E-Commerce Adoption, Technology Perceptions and Perceived Business Competitiveness among Smes in Selangor, Malaysia

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ABSTRACT

This study examines the associations of e-commerce adoption and technology-related perceptions with perceived business competitiveness among micro, small and medium-sized enterprises in Selangor, Malaysia. An exploratory cross-sectional survey was conducted between November 2025 and February 2026 using a Malay-language questionnaire distributed through entrepreneur associations and WhatsApp groups. Participants were business owners or managers who reported holding or having applied for halal certification and using digital transactions, including QR-code payment acceptance. Of 346 submissions, 311 were retained after screening. The reported partial least squares structural equation modelling results indicate statistically significant associations with perceived business competitiveness for e-commerce adoption ($p < 0.001$), perceived usefulness ($p < 0.001$), and perceived trust and security ($p = 0.017$). Perceived ease of use ($p = 0.072$) and perceived competitive advantage ($p = 0.918$) were not statistically significant at the 0.05 level. However, measurement validity concerns remain: average variance extracted for perceived trust and security was 0.495, while two heterotrait–monotrait ratios exceeded 0.90. The unavailable raw data and original analytical output also prevent re-estimation and full verification of the reported model. The findings therefore provide provisional evidence of associations between digital business perceptions, adoption and self-reported competitiveness, rather than causal effects. Their potential relevance to SME digitalisation support requires further investigation using validated measures and reproducible analyses.

Keywords: E-commerce adoption; technology perceptions; perceived business competitiveness; SMEs; Selangor.

INTRODUCTION

E-commerce provides small and medium-sized enterprises (SMEs) with opportunities to conduct sales, market their products and maintain relationships with customers and business partners through digital platforms. Its business value, however, requires consideration of both adoption and the benefits that enterprises associate with its use. In Malaysia, Kartiwi et al. (2018) examined how external factors motivating e-commerce adoption relate to the benefits obtained by SMEs. Their work establishes the relevance of examining business benefits alongside participation in digital commerce. For the present study, this distinction directs attention to how SME owners and managers evaluate digital technologies and how these evaluations relate to their perceptions of business competitiveness.

Research on e-commerce adoption offers an important foundation for this investigation. Rahayu and Day (2015) examined adoption among Indonesian SMEs and identified the relevance of perceived benefits, technological readiness and characteristics of business owners. Their findings situate adoption within the technological and managerial circumstances of smaller enterprises. A related research stream considers the business outcomes associated with online activity. Lányi et al. (2021), for example, reported positive relationships between website presence, website quality and SME competitiveness. Together, these studies support examining technology-

related perceptions, adoption and business outcomes as related but conceptually distinct aspects of SME digitalisation.

The present study focuses on the distinction between favourable evaluations of technology and perceived business outcomes. An entrepreneur may consider an online platform easy to use, useful or trustworthy without necessarily reporting stronger business growth or profitability. Likewise, recognising opportunities for innovation and improved customer interaction does not, by itself, demonstrate that a business has become more competitive. These distinctions motivate an examination of whether different technology-related perceptions remain associated with perceived business competitiveness when considered alongside e-commerce adoption within the same analytical model. The research problem addressed here is therefore the relationship between SMEs' assessments of digital commerce and their reported business outcomes. Rather than claiming that e-commerce adoption or its benefits have been overlooked, this study examines the specific associations of perceived ease of use, perceived usefulness, perceived trust and security, perceived competitive advantage, and e-commerce adoption with perceived business competitiveness in a Malaysian SME sample. This approach provides a contextual examination of whether these constructs exhibit distinct associations with the outcome when considered together.

Drawing on survey responses from 311 owners and managers of SMEs in Selangor, Malaysia, the study examines the reported associations using PLS-SEM results preserved in the manuscript. Perceived business competitiveness is operationalised through respondents' assessments of business growth, profitability and overall benefits associated with digital platform use. The outcome consequently represents self-reported business evaluations rather than independently verified financial performance or market position. The cross-sectional design also limits interpretation to associations and does not establish whether technology perceptions or adoption precede changes in business outcomes.

