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Critical Success Factors for Online Collaboration Tools and the Moderating Effects of Personality Traits on Operational Performance of SMEs in the Klang Valley

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Abstract

This study examines the critical success factors (CSFs) and aims to help adoption successfully for online collaboration tools among Malaysian small and medium enterprises (SMEs) in the Klang Valley. Then, further investigates whether Big Five personality traits moderate the CSF-operational performance relationship. A quantitative by using cross-sectional design grounded in the IT Interaction Model was adopted. Klang Valley SME employees who are eligible in technology adoption process are the study subject, of 224 usable responses (70.0% valid response rate) were analyzed using partial least squares structural equation modeling via SmartPLS v4. Five CSFs, structure and culture, IT infrastructure, business processes, external environment, and firm strategy, collectively explained 66.6% of variance in operational performance (R^2 = 0.666), with structure and culture (β = 0.806) and IT infrastructure (β = 0.621) the strongest predictors. While conscientiousness (β = 0.239) and extraversion (β = 0.236) produced significant moderating effects, and the combined five-trait model raised explained variance to R^2 = 0.732. Thus, SMEs should prioritize infrastructure investment and collaborative culture-building, supported by personality-aware onboarding, particularly positioning conscientious and extraverted traits employees as early adopters. This study serves to apply the CSF framework to online collaboration tools in an SME context, extending the IT Interaction Model with validated personality traits as moderator effects.

Keywords: Online Collaboration Tools, Malaysian SMES, Operational Performance, Big Five Personality Traits, Critical Success Factors

Introduction

The interventions of technologies always reshape how an organization communicate, coordinate, and perform work then direct impact to operational performance. Online collaboration tools, comprising cloud-based project management platforms, real-time communication applications, document co-authoring systems, and virtual meeting environments, are becoming one of the newest working tools deployed in many business environments. Their strategic importance was amplified during the COVID-19 pandemic, which accelerated the normalization of remote and hybrid work arrangements and exposed the operational vulnerabilities especially to the organizations lacking mature digital collaboration capabilities (Leonardi, 2021). Organizations that had invested in robust online collaboration tools demonstrated greater operational resilience in various business performances, while those without faced impact in disruptive and difficulties in digital transitions.

As of small and medium enterprises (SMEs), online collaboration tools provide a dual dynamic fir both opportunity and constraint. These tools offer SMEs a means to compete with larger organizations through enhanced agility, reduced coordination costs. Meanwhile. the capacity to manage dispersed teams is manageable without traditional enterprise-grade capital expenditures as previous days. However, the performance impacts from such tools are not rewarding automatically. It is a contingent upon a set of organizational prerequisites where adequate IT infrastructure, aligned to existing business processes by a supportive internal culture, including strategic intent, which many SMEs are structurally or resource-constrained to establish adequately.

In Malaysia, SMEs constitute approximately 97% of all business establishments and they are central to the nation's economic structure in terms of GDP contribution, employment, and export value (SME Corporation Malaysia, 2023). Yet, digital technology adoption and transition among Malaysian SMEs remains relatively low and slow, with an estimation of only 6% to 20% have invested substantively in digital technologies (World Bank, 2023, 2024; OECD, 2024). Even where tools are available, the utilization of such tools is limited to basic communication and cloud storage functions. In a more sophisticated phenomenon, collaborative and productivity-enhancing capabilities of these platforms are still underexploited significantly. The digital skills gap is persistent, which limiting the workforce's capacity to leverage available tools effectively (OECD, 2024).

The academic literature on technology adoption in SMEs is extensive. However, the fragmentation in its applicability to online collaboration tools is found. Dominant frameworks including the Theory of Planned Behavior (TPB) (Ajzen, 1991), the Technology Acceptance Model (TAM) (Davis, 1989), and the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) have been widely deployed mostly in enterprise resource planning (ERP), e-commerce, and cloud computing research. This offers a limited explanatory power for the multi-level determinants for online collaboration tool to be adopted effectively by resource-constrained SME environments. Three specific research gaps motivate this study. Firstly, the critical success factor (CSF) approach is commonly being used to identify the minimum necessary organizational conditions for technology implementation success but has not been applied to online collaboration tools. Secondly, the IT Interaction Model (Silver et al., 1995), as an emergence from the interaction between technological, organizational, and

external environment, has rarely been extended. Thirdly, individual-level behavioral as moderators by examine the user characteristics dimension remains under-operationalized empirically. Hence, no prior study has jointly examined how both organizational CSFs and Big Five personality traits shape the online collaboration tool to be adopted successfully and effectively within the Malaysian SME context.

This study addresses all three gaps with two research objectives. First, to identify the CSFs determining online collaboration tool adoption and operational performance among Klang Valley SMEs. Second, to examine whether Big Five personality traits moderate the CSF–operational performance relationship. The Klang Valley constitutes the most pertinent research setting for this study due to its concentration of SME activities, and its designation as Malaysia's primary digital economy hub, including its infrastructural profile that is broadly representative in a more advanced environment of Malaysian regional economies. The significance of this study extends for online collaboration tool adoption in helping accelerates across Malaysian SMEs, with a validated, multi-level organizational readiness framework together the moderating effect of personal characteristic, with its values to researchers, practitioners, and policymakers navigating the complex relationship between digital technology adoption, operational performance and human resource investment in current organization environments. The paper proceeds as follows: the Literature Review gives relevant literature and presents the theoretical framework and hypotheses; the Method section describes the methodology; the Findings section reports the analysis results; and the Discussion interprets the implications. Lastly, the Conclusion closes the paper.

Literature Review

Online Collaboration Tools and SME Operational Performance

Online collaboration tools is a broad range of digital platforms designed to facilitate joint work through integrated communication, task arrangement, info sharing, and project execution range. Platforms such as Microsoft Teams, Slack, Zoom, Google Workspace, Trello, and Asana and etc. are offering various degrees of real-time communication, co-authoring, workflow automation, and team management capability (Leonardi, 2021). In the SMEs context, operational performance acts as the dependent construct of this study. It is to measure the improvements in organizational processes attributes to such tool adoption. Online collaboration tools aim to gain adoption successfully in task execution efficiency, reductions in communication latency, improvements in decision responsiveness, enhanced project tracking accuracy, and improvements in output quality which enhance operation performance. While documented performance benefits are substantial in different supportive environments, they are contingent upon the organizational conditions in which tools are embedded (World Bank, 2023). For Malaysian SMEs, which frequently adopt tools without accompanying process redesign or workforce capability development, these conditions are particularly critical determinants of whether technology can be adopted successfully.

