

To set the stage...



Adoption of Digital Technologies, Business Model Innovation, and Entrepreneurial Firm Performance: Evidence from ASEAN Start-Ups

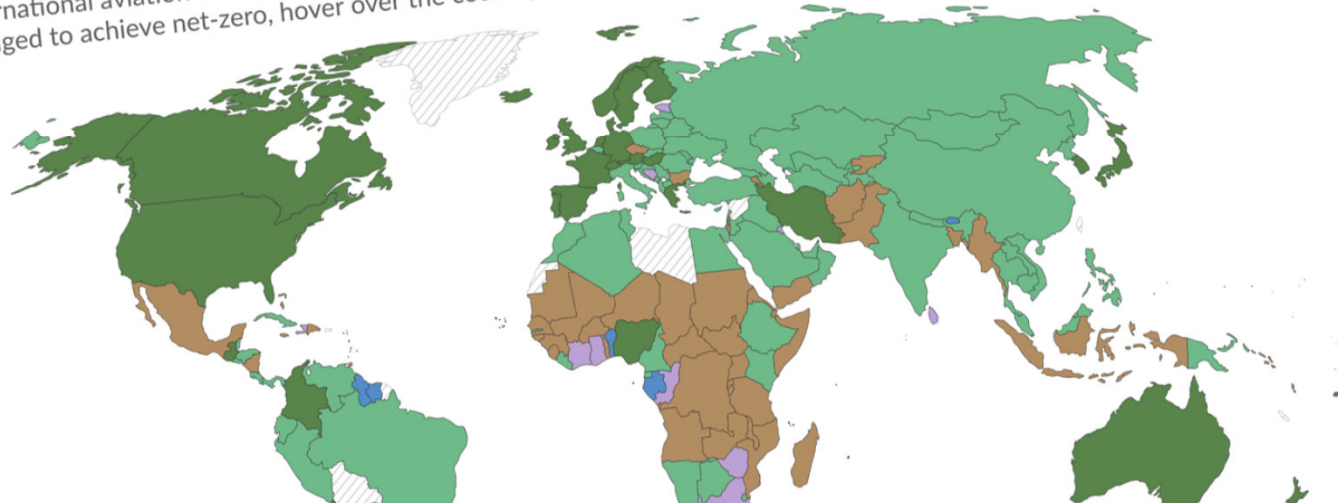
Presented by Dr. Donghun Park, Asian Development Bank

2025 ASSA Annual Meeting, San Francisco, 3-5 January



Status of net-zero carbon emissions targets

The inclusion criteria for net-zero commitments may vary from country to country. For example, the inclusion of international aviation emissions; or the acceptance of carbon offsets. To see the year for which countries have pledged to achieve net-zero, hover over the country in the interactive version of this chart.



Governments have set their targets

Legend:
 ■ Achieved (self-declared) ■ Pledged ■ In Law ■ In Policy Document ■ Proposed

Data source: Energy and Climate Intelligence Unit, Data-Driven EnviroLab, NewClimate Institute, Oxford Net Zero - Net Zero Tracker (2023)
OurWorldInData.org
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ESG related regulations are increasing globally

dun & bradstreet

ESG regulations are growing more complex

Current regulations regarding ESG practices

Change in private company data due to



Big business is expected to be ESG compliant

Program displays a selection of ESG related regulations and disclosures.*

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But what about entrepreneurs?