The intended contribution is to provide evidence on how e-commerce adoption and technology-related perceptions relate to perceived business competitiveness within the surveyed SMEs. The findings may inform the design of SME digitalisation support by identifying which dimensions warrant closer attention, subject to the adequacy of the measurement model and the limitations of the sample. The study's empirical scope is e-commerce and digital business platform use; it does not assess credit-scoring accuracy, algorithmic transparency or access to financing.

Research Objectives and Research Questions

This study aims to examine the associations of e-commerce adoption and technology-related perceptions with perceived business competitiveness among SMEs in Selangor, Malaysia. Technology-related perceptions comprise perceived ease of use, perceived usefulness, perceived trust and security, and perceived competitive advantage. Business competitiveness is assessed through owners' and managers' self-reported evaluations of business growth, profitability and benefits associated with digital platform use.

The specific research objectives are:

1. To examine the association between e-commerce adoption and perceived business competitiveness among SMEs in Selangor, Malaysia.

2. To examine the association between perceived ease of use and perceived business competitiveness among SMEs in Selangor, Malaysia.

3. To examine the association between perceived usefulness and perceived business competitiveness among SMEs in Selangor, Malaysia.

4. To examine the association between perceived trust and security and perceived business competitiveness among SMEs in Selangor, Malaysia.

5. To examine the association between perceived competitive advantage and perceived business competitiveness among SMEs in Selangor, Malaysia.

Correspondingly, the study addresses the following research questions:

1. How is e-commerce adoption associated with perceived business competitiveness among SMEs in Selangor, Malaysia?

2. How is perceived ease of use associated with perceived business competitiveness among SMEs in Selangor, Malaysia?

3. How is perceived usefulness associated with perceived business competitiveness among SMEs in Selangor, Malaysia?

4. How are perceived trust and security associated with perceived business competitiveness among SMEs in Selangor, Malaysia?

5. How is perceived competitive advantage associated with perceived business competitiveness among SMEs in Selangor, Malaysia?

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Theoretical Foundation

The Technology Acceptance Model provides a foundation for understanding users' evaluations of information technology. Davis (1989) identifies perceived usefulness and perceived ease of use as central beliefs associated with technology acceptance. These concepts help explain why SME owners and managers may regard digital business platforms as beneficial and manageable. However, technology acceptance and business competitiveness represent different outcomes. The present study therefore draws on TAM to inform the selection of technology-related perceptions rather than treating the proposed framework as a direct replication of the original model.

The framework also draws on research concerning e-commerce adoption and its business benefits. Rahayu and Day (2015) identify perceived benefits, technological readiness and owner characteristics as relevant to adoption among Indonesian SMEs. In Malaysia, Kartiwi et al. (2018) examine the relationship between external adoption drivers and the benefits obtained from e-commerce. These studies provide a basis for considering both technological evaluations and business circumstances when examining digital commerce. They do not, however, establish that each perception necessarily has an independent direct relationship with competitiveness. The direct relationships proposed here are consequently treated as propositions requiring empirical assessment.

E-Commerce Adoption and Perceived Business Competitiveness

E-commerce adoption concerns the incorporation of online platforms into business activities. Such participation can provide channels for sales, marketing and communication, creating opportunities for enterprises to develop their operations. Lányi et al. (2021) report positive relationships between website presence, website quality and SME competitiveness. Their findings support the relevance of online activity to business outcomes, although website characteristics are not equivalent to the adoption measures employed in the present study.

The proposed relationship rests on the expectation that enterprises reporting greater engagement with e-commerce may also report stronger business benefits. This expectation does not imply that registration on a platform alone produces growth or profitability. Rather, adoption provides an opportunity for business use whose outcomes must be examined empirically. Accordingly, the following hypothesis is proposed:

H1: E-commerce adoption is positively associated with perceived business competitiveness among SMEs in Selangor, Malaysia.

Perceived Ease of Use and Perceived Business Competitiveness

Perceived ease of use concerns the effort associated with using technology (Davis, 1989). In the present context, it relates to respondents' assessments of the simplicity and convenience of digital tools and online business platforms.