Critical Success Factors for Technology Adoption

The CSF concept is first introduced by Rockart (1979). Primarily for executive the information systems and identifies the minimum set of organizational conditions required for an initiative to achieve its intended outcomes. When it applied to technology implementation, CSFs have been identified extensively across ERP (Ahmad & Cuenca, 2013) and cloud computing

adoption (Hentschel et al., 2019), with recurring themes including top management support, infrastructure readiness, process alignment, change management competency, and user capability development. This study derives and empirically tests the five CSFs from IT Interaction Model (Silver et al. 1995), with its initiation-phase constructs, each representing a distinct organizational dimension relevant to online collaboration tool adoption in Malaysian SMEs.

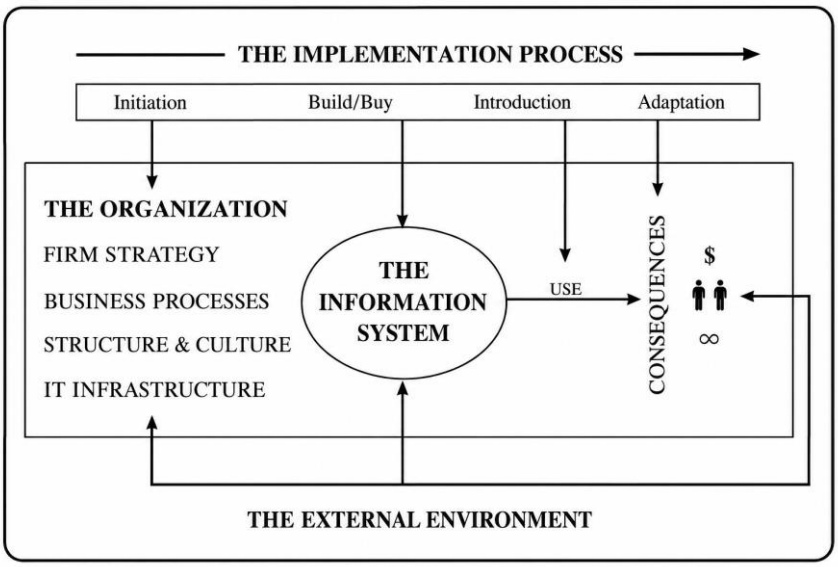


Figure 1: The IT Interaction Model (Silver et al., 1995)

External Environment

The external environment comprises the competitive dynamics, regulatory conditions, industry digitalization norms, and broader digital ecosystem factors. They are influencing the adoption decisions. While environmental pressures create impetus, they do not create internal capacity, but the performance effects are therefore expected to be significant but weaker than internal organizational factors.

Firm Strategy

Firm strategy captures the extent to which senior management has articulated a shared digital vision, then allocate resources for technology investment and embedded online collaboration tool adoption within the organization's strategic objectives. In SMEs context, the strategic decisions are concentrating at owner-management level. While the quality and consistency of a strategic commitment is directly determining the scope and sustainability for adoption efforts.

Business Processes

Business processes explain the extent to an organization which has its redesigned workflows, documented operating procedures, and implemented change management practices to accommodate to a new tool. Adoption without process redesign consistently results in underutilization. For SMEs, when process documentation is often informal or absent, the alignment is both a critical leverage point and a substantive implementation challenge when comes to adoption to such tools.

Structure and Culture

Organizational structure and culture encompass the formal and informal characteristics of a workplace environment, where shaping the communication patterns, collaborative norms, and responses to technological changes. In flat, open-communication structures and trust-based cultures facilitating the digital transitions by reducing hierarchical barriers to information sharing and legitimizing peer-level coordination. In Malaysian SMEs, many of which operate within family business structures characterized by centralized authority, where organizational structure and culture can represent the most decisive and most demanding challenges to make effective in online collaboration tool utilization.

IT Infrastructure

IT infrastructure comprises the hardware quality, broadband connectivity, network reliability, system interoperability, and cybersecurity provision. Inadequately, infrastructure is a persistent adoption barrier in SMEs (World Bank, 2023), manifesting as connectivity failures, device constraints, and system incompatibilities that undermine user experience and erode trust in digital platforms. Robust infrastructure provides the foundational reliability on which tools to be adopted in an organization.

Theoretical Foundation: The IT Interaction Model

The IT Interaction Model (Silver et al., 1995) provides the theoretical foundation for this study. The model posits that IS effectiveness emerging from the dynamic interaction among three dimensions at the implementation stage: IT system characteristics, the task and structure characteristics, and the user characteristics. Unlike TAM, which privileges individual-level adoption perceptions, or TOE, which treats organizational dimensions as passive contextual variables, the IT Interaction Model conceptualizes these three dimensions as active participants in a joint interaction that determines system effectiveness in adoptions. In this study, the five CSFs operationalize the external environment, task, structure and IT system dimensions. On other hand, the Big Five personality traits operationalize the user characteristics dimension, enabling an integrated examination of both organizational and individual-level determinants for online collaboration tool adoptions.

Big Five Personality Traits as Moderators

The Big Five personality model comprises openness to experience (O), conscientiousness (C), extraversion (E), agreeableness (A), and neuroticism (N). The model provides an applicable framework for understanding individual differences and characteristics in workplace behavior and technology engagement (González-Padilla et al., 2024). Openness is about curious, creative, novelty-seeking. Conscientiousness is considered a person characteristics in systematic, organized, and goal oriented. Extraversion embedded with communicative, assertive, socially energetic. Agreeableness characterizes cooperative, accommodating, interpersonally attuned. Neuroticism is regarding emotionally reactive, stress sensitive.

People with the characteristics of openness to experience and agreeableness tend to be expected to produce theoretically ambiguous effects in structured SME environments where organizational mandates dominate individual dispositional tendencies. People with higher conscientiousness is expected to amplify the performance returns of organizationally enabled adoption, as disciplined individuals more methodically leverage available tools and conditions. Extraversion characterized is expected to reinforce performance gains in collaboration-oriented digital environments through increased interaction frequency and

engagement quality. People with higher neuroticism characteristic may produce a variable moderation, and amplifying performance under well-supported conditions while introducing instability under poorly supported ones.