**Do they want to contribute?
And would digital technologies help them?**

**We interviewed
685 DIGITAL ENTREPRENEURS
in six ASEAN markets**



Jessy Abdurrahman,
Founder & CEO Zi.Care
Indonesia



Heislyc Loh
Founder & CEO DevsAsia
Malaysia



Richard Chew
CEO Harmonix Solutions
Malaysia



Wan Azrain Adnan
CEO MATA Aerotech
Malaysia



Gabriele Fadda
SmartBite
Malaysia



Enrique Juan VII Sta. Ana
Owner Dumb Ox Books
Philippines



Mai Xuan Date
Fouder Seongon
Vietnam



Geok Leng Tan
CEO AIDAtech
Singapore



Mufid Salim
Founder Gizido
Malaysia



Surat Tanprawate
Founder Smile Migraine
Thailand



Ivan Poon
Co-Founder Payboy
Singapore



Muhammad Yusuf
Founder Escredia Digital
Indonesia



Johanne Lim
CTO & Co-Founder
Philippines



Thanawat Malabuppha
Co-Founder PriceZa
Thailand



Ira Villanueva
Founder
Philippines



JR Visitkitjakarn
Co-Founder Apptivida
Thailand



Benz Ordenez Cassi
Founder Unoxing Cathol
Philippines

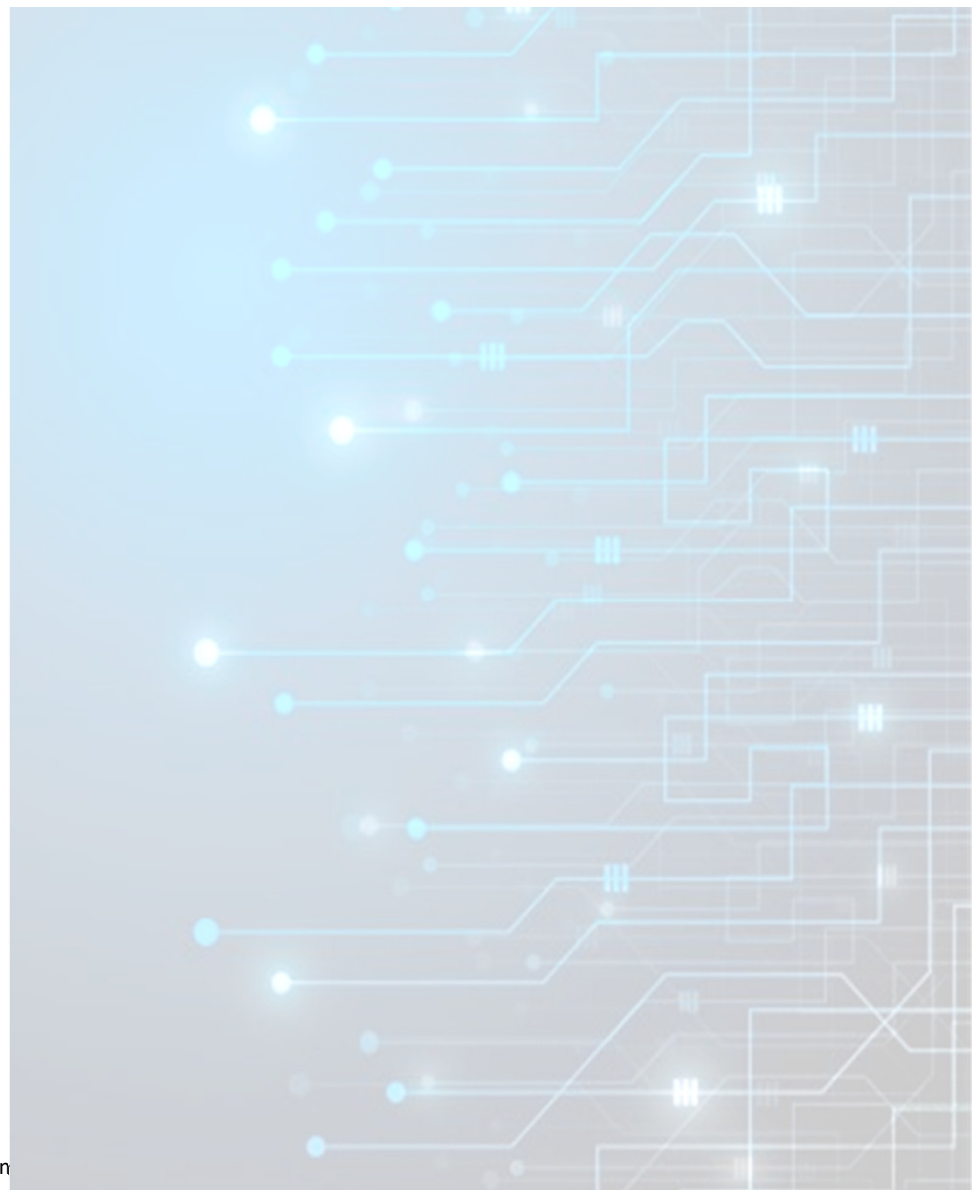


Tien Le Anh
CEO Botbanhang
Vietnam

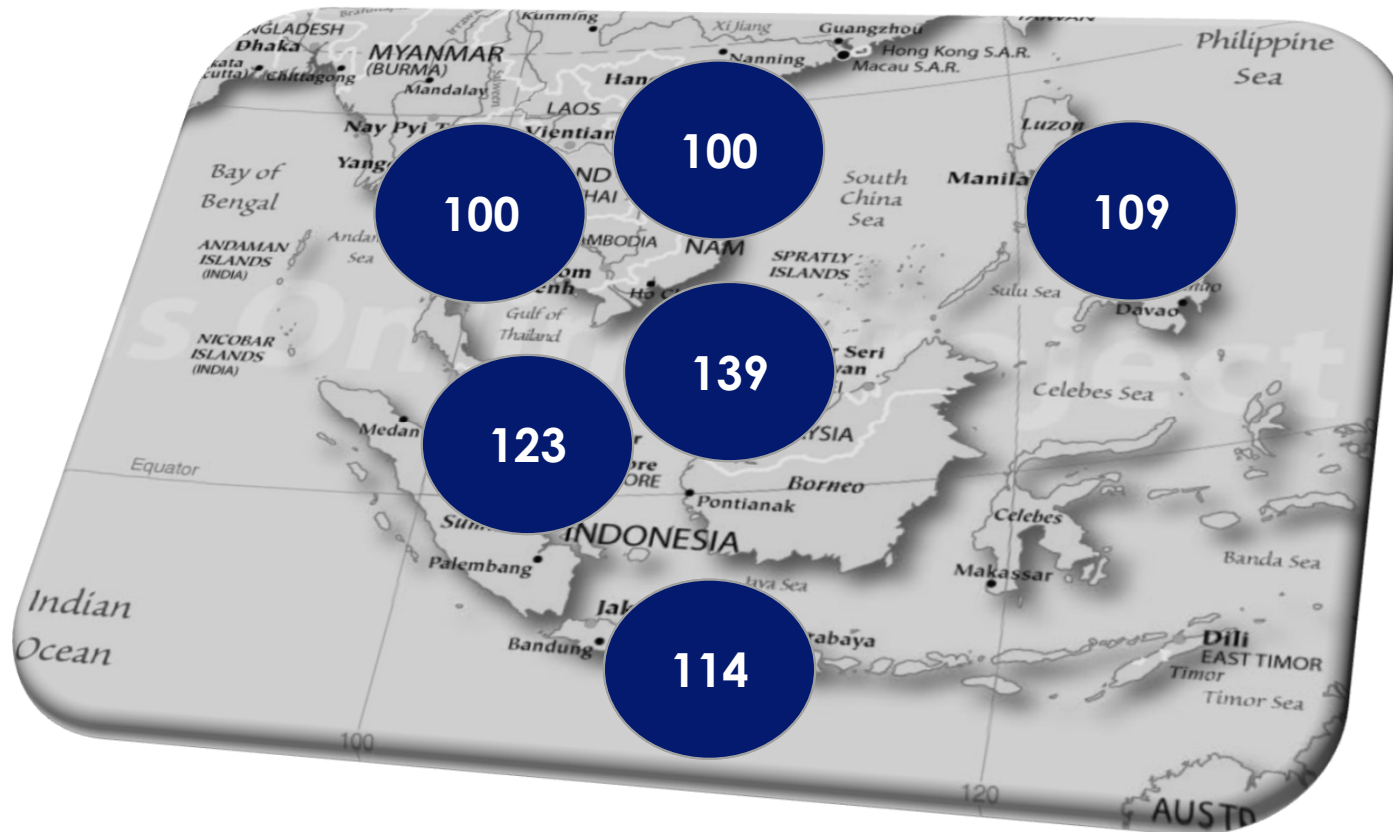


Our Study

1. Questionnaire and Data Collection
2. Theoretical Model
3. Analyses and Findings
4. Key Insights



ASEAN Startup Data collected



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

QUESTIONNAIRE & DATA COLLECTION

1. General Questions
2. Firm Characteristics
3. Business Model Digitalization
4. Sustainability
5. Performance

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QUESTIONNAIRE & DATA COLLECTION

1. General Questions
2. Firm Characteristics
3. Business Model Digitalization
4. Sustainability
5. Performance



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

QUESTIONNAIRE & DATA COLLECTION

1. General Questions

2. Firm Characteristics

3. Business Model Digitalization

4. Sustainability


5. Performance



5 Questions

- Startup phase
- COVID-19 crisis impact
- Business model status
- Startup funding
- Export performance

QUESTIONNAIRE & DATA COLLECTION

1. General Questions
 2. Firm Characteristics
 3. Business Model Digitalization
 4. Sustainability
 5. 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)

QUESTIONNAIRE & DATA COLLECTION

1. General Questions
2. Firm Characteristics
3. Business Model Digitalization
4. Sustainability
5. Performance

DATA COLLECTION:

- Six country leads at schools in the region
- Use of trained interviewers (no self-response)
- Snowballing to find subjects
- Interviews conducted on Zoom; reading out the questions to the respondent, answers inserted at the guidance of the respondent

Do entrepreneurs want to contribute to sustainable development?

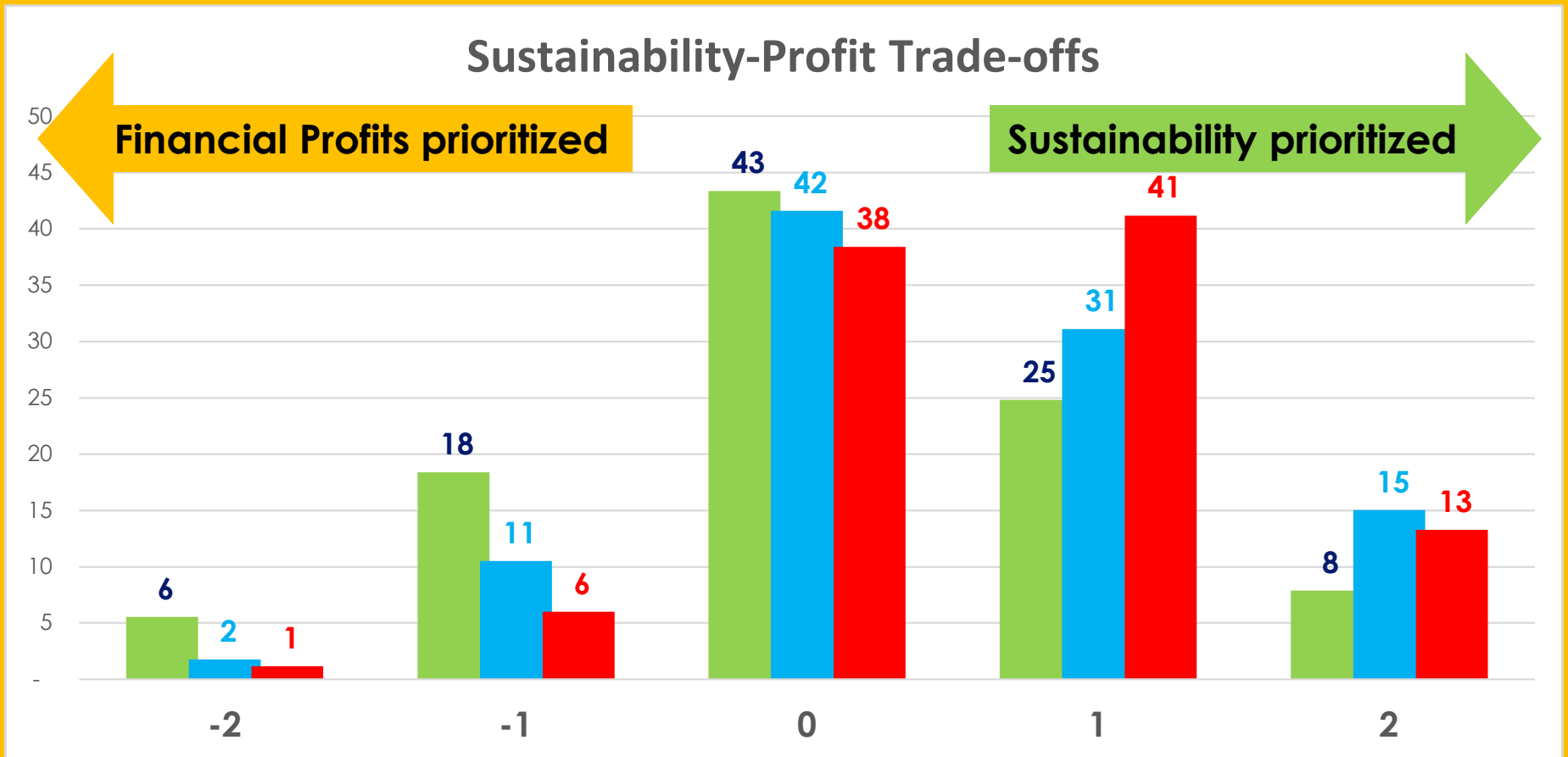
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We asked them about their strategic trade-offs...

	-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

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We asked them about their decision trade-offs...