The proposed business-level rationale is that manageable technologies may reduce operational friction when owners and managers perform online activities. Easier interaction with digital platforms could leave more attention available for serving customers and organising business processes. Nevertheless, usability does not ensure commercial success, and its association with competitiveness may operate through technology use or other mechanisms. The direct relationship examined here therefore extends beyond the acceptance outcome addressed by TAM:

H2: Perceived ease of use is positively associated with perceived business competitiveness among SMEs in Selangor, Malaysia.

Perceived Usefulness and Perceived Business Competitiveness

Perceived usefulness reflects the belief that technology can enhance task performance (Davis, 1989). For SME owners and managers, this belief may concern the contribution of e-commerce to business operations and marketing.

The proposed association with competitiveness rests on the expectation that respondents who regard digital platforms as useful for their business activities may also report favourable business outcomes. Conceptually, usefulness concerns an evaluation of the technology's utility, whereas perceived business competitiveness concerns an evaluation of business results. These evaluations may be closely related, making their empirical distinctiveness important. Subject to that distinction, the following hypothesis is proposed:

H3: Perceived usefulness is positively associated with perceived business competitiveness among SMEs in Selangor, Malaysia.

Perceived Trust and Security and Perceived Business Competitiveness

Gefen et al. (2003) integrate trust with TAM in an online shopping context, providing a basis for considering confidence in digital exchanges alongside usefulness and ease of use. Their consumer-focused framework informs the relevance of trust but does not directly establish a relationship with SME competitiveness.

For the present study, the proposed rationale is that confidence in online platforms and the perceived safety of transactions may support firms' willingness to conduct business digitally. Such confidence could facilitate commercial interactions associated with favourable business outcomes. However, trust and security are related concepts rather than automatically interchangeable dimensions; their treatment within a combined construct requires measurement justification. The proposed relationship is:

H4: Perceived trust and security is positively associated with perceived business competitiveness among SMEs in Selangor, Malaysia.

Perceived Competitive Advantage and Perceived Business Competitiveness

The questionnaire's perceived competitive advantage items address customer preferences for online purchasing, digitally supported innovation, and interactions with customers, suppliers and business partners. Their substantive emphasis is therefore on perceived commercial and relational benefits of digital technology. By comparison, the outcome items concern respondents' assessments of business growth, profitability and overall benefits.

The proposed relationship rests on the expectation that favourable assessments of digital technology's contribution to innovation and business relationships may accompany stronger assessments of business outcomes. This distinction remains provisional because the items do not directly establish superiority over competitors, and some conceptual overlap with the outcome is possible. The construct label and its empirical distinctiveness therefore require reassessment before substantive conclusions are drawn. Under the current specification, the hypothesis is:

H5: Perceived competitive advantage is positively associated with perceived business competitiveness among SMEs in Selangor, Malaysia.

Conceptual Framework and Hypotheses

The framework brings together the five relationships discussed in the preceding sections. E-commerce adoption, perceived ease of use, perceived usefulness, perceived trust and security, and perceived competitive advantage are positioned as explanatory constructs associated with perceived business competitiveness among SMEs in Selangor, Malaysia. E-commerce adoption is represented as a direct correlate of the outcome; no mediation effect is specified.

This revised presentation follows the direct relationships listed in the manuscript's structural-results table. It does not constitute a re-estimation of the model or establish that these relationships were all specified before the original analysis. The discrepancy between the earlier hypotheses and the reported structural paths cannot be conclusively resolved without the original analytical records. Accordingly, the framework organises the available findings for exploratory interpretation, subject to the measurement and reporting limitations described below.

Research Design and Study Context

This study employed an exploratory, quantitative, cross-sectional survey to examine the associations between technology-related perceptions, e-commerce adoption and perceived business competitiveness. The main survey was conducted among owners and managers of micro, small and medium-sized enterprises in Selangor, Malaysia, between November 2025 and February 2026. One respondent, either an owner or a manager, represented each participating enterprise.

