DIGITALIZATION, BUSINESS MODEL EXPERIMENTATION, AND SUSTAINABILITY IMPACT:
Firm-Level Evidence from ASEAN Entrepreneurs

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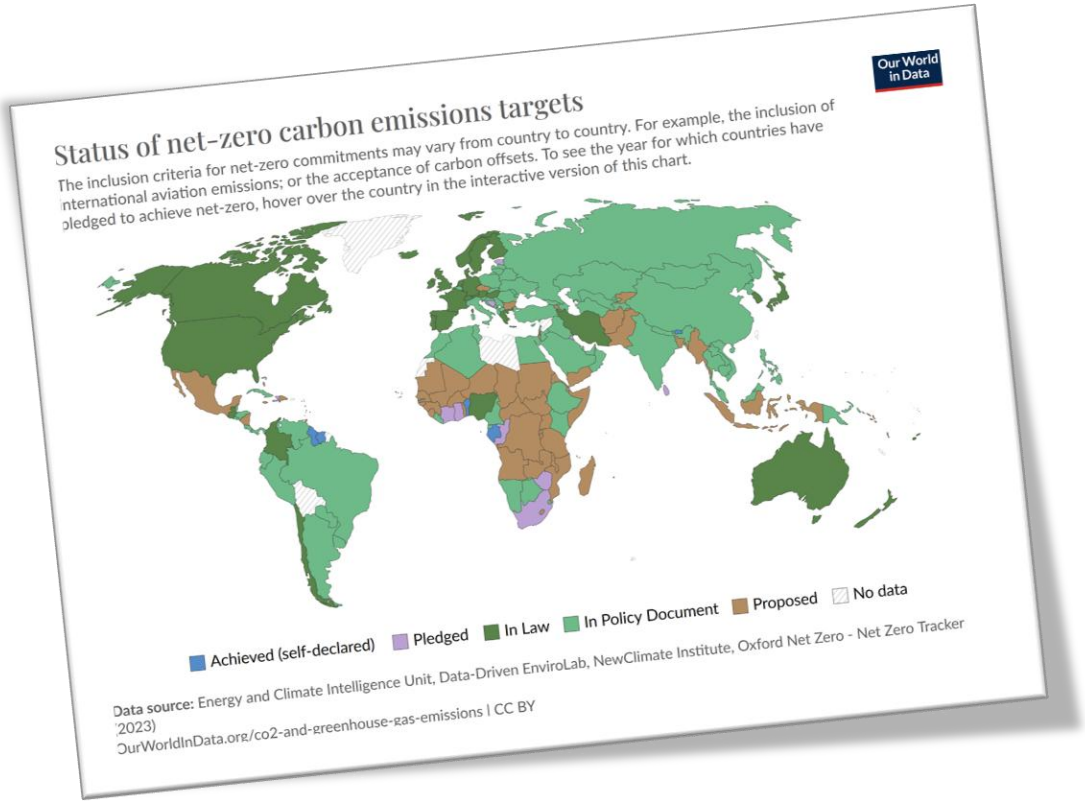
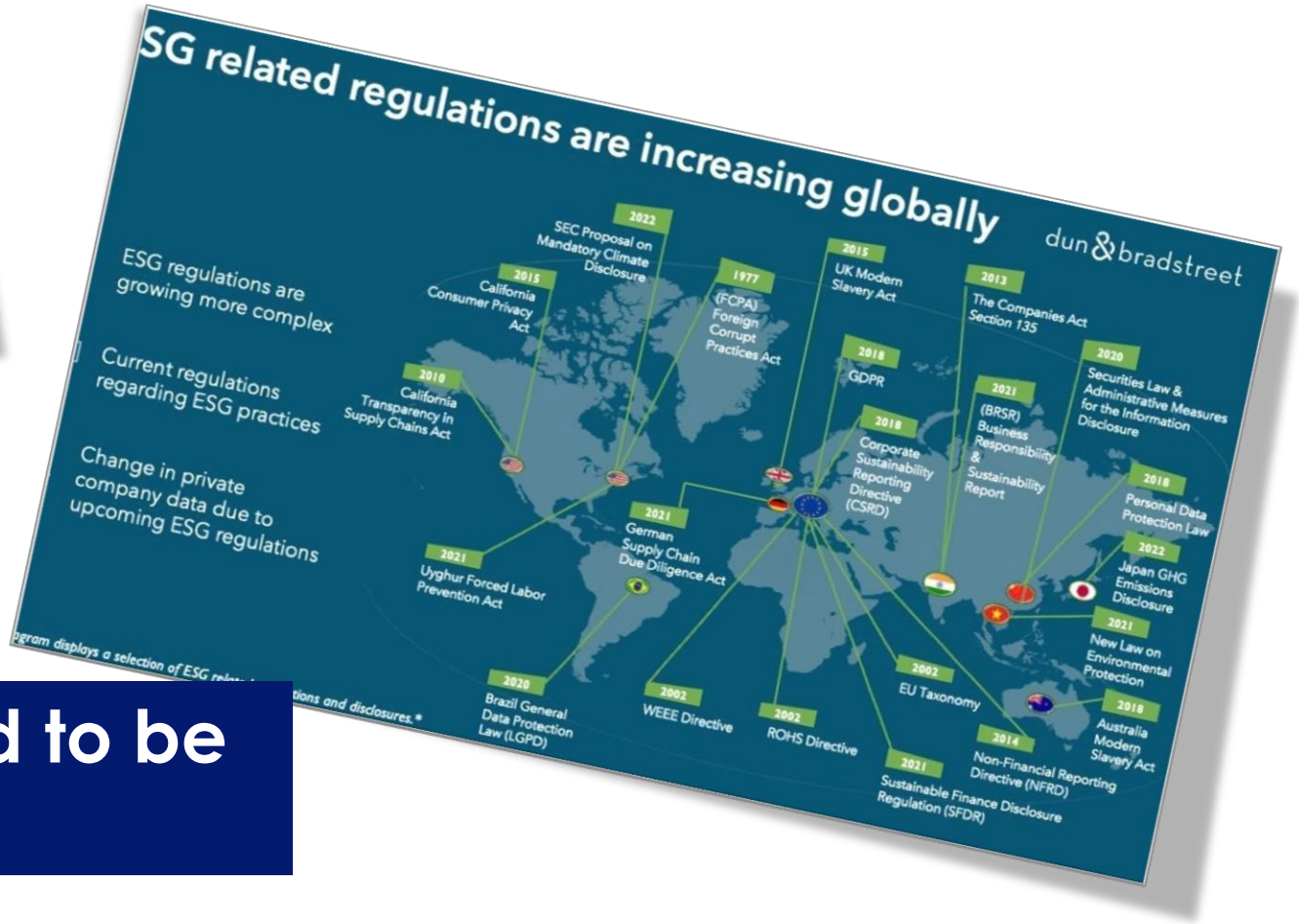