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How can Digital Technologies help them achieve these [conflicting] goals?

INFRASTRUCTURE

Collaboration
& Ecosystem
coordination

Cost
reduction
and
efficiency

Innovation in
Business
Models

ARTIFACTS

By combining digital innovation with sustainability principles, entrepreneurs and SMEs can drive positive social and environmental impact,...

scalability
and
accessibility

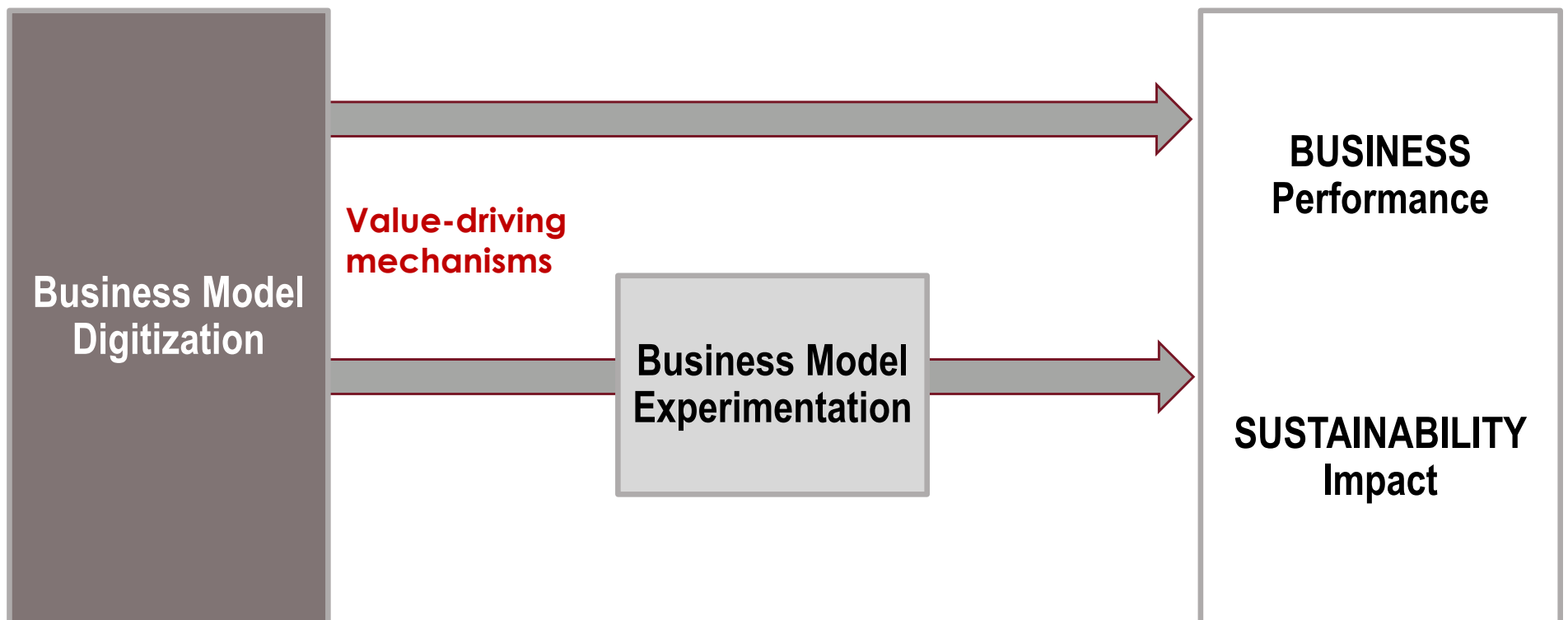
New
market
creation

PLATFORMS

Source: Nambisan S. Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship. Entrepreneurship Theory and Practice. 2017;41(6):1029-1055.
George, G., R. K. Merrill, and Si. J. D. Schillebeeckx, (2021). "Digital Sustainability and Entrepreneurship: How Digital Innovations Are Helping Tackle Climate Change and Sustainable Development," Entrepreneurship Theory and Practice, , vol. 45(5), pages 999-1027, September.

Theoretical Model

How to digitalize the **Business Model** for better performance? What are the value-driving mechanisms?



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How to digitalize the Business Model for better performance? What are the dimensions of BMDigi?

Business Model
Digitization
(BMDigi)

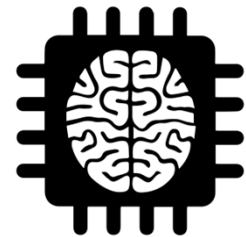
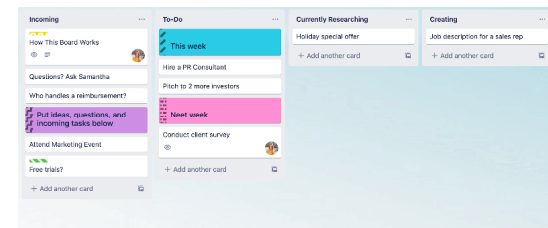
1. Digital Technology Adoption (breadth)
2. Digital Technology Application in the Business Model (width)

Digitalization of Business Models of ASEAN Startups

Variety in Digital Technology Adoption (breadth)



- Mobile phones and smartphones
- Fixed line Internet (cable, optical cable, copper line)
- Company homepage and website
- Internet resources such as bit.ly, Trello, Slack, FB business suite, .
- Cloud computing and cloud services
- Our own applications on the Internet
- Our own Mobile Applications
- Machine learning, AI technologies (artificial intelligence)
- Internet of Things (IoT), Industrial Internet of Things (IIoT)
- Augmented Reality, Virtual Reality (AR, VR)
- Blockchain, distributed ledgers
- Robotics, intelligent machinery



N=685 startups based in one of the 6 ASEAN economies

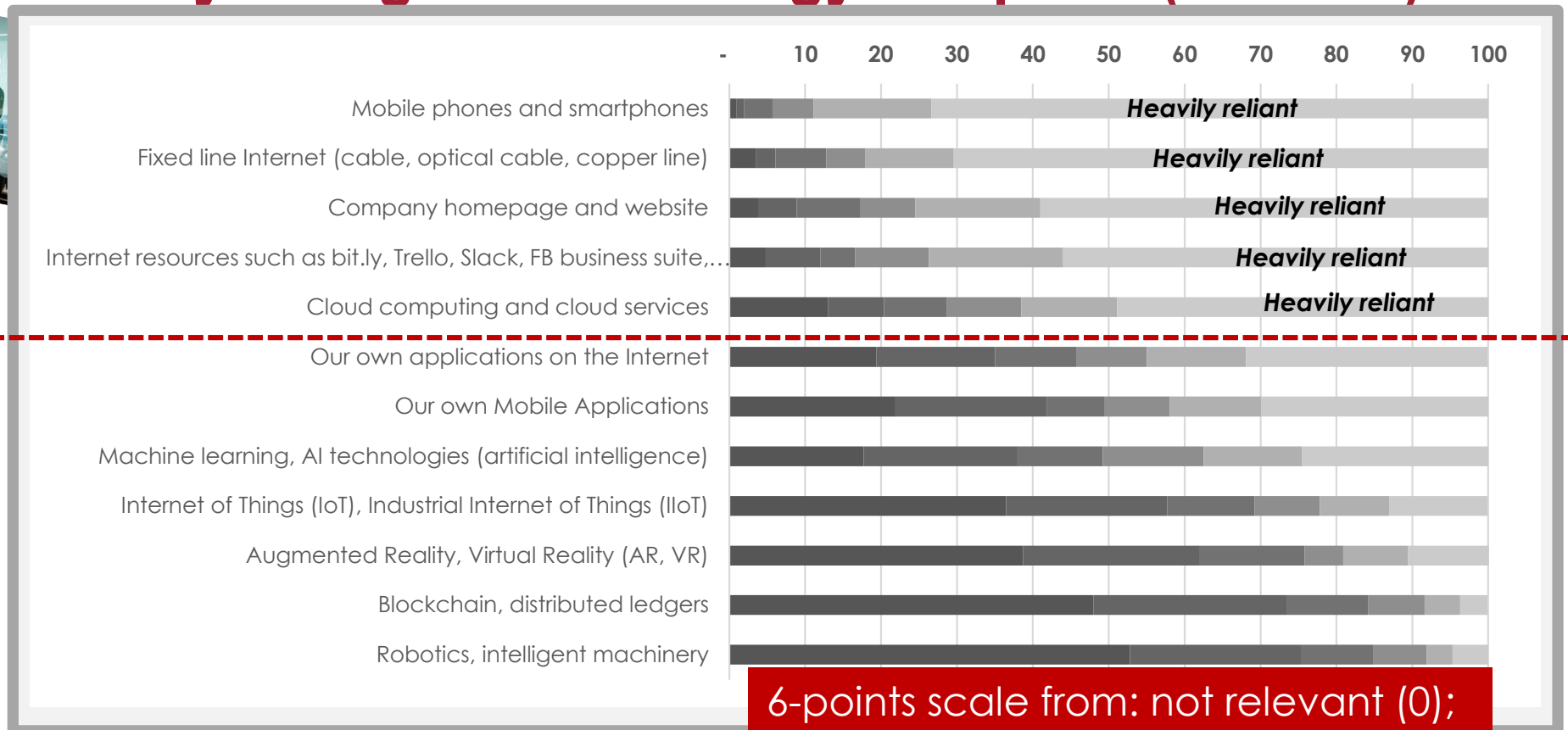
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Digitalization of Business Models of ASEAN Startups