Eligibility was assessed using self-reported annual sales turnover against the applicable SME Corp Malaysia classification. Microenterprises were included. Participating businesses were required to provide a business registration number and report that they had either obtained halal certification or submitted an application for certification. Registration and certification status were based on respondents' declarations and were not independently verified against official records.

Participants were also required to use digital transactions in their business activities. This criterion included businesses accepting customer payments through QR codes, even if they did not conduct online sales. Consequently, eligibility reflected participation in digital transactions rather than a requirement that all respondents already operated through e-commerce platforms.

Sampling and Recruitment

The study used non-probability convenience sampling. The researchers visited business locations and contacted entrepreneur associations to facilitate access to potential participants. A Google Forms questionnaire was subsequently distributed through the associated entrepreneur WhatsApp groups. Group members could participate voluntarily, subject to the study's eligibility criteria. The recruitment procedure did not involve random selection from a comprehensive sampling frame. The resulting sample should therefore be understood as a sample of eligible respondents reached through the participating business networks, rather than a statistically representative sample of all enterprises in Selangor or Malaysia.

Questionnaire Development and Pilot Study

Questionnaire items were developed with reference to previous studies identified through the literature review and translated directly into Malay by the researchers. No separate language or content review was conducted before the pilot study. The questionnaire was administered entirely in Malay.

The instrument comprised a demographic section and a section measuring perceived ease of use, perceived usefulness, perceived trust and security, perceived competitive advantage, e-commerce adoption, and perceived

business competitiveness. Construct items used a seven-point Likert scale, anchored at 1 for strongly disagree and 7 for strongly agree.

A pilot study involving 30 participants was conducted in Kuala Tahan in August 2025. These participants were separate from the main survey sample. Following the pilot analysis, two items were removed because their reported outer loadings were below 0.40: PTS5, concerning the ease of monitoring online transactions, and ECA4, concerning the business's use of ICT utilities. Neither item was included in the main survey questionnaire.

The remaining instrument contained 23 construct items: four each for perceived ease of use, perceived usefulness, perceived trust and security, perceived competitive advantage, and perceived business competitiveness, and three for e-commerce adoption. The pilot-based removal of items did not, by itself, establish the validity of the remaining measures; measurement quality was subsequently assessed in the main analysis.

Response Screening and Analytical Sample

The main survey received 346 submissions. Screening resulted in the exclusion of 35 submissions, leaving 311 responses for analysis. Reasons for exclusion included business locations outside Selangor, missing information on business type, duplicate submissions, and selection of the same response category, specifically a score of 5, across all construct items.

Duplicate submissions were identified by checking respondents' names and telephone numbers. Where repeated submissions were identified, the most complete response was retained. A verified numerical breakdown of exclusions by reason is no longer available; the exclusion count is therefore reported only in aggregate.

The uniform-response exclusion was applied as a response-quality screening rule. Such a pattern does not independently establish inattentive responding, and the consequences of this screening decision cannot now be evaluated through sensitivity analysis.

Statistical Analysis and Reporting Constraints

The original analysis used partial least squares structural equation modelling in SmartPLS. The available manuscript reports Cronbach's alpha, composite reliability, average variance extracted, heterotrait–monotrait ratios, structural-path statistics and the coefficient of determination for perceived business competitiveness.

The raw dataset, SmartPLS project and original analytical output are no longer available. Consequently, the reported results cannot be independently reproduced or re-estimated during revision. The software version, estimation settings and bootstrapping configuration cannot be verified. The minimum sample-size claim previously attributed to G*Power has been omitted because its original settings and output are unavailable.

Interpretation is restricted to the statistics preserved in the manuscript. In particular, the discrepancy between the proposed conceptual model and the reported structural paths remains unresolved. The structural-results table also labels its estimates as bootstrap sample means rather than original-sample coefficients, preventing their unqualified reporting as original-sample path estimates.

The reported measurement results identify unresolved concerns, including an average variance extracted of 0.495 for perceived trust and security and heterotrait–monotrait ratios of 0.919 for perceived trust and security with perceived competitive advantage, and 0.905 for e-commerce adoption with perceived business competitiveness. These concerns limit substantive interpretation of the structural relationships. The findings are therefore treated as provisional associations within the surveyed sample rather than as validated causal effects.

