
	ATD3	0.914			
	ATD4	0.898			
	ATD5	0.887			
	ATD6	0.831			
	ATD7	0.745			

Structural model

The path coefficient, T-value and p-value of every direct were measured in Table 2. According to Table 2, two out of three hypotheses were supported.

Table 1: Structural model

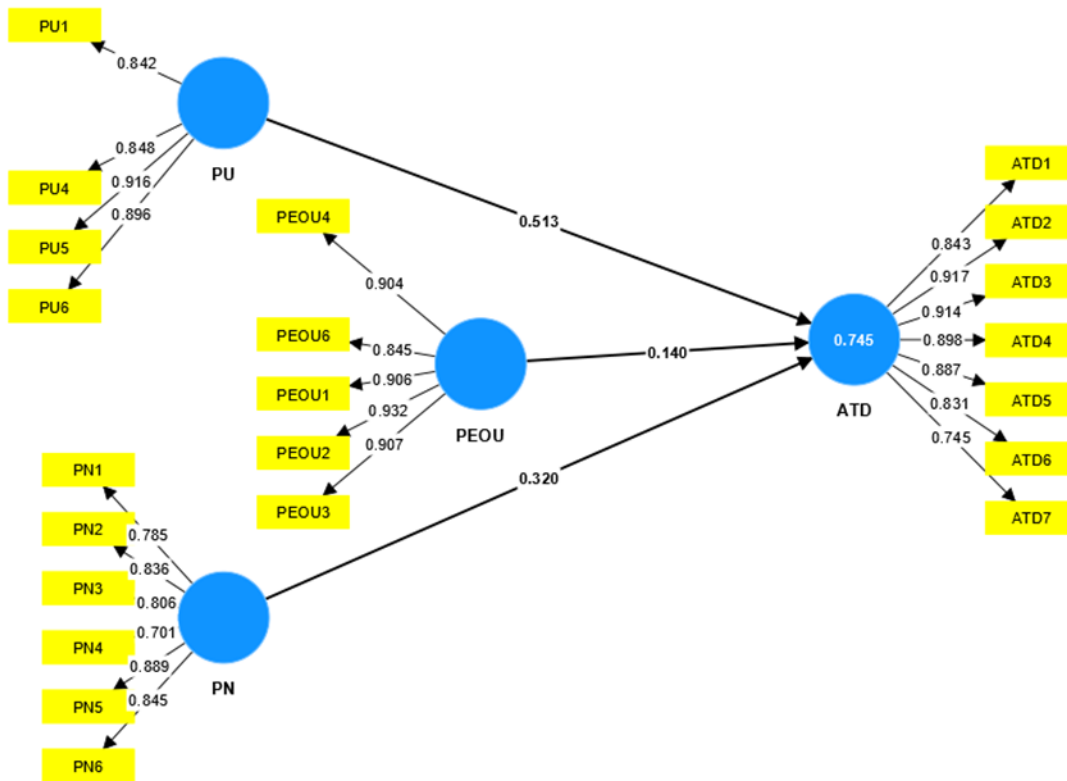| Hypothesis	Path	Direct effect	S.D.	T-value	P-value	Decision
H1	PU → ATD	0.513	0.102	5.007	0.000	Supported
H2	PEU → ATD	0.140	0.095	1.482	0.138	Not supported
H3	PN→ATD	0.320	0.076	4.227	0.000	Supported

Figure 1: Structural model results

The result showed that perceived usefulness was not significantly related to customers' attitudes towards SRT (ß = 0.049, t = 0.393, p = 0.695) and H1 was rejected. However, the relationships between perceived ease of use and attitudes towards SRT (ß = 0.140, t = 1.482, p =0.138 has indicated a significant relationship. Thus, H2 was supported. Meanwhile, the relationship is a positive relationship between perceived novelty and attitudes towards SRT ß = 0.320, t = 4.227, p= 0.0000, and H3 was supported. (Figure 1)

The result showed that perceived usefulness insignificantly influences shoppers' attitudes towards SRT (ß = 0.513, t = 5.007, p = 0.000) and H1 was supported. Meanwhile, the relationships between perceived ease of use and attitudes towards SRT (ß = 0.140, t = 1.482, p =0.138) has indicated positive and significant effect. Thus, H2 was supported. Similarly, the relationship between attitudes towards SRT and behavioural intentions of using SRT (ß = 0.320, t = 4.227, p= 0.000), H3 was supported.