Variety in Digital Technology Adoption (breadth)

Essential / basic

Advanced / specialized












N=685 startups based in one of the 6 ASEAN economies

6-points scale from: not relevant (0); not at all (1) to all the time (5)

Digitalization of Business Models of ASEAN Startups

In-depth BM Application of Digital Technology adoption

The Business Model Canvas Designed for: Designed by: On: Duration:

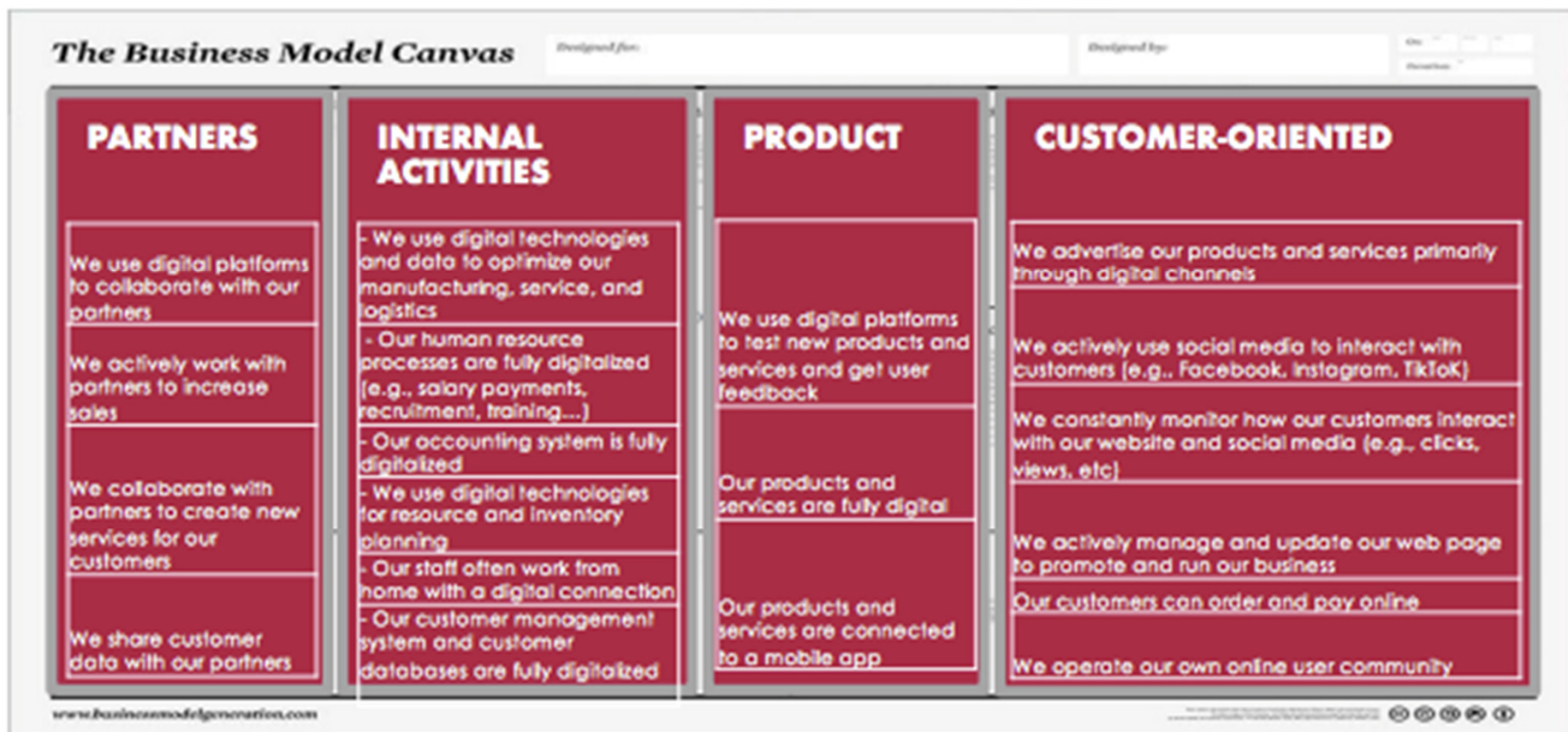
<p>Key Partners</p>  <p>What are our Key Partners? Who are our Key Suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform?</p>	<p>Key Activities</p>  <p>What Key Activities do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue Streams?</p>	<p>Value Propositions</p>  <p>What value do we deliver to the customer? Which one of our customer problems are we looking to solve? What bundles of products and services are we offering to each Customer Segment? Which customer needs are we satisfying?</p> <p style="text-align: center;">Collaborate in real time</p>	<p>Customer Relationships</p>  <p>What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established? How and how integrated with the rest of our business model? Which ones are best?</p>	<p>Customer Segments</p>  <p>For whom are we creating value? Who are our most important customers?</p>
<p>Key Resources</p>  <p>What Key Resources do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue Streams?</p>	<p>Channels</p>  <p>Through which Channels do our Customer Segments want to be reached? How are we reaching them now? How are our Channels integrated? Which ones work best? Which ones are most cost-efficient? How are we packaging them with customer segments?</p>			
<p>Cost Structure</p>  <p>What are the most important costs inherent in our business model? Which Key Resources are most expensive? Which Key Activities are most expensive?</p>		<p>Revenue Streams</p>  <p>For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?</p>		

www.businessmodelgeneration.com

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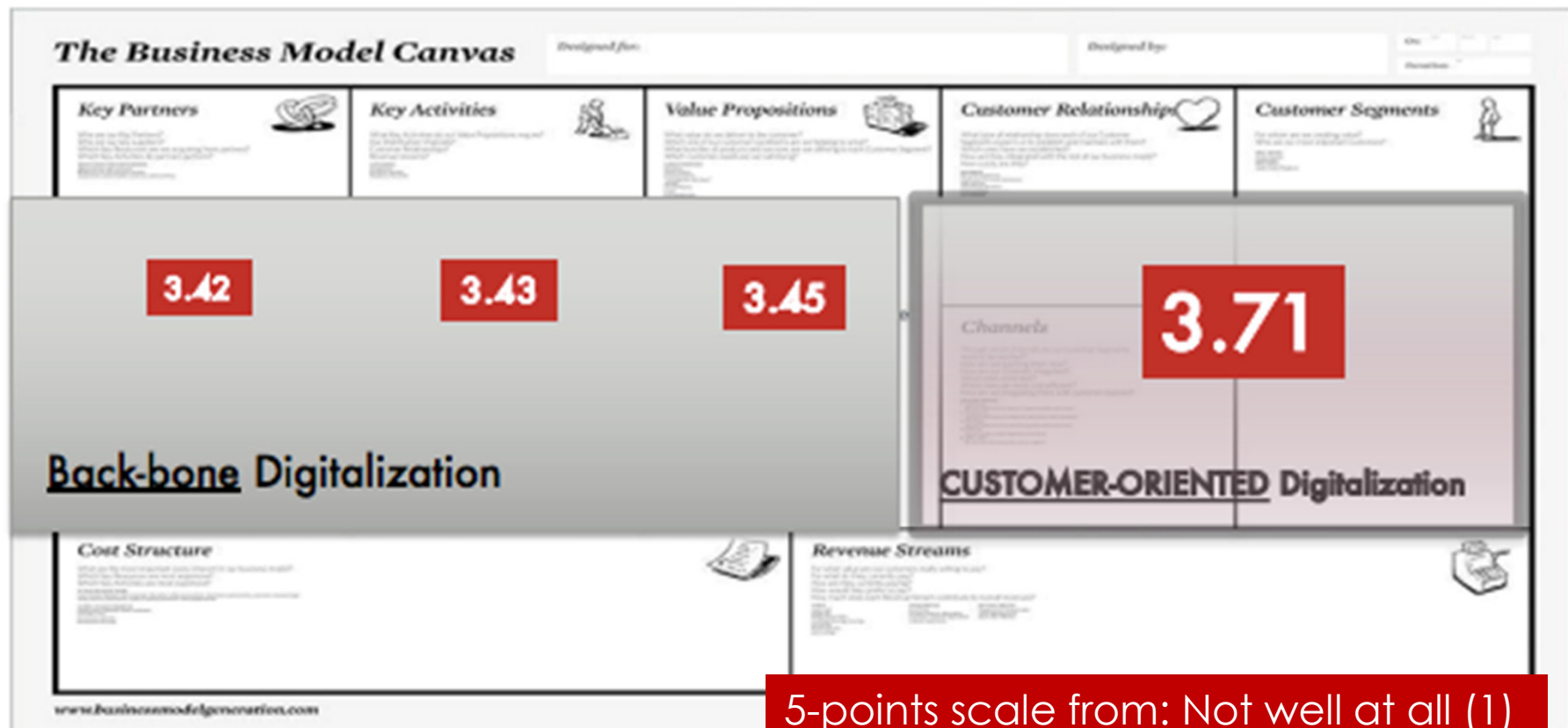
Digitalization of Business Models of ASEAN Startups

