Measuring and Examining Innovation in Philippine Business and Industry (Results of the 2015 PIDS Survey of Innovation Activities)

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1. Introduction

Innovation

- widely regarded as a major driver of economic output, productivity and competitiveness
- verlaps with R&D; and thus, traditionally its measurement focused on scientific or technological outputs.
- involves application of (new) knowledge in production to increase value such as devt of new or significantly improved products or processes, or implementing new marketing or organizational methods



1.1. How does PH fare in Innovation?

Global Innovation Index (GII)

ASEAN Member State	2017 GII Global Rank	2016 GII Global Rank	
Singapore	7 th	6 th	
Malaysia	37 th	35 th	PH ranks 5 th
Thailand	51 st	52 nd	in Southeast
Viet Nam	47 th	59 th	Asia
Philippines	73 rd	74 th	
Indonesia	87 th	88 th	
Cambodia	101 st	95 th	



1.1 How does PH fare in Innovation?



Source: 2017 ASEAN Community Progress Monitoring System Report.

Note: Earliest year: SGP (2005), THA (2005), PHI (2005), MYS (2006), IDN (2009); Latest year: THA (2010), Viet Nam (2011), MYS (2013), PHI (2013), IDN (2013), SGP (2015).

Note: Earliest year: SGP (2005), MYS (2006), THA (2005), PHI (2005), IDN (2009); Latest year: SGP (2015), MYS (2014), THA (2014), PHI (2013)



Source: 2017 ASEAN Community Progress Monitoring System Report.

1.2. 2015 Survey of Innovation Activities (SIA)

Survey Objectives :

- To describe the types of innovations engaged in by firms
- To provide information on the environments in which these innovative activities are conducted
- To determine the factors of innovation performance, barriers to innovation, and effects of innovation of firms
- Conducted by PH Institute for Development Studies (PIDS) with assistance of Ph Statistics Authority (PSA)
 - Second survey on innovation (pilot 2009 survey conducted by DOST with PSA and PIDS)
- > A thousand firms targeted (89.1% response rate) from
 - Some sampled firms interviewed in 2009 SIA

1.2.1 Profile of Establishments

Distribution of Establishments in Frame Distribution of Establishments in Sample

Major	E	mployment	Size Catego	ry	Total	Major	l	Employment	: Size Catego	ry	Total
Industry Groups	Micro	Small	Medium	Large		Industry Groups	Micro	Small	Medium	Large	
Food	8,103	4,148	227	245	12,723	Food	53	60	26	41	180
Manufacturing	(27.4%)	(14.0%)	(0.8%)	(0.8%)	(43.1%)	Manufacturing	(28.6%)	(13.9%)	(0.7%)	(0.8%)	(44.0%)
Other	3 4 1 9	7 345	676	779	12 219	Other	60	157	115	141	473
Manufacturing	(11.6%)	(24.9%)	(2 3%)	(2.6%)	(41.4%)	Manufacturing	(11.7%)	(23.6%)	(2.2%)	(2.6%)	(40.1%)
ІСТ	2 2/18	1 317	105	123	3 703	ІСТ	63	78	25	25	191
	(7.6%)	(1 5%)	(0.4%)	(0.4%)	(12.8%)		(7.6%)	(5.6%)	(0.3%)	(0.4%)	(13.9%)
RPO	105	(4.570)	(0.470)	(0.470)	(12.070)	ВРО	6	4	6	31	47
		304	() 20()	325	801 () 70()		(0.4%)	(0.5%)	(0.2%)	(0.9%)	(2.0%)
	(0.4%)	(1.0%)	(0.2%)	(1.1%)	(2.7%)	Total	182	299	172	238	891
lotal	13,875	13,114	1,075	1,472	29,536		(48.3%)	(43.7%)	(3.4%)	(4.7%)	(100%)
	(47.0%)	(44.4%)	(3.6%)	(5.0%)	(100%)		. ,	. ,	. ,	. ,	



1.2.1 Profile of Establishments (cont'd)

Distribution of Firms by Legal Organization

 About two-thirds of establishments are stock corporations, while three-tenths are single proprietorships.