Participant Consent and Research Ethics

The introductory page of the questionnaire explained the study's purpose, the voluntary nature of participation and confidentiality arrangements. Respondents were asked to indicate their agreement before completing the

questionnaire. Names and telephone numbers were collected and used to identify duplicate submissions; the survey was therefore not anonymous.

No institutional research ethics approval was obtained. Respondent consent is reported as a participation procedure and is not presented as a substitute for institutional ethics approval.

Measurement Items

Each item that is an instrument of study is encoded with a specific series of figures and is a reference for the link between the constructs in the PLS-SEM analysis. In testing the validity of each factor, a preliminary test was conducted. Marking * is placed on factor items that have been isolated from the actual survey on the target population of this study as below:

Table 1.0: Measurement items and pilot-stage exclusions

Construct	Questions Based On Thematic Items	Code
Perceived ease of use (PEOU)	1. I can easily use digital gadgets	PEOU1
	2. Online sales platform is easy to use	PEOU2
	3. Marketing through the website is simple and uncomplicated.	PEOU3
	4. Trading through the website is easy and convenient	PEOU4
Perceived usefulness (FPU)	1. E-commerce can benefit my business operation	FPU1
	2. Access to digital business platforms is cheap and affordable	FPU2
	3. My business can operate effectively with E-commerce	FPU3
	4. E-commerce can be a good marketing platform for my business	FPU4
Perceived trust and security (PTS)	1. I am confident in the advantages of business digitalization.	PTS1
	2. The use of digital gadgets has always helped my business without problems.	PTS2
	3. Businesses through E-commerce are safe and secure	PTS3
	4. I trust to use the E-commerce platform	PTS4
	5. I can easily monitor my transaction online*	PTS5
Perceived competitive advantage (PCA)	1. My customers like to buy online.	PCA1
	2. My business is more innovative with the advent of digital technology	PCA2
	3. I interact with customers better with the availability of online business platforms.	PCA3
	4. I can better interact with suppliers and business partners over the Internet.	PCA4
	1. I had already registered on the E-commerce platform.	ECA1
	2. I trust online transactions in E-commerce.	ECA2

E-commerce adoption (ECA)	3. My business already operated on e-commerce platform.	ECA3
	4. My business already employs ICT utility.*	ECA4
SME Business Competitiveness (SBC)	1. My business is growing with digital applications.	SBC1
	2. I got more profit after using an online business platform.	SBC2
	3. I can grow my business with the advent of digital technology	SBC3
	4. I benefited greatly as a result of using an online business platform	SBC4

RESULTS AND DISCUSSIONS

The study employed a two-stage approach as recommended by Anderson and Gerbing (1988) and Ken & Kay (2019). Initially, this reflective assessment-based research examines the validity of convergence among items and constructs, along with alpha reliability and discriminant validity. Convergent validity is confirmed if the factor loadings exceed 0.5 (Hair et al., 2019), composite reliability is above 0.7 (Sarstedt et al., 2014), and the average variance extracted is greater than 0.5 (Fornell & Larcker, 1981). Following this, the structural models were tested (Hair et al., 2019).

Measurement Model Assessment

The measurement model was assessed using the internal consistency and validity statistics retained in the original manuscript. Table 2 presents Cronbach's alpha, composite reliability and average variance extracted for the six constructs. These values reproduce the previously reported results and do not represent a new estimation of the model.

Table 2.0 Reported internal consistency and convergent validity statistics

Construct	Cronbach's alpha	Composite reliability	Average variance extracted
E-commerce adoption (ECA)	0.851	0.900	0.694
Perceived usefulness (FPU)	0.793	0.865	0.617
Perceived competitive advantage (PCA)	0.777	0.860	0.610
Perceived ease of use (PEOU)	0.891	0.924	0.753
Perceived trust and security (PTS)	0.738	0.828	0.495
Perceived business competitiveness (SBC)	0.862	0.906	0.707

Cronbach's alpha ranged from 0.738 to 0.891, while composite reliability ranged from 0.828 to 0.924. All reported values exceeded the conventional reference value of 0.70, providing evidence of internal consistency. Internal consistency, however, does not establish that the constructs capture their intended concepts or that they are empirically distinct.

