

Supplementary Material

When Does AI Adoption Enhance SME Innovation Performance? The Roles of Absorptive Capacity, Entrepreneurial Agility, and Digital Maturity

This supplementary file reports additional measurement and predictive assessment results referenced in the main manuscript. Values are rounded to three decimals for readability. The interaction term (AIAD×DMAT) is reported for transparency but is not interpreted as a substantive reflective construct.

Supplementary Table S1. Measurement items

Item	Construct	Measurement item
AIAD1	AI Adoption Intensity	Our firm uses AI-based tools to support business decision-making.
AIAD2	AI Adoption Intensity	Our firm uses AI to analyze customer needs and market trends.
AIAD3	AI Adoption Intensity	Our firm applies AI tools to support product or service development.
AIAD4	AI Adoption Intensity	Our firm uses AI to improve or automate internal business processes.
AIAD5	AI Adoption Intensity	Our firm uses AI to identify new business opportunities.
AIAD6	AI Adoption Intensity	Our firm integrates AI-generated insights into strategic or operational decisions.
ACAP1	Absorptive Capacity	Our firm regularly identifies valuable external knowledge relevant to its business.
ACAP2	Absorptive Capacity	Our firm frequently acquires new knowledge from customers, suppliers, competitors, or partners.
ACAP3	Absorptive Capacity	Our firm quickly understands new technological knowledge relevant to its business.
ACAP4	Absorptive Capacity	Our firm is effective at analyzing and interpreting newly acquired knowledge.
ACAP5	Absorptive Capacity	Our firm combines new knowledge with its existing knowledge base.
ACAP6	Absorptive Capacity	Our firm transforms new knowledge into practical business applications.
ACAP7	Absorptive Capacity	Our firm applies new knowledge to improve products, services, or processes.
ACAP8	Absorptive Capacity	Our firm effectively uses newly acquired knowledge for commercial or strategic purposes.
EAG1	Entrepreneurial Agility	Our firm quickly recognizes emerging market opportunities.
EAG2	Entrepreneurial Agility	Our firm rapidly responds to changes in customer needs.
EAG3	Entrepreneurial Agility	Our firm experiments with new business ideas faster than competitors.
EAG4	Entrepreneurial Agility	Our firm quickly reallocates resources to pursue promising opportunities.
EAG5	Entrepreneurial Agility	Our firm makes rapid entrepreneurial decisions under uncertainty.
EAG6	Entrepreneurial Agility	Our firm flexibly changes its products, services, or business model when new opportunities arise.
INNP1	SME Innovation Performance	Our firm frequently introduces new or significantly improved products or services.
INNP2	SME Innovation Performance	Our firm frequently improves its internal business processes through new methods or technologies.
INNP3	SME Innovation Performance	Our firm develops new ways to reach, interact with, or serve customers.
INNP4	SME Innovation Performance	Our firm introduces new or significantly improved business models or revenue models.
INNP5	SME Innovation Performance	Our firm successfully converts new ideas into marketable products, services, or processes.
INNP6	SME Innovation Performance	Compared with our main competitors, our firm has achieved stronger innovation outcomes.
DMAT1	Digital Maturity	Our firm has adequate digital infrastructure to support advanced technologies.
DMAT2	Digital Maturity	Our firm uses integrated digital tools across key business functions.
DMAT3	Digital Maturity	Our firm has reliable and accessible data for decision-making.
DMAT4	Digital Maturity	Employees in our firm have sufficient digital skills to use advanced technologies.
DMAT5	Digital Maturity	Our firm has a culture that supports digital transformation.
DMAT6	Digital Maturity	Top management actively supports digital initiatives.
DMAT7	Digital Maturity	Our firm continuously invests in digital tools, data systems, and digital capabilities.

Note. All perceptual items were measured on a seven-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree.

Supplementary Table S2. Full outer loadings

Indicator	Construct	Outer loading
ACAP1	ACAP	0.750
ACAP2	ACAP	0.757
ACAP3	ACAP	0.807
ACAP4	ACAP	0.822
ACAP5	ACAP	0.791
ACAP6	ACAP	0.797
ACAP7	ACAP	0.829
ACAP8	ACAP	0.810
AIAD×DMAT	AIAD×DMAT	0.978
AIAD1	AIAD	0.841
AIAD2	AIAD	0.847
AIAD3	AIAD	0.838
AIAD4	AIAD	0.828
AIAD5	AIAD	0.777
AIAD6	AIAD	0.815
DMAT1	DMAT	0.854
DMAT2	DMAT	0.832
DMAT3	DMAT	0.842
DMAT4	DMAT	0.807
DMAT5	DMAT	0.834
DMAT6	DMAT	0.873
DMAT7	DMAT	0.838
EAG1	EAG	0.848
EAG2	EAG	0.787
EAG3	EAG	0.774
EAG4	EAG	0.850
EAG5	EAG	0.718
EAG6	EAG	0.823
INNP1	INNP	0.827
INNP2	INNP	0.814
INNP3	INNP	0.809
INNP4	INNP	0.760
INNP5	INNP	0.827
INNP6	INNP	0.802

Note. All reflective indicators exceeded the 0.70 threshold. AIAD×DMAT is a derived interaction term and is reported only for transparency.