Research Hypotheses

Drawing on the theoretical foundations above, the following hypotheses are proposed:

H1–H5: Each of the five CSFs (external environment, firm strategy, business processes, structure and culture, IT infrastructure) has a significant positive impact on operational performance.

H6–H11: Each of the Big Five personality traits moderates the relationship between CSFs and operational performance (H6: Openness; H7: Conscientiousness; H8: Extraversion; H9: Agreeableness; H10: Neuroticism; H11: All five traits combined).

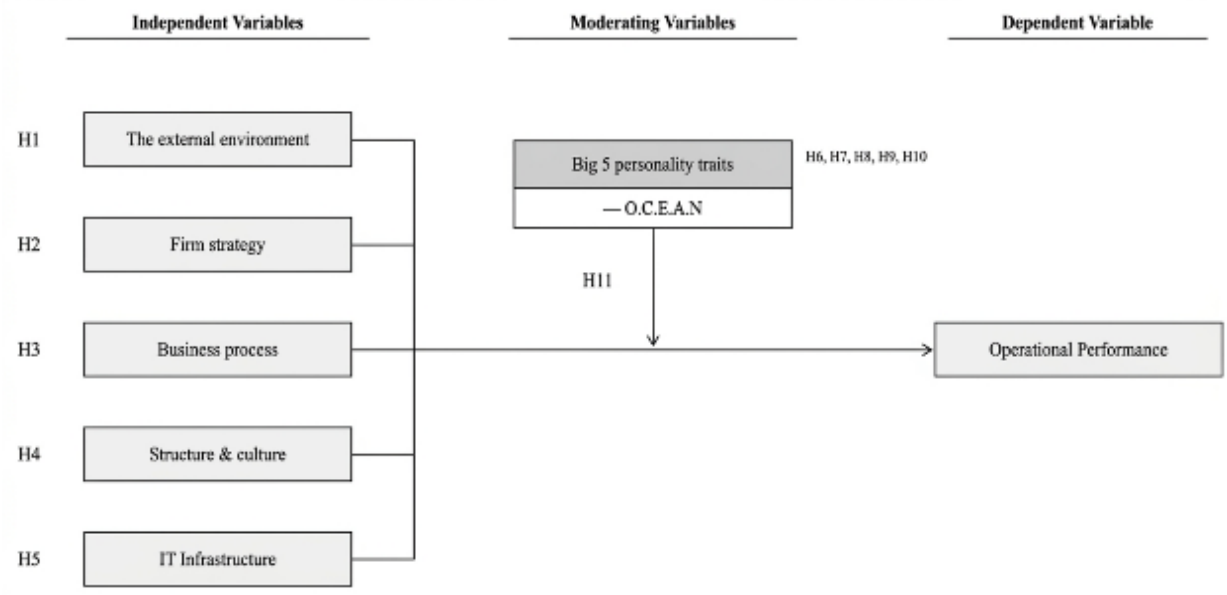


Figure 2: Theoretical Framework — IT Interaction Model with Critical Success Factors, Big Five Personality Trait Moderators, and Operational Performance

Method

Research Design

This study is a quantitative with cross-sectional research design. Hypotheses are derived deductively from established theoretical frameworks and tested empirically using structured questionnaire data, aligning with the variance-explanation objectives of the CSF and IT Interaction Model approaches (Hair et al., 2022).

Population, Sampling, and Data Collection

The research main respondents were the employees of SMEs in Malaysia's Klang Valley with who is having direct involvement in the use of online collaboration tools in the organizations. The purposive sampling was employed to ensure the respondents possessed decision-making authority or active involvement and even familiar with collaboration tool usage at their workplace. The questionnaire instrument was distributed via Google Forms. A total of 320 questionnaire sets were distributed by email to SME employees with no repetition in organizations. As of, 244 responses were collected, yielding a primary response rate at 76.25%. Following eligibility screening, a total 20 responses were excluded because

respondents did not possess decision-making authority over online collaboration tools or were not familiar with online collaboration tools. A final usable sample of 224 respondents was retained, rating at final valid response rate of 70.0%. This sample size exceeds the threshold of 200 recommended by Hair et al. (2022) for partial least squares structural equation modeling (PLS-SEM). It is a strong indicator loading and is well above the minimum required for adequate statistical power in behavioral research (Gravetter & Wallnau, 2021). This confirming the adequacy for the planned moderation analyses is achievable. Table 1 summarizes the response rate.

Table 1
Response Rate Summary

Distribution Method	Total Distributed	Total Responded	Response Rate (%)	Not Eligible	Final Usable
Online (Google Form)	320	244	76.25%	20	224
Final			**70.0%**		**224**

Measurement Instrument

Total of three main sections in the questionnaire. First, were measuring the CSF dimensions. Second, were measuring Big Five personality traits. Third, were measuring operational performance. All items were rated on a five-point Likert scale (1=Strongly Disagree; 5=Strongly Agree). For CSF items were adapted from validated IS implementation and organizational management scales, adjusted to the online collaboration tool and Malaysian SME context. The Big Five personality items were adapted from the Big Five Inventory (BFI-44). While the operational performance items were adapted from established IS effectiveness and SME performance scales from 5 different dimensions. A pilot test confirmed acceptable Cronbach's alpha for all constructs prior to full distribution. Detailed reliability and validity results following PLS-SEM model refinement are reported in the Measurement Model Assessment (Table 4) subsection below.

Analytical Method

Both SPSS v26 and SmartPLS v4 were employed for analyses process. SPSS v26 was used for descriptive statistics and Exploratory Data Analysis (EDA), including missing data checks, normality assessments via histograms, and multicollinearity screening via Variance Inflation Factor (VIF). SmartPLS v4 was used for PLS-SEM structural analysis. PLS-SEM was selected over covariance-based SEM (CB-SEM) for three reasons: its suitability for predictive, variance-explanation research with complex multi-construct models. The robustness with sample sizes were above 200 and its established protocol for continuous-variable moderation testing via interaction terms and bootstrapping (Hair et al., 2022). All significance tests employed bootstrapping with 5,000 subsamples, with $p<0.05$ as the decision threshold.