Average variance extracted exceeded 0.50 for ECA, FPU, PCA, PEOU and SBC. The value for PTS was 0.495, falling slightly below this reference value. Although the shortfall was small, the result does not support an unqualified statement that convergent validity was established for every construct. The satisfactory internal consistency coefficients for PTS do not remove this concern. Its indicator content and main-sample loadings require examination, but the latter are not available for verification.

Discriminant Validity

Discriminant validity was examined using the reported heterotrait–monotrait ratios. Table 3 reproduces the values preserved in the manuscript.

Table 3.0 Reported heterotrait–monotrait ratios

Construct	ECA	FPU	PCA	PEOU	PTS	SBC
ECA	—					
FPU	0.717	—				
PCA	0.821	0.745	—			
PEOU	0.556	0.780	0.621	—		
PTS	0.724	0.761	**0.919**	0.661	—	
SBC	**0.905**	0.793	0.753	0.627	0.758	—

Two construct pairs yielded HTMT values above the 0.90 reference threshold: perceived trust and security with perceived competitive advantage (0.919), and e-commerce adoption with perceived business competitiveness (0.905). Henseler et al. (2015) distinguish threshold-based HTMT assessment from inference using bootstrap confidence intervals, while Franke and Sarstedt (2019) highlight the distinction between heuristic cutoffs and inferential testing. Accordingly, the observed exceedances raise concerns about discriminant validity and warrant further assessment rather than an unqualified conclusion that the constructs are empirically distinct. As HTMT confidence intervals are unavailable, discriminant validity remains unconfirmed for these two pairs, and the associated structural relationships are interpreted cautiously.

An examination of item wording provides possible explanations for these concerns, although these explanations cannot be confirmed without the underlying data. The PTS items include confidence in the advantages of business digitalisation and favourable experiences with digital tools, extending beyond narrowly defined trust and transaction security. These items may share substantive content with the benefits represented by PCA. Similarly, the ECA instrument includes trust in online transactions alongside indicators of platform registration and business operation. It therefore combines an evaluative belief with indicators intended to represent adoption. These observations indicate that the measurement concerns are not solely numerical. They also involve the correspondence between construct labels and indicator content. Deleting items or renaming constructs without supporting conceptual and empirical assessment would not establish measurement validity.

Implications for Interpretation

The reported statistics provide evidence of internal consistency but incomplete support for construct validity. In particular, the convergent validity concern for PTS and the elevated HTMT ratios remain unresolved. Structural associations involving these constructs must therefore be interpreted cautiously, because overlap between measures may affect the estimated relationships.

The absence of the raw dataset and original analytical output prevents reassessment of indicator loadings, evaluation of alternative measurement specifications and sensitivity analysis. Accordingly, the measurement model cannot be described as fully validated, and the structural findings should be regarded as provisional.

Reliability and validity

The study proceeded with a path coefficient analysis using 5,000 subsamples, as recommended by Hair et al. (2019). The findings of this analysis are presented in Table 3.1:

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Table 4. Reported structural-path statistics

	Sample mean (M)	T statistics	P values
ECA -> SBC	0.555	10.442	0.000
FPU -> SBC	0.208	3.829	0.000
PCA -> SBC	0.006	0.103	0.918
PEOU -> SBC	0.086	1.800	0.072
PTS -> SBC	0.120	2.378	0.017

***P-value below cut off 0.05**

Note: ECA=E-commerce adoption, FPU=Perceived usefulness, PCA= Perceived competitive advantage, PEOU=Perceived ease of use, PTS=Perceived trust and security, SBC=SME business competitiveness.