Governments set sustainability and climate targets



Big business have committed to be ESG compliant

Data source: Energy and Climate Intelligence Unit, Data-Driven EnviroLab, NewClimate Institute, Oxford Net Zero - Net Zero Tracker (2023)

Digitalization enables sustainable business model transformation of entrepreneurs

Digital technologies thus enables more sustainable business models:

- ✓ de-materialization and de-physicalization of business operations and separation of the materials flows from data flows , reducing environmental footprint (Yoo, Boland Jr, Lyytinen, & Majchrzak, 2012).
- ✓ business model circularity, contributing to Sustainability (Bocken et al., 2019; Neligan, et al., 2023).
- ✓ business model experimentation, which support business model sustainability from a *Stakeholder* orientation rather than *Shareholder* orientation (Matarazzo, et al., 2021; Ghezzi & Cavallo, 2020; Rachinger, Rauter, Müller, Vorraber, & Schirgi, 2019).
- ✓ greater optimization of business models and value chains, increasing efficiency and reducing waste.

Research questions and summary of findings

Would digitalized business model help achieve both business performance and sustainability goals?

Using interview data from 685 DIGITAL ENTREPRENEURS from 6 ASEAN markets, we established a causal link between digital technology adoption, business model, and sustainability outcomes.

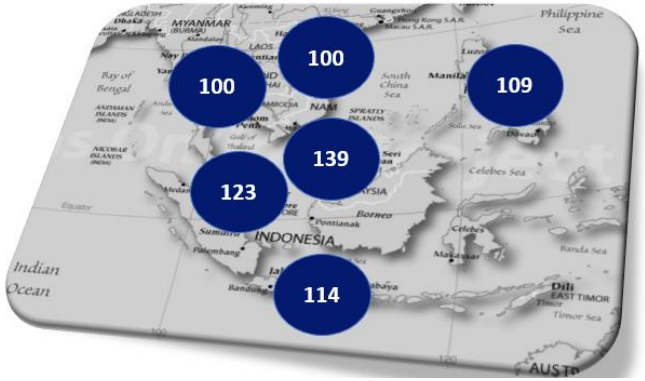
- Business model digitalization drives sustainability performance: environmental internal practices, environmental external practices, social sustainability, and stakeholder welfare.
- Business model digitalization contribute to business performance
- Business model experimentation can explain the improvement of sustainability performance via mediating role

Data collection

Using interview data from 685 DIGITAL ENTREPRENEURS from 6 ASEAN markets, we established a causal link between digital technology adoption, business model, and sustainability outcomes.