V. DISCUSSION

The present study has extended the research on SRT in Malaysia, one of the emerging Asian markets. Post-pandemic scenarios have created new opportunities and norms that most retailers are incorporating SRT in retail setting. The findings show a significant relationship between the perceived usefulness of SRT and attitudes toward it. This finding is in line to study by [3] and [17] studies on argument reality retail apps and e-commerce respectively. This implies that consumer appreciate the usefulness and convenience of SRT and perceived using smart retail technologies enhance personal performance in shopping process. In addition to this, perceived novelty also significant effect on forming customers' attitude towards SRT. The customers might perceived and identify the SRT to be helping them in a better and unique way to achieve shipping tasks. This result consistent with previous studies [28]). This also could indicate the shoppers' motivation in relating SRT to fun and enjoyment use of technological advancement in retailing. In contrast, there was no significant relationship between perceived ease of use and attitude towards SRT. This result was not in line with the study by [30], [18] in which perceived ease of use had a significant positive influence on the Australian shoppers' attitude. It could be because shoppers' may feel that their have to put more efforts in handling the SRT even though they perceived usefulness and novelty of it. This could be in term of operating and interacting with technologies. However, the findings implies that shoppers are expecting more user-friendliness, minimal effort and less complexity in handling SRT in shopping

context. Also, the study has affirmed that perception of technologies would determine the attitude and behaviour.

CONCLUSION

This study helps retailers and mall operators who are considering using SRT to renovate their physical retail operations. The practitioners need to aware the rising trend in SRT development and its relevancy in shaping customers buying behaviour. This study specifically, highlights the expectation of shoppers toward SRT accessibility in physical stores. In addition, the lack of SRT availability in a physical store could create a barrier that makes it challenging for shoppers to learn about the utility of that technology. Availability of SRT that give smooth and novelty experience to navigate shoppers' shopping experience in the store could lead to the sustainability of SRT in the marketplace.

The research framework is limited to focus on attitude towards SRT. Future studies should consider other potential consequences of attitude such as behavioral and experience dimensions. Apart from behavioral intentions, actual behavior, citizenship behavior and any potential obstruction that can determine the evolution of SRT also has the potential to be taken into account by upcoming studies.

ACKNOWLEDGMENT

REFERENCES

[1] S. Adapa, S.M. Fazal, S.B. Makam, M.M. Azeem, and G. Mortimer, "Examining the antecedents and consequences of perceived shopping value through smart retail technology," Journal of Retailing and Consumer Services, vol. 52, pp. 1-11, 2020.

[2] I. Ajzen, and M. Fishbein, "Understanding attitudes and predicting social behavior," Prentice-Hall, 1980

[3] F. Bonetti, G. Warnaby, and L. Quinn, "Augmented reality and virtual reality in physical and online retailing: A review, synthesis and research agenda," Springer, pp. 119–132, 2018.

[4] Business Wire, "Global smart retail market report 2021-2028," 2021. https://www.businesswire.com/news/home/20211202005452/en/Global-Smart-Retail-Market-Report-2021-2028

[5] Y. W. Chang and J. Chen, "What motivates customers to shop in smart shops? The impacts of smart technology and
technology readiness," Journal of Retailing and Consumer Services, vol. 58, pp. 102-325, 2021

[6] A. Daragmeh, J. Sági, and Z. Zéman, "Continuous intention to use e-wallet in the context of the covid-19 pandemic: Integrating the health belief model (hbm) and technology continuous theory (tct)," Journal of Open Innovation: Technology, Market, and Complexity, vol.7(2). pp. 1-23, 2021. https://doi.org/10.3390/joitmc7020132

[7] F.D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," MIS Quarterly: Management Information Systems, vol. 13(3), pp. 319–339. 1989.

[8] F.D. Davis, R.P. Bagozzi, and P.R. Warshaw, "User acceptance of computer technology: A comparison of two theoretical model," Management Science, vol. 35(8), pp. 982-1003, 1989.

[9] F.D. Davis, and V. Venkatesh, "A critical assessment of potential measurement biases in the technology acceptance model: three experiments," International Journal Human-Computer Studies, vol. 45 (1), pp. 19-45, 1996

[10] X. Fan, Z. Chai, N. Deng, and X. Dong, "Adoption of augmented reality in online retailing and consumers' product attitude: A cognitive perspective," Journal of Retailing and Consumer Services, vol. 53, pp.101986, March 2020

[11] M. Fishbein, and I. Ajzen, "Belief, attitude, intention, and behavior: An introduction to theory and research," Reading, MA: Addison-Wesley, 1975

[12] C. Fornell, and D.F. Larcker, "Structural equation models with unobservable variables and measurement error: Algebra and statistics," Journal of Marketing Research, vol.18(3), pp. 382–388, August 1981