Discussion of the Reported Relationships

The reported results suggest different patterns of association between the explanatory constructs and perceived business competitiveness. E-commerce adoption, perceived usefulness, and perceived trust and security have reported p values below 0.05, whereas perceived ease of use and perceived competitive advantage do not. These findings are discussed according to the hypothesis numbering in the revised framework. This numbering aligns the discussion with the reported paths but does not resolve the discrepancy between the earlier conceptual model and the structural results. Moreover, the available estimates are labelled sample means (M), rather than original-sample coefficients. Interpretation therefore remains provisional and subject to the measurement limitations identified above.

E-Commerce Adoption and Perceived Business Competitiveness

For H1, the reported ECA–SBC relationship has a sample mean of 0.555, a t statistic of 10.442 and $p < 0.001$. The reported significance and positive sample mean are consistent with the proposed positive association between e-commerce adoption and perceived business competitiveness. This pattern is broadly compatible with research connecting online business activity with SME competitiveness, including Lányi et al. (2021). However, differences in measurement and study context mean that the present finding should not be treated as a direct replication of earlier evidence.

A possible interpretation is that respondents reporting greater engagement with online business platforms also perceive stronger business benefits. Nevertheless, the HTMT value of 0.905 between ECA and SBC raises concerns about whether the measures are sufficiently distinct. Their association may partly reflect overlapping perceptions of digital business activity and its benefits. In addition, the sample included enterprises whose digital participation consisted only of accepting QR-code payments, which does not necessarily involve online selling. The finding therefore cannot establish that adopting an e-commerce platform causes improvements in growth or profitability, nor can it demonstrate equivalent benefits across different forms of digital participation.

Perceived Ease of Use and Perceived Business Competitiveness

For H2, the reported PEOU–SBC relationship has a sample mean of 0.086, a t statistic of 1.800 and $p = 0.072$. The reported result does not provide statistically significant evidence for the proposed association at the 0.05 level. Accordingly, H2 is not supported by the reported significance test. The positive sample mean should not be interpreted as evidence that ease of use improves business competitiveness.

This result needs to be distinguished from the role of ease of use in technology acceptance. Davis (1989) addresses users' acceptance of technology, whereas the outcome examined here concerns perceived business

competitiveness. A technology may be straightforward to operate without being associated with stronger commercial outcomes. Ease of use could also relate to business outcomes through adoption or other intermediate processes, but those mechanisms were not tested in the reported direct-path specification. The result therefore neither invalidates the role of usability in technology acceptance nor establishes an indirect effect.

Perceived Usefulness and Perceived Business Competitiveness

For H3, the reported FPU–SBC relationship has a sample mean of 0.208, a t statistic of 3.829 and $p < 0.001$. These reported statistics are consistent with the proposed association between perceived usefulness and perceived business competitiveness. Respondents who evaluate digital platforms as useful for their operations and marketing may also evaluate their business outcomes more favourably.

This interpretation is compatible with the performance-related meaning of perceived usefulness in Davis (1989), but it extends beyond the technology-acceptance outcome of the original model. Likewise, Rahayu and Day (2015) provide evidence concerning perceived benefits and e-commerce adoption, rather than direct confirmation of the particular usefulness–competitiveness relationship examined here. The present finding should therefore be understood as a contextual association requiring further validation.

The distinction between an evaluation of technological usefulness and an evaluation of business outcomes is also important. Both measures rely on the same respondent's assessment, and the cross-sectional design cannot establish which evaluation precedes the other. Favourable business experiences may influence perceptions of usefulness, just as useful technologies may contribute to business activities. The available evidence cannot distinguish these explanations or establish improvements in independently measured financial performance.

Perceived Trust and Security and Perceived Business Competitiveness

For H4, the reported PTS–SBC relationship has a sample mean of 0.120, a t statistic of 2.378 and $p = 0.017$. The reported significance test is consistent with an association between perceived trust and security and perceived business competitiveness. One possible explanation is that confidence in digital platforms accompanies greater willingness to conduct business through them. Gefen et al. (2003) provide a conceptual basis for considering trust alongside technology-acceptance beliefs, although their online-shopping context does not directly establish effects on SME competitiveness.