Findings

Respondent Profile

Table 2 presents the demographic profile for total of 224 respondents. Gender distribution showed a slight female majority, with 129 female (57.6%) and 95 male respondents (42.4%). This reflecting the gender composition of executive and administrative roles within the Klang

Valley SME workforce. Age distribution was concentrated in the 25–34 of ages (34.4%), followed by 18–24 of ages (28.6%), 35–44 of ages (20.1%), 45–54 of ages (12.1%), and 55–64 of ages (4.9%). The predominance of respondents in the 18–34 of ages range is noteworthy, which explaining a digital native who have entered the workforce during the period of rapid collaboration tool proliferation. They are typically the most active users and early adopters of such digital platforms within their organizations and workplace. Their perspectives on the organizational conditions are enabling or impeding the tool adoptions and effectiveness are therefore particularly germane to the research questions.

In terms of position, 50.0% of respondents held executive-level roles, followed by managing level (25.9%), director level (12.9%), and self-employed (11.2%). This distribution confirms that the sample encompassed a substantial proportion of individuals with direct decision-making involvement in digital tool adoption, where consistent with the eligibility screening criteria applied prior to answering the questionnaire. The high representation of executive-level respondents is analytically appropriate, as this group operates at the intersection of strategic mandates and day-to-day digital tool usage, which making them be a well-positioned to assess both organizational enablers and operational performance outcomes.

Regarding the online collaboration tools using experiences, 58.0% reported 1–5 years, followed by 6–10 years (19.6%), 11–20 years (13.4%), and 20 years and above (8.9%). The dominance of early-career respondents is consistent with the age and position profiles and reflects the typical talent composition of Klang Valley SMEs. Educational profile wise was predominantly at bachelor's degree level (63.8%), followed by master's degree (23.3%), SPM and below (10.3%), and doctoral degree (2.7%). The high proportion of degree and postgraduate holders indicates a workforce with substantial educational capacity to engage with online collaboration tools substantially and to critically assess organizational and process-level enablers of adoption successfully.

Table 2
Respondent Demographic Profile (n = 224)

Criteria	Category	n	%
Gender	Female	129	57.6%
	Male	95	42.4%
Age Group	18–24	64	28.6%
	25–34	77	34.4%
	35–44	45	20.1%
	45–54	27	12.1%
	55–64	11	4.9%
Position in Company	Executive Level	112	50.0%
	Managing Level	58	25.9%
	Director Level	29	12.9%
	Self-employed	25	11.2%
Years of Experience	1–5 years	130	58.0%

	6–10 years	44	19.6%
	11–20 years	30	13.4%
	20 years and above	20	8.9%
Education Level	Degree Holder	143	63.8%
	Master's Degree	52	23.3%
	SPM and below	23	10.3%
	Doctoral Degree	6	2.7%

Descriptive Statistics: Mean and Standard Deviation

Prior to structural analysis, descriptive statistics were computed for all construct variables by using SPSS v26. Mean values were interpreted on a five-point scale, in which 1.00–2.49 (disagree range), 2.50–3.49 (neutral range), 3.50–4.49 (agree range), and 4.50–5.00 (strongly agree range). On standard deviation (SD), the interpretation as follows: SD<0.9 (high agreement/low variability), 0.9–1.2 (moderate consistency), and SD>1.2 (high variability).

Starting with external environment (SF1-1 to SF1-5), mean values is ranged from 2.97 to 3.63, yielding an average mean of 3.27. This is indicating a broadly neutral perception among respondents, with some constructs crossing into mild agreement. It reflects the contextual ambiguity that characterizes external environmental pressures in the Klang Valley SME landscape where competitive digitization pressure is acknowledged but not uniformly experienced as a driving force. The average SD of 1.14 indicates moderate consistency for this matter. On firm strategy (SF2-1 to SF2-5) side, the results yielded a mean values ranging from 3.59 to 3.94 (average: 3.68), placing respondents solidly in the agreement range. This suggesting that strategic commitment to online collaboration tools adoption is generally perceived as present and relevant within their organizations and workplace. Average SD of 1.13 reflects moderate consistency.

For business processes (SF3-1 to SF3-5), it produced mean values of 3.59 to 3.87 (average: 3.66). This is again in the agreement range, indicating that respondents broadly affirm the importance of process alignment, change management, and business process re-engineering in enabling effective online collaboration tool adoption. Average SD of 1.04 cites relatively good internal consistency. Onto structure and culture (SF4-1 to SF4-5), the results yielded the highest average mean among the other CSFs at 3.79 (range: 3.59–3.94), with an average SD of 1.12. This is indicating moderate consistency, having the strongest positive signal among the independent variables. Last but not least, the IT infrastructure (SF5-1 to SF5-5) produced mean values ranging from 3.63 to 3.91 (average: 3.78; average SD:1.03). This is reflecting strong agreement on the importance of technological readiness and confirming that infrastructure is a valued and necessary enabler for online collaboration tools adoptions.

Among the moderating variables, openness to experience (ON1–ON5) averaged 3.61 (range: 3.34–3.94; average SD:0.98). this indicates a mild agreement that respondents identify with open, curious characteristics. For conscientiousness (CO1–CO5), results produced an average mean of 3.37 (range: 3.34–3.94; average SD: 0.95). It is reflecting a more mixed distribution. The agreement among many respondents alongside notable neutral and disagreement responses and consistent with the heterogeneous composition of the sample size. For

extraversion (EX1–EX5), results are yielded the lowest average mean among the other Big Five constructs at 3.31 (range: 2.87–3.44; average SD:1.00). This is indicating a tendency toward neutral to mild agreement, with EX5 registering slightly more disagreement. Onto agreeableness (AG1–AG5), averaged 3.26 (range: 3.19–3.78; average SD:1.11), and for neuroticism (NE1–NE5), results produced the lowest average mean value of 3.00 (range: 2.59–3.31; average SD:1.12). This is reflecting a predominantly neutral-to-disagreement distribution consistent with the expectation that emotional reactivity varies substantially across individuals. As of operational performance (OP1–OP5), results are yielded an average mean value of 3.24 (range: 3.06–3.53; average SD:1.16), where indicating a moderate agreement on performance outcomes from collaboration tool usage. Particularly for OP1 is showing a notable variability (SD=1.481), suggesting divergent experiences of performance impact at the individual level.