Source: 2015 Survey of Innovation Activities, Philippine Insitute for Development Studies



1.2.1 Profile of Establishments (cont'd)



3/5 are single establishments.

70.3% firms built in the last 20 years.



1.2.1 Profile of Establishments (cont'd):

Capital Formation across Nationalities of Investors

- Biggest share of capital is from local investors (88.2%); with 96.5% micro firms locally owned
 - Balance Luzon: least local at 85.1%; Japanese-7.5%
 - NCR: Local at 87%; Americans-4.4%; Chinese-3.3%
 - □ Visayas: Local at 89.6%; Taiwanese-3.3%; Japanese-2.8%
 - Mindanao: 96.6% of firms are locally owned



1.2.1 Profile of Establishments (cont'd)



Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies

About three fifths of firms have local markets, a third have national markets, about 5% have markets in ASEAN and at least a tenth have markets outside ASEAN.



1.2.1 Profile of Establishments (cont'd)



Franchising is rare at 2%--concentrated at micro and small firms in Food Manufacturing Sector (82.9%).



1.2.1 Profile of Establishments: (cont'd)



Female share of employment among firms is about half across the country, but varying across areas, from 38.1% in Mindanao to 52.1% in Balance Luzon.

Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies



1.2.1 Profile of Establishments (cont'd)

- More than half of employees in BPO sector are female;
- > Food Manufacturing has smallest share (36%) of female employees.

Major Industry	Employment Size							
	Micro	Small	Medium	Large	Total			
Food	38.3	40.4	35.9	29.1	35.7			
Manufacturing								
Other	33.7	34.6	36.0	60.0	49.5			
Manufacturing								
ICT	40.0	34.6	41.0	46.0	43.3			
BPO	75.6	59.2	72.3	54.8	55.2			
All Industries	38.0	36.9	38.7	53.5	48.2			



1.2.1 Profile of Establishments (cont'd)



Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies

About three fifths of establishments have no employees with postbaccalaureate degrees: with micro firms having as high as 63.2%.



1.2.2 Innovation: Operational Definition

What makes an establishment innovation active?

- 1. **Product innovation**: new or significantly improved good/service
- 2. **Process innovation**: new production process, distribution method or support activity for goods/service
- **3. Expenditure on Innovation Activity**: R&D, training, external knowledge machinery, equipment or software linked to innovation, market introduction and other preparations to implement innovations
- 4. Engaged in abandoned or ongoing innovation projects

Wider forms of Innovation:

- Organizational innovation
- Marketing innovation

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2.1. Key Statistics on Innovation

About two-fifths (42.9%) of firms are innovation active, about a third are product innovators and about the same proportion are process innovators.



Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies



2.1. Key Statistics on Innovation

Innovation Active

- Almost two-thirds of large firms are innovation active compared to twofifths of MSMEs.
- About half of firms in Other Mfg and ICT are innovation active; while same goes for 1/3 of firms in Food Mfg and BPO.
- About half of firms in Mindanao and NCR are innovation active.

Product Innovators

 A third of firm in ICT and Other Manufacturing sectors are product innovators; a fourth of the Food Manufacturing sector and more than 10 percent across BPO sector are product innovators

Process innovators

37.2% of firms in Other Manufacturing, one-fourth in Food Manufacturing and ICT, and one-tenth of BPO firms are process innovators



2.1. Key Statistics on Innovation

Comparison of Results with Other Surveys that Measure Innovation

		PHILIPPINES		ALL COUNTRIES
Indicator	2009 SIA	2015 PIDS SIA	2015 WOI ENTERPRIS	RLD BANK SE SURVEY
Percent of firms that introduced a new product/service	37.6	30.7	32.9	36.6
Percent of firms that introduced a process innovation	43.9	30.6	40.9	34.2
Percent of firms that spend on R&D/Innovation	40.3	26.7	21.9	16.9

Note that survey designs are not similar.