In-depth BM Application of Digital Technology adoption



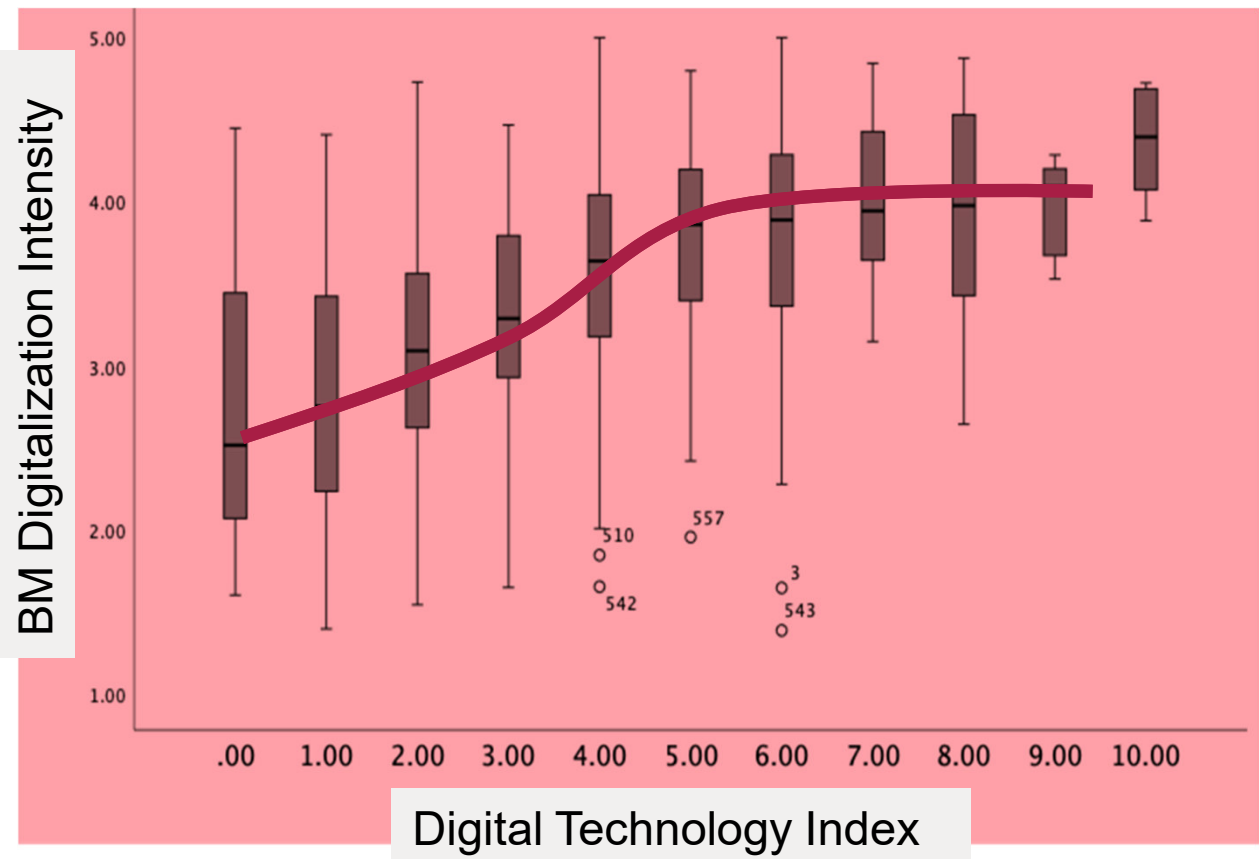
Digitalization of Business Models of ASEAN Startups

In-depth BM Application of Digital Technology adoption

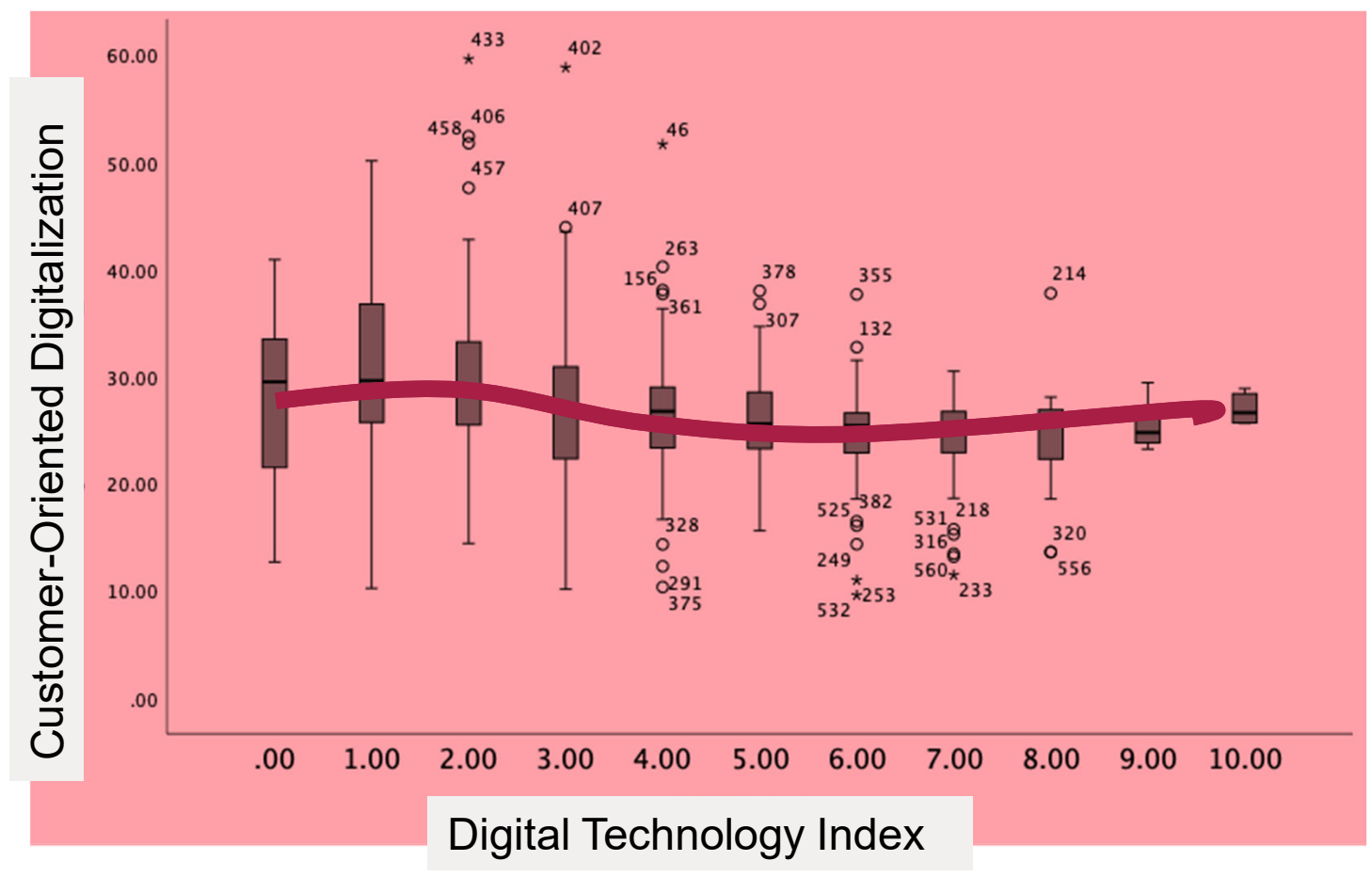


5-points scale from: Not well at all (1) to Perfectly Well (5)