Supplementary Table S3. Fornell-Larcker criterion

Construct	ACAP	AIAD	AIAD×DMAT	DMAT	EAG	INNP
ACAP	0.796					
AIAD	0.471	0.825				
AIAD×DMAT	0.125	0.043	1.000			
DMAT	0.354	0.305	-0.068	0.840		
EAG	0.607	0.371	0.087	0.368	0.801	
INNP	0.516	0.346	0.132	0.415	0.626	0.807

Note. Diagonal values represent the square root of AVE. Off-diagonal values represent inter-construct correlations. The interaction term is included for transparency but is not interpreted as a substantive latent construct.

Supplementary Table S4. Outer VIF values

Indicator	VIF	Indicator	VIF
ACAP1	1.892	ACAP2	1.957
ACAP3	2.239	ACAP4	2.408
ACAP5	2.214	ACAP6	2.142
ACAP7	2.534	ACAP8	2.314
AIAD×DMAT	1.000	AIAD1	2.462
AIAD2	2.419	AIAD3	2.347
AIAD4	2.241	AIAD5	1.984
AIAD6	2.163	DMAT1	2.778
DMAT2	2.455	DMAT3	2.513
DMAT4	2.355	DMAT5	2.556
DMAT6	3.331	DMAT7	2.363
EAG1	2.469	EAG2	1.960
EAG3	1.821	EAG4	2.516
EAG5	1.604	EAG6	2.237
INNP1	2.304	INNP2	2.140
INNP3	2.027	INNP4	1.767
INNP5	2.226	INNP6	2.014

Note. Outer VIF values did not indicate problematic indicator-level multicollinearity. DMAT6 had the highest VIF (3.331), which remains below the conventional threshold of 5.

Supplementary Table S5. Full PLSpredict results for endogenous indicators

Indicator	Q ² _predict	PLS RMSE	LM RMSE	RMSE result	PLS MAE	LM MAE	MAE result
ACAP1	0.147	1.594	1.618	PLS better	1.335	1.347	PLS better
ACAP2	0.157	1.630	1.663	PLS better	1.342	1.378	PLS better
ACAP3	0.141	1.572	1.582	PLS better	1.290	1.325	PLS better
ACAP4	0.161	1.469	1.495	PLS better	1.218	1.240	PLS better
ACAP5	0.170	1.588	1.617	PLS better	1.268	1.305	PLS better
ACAP6	0.178	1.625	1.641	PLS better	1.360	1.360	LM better
ACAP7	0.171	1.556	1.600	PLS better	1.276	1.318	PLS better
ACAP8	0.148	1.664	1.701	PLS better	1.402	1.438	PLS better
EAG1	0.164	1.507	1.537	PLS better	1.244	1.259	PLS better
EAG2	0.100	1.578	1.624	PLS better	1.330	1.357	PLS better
EAG3	0.122	1.674	1.701	PLS better	1.371	1.396	PLS better
EAG4	0.105	1.701	1.717	PLS better	1.403	1.406	PLS better
EAG5	0.119	1.682	1.744	PLS better	1.407	1.454	PLS better
EAG6	0.109	1.664	1.696	PLS better	1.393	1.418	PLS better
INN1	0.120	1.730	1.745	PLS better	1.442	1.439	LM slightly better
INN2	0.111	1.654	1.658	PLS better	1.363	1.345	LM better
INN3	0.141	1.618	1.652	PLS better	1.356	1.374	PLS better
INN4	0.071	1.737	1.761	PLS better	1.457	1.463	PLS better
INN5	0.137	1.650	1.657	PLS better	1.366	1.364	LM slightly better
INN6	0.137	1.678	1.719	PLS better	1.407	1.436	PLS better

Note. PLSpredict was interpreted at the manifest indicator level. RMSE was used as the main prediction error criterion, while MAE was inspected as an additional robustness indicator. MAPE is not reported because it is less informative for Likert-type indicators.