2.1.1. Expenditures in Innovation

- Large firms spend 30 Million PHP on innovation, 10x the average spending of all firms (3 Million PHP).
 - Medium firms spend 7.5M PHP while small firms spend 2.4M PHP.
 - Micro firms spend 208 K PHP—a tenth of their total gross sales.
- Across sectors, BPO firms spend most at 12.5M PHP, followed by Other Manufacturing (4.2M PHP), ICT (3.7M PHP) and Food Manufacturing (0.9 M PHP)
 - ICT sector spends highest relative to gross sales at 15.6% compared to that of BPO at 2.7%.
- Luzon firms spend 3.8M PHP followed by NCR at 3.6M PHP—twice what Visayas spends (1.9M PHP). Mindanao spends 0.58 M PHP.



2.1.1. Expenditures in Innovation



Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies

Most commonly reported innovation investments:

- 1. Training (55.9%)
- Acquisition of machinery, equipment and software (51.0%)

2.1.2. Wider Forms of Innovation

- > Three-eights of firms are engaged in organizational innovation.
 - About half of large firms engage in organizational innovation. Similarly for ICT sector. Only one-fifth of BPO firms have organizational innovations.
- About two fifth of firms have marketing innovations. Two-fifths also are equipped w/ knowledge management practices.
- A third of innovation active firms filed for intellectual property rights, especially in claiming a brand name (26.7%) and registering a trademark (19.5%).



2.1.3. Innovation in Govt Procurement Contracts

- A fifth (17.4 %) of firms undertook innovation as part of a govt contract, of which a third (35.7%) did so as innovation was required from contract.
 - Among BPOs, a quarter (23.7%) engaged in innovation as part of a procurement contract, but bulk of these innovation activities (87.8%) was not required from contract.



Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies

Logistic Regression Results

Variable	Innovation	Product	Process	Organizational	Marketing
	Active	Innovator	Innovator	Innovator	Innovator
Age	+***	+	+***	+**	+**
gross sales (in logarithm form)	+**	+	+	-	+
share of employees with a					
post baccalaureate degree					
None	_**	_**	_**	_***	_**
1 to 9 percent	-	-	-	-	_*
10 to 19 percent	-	-	+	-	_**
20 and above	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
export orientation:	-	-	_**	_*	_**
foreign ownership	+	-	_*	+	_***



Logistic Regression Results

Variable	Innovation	Product	Process	Organizational	Marketing
	Active	Innovator	Innovator	Innovator	Innovator
interaction of export					
orientation and foreign	-	+	+	+	+
ownership					
share of female employment	+	+	+	+	+
Area					
NCR	-	+*	-	-	-
Balance Luzon	+	+**	+	+	+
Visayas	+	+	+	+	+
Mindanao	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)



Logistic Regression Results

Variable	Innovation Active	Product Innovator	Process Innovator	Organizational Innovator	Marketing Innovator
industry group					
Food Manufacturing	+	+	+*	+	+
Other Manufacturing	+	+	+**	+	+
ICT	+	+	+	+	+
BPO	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
knowledge management	+***	+***	+***	+***	+**

* = significant at 0.10; **= significant at 0.05 level; ***=significant at 0.01 level



Summary of Econometric Model Results

- The practice of knowledge management is a determinant of product innovation, process innovation and being an innovator.
- Human resources matter: firms with 20 percent or fewer employees having post-baccalaureate degrees are less likely to be innovators than those with at least a fifth of employees having post-baccalaureate degrees.
- Gross sales matters: higher gross sales (which correlates with establishment size) is a positive determinant of innovation..
- Location generally does not matter much, except for product innovation



2.2.1. Panel Data

- 232 establishments were interviewed both in 2015 SIA and 2009 SIA conducted by DOST.
- There was a reduction in innovative behavior, especially in process innovation, and wider forms of innovation.

Proportion of establishments		2009			2015	
that are:	MSME	Large	All firms	MSME	Large	All firms
Innovation active	55.6%	66.1%	60.8%	46.2%	58.3%	52.2%
Product innovators	34.2%	47.8%	40.9%	34.2%	41.7%	37.9%
Process innovators	42.7%	56.5%	49.6%	34.2%	44.3%	39.2%
Organizational innovators	60.7%	72.2%	66.4%	42.7%	53.9%	48.3%
Marketing innovators	56.4%	48.7%	52.6%	43.6%	31.3%	37.5%



2009 size		2015 size						
	Micro	Small	Medium	Large	All firms			
Micro	46	4	0	3	53			
Small	2	9	5	2	18			
Medium	3	10	22	11	46			
Large	2	4	10	99	115			
All firms	53	27	37	115	232			



While 25 out of 232 firms observed upward movements in employment size, 15 MSMEs and 16 large firms had significant downward movements in the two periods.