Measurement Model Assessment

Full convergent validity assessment was conducted in accordance with Hamid et al. (2017). In the initial PLS model (version 1), the items for SF1-3, SF1-4, SF2-5, SF3-5, SF4-2, SF5-5, and OP3 registered an outer loading value below the 0.70 threshold. These were excluded from the model. Then, the refined version 2 model met all validity thresholds. Meanwhile, Cronbach's alpha is ranged from 0.704 (external environment) to 0.910 (firm strategy), followed by intermediate values 0.855 (business processes), 0.889 (IT infrastructure), 0.904 (structure and culture), and 0.904 (operational performance). These are all indicating a good to excellent reliability according to threshold value. For composite reliability, it ranged from 0.834 to 0.935, with all constructs above the 0.70 minimum. This is indicating a strong internal consistency for all latent variable measurement. Onto AVE, values are ranged from 0.627 (external environment) to 0.784 (firm strategy), with all constructs exceeding 0.50. This is confirming that each latent variable could explains the majority of the variance in its constituent indicators. The final model R^2=0.666, is confirmed adequate predictive validity for hypothesis testing.

Table 3
Measurement Model — Outer Loadings, Construct Reliability, Validity, and Path Coefficients

Latent Variable	Item	Outer Loading	α	CR	AVE	β	R^2
The External Environment	SF1-1	0.778	0.704	0.834	0.627	0.318	
	SF1-2	0.750					
	~~SF1-3~~	—					
	~~SF1-4~~	—					
	SF1-5	0.844					
Firm Strategy	SF2-1	0.889	0.910	0.935	0.784	0.270	
	SF2-2	0.902					
	SF2-3	0.928					
	SF2-4	0.919					

Latent Variable	Item	Outer Loading	α	CR	AVE	β	R^2
	~~SF2-5~~	—					
Business Process	SF3-1	0.897	0.855	0.902	0.700	0.366	
	SF3-2	0.910					
	SF3-3	0.787					
	SF3-4	0.738					
	~~SF3-5~~	—					
Structure & Culture	SF4-1	0.855	0.904	0.922	0.748	0.806	
	~~SF4-2~~	—					
	SF4-3	0.888					
	SF4-4	0.854					
	SF4-5	0.831					
IT Infrastructure	SF5-1	0.870	0.889	0.923	0.749	0.621	
	SF5-2	0.903					
	SF5-3	0.847					
	SF5-4	0.841					
	~~SF5-5~~	—					
Operational Performance	OP1	0.893	0.905	0.934	0.778		
	OP2	0.889					
	~~OP3~~	—					**0.666**
	OP4	0.837					
	OP5	0.908					

Cronbach's Alpha; CR = Composite Reliability; AVE = Average Variance Extracted; β = Path Coefficient; R^2 = R-Square. Items with strikethrough were excluded during measurement model refinement due to outer loadings below the 0.70 threshold (Hair et al., 2022). Threshold criteria applied: α ≥ 0.70; CR ≥ 0.70; AVE ≥ 0.50; Outer Loading ≥ 0.70.

Direct Path Analysis: CSFs and Operational Performance (H1–H5)

The path coefficients, significance levels, and hypothesis outcomes from the PLS-SEM direct effects model (n=224, bootstrapping = 5,000 subsamples). As shown in table 4, the overall model yielded at $R^2 = 0.666$, which indicating that the five CSFs collectively explain 66.6% of the variance in operational performance. It is a moderate-to-strong result that confirms the framework's predictive validity and the collective explanatory power of the proposed CSF constructs. All five direct hypotheses were supported at $p<0.05$.

Table 4
Direct Path Coefficients — CSFs and Operational Performance (R^2 = 0.666, n = 224)

Hypothesis	Critical Success Factor	β	p-value	Result
H1	External Environment	0.318	< 0.05	Supported
H2	Firm Strategy	0.270	< 0.05	Supported
H3	Business Processes	0.366	< 0.05	Supported
H4	Structure & Culture	0.806	< 0.05	Supported
H5	IT Infrastructure	0.621	< 0.05	Supported

The path coefficients reveal that the structure & culture is having the highest value, whereas 0.806. It is the most influential factors that affecting to operational performance. The management structure, trust & understanding, communication and organization issues are relatively critical success factors when deciding on using online collaboration tools. This is indicating organization structure must build up the composition in trusting using the online collaboration tools to boost operational performance.

The second highest path coefficient is IT infrastructure, which is having value of 0.621. The critical success factors including technology readiness, adoption of existing technology, configuration and data import but not including system selection as critical success factor. This is suggesting that when adopting online collaborating tools, the IT infrastructure is needed to be ready that can run and adapt the exiting data and migration enable to enhance on operational performance rather than just adopt a new tool with zero adaptation of existing data.

Followed by business process, it is having path coefficient value of 0.366. The constructs are including the contribution of workflow redesign, business process re-engineering (BPR), change management practices, project management integration, and progress scheduling to adoption quality. The significant effect of this construct highlights the risk for common adoption failure pattern in SMEs were procuring and deploying tools without the accompanying process is creating disturbance on exiting business procedural.

The influence of extremal environment is having path coefficient value at 0.318. IT interaction model suggests that to understand the external business environment is rather important as it provides the context within which the organization is currently operating and will be varied from time to time. The critical success factor constructs including big environment readiness, external pressure, and geography & time differences were indicating that the organization need to take note of the external issue while make the current organization able to ensure the organizational conditions required for performance realization.

The position of firm strategy as the weakest predictor, the path coefficient value at 0.270, is among the most practically instructive findings in this study. The result suggesting when adopting online collaboration tools, the aspects of senior management's articulation of a digital vision, or approval of tool procurement budgets from an organization needed to

translate into operational outcomes. In the absence of these, strategy functions as a declared aspiration rather than an enacted programme of change.

Collectively, the direct path analysis confirms that internal organizational factors are more significantly determinants and effectiveness than external environmental or strategic variables. SMEs seeking performance improvement from adoption of an online collaboration tool investments must invest primarily in the conditions they create in their workforce. The results are aligned with the IT interaction model as these are the initial stages when deciding a new digital solution in the organization. It leads to boost the operational performance at the ultimate goals.

Moderation Analysis: Big Five Personality Traits (H6–H11)
Table 5 presents the moderation analysis results. Each personality trait was tested individually by introducing an interaction term into the base model ($R^2 = 0.666$), and all five traits were then incorporated simultaneously into a combined model. By examining the incremental of R^2 changes, with interaction of path coefficients, the significance levels ($p < 0.05$) are reported. Bootstrapping with 5,000 subsamples was used for all significance tests for all personality traits and a combined model.