[13] C. Harrison, B. Eckman, R. Hamilton, P. Hartwick, J. Kalagnanam, J. Paraszczak, and P. Williams, "Foundations for smarter cities," IBM Journal of Research and Development, vol. 54(4), pp. 350-365, 2010

[14] D.L. Kasilingam, "Understanding the attitude and intention to use smartphone chatbots for shopping," Technology in Society, vol.62, pp. 101280, May 2020

[15] A. Khayer, and Y. Bao, "The continuance usage intention of Alipay: Integrating context-awareness and technology continuance theory," The Bottom Line, vol. 32(3), pp. 211-229, 2020

[16] L.W. Lam, "Impact of competitiveness on salespeople's commitment and performance," Journal of Business Research, vol. 65(9), pp. 1328–1334, 2012.

[17] J.H. Lee, and C,H. Song, "Effects of trust and perceived risk on user acceptance of new technology service," Social Behavior and Personality: An International Journal, vol. 41(4), pp. 587-597, 2013

[18] R. Li, T.L. T.L. Chung, and A.M. Fiore, "Factors affecting current users' attitude towards e-auctions in China: An extended TAM study," Journal of Retailing and Consumer Services, vol. 34 ,pp. 19–29, 2017

[19] Markets and Markets. "Smart retail market by system (smart payment systems, intelligent vending machines), application (foot-traffic monitoring, inventory management), retail offering (fast-moving consumer goods, hardlines, and leisure goods), and geography - Global forecast to 2025, April 2020. https://www.marketsandmarkets.com/Market-Reports/smart-retail-market-78791828.html

[20] S.I. Ng, J.A. Ho, X.J. Lim, K.L. Chong, and K. Latiff, " Mirror, mirror on the wall, are we ready for Gen-Z in marketplace? A study of smart retailing technology in Malaysia," Young Consumers, vol. 22(1), pp. 68–89, 2019

[21] S.R. Nikhashemi, H.H. Knight, K. Nusair, and C.B. Liat, "Augmented reality in smart retailing: A (n) (A) Symmetric Approach to continuous intention to use retail brands' mobile AR apps," Journal of Retailing and Consumer Services, vol. 60, pp. 102464, May 2021

[22] S.R. Nikhashemi, C. Jebarajakirthy, and K. Nusair, " Uncovering the roles of retail brand experience and brand love in the apparel industry: Non-linear structural equation modeling approach," Journal of Retailing and Consumer Services, vol. 48, pp. 122-135, 2019

[23] J.S. Park, S. Ha, and S.W. Jeong, "Consumer acceptance of self-service technologies in fashion retail stores," Journal of Fashion Marketing and Management, vo. 25(2), pp. 371–388, 2021.

[24] P. Patil, K. Tamilmani, N.P. Rana, and V. Raghavan, "Understanding consumer adoption of mobile payment in India: Extending Meta-UTAUT model with personal innovativeness, anxiety, trust, and grievance redressal," International Journal of Information Management, vol. 54(February), 102144, 2020

[25] R. Pillai, B. Sivathanu, and Y.K. Dwivedi, "Shopping intention at AI-powered automated retail stores (AIPARS)," Journal of Retailing and Consumer Services, vol. 57(August), 102207, 2020

[26] S. Rahi, M.A. Ghani, and A.H. Ngah, "Factors propelling the adoption of internet banking: The role of e-customer service, website design, brand image and customer satisfaction," International Journal of Business Information Systems, vol. 33(4), pp. 549-569, 2020

[27] M. Sarstedt, C.M. Ringle, and J.F. Hair, "Partial least squares structural equation modeling," Handbook of Market Research, Springer, 2020.

[28] E.M. Roger, "A prospective and retrospective look at the diffusion model," Journal of Health Communication, vol. 9(1), pp. 13-19, 2004.

[29] S.K. Roy, M.S. Balaji, S. Sadeque, B. Nguyen, and T.C. Melewar, "Constituents and consequences of smart customer experience in retailing," Technological Forecasting and Social Change, vol.124, pp. 257–270, November 2017.

[30] S.K. Roy, M.S. Balaji, A. Quazi, and M. Quaddus, " Predictors of customer acceptance of and resistance to smart technologies in the retail sector," Journal of Retailing and Consumer Services, vol. 42, pp. 147–160, February 2018

[31] S.K. Roy, M.S. Balaji, and B. Nguyen, "Consumer-computer interaction and in-store smart technology (IST) in the retail industry: the role of motivation, opportunity, and ability," Journal of Marketing Management, vol. 36(3-4), pp. 299-333, 2020

[32] The Star, "Penang retail market adapting to new trends," 17 September 2021