- Sample size: **685 (total ASEAN-6)** 182 variables / survey questions.

ASEAN Startup Data collected



Data collection in questionnaire

General Questions
15 Questions
Background description (qualitative)
firm size (employees)
Firm age (start year)
Customer size
Individual characteristics (education, foreign experience, startup experience)
TMT size and diversity

Firm Characteristics
5 Questions
- Startup phase
- COVID-19 crisis impact
- Business model status
- Startup funding
- Export performance

Business Model Digitalization; Sustainability; Performance
Multi-item scales. We used established measurement scales when available.

For new scales we carefully assessed the construct design (reflective vs composite).

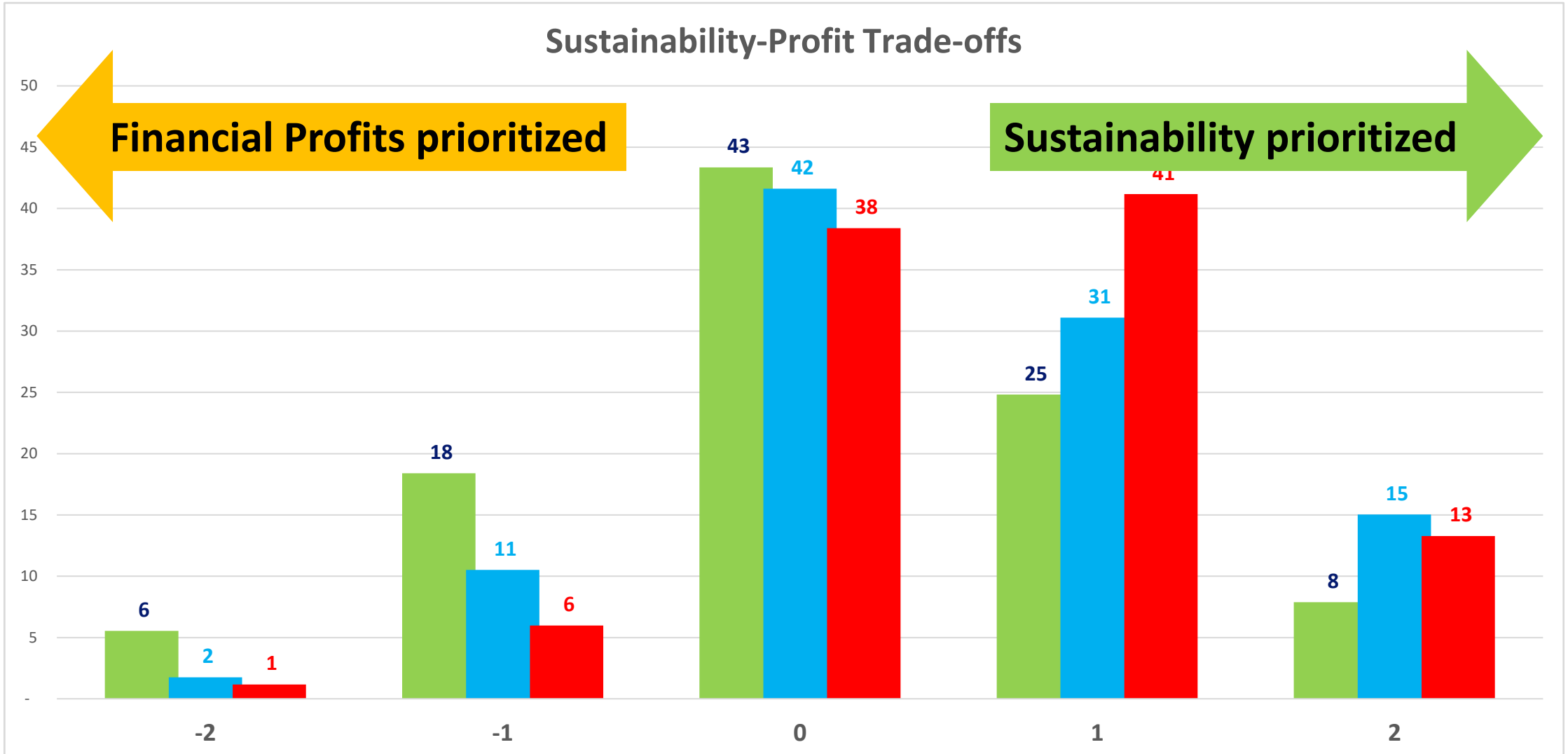
We calculated construct reliability (internal coherence; performed factor analysis to purify scales; $\alpha > .738$ construct validity (external validation)