Table 5
Moderation Effects of Big Five Personality Traits on the CSF–Performance Relationship

Hypothesis / Trait	R^2 (with trait)	ΔR^2	β	p-value	Result
H6: Openness to Experience	0.667	+0.001	0.041	> 0.05	Not Supported
H7: Conscientiousness	0.709	+0.043	0.239	< 0.05	Supported
H8: Extraversion	0.697	+0.031	0.236	< 0.05	Supported
H9: Agreeableness	0.676	+0.010	0.157	> 0.05	Not Supported
H10: Neuroticism	0.682	+0.016	0.168	< 0.05	Supported
H11: All Five Traits (OCEAN)	0.732	+0.066	—	< 0.001	Supported

*Note: Base model $R^2 = 0.666$, n = 224; bootstrapping = 5,000 subsamples; * p < 0.05; *** p < 0.001*

Conscientiousness produced the largest individual incremental contribution to the model's explanatory power ($\Delta R^2 = +0.043$; $\beta = 0.239$; $p < 0.05$), hence H7 is supported. The interaction term's positive and significant coefficient indicates that the positive relationship between CSFs and operational performance is stronger among individuals with high conscientiousness, characterized by reliability, efficiency, and plans making in task execution, and individual goal orientation. Theoretically, this finding aligns with the IT Interaction Model's proposition that user characteristics amplify the interaction between technological and organizational conditions. Conscientious employees, when operating within an organization, tend to be more disciplined in online collaboration tool adoption in routines, more consistent in following redesigned processes, and more accountable for performance outcome targets. The

R^2 model is enhancing from 0.666 to 0.709, represents a practically meaningful enhancement where 70.9% of operational performance variance is explained, compared to 66.6% from organizational factors alone.

Extraversion produced the second-largest individual moderation effect ($\Delta R^2 = +0.031$; $\beta = 0.236$; $p < 0.05$), hence H8 is supported. The positive interaction coefficient indicates that extraverted individuals, characterized by energy level, enthusiasm, assertive personality, outgoing, and level of sociable. In the result, it is having the stronger impact where it enhanced the overall module to a R^2 value of 0.697. This is suggesting that an individual who are extraverted will help in interacting with new opportunities such as trying new digital solutions like online collaboration tools and it helps enhanced on operational performance and get benefits from CSF-supportive organizational conditions than their more introverted counterparts. Within tool-supportive environments, extraverted employees more actively initiate interactions, seek collaborative problem-solving, reinforce team engagement norms.

Neuroticism registered a significant and a modest moderating effect ($\Delta R^2 = +0.016$; $\beta = 0.168$; $p < 0.05$), hence H10 is supported, too. The R^2 value is enhanced from 0.666 to 0.682. The positive coefficient does not imply that emotionally reactive individuals unconditionally achieve higher performance. Rather, it suggests that in the specific context of this model, where the base organizational conditions are represented by five significant CSFs, neurotic individuals respond more emotional status and sensitively to quality dynamic. Where structure and culture are strong and IT infrastructure is reliable structurally, emotionally reactive individuals tend to internalize these supportive conditions as psychological anchors and enabling sustained performance outcomes. When comes to practical implications, organizations investing in the dominant CSFs, particularly structure and culture and IT infrastructure may be inadvertently providing the greatest benefit to their most emotionally sensitive employees, whose performance is most contingent on organizational stability and reliability. Taken together, conscientiousness, extraversion and neuroticism are the behavioral traits where disciplined, communicative, actively engaged and emotional supportive are more effectively translates into organizational enablers to better performance outcomes.

Openness to experience and agreeableness produced non-significant moderation effects (both $p > 0.05$), leading H6 and H9 are not supported respectively. The R^2 increments ($\Delta R^2 = +0.001$ for openness; $\Delta R^2 = +0.010$ for agreeableness) are not significant. This is also confirmed that neither trait is being meaningfully alters the CSF-to-performance pathway. It is a least moderating effect from this personality trait, but it is slightly enhancing the overall model, not in an impactful effect in overall. The non-significant effect of openness is theoretically counterintuitive. It is commonly assumed that technologically curious and intellectually open individuals are natural early adopters and effective users of new digital tools like online collaboration tools. This is suggesting that individual intellectual curiosity does not significantly amplify the operational performance outcomes generated by the organizational enablers. Similarly, the non-significant effect of agreeableness suggests that cooperative and accommodating interpersonal tendencies do not moderate directly produce an improved operational performance in work settings.

The combined five-trait model (H11) has resulted and yielded adjusted R^2 value at 0.732 ($p < 0.001$), a 6.6 percentage point improvement over the base model ($R^2 = 0.666$). H11 is strongly supported. Within the combined model, the path coefficient hierarchy shifts notably, where openness ($\beta = 0.242$) and extraversion ($\beta = 0.234$) emerge as the strongest contributors, followed by conscientiousness ($\beta = 0.179$), with agreeableness and neuroticism both registering $\beta = 0.084$. Notably, the elevation of openness to the highest contribution within the collective model, despite its non-significant effect when tested individually, suggesting the presence of interaction effects among the five personality traits themselves when modelled jointly as a person is having all combined personality traits as combined model. This finding introduces a theoretically important circumstances where the personality traits may operate as a system rather than as independent moderators, and their combined effect may exceed what individual testing reveals. This represents a significant avenue for future research in IS adoption and personality-performance modelling. The theory of planned behavior (TPB) also suggested that upon a set of user belief and attitudes, it could influence the acceptance and use of new technology. Furthermore, the perceived behavioral control is the main component led to behavioral intention. The association with Big Five personality traits are implying onto personal perception intention on using online collaboration tools, which directly influencing the operational performance outcomes.

Discussion

The Primacy of Organizational Culture and Infrastructure

The dominance of CSF is structure and culture ($\beta = 0.806$) as the primary determinant of online collaboration tool effectiveness carries fundamental theoretical and practical implications. Theoretically, it provides strong empirical support for the IT Interaction Model's central proposition that IS effectiveness is not only to technical features of the tool itself but emerges from the interaction between the technology and the organizational environment. An organization may deploy the most capable collaboration platform or any digital tools available, but without a cultural foundation characterized by internal trust and open communication, the technology remains being an underutilized resources rather than a performance asset that led better operational outcomes.