This relationship requires particular caution because PTS has an AVE of 0.495 and an HTMT value of 0.919 with PCA. The PTS items also encompass confidence in the benefits of digitalisation and favourable experiences with digital tools, extending beyond transaction security alone. Consequently, the reported relationship cannot be attributed specifically to security features or trust mechanisms. Statistical significance does not resolve uncertainty about what the construct measures.

The finding also provides no direct evidence concerning algorithmic transparency, credit-scoring fairness, data privacy safeguards or access to financing. These issues were not separately measured and should not be presented as explanations established by the study.

Perceived Competitive Advantage and Perceived Business Competitiveness

For H5, the reported PCA–SBC relationship has a sample mean of 0.006, a t statistic of 0.103 and $p = 0.918$. The reported significance test does not support the proposed direct association at the 0.05 level. This result should not be interpreted as proof that digital innovation or relationships with customers and suppliers have no business value. The PCA items concern customer preferences for online purchasing, innovation and digitally enabled business interactions. They do not directly establish a firm's advantage over competitors. Moreover, the elevated HTMT value between PCA and PTS suggests that the measures may share substantial content. These issues complicate interpretation of PCA's distinct relationship with the outcome. It is possible that perceived commercial benefits are related to competitiveness through other organisational processes. However, the study did not test the capabilities, implementation practices or intermediate mechanisms needed to evaluate that

explanation. Claims that complementary capabilities are required, or that strategic integration explains the non-significant result, would therefore go beyond the available evidence.

Overall Interpretation and Implications

Taken together, the reported results identify e-commerce adoption, perceived usefulness, and perceived trust and security as potential areas for further investigation in relation to self-reported SME competitiveness. They do not establish causal drivers or provide a sufficient basis for ranking digitalisation interventions. The non-significant results for perceived ease of use and perceived competitive advantage likewise should not be used to dismiss the practical relevance of usability, innovation or business relationships. For SME support organisations, the study suggests questions worth examining when evaluating digitalisation programmes: whether enterprises progress beyond accepting digital payments to conducting online business, whether owners and managers find platforms useful for their operations, and whether they feel confident using them. These are implications for further assessment rather than demonstrated prescriptions for improving performance. The findings are limited to a non-probability sample of enterprises in Selangor whose respondents reported holding or applying for halal certification. They do not establish effects specific to halal certification or represent all Malaysian SMEs. Interpretation is further constrained by self-reported outcomes, unresolved construct validity concerns and the absence of the original analytical records. Future research should distinguish payment acceptance from e-commerce adoption, establish clearer boundaries between the constructs, and examine business outcomes using longitudinal or independently verified measures.

CONCLUSION

This study examined the reported associations of e-commerce adoption and technology-related perceptions with perceived business competitiveness among 311 owners and managers of micro, small and medium-sized enterprises in Selangor, Malaysia. The reported significance tests indicated associations for e-commerce adoption, perceived usefulness, and perceived trust and security. Perceived ease of use and perceived competitive advantage were not statistically significant at the 0.05 level. These findings concern respondents' evaluations of digital business activities and business outcomes, they do not establish causal improvements in competitiveness. The study offers a provisional account of how digital participation and technology-related perceptions may relate to self-reported business outcomes within the surveyed enterprises. However, the evidence is constrained by unresolved measurement concerns, particularly the AVE of 0.495 for perceived trust and security and HTMT values exceeding 0.90 for two construct pairs. The unavailability of the raw data and original analytical output prevents re-estimation and full verification of the structural model. Consequently, the findings should not be treated as confirmation of a validated explanatory model or as a sufficient basis for prescribing specific digitalisation interventions.

The sample's scope further limits generalisation. Participants were recruited through business networks in Selangor and reported that their enterprises had obtained or applied for halal certification. Eligibility included businesses accepting QR-code payments without necessarily conducting online sales. Future studies should therefore distinguish digital payment acceptance from e-commerce adoption, refine overlapping measures, and assess business outcomes through longitudinal designs or independently verified indicators. With these improvements, subsequent research could establish more clearly when and how digital business practices contribute to SME competitiveness.

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