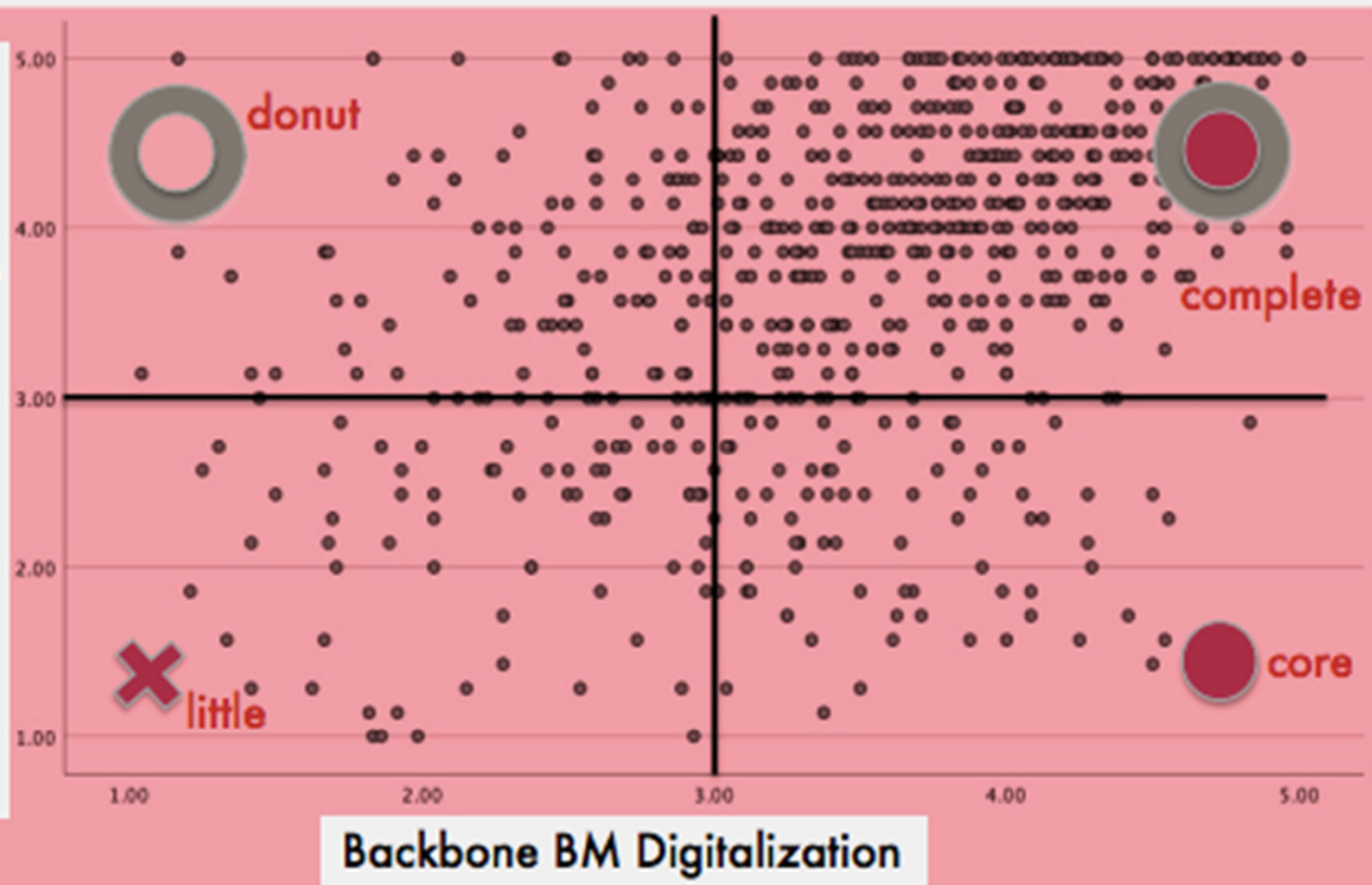
Decreasing marginal returns on BM Digitalization Application



No clear relationship between Digital Technology Index and Customer-Oriented Digitalization



Customer-Oriented BM Digitalization

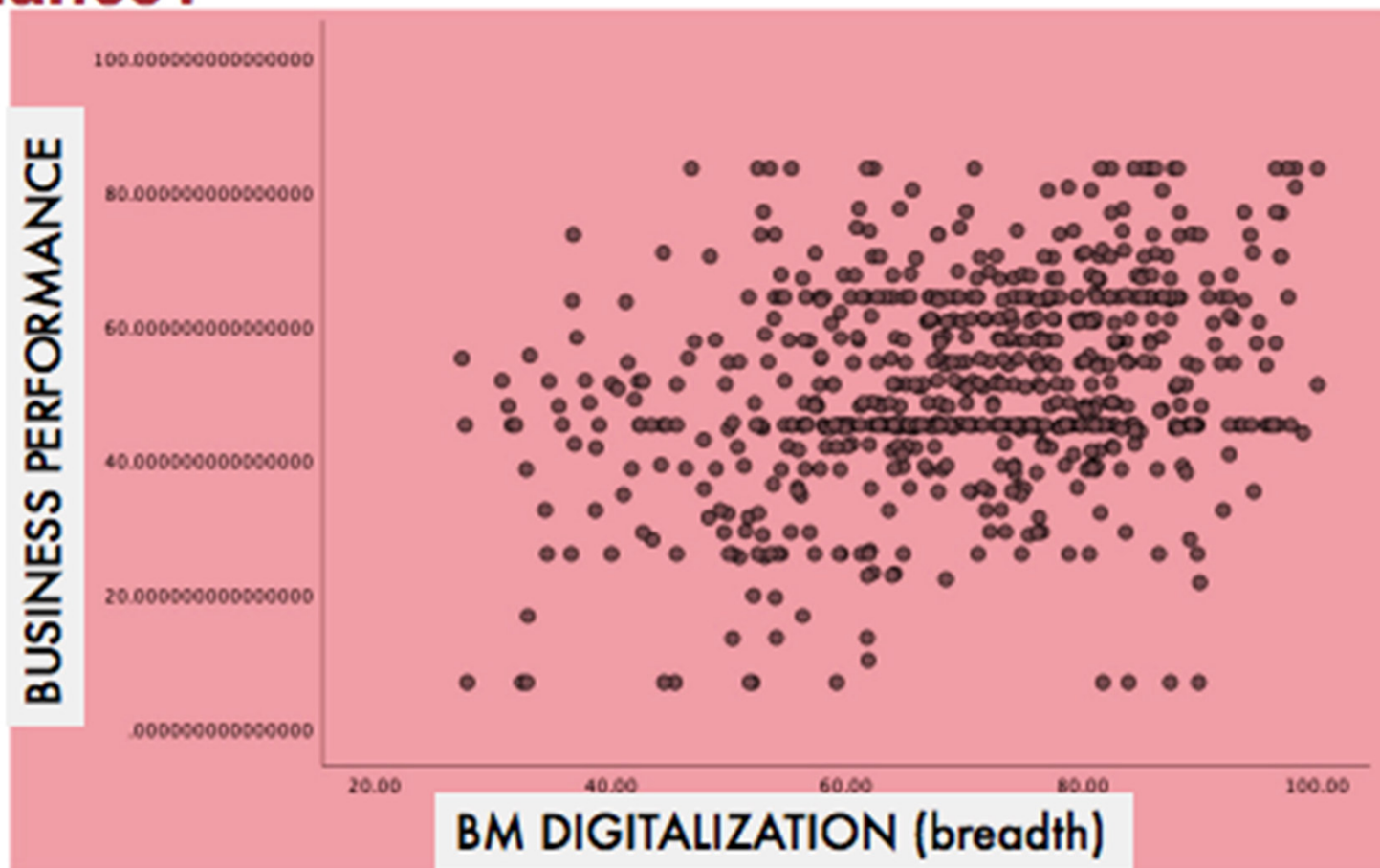


The Mix of BM Digitalization Areas:

Backbone vs Customer-Oriented

BM Digitalization

How to digitalize the Business Model for better performance?