This finding resonates with organizational perspectives on technology adoption to be successful in which propose that tools are more likely to be genuinely embedded into work practice when they align with and reinforce existing workplace norms. Rather, they are more likely to be superficially adopted or abandoned when deployed in cultural environments when it is not supported under the collaborative. The descriptive statistics corroborate these circumstances. Firstly, structure and culture yielded the highest average mean of 3.79 among all five CSFs, indicating that respondents most strongly affirm this dimension as a relevant organizational condition in Malaysian SMEs context. Also, it paired with the strongest path coefficient in the structural model. Furthermore, it signals an important practical alignment, too. The employees who work within the organizations where structure and culture are perceived as strong are collectively the most likely to report improved operational performance from online collaboration tool adoptions, where creating a reinforcing cycle between cultural investment and performance returns. For Malaysian SMEs owner and managers, who functions as both strategic and operational leaders can imply a dual articulate and model. First, a digital collaboration culture, and second, to institutionalize that culture

through visible behavioral norms, then elevate the performance management systems that recognize and reward collaborative practice.

The strong effect of IT infrastructure (β = 0.621) also confirms that foundational technological readiness is as significant as prerequisite settings. The finding that the two internal organizational factors for both structure & culture and IT infrastructure together are dominating the model and aligned with a resource-based view of online collaboration tools adoption, in which the productive deployment of such tools depends on the quality of the internal organizational capabilities that surround and support them. For Malaysian SME policymakers and practitioners, this means that the decision of the adoption of online collaboration tools can be invested in higher IT infrastructure to supporting running such digital tools and foster the operational performances in higher returns.

Personality as Differential Amplifier

The moderation results in different outcomes. The differential of moderation findings particularly with conscientiousness and extraversion producing a stronger significant moderating effects and neuroticism produces a modest moderating effect. While openness and agreeableness do not advance the moderating effects of individual-level factors in online collaboration tools adoption in ways that challenge common assumptions. The operative amplifiers of CSF-to-performance pathways are not the traits most associated with technology enthusiasm (openness) or social cooperativeness (agreeableness). However, employees with those associated with disciplined execution (conscientiousness), extroverted (extraversion) and emotional supportive (neuroticism) are communicative assertive in the online collaboration tools adoptions. This finding is practically consequential for HR strategy where it tells the focus from identifying technologically enthusiastic employees toward identifying and positioning disciplined, communicative individuals as online collaboration tools early-adopters. It also implies that technology adoption programmes that target in general workforce awareness or broad enthusiasm may be less effective than those that particularly engage and empower to conscientious and extraverted employees in implementation leadership roles while neuroticism is acting as modest traits.

A further layer of analytical depth is examined. There is divergence between the individual and collective moderation results. Initially, when openness was tested individually, it produced a non-significant interaction effect (ΔR^2 = +0.001) but yet within the combined OCEAN model, openness emerged as the highest individual contributor (β = 0.242). This divergence is theoretically significant and suggests that the Big Five traits do not operate as independent moderating model, but it should also act as an interdependent personality system. This pattern is consistent with a statistical suppression effect (Muniz & MacKinnon, 2025), in which stating a genuine relationship with an outcome is masked when it shares substantial variance. When it comes to a correlated covariate, it is recovered only once that shared variance, then partialled out by the co-presence of the covariate in the estimated model.

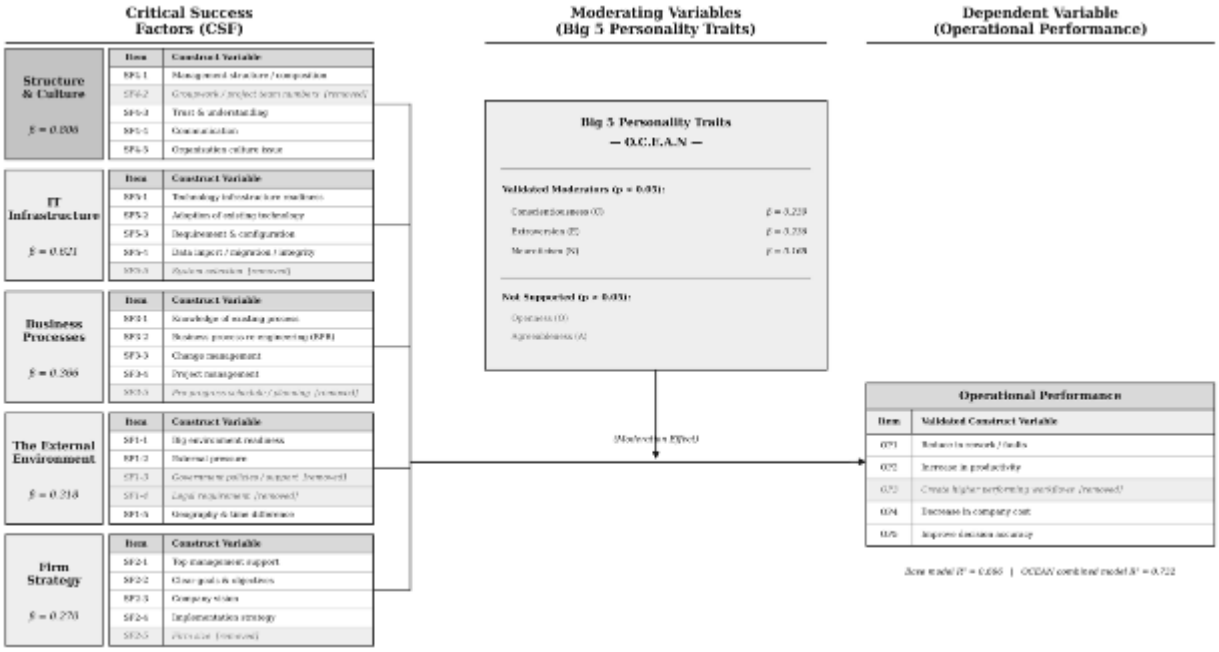
Openness and extraversion are the two facets that load onto a common higher order traits that recent meta-analytic evidence identifies as “Plasticity” (Rockstuhl, Ng, & Ang, 2025). This is reflecting a shared underlying disposition toward exploratory engagement, cognitive flexibility, and approach-oriented behaviour. When openness is tested in separately, the

performance-relevant variance overlaps with extraversion's single modelled effect. Thus, its unique interaction term is statistically absorbed and registers as non-significant. Once extraversion, conscientiousness, agreeableness, and neuroticism are entered simultaneously in the combined OCEAN model, it shared a variance that is partitioned across the trait system. At the same time, the openness's residual, trait-specific contribution to the CSF-performance interaction is re-emerging as the strongest individual path coefficient (β = 0.242) in the combined estimation. This interpretation is also consistent with Trait Activation Theory (Tett, Toich, & Ozkum, 2021). This has important implications for future research where personality moderation can be treated separately and in a combined system to find different variance. In online collaboration tools adoption contexts, it may require within-personality interaction modelling rather than the trait-by-trait assessment approach. In this study, OCEAN combined model (R^2 = 0.732) offers a first empirical basis for this more holistic approach.