Do entrepreneurs want to contribute to sustainable development?

Their strategic trade-offs…

	-2	-1	0	1	2	
Financial profit regardless of our impact on the environment	5.55	18.39	**43.36**	24.82	7.88	**Environmental sustainability** even if this would mean we make no profit at all
Financial profit regardless of our impact on our local community	1.75	10.51	**41.61**	31.09	15.04	**Social mission** even if this would mean we make no profit at all
Financial profit regardless of the needs of our suppliers and employees	1.17	5.99	38.39	**41.17**	13.28	The **welfare of our employees and suppliers** even if we would have to sacrifice profit

Do entrepreneurs want to contribute to sustainable development?



Digitalized business model help achieve both business performance & sustainability impact goals

Scalability and accessibility: digital tools provide the opportunity to scale sustainability efforts without being geographically constrained, and allow monitor, manage, and track sustainability metrics. Thus SMEs can expand their sustainable impact without the high costs traditionally associated with large-scale operations

Cost reduction and efficiency: Digital technologies make it easier to track and reduce operational inefficiencies, enabling SMEs to optimize energy consumption, waste, or resource use, leading to cost savings while meeting sustainability goals.

New market creation: SMEs can access new markets via platforms, tokenization and smart contracts and add socioecological value (e.g., carbon credits, renewable energy, sustainable agriculture).

Innovative business models and sustainability practices: e.g. SMEs can use blockchain to ensure transparency in sustainable supply chains or utilize AI to enhance decision-making in environmental management, attracting ethical investors and consumers

Ecosystem Coordination: digitalization help create ecosystem-level collaborations among various actors—entrepreneurs, governments, non-profits, and consumers. This collaborative approach supports entrepreneurs to tackle sustainability issues

Testable hypotheses

Hypothesis 1: The more digital technologies the firm incorporate into their business model, the better its sustainability performance

Hypothesis 2: the application of digital technologies in the business model processes enhances business performance

Hypothesis 3. The effect of digital technology adoption on sustainability performance is partially mediated through the effect of business model experimentation.

Key Variables

Digitalization in business operations

(1) Variety and reliance on digital technologies : principal component analysis of the 12 measures of reliance of the business on digital technologies => Reliance on Mobile and Web applications & Industrial Internet technologies

(2) Digitalized business model (application digital technology in business operations): Principal component analyses of 23items on the application of digital technologies in 4 aspects of firm's business operations: (1) internal activities; (2) marketing, sales, and customer interactions; (3) products and services; (4) partnerships.

(3) Business model experimentation: A principal component analysis of 11 items about changes in elements of business model during the past 12 months.

Sustainability Impact -self-assessments of three aspects of business sustainability: environmental sustainability (internal & external); social sustainability; stakeholder sustainability

Four types of Sustainability Impact

Scale	Items
Environmental Sustainability (internal)	We go well beyond the minimum required by legal authorities to minimize any negative impact of our business on the environment (e.g., waste, recycling, etc)
	We take great effort to use renewable and environmentally friendly materials in our products and operations
	We recycle all our waste
Environmental Sustainability (external)	We have applied for or been awarded a green label or certification
	We monitor our suppliers closely to ensure they are environmentally sustainable
	We often donate to environmental causes
	We have a clearly defined mission to help save the environment and planet
	We are widely recognized as an environmentally friendly company
	We have a system in place to ensure we keep focused on environmental friendliness
Social Sustainability	We go well beyond the minimum required by legal authorities to minimize any negative impact of our business on our local community
	We take great effort to make a positive contribution to the social community where we operate
	We have a clearly defined social mission in addition to our business mission
	We often donate to those in need
	It is very important for us to be a good corporate citizen in our community
	We have a system in place to ensure we keep focused on our social mission
Stakeholder Sustainability	We take extra effort to treat our employees well, like family
	It is very important for us to treat our suppliers and partners fairly and not take unfair advantage over them
	We pay close attention to workplace safety
	It is important for us to treat all our employees equally regardless of gender, age, ethnicity, or religion