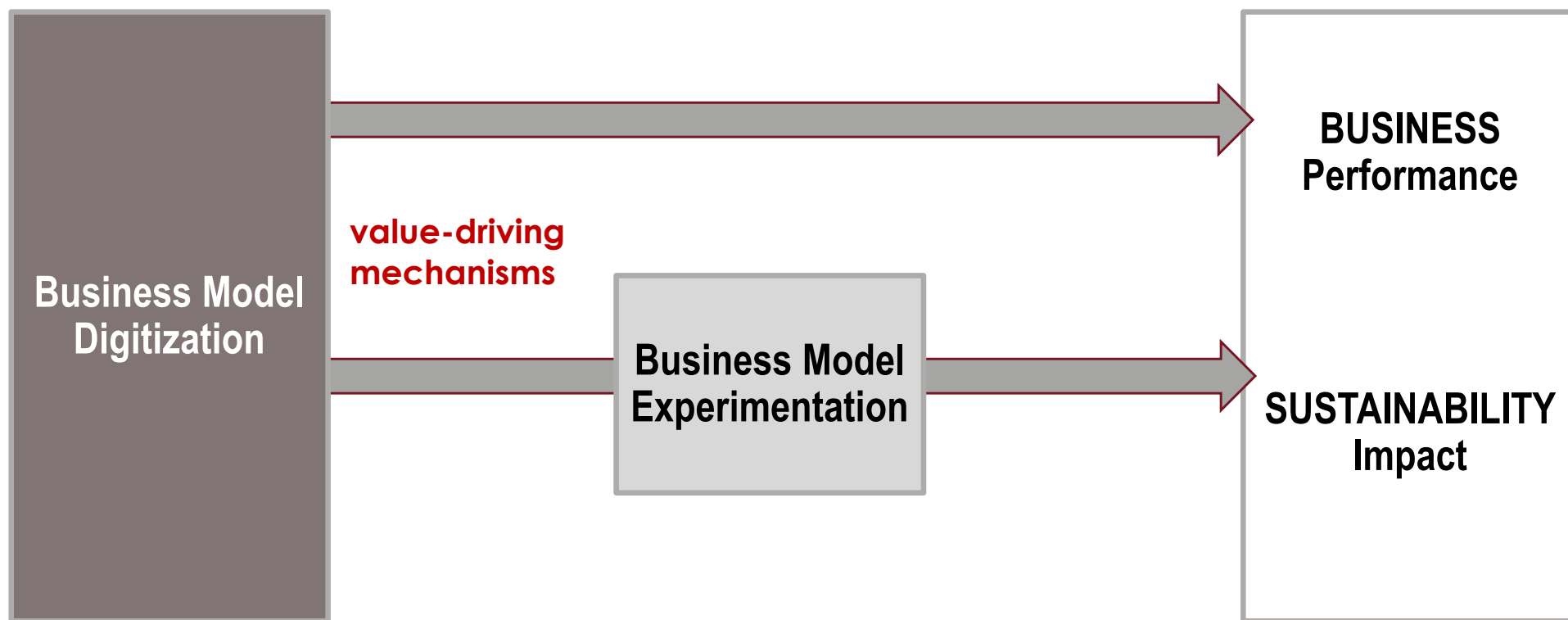
How we measured business performance (existing scales)

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 <u>typical</u> 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

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How to digitalize the Business Model for better performance? What's the value of BM experimentation?



BUSINESS MODEL EXPERIMENTATION

What business opportunities we address

Our sales and marketing operations

How we interact with our customers

How we make and deliver our products and services

Our products and services

How we generate revenue (e.g., how we charge for our products)

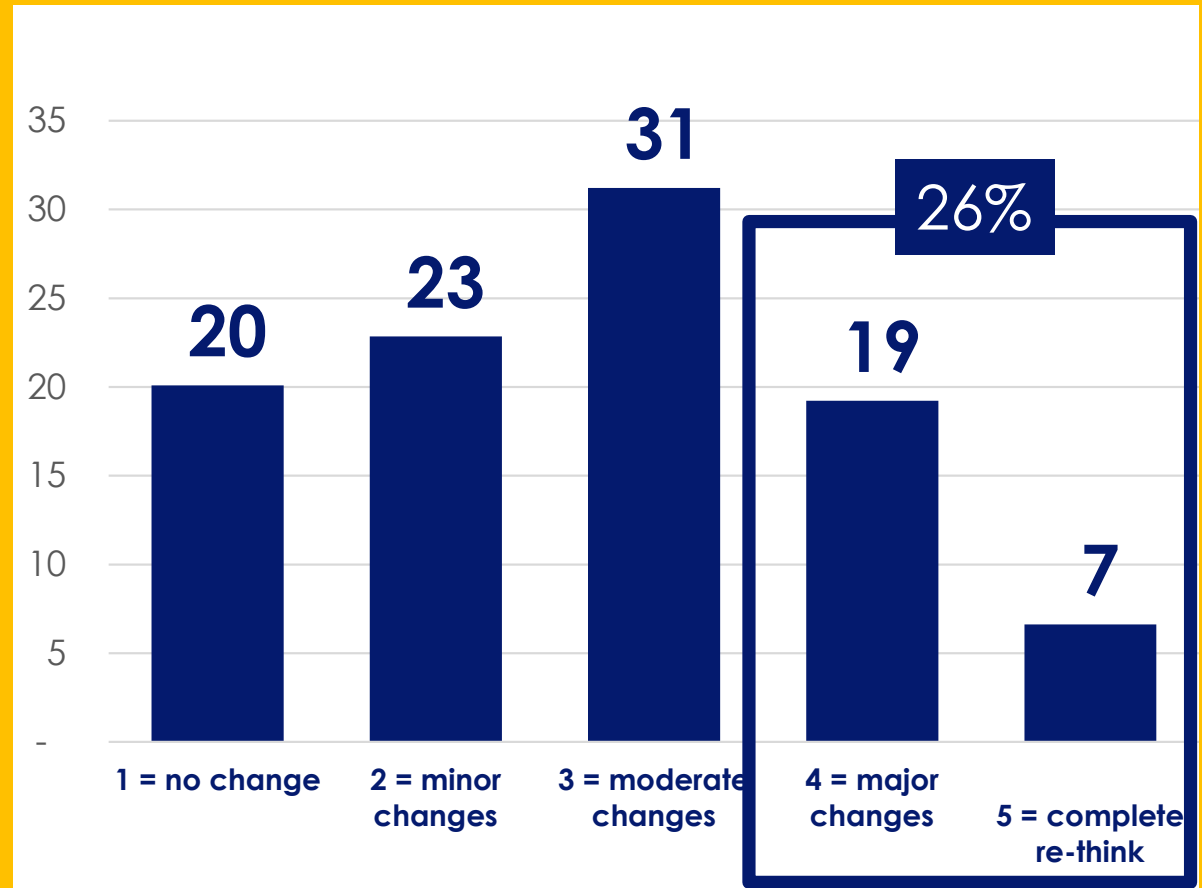
Our entire business model—i.e., how our company does business and organizes its operations

Our target customers and customer segment

Our partnerships (i.e., who we work with—other than suppliers)

What activities we do ourselves and what activities our partners do

Our suppliers



Source: ADB research on 685 ASEAN-6 Digital Entrepreneurs, Autio, et al (2024)

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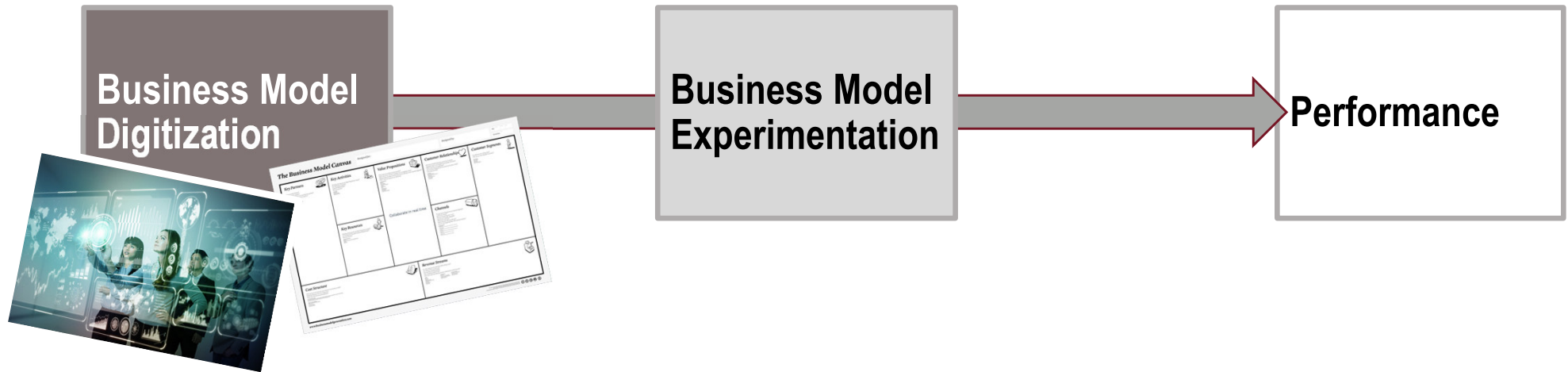
Startup Digitalization and Business Performance