Theoretical Contributions

Three principal theoretical contributions are made. Firstly, the study is the first to apply the CSF framework systematically to online collaboration tools adoption in Malaysian SMEs context to be successfully. The results yielding a five-factor model with strong predictive validity (R^2 = 0.666) that extends CSF methodology from its ERP and cloud computing origins. Secondly, the study extends the IT Interaction Model by empirically operationalizing its user characteristic dimensions through the validated Big Five framework, proving the evidence that personality profiles could moderate the operational performance of an organizational in online collaboration tools adoption. Thirdly, the integrated model (R^2=0.732) provides the theoretical and empirical foundation for a pre-implementation organizational readiness assessment module, which can function as a diagnostic instrument for evaluating SME readiness for online collaboration tools deployment prior to investment.

Figure 3 presents the revised research model derived from the empirical findings from this study. Relative to the original theoretical framework (Figure 2), two refinements distinguish this adjusted model. Firstly, the five CSFs are reordered by empirically validated path coefficient magnitude, with structure and culture positioned as the dominant determinant (β = 0.806) with outer loadings construct being removed. Secondly, the moderating variable component is refined to reflect only supported hypothesis testing outcomes (the single trait). The conscientiousness, extraversion, and neuroticism are retained as empirically validated moderators while the openness and agreeableness are excluded on grounds of non-significant moderation effects. However, the combined OCEAN model is still retained. The revised research model serves as the conceptual basis for the pre-implementation organizational readiness assessment module proposed by this study.



Note: CSFs ranked by empirically validated path coefficient (β). Darker shading = dominant factor (Structure & Culture, β = 0.806). Shaded item rows = excluded during measurement model refinement (outer loading < 0.70). Source: Adapted from Silver, Markus, and Beath (1995).

Figure 3: Revised Research Model — Empirically Validated CSF Model with Supported Personality Trait Moderators

Limitations and Boundary Conditions of Generalizability

Two methodological boundary conditions have been identified. First, the cross-sectional design captures the CSF–performance and personality-moderation relationships at a single point in time. This is citing it cannot establish the temporal ordering of these relationships or how they evolve as online collaboration tool usage matures within an organization. Second, and more consequential for external validity, the sampling frame was confined to Malaysian SMEs operating within the Klang Valley. This was a deliberate and defensible choice for the study's initial validation whereas Malaysia's principal digital economy hub, the Klang Valley concentrates the infrastructural maturity, digital-service density, and digital tool penetration necessary to observe the full range of CSF. However, this concentration also means the sample over-represents Malaysians SMEs operating within a digitally advanced, urbanized, and service-oriented ecosystem. It might be different from other Malaysia regions as different cultural norms and practices could be varied. The empirically estimated path coefficients, in particular the dominance of structure and culture (β = 0.806) and IT infrastructure (β = 0.621), should therefore be interpreted as bound to this context rather than assumed to generalize uniformly across Malaysia's more heterogeneous regional economies like other states outside of Klang Valley.

Malaysians SMEs landscape is not monolithic, and industrial clusters outside the Klang Valley differ substantially in sectoral composition, digital infrastructure maturity, and organizational culture. Penang state, for example for another digital and economy in Malaysia, is anchored by electronics and precision-manufacturing SMEs embedded within tightly integrated global supply chains, where business process alignment and external environment pressures, such

as OEM-driven digitalization mandates, may exert comparatively greater influence than in the Klang Valley's more service-dominated economy. Hence, firm strategy may carry different relative weights. Replicating the present CSF–OCEAN model across such regional industrial clusters would test the cross-regional consistency of the path coefficient hierarchy identified in this study and would be varied whether the primacy of structure and culture observed here is a general property of Malaysian SMEs in online collaboration tool adoption or a feature specific to the Klang Valley's digital and economy hub context

Conclusion

This study examined the critical success factors determining online collaboration tool adoption and operational performance among Malaysian SMEs in the Klang Valley. It also investigated the moderating role of Big Five personality traits. Based on PLS-SEM analysis of 224 valid responses, all five CSFs were confirmed as significant positive latent variables to operational performance (R^2 = 0.666). Specifically, Structure & culture (β = 0.806) and IT infrastructure (β = 0.621) exerted dominant influences, affirming the primacy of internal organizational readiness over external environmental pressure and firm strategy. On moderation effects, the personality traits, it is proven that conscientiousness and extraversion produced individually strong significant moderating effects while neuroticism produced a modest significant effect. While the integrated five-trait OCEAN model achieved R^2 = 0.732 in a more holistic perspective.

Three actionable priorities emerge for SME practitioners. Firstly, invest in digital infrastructure as a priority prerequisite for reliable online collaboration tools engagement. Secondly, invest deliberately in organizational culture through leadership modelling, communication norm development, and institutionalization of internal trust-based practices, as these are representing the single most decisive performance enabler to adoption successful within an organization. Thirdly, aware of personality informed as HR strategies where employees with higher conscientious and extraverted traits as early adopters, then implementation and accelerate the adoption velocity and amplify to operational performance returns.

Finally, the rapid integration of AI-powered features into online collaboration tools platforms represents a significant and proximate research frontier. As the continuous intervention of artificial intelligent tools reshape how teams communicate, coordinate, and make decisions in real time, the CSF model may require a theoretical extension to account for the additional context. Both organizational and individual conditions that determine whether AI-enhanced online collaboration tools translates into performance advantage (Cisco, 2024).

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