Digitalized business model improved sustainability performance

Dependent variable	Environmental sustainability of Internal operations		Environmental sustainability of External impact		Stakeholders welfare (internal)		Social Sustainability (external)		Business model Experimentation	
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
(constant)	41.277***	3.680	33.417***	4.592	36.530***	4.356	13.141***	4.229	34.654***	4.293
Digital Technology	.065	.327	.425	.389	-.197	.369	-.616	.358	.452	.383
BM digitalization	1.761**	.801	3.730***	.953	2.587***	.904	7.725***	.877	5.254***	.909
Business model experimentation	.092***	.036	-.044	.042	.041	.040	.124***	.039	-	-
Controls										
Firm age	Included		Included**		Included		Included		Included	
Firm size (employees)	Included		Included		Included		Included		Included**	
Firm type (b2b vs b2c)	Included		Included		Included		Included		Included	
Malaysia	Included***		Included**		Included*		Included		Included	
Philippines	Included***		Included***		Included***		Included*		Included	
Singapore	Included**		Included***		Included		Included		Included**	
Thailand	Included***		Included***		Included**		Included***		Included	
Vietnam	Included***		Included***		Included**		Included***		Included***	
Sectors (11 dummies)	Included		Included		Included*		Included		Included*	
Adj r^2	.339		.112		.141		.217		.118	
Number of observations	596		596		596		596		596	

Key Variables

Business performance

Comparing against your goals and expectations you had for the company one year ago, how well has your company performed during the past 12 months? (1=much worse … 5=much better)	
Scale	**Items**
Financial Performance Against Expectations (3 items, alpha = .914)	Sales growth
	Profitability
	Number of paying customers
Operational Performance Against Expectations (3 items, alpha = .775)	Development of new products and services
	Efficiency of our operations
	Our ability to cope with the COVID-19 crisis

How does your company's performance compare against your typical competitor over the past 12 months? (1=much worse … 5=much better)	
Scale	**Items**
Performance Against Peers (5 items, alpha = .893)	Sales growth
	Profitability
	Number of paying customers
	Development of new products and services
	Efficiency of our operations

Digitalization and Business Performance

	(1)	(2)	(3)	(4)
VARIABLES	**Financial Performance**	**Operational Performance**	**Competitive performance (peer comparison)**	**Business Model Experimentation**
Constant	46.46***	29.46***	31.04***	33.65***
	(3.617)	(3.367)	(3.401)	(3.189)
Technology	0.211	0.530	0.515	0.605*
	(0.356)	(0.331)	(0.334)	(0.338)
BM Digitalization	2.532***	4.892***	5.134***	4.953***
	(0.887)	(0.826)	(0.834)	(0.822)
Business Model Experimentation	-0.0448	0.0927**	0.0669*	
	(0.0405)	(0.0377)	(0.0381)	
Controls				
Firm age	included	included*	included*	included
Firm size (employees)	included	included	included	included*
Countries	included**	included**	included**	included***
Observations	682	682	682	682
Adjusted R-squared	0.026	0.155	0.141	0.120

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Four Main Conclusions

Digitalization Drives Entrepreneurial Performance: business model digitalization significantly impacts entrepreneurial performance. Particularly. the application of digital technologies within business models is more important than the variety of technologies adopted.

Sustainability Goals Can Be Achieved Through Digitalization: the integration of digital technologies into business models not only enhances performance but also contributes to sustainability. Entrepreneurs in ASEAN are increasingly adopting digital tools to align their business models with environmental and social sustainability goals, though financial performance often remains a priority.

Business Model Experimentation is Crucial: a key factor in improving business performance is **business model experimentation,** as we find evidence that it carries both business performance and sustainability impact.

Variety of Digital Technologies Does Not Guarantee Success:

The **variety of digital technologies** adopted is of secondary importance when compared to how well those technologies are applied in core business functions. Successful digital transformation depends on how businesses integrate and apply these technologies into their operations, particularly in customer interactions and internal processes.

Startup Digitalization enables entrepreneurs to make their **Sustainability Impact** contributions while achieving **Business Performance**

THANK YOU!