VARIABLES	(1) Financial Performance	(2) Operational Performance	(3) Competitive performance (peer comparison)	(4) Business Model Experimentation
Constant	46.46*** (3.617)	29.46*** (3.367)	31.04*** (3.401)	33.65*** (3.189)
Technology	0.211 (0.356)	0.530 (0.331)	0.515 (0.334)	0.605* (0.338)
BM Digitalization	2.532*** (0.887)	4.892*** (0.826)	5.134*** (0.834)	4.953*** (0.822)
Business Model Experimentation	-0.0448 (0.0405)	0.0927** (0.0377)	0.0669* (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				

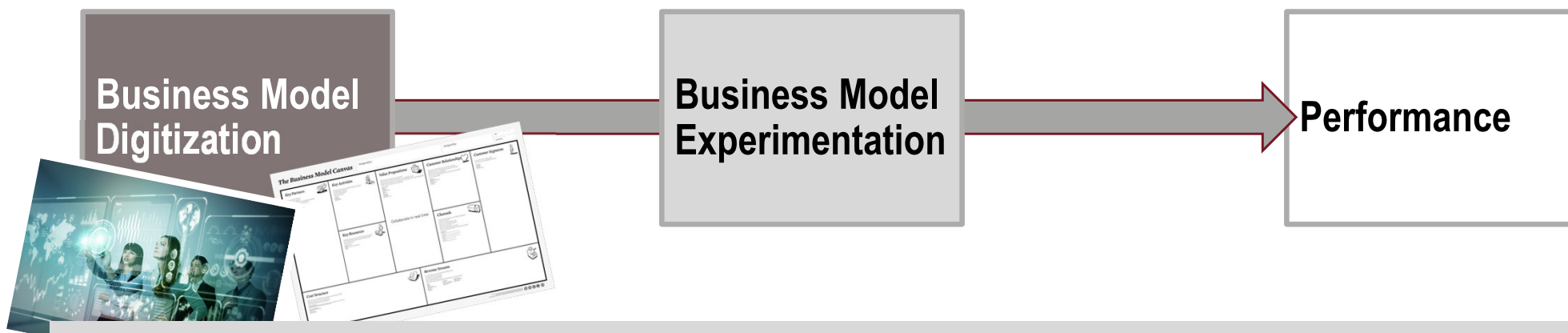


*** p<0.01, ** p<0.05, * p<0.1

How to digitalize the Business Model for better Business Performance?



How to digitalize the Business Model for better Business Performance?



1. A distinction between Elementary vs Advanced Digital Technologies needs to be made
2. Variety in Digital Technology is of secondary importance, only on BM experimentation
3. Application in Business Model is key
4. Positive Performance Effect of BM Digitalization is (partly) explained by BM Experimentation

But do Digital Technologies help them achieving [desired] sustainability impact?

We differentiate 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

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Startup Digitalization and Sustainability Impact

	Environmental sustainability of Internal operations		Environmental sustainability of External impact		Social Sustainability		Stakeholders welfare		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	13.141***	4.229	36.530***	4.356	34.654***	4.293
Technology	.065	.327	.425	.389	-.616	.358	-.197	.369	.452	.383
BM digitalization	1.761**	.801	3.730***	.953	7.725***	.877	2.587***	.904	5.254***	.909
Business model experimentation	.092***	.036	-.044	.042	.124***	.039	.041	.040	-	-
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		.217		.141		.118	
Number of observations	596		596		596		596		596	

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Robustness Checks

To address concerns about CMB: Measurement Validation Test

Performance

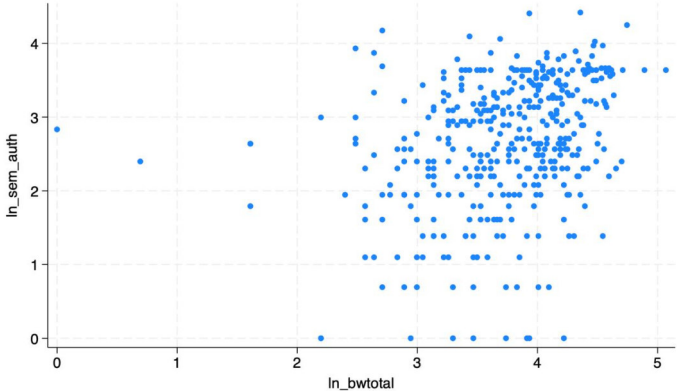
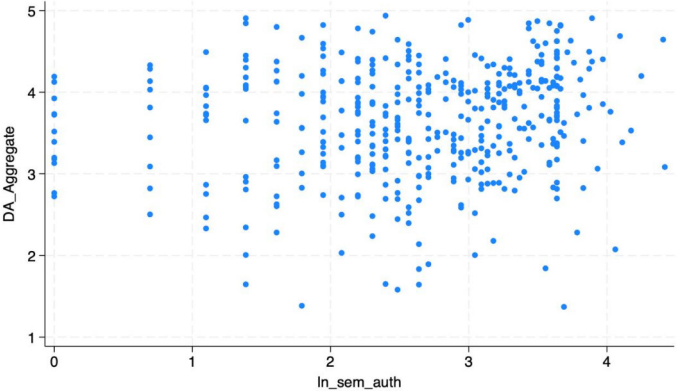
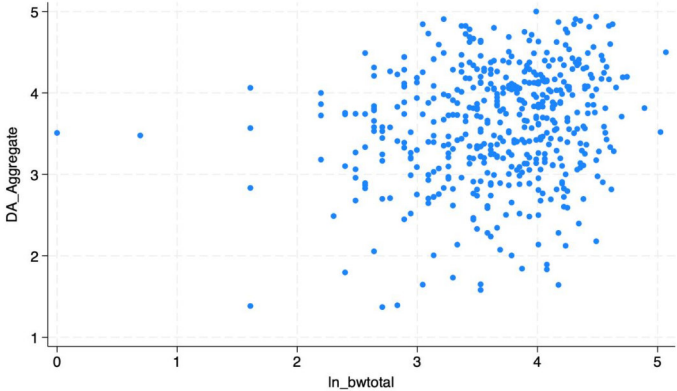
Digitalization Scores	Firms with LOW Business Model Digitalization		Firms with HIGH Business Model Digitalization		p-value
	(n=30) ¹		(n=30)		
(Semrush)	Average	(sd)	Average	(sd)	
Authority Score	9.13	11.42	18.21	14.79	0.020**
Organic Search (SEO)	982.38	3558.69	34067.03	166518.44	0.201
Paid Search (CPC)	13.25	53.00	1.69	9.10	0.077*
Backlinks	3291.88	10809.30	61479.69	214031.59	0.099*
Display Advertising	2.19	4.49	25.93	72.95	0.061*

digitalization

(BuiltWith)	Firms with LOW Business Model		Firms with HIGH Business Model		p-value
	% Top 5 Adopted	Proportional Variance	% Top 5 Adopted	Proportional Variance	
Analytics & Tracking (54)	51.3	0.25	18.0	0.15	0.006***
Widgets (125)	50.7	0.25	20.7	0.16	0.015**
JavaScript Libraries (119)	53.3	0.25	20.7	.17	0.009***

sd =standard deviation.
¹note: for 5 of the Lowly digitalized startups, we were unable to identify their websites.

To address concerns about CMB: Measurement Validation Test



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To address concerns about CMB: Measurement Validation Test

	bwtotal	sem_auth	selfcompare_f1_rescale	selfcompare_f2_rescale	peercompare_f1_rescale	change_bm_f1_rescale	TECH_index_new	DA_Aggregate
bwtotal	1							
sem_auth	0.3676 0	1						
selfcompare_f1_rescale	0.084 0.0412	0.1766 0.0001	1					
selfcompare_f2_rescale	0.0361 0.3811	-0.0219 0.6303	0 1	1				
peercompare_f1_rescale	0.0767 0.0623	0.1305 0.0039	0.3914 0	0.4308 0	1			
change_bm_f1_rescale	0.0833 0.0427	0.0563 0.2144	-0.02 0.6012	0.1702 0	0.1326 0.0005	1		
TECH_index_new	0.0345 0.4018	0.0263 0.5619	0.0275 0.4727	0.1258 0.001	0.144 0.0002	0.1349 0.0004	1	
BM Digitalization	0.2151 0	0.1876 0	0.108 0.0047	0.2899 0	0.3055 0	0.2504 0	0.3927 0	1 42

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The Missing Link: Business Model Experimentation

Experimentation

Over the past 12 months, have you changed any of the following elements of your business model



5-points scale from: no changes (1);
Complete rethink (5)

Innovativeness – 4 dimensions

Number of changes to **existing products and services**

Number of completely new products and services that we did not sell before - Number

Number of smaller adjustments in our business model (ie, how we do business - other than products and services) - Number

Number of major changes in our business model (ie, how we do business - other than products and services) - Number

Four Main Conclusions

Digitalization Drives Entrepreneurial Performance: we find that 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!

I welcome your questions and suggestions.

Please stay in touch, and connect with me



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