Changes in employment size of firms would suggest that capacities to innovate for these firms would also change.



The reduction in innovation behavior in 2015 compared to 2009 was most severe in the BPO industry with organizational innovation experiencing the biggest decline.

Innovation active -2.7% -10.0% -9.6% -23.5% -8. Product innovators 6.8% -6.3% 0.0% -29.5% -3. Process innovators -5.4% -10.9% -9.7% -29.5% -10.	ms
Product innovators 6.8% -6.3% 0.0% -29.5% -3. Process innovators -5.4% -10.9% -9.7% -29.5% -10.	3.6%
Process innovators -5.4% -10.9% -9.7% -29.5% -10.	3.0%
).4%
Organizational innovators -13.5% -14.5% -22.6% -53.0% -18.	3.1%
Marketing innovators -6.7% -14.6% -25.8% -35.3% -15.	5.1%



Panel Regression Results

Variable	Innovation	Product	Process	Organizational	Marketing
	Active	Innovator	Innovator	Innovator	Innovator
Age	+	+	+	+	-
employment size (in					
logarithm form)	+**	+	+**	-	+
geographic market is					
solely local market	+	-	+	+	+
share of foreign capital					
participation	+	+	+	+	+**
share of female					
employment	+	+	-	-	+
firm in PEZA (or not)	+	+	+	-	-

* = significant at 0.10; **= significant at 0.05 level; ***=significant at 0.01 level



Panel Regression Results

Variable	Innovation	Product	Process	Organizational	Marketing
	Active	Innovator	Innovator	Innovator	Innovator
industry group					
Food Manufacturing	+**	+**	+**	+	+
Other Manufacturing	+	+	+	-	+
ICT and BPO	+	+	+	+	-
BPO	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
knowledge					
management	+***	+***	+***	+***	+***
constant	***	***	***	-	-

* = significant at 0.10; **= significant at 0.05 level; ***=significant at 0.01 level



Summary of Panel Regression Results

- The size of the establishment is a significant determinant of being innovation active, specifically for process innovation.
- Firms in food manufacturing would more likely be innovation active, product innovators or process innovators than in other sectors, ceteris paribus.
- Foreign share of capital participation is marginally significant in explaining marketing innovation behavior.
- Knowledge management is a good determinant of innovation behavior of panel firms whether for innovation active, process, product, organizational, or marketing innovators, just like the cross-section results of 2015 SIA.



2.3. Effects and Sources of Innovation

- Effects of innovation are mainly customer-driven.
- Product oriented effects (about 30-40%) are more often highly rated than process related effects (about 20-30%).
 - Half of MSMEs in Food Manufacturing highly cited increased range of goods/services;
 - Half of firms in Other Manufacturing highly considered the effect of product on improved quality of goods or service;
 - Half of MSMEs in ICT and four-fifths of large firms in BPO sector highly rated all product innovation effect; and
 - BPO firms often cited process effects of improved flexibility and increased capacity of production/service provision.



2.3. Effects and Sources of Innovation

Information source rated with "high" importance					Large	All Firms	
1.	Internal	a.	Within your establishment or enterprise	9.1	32.3	10.2]
2.	Market	a.	Suppliers of equipment, materials, components,	7.5	16.1	7.9	
	source		or software				
		b.	Clients or customer	14.1	19.8	14.3	
		C.	Competitors or other enterprise in your sector	8.7	9.0	8.7	
		d.	Consultants, commercial laboratories, or private	3.5	6.7	3.6	
			R&D institutes				
3.	Institutional	a.	Universities or other higher education institutions	1.9	3.7	1.9	
	source	b.	Government or public research institutes	1.1	2.6	1.2	
4.	Other source	a.	Conferences, trade fairs, exhibitions	5.9	10.8	6.2	
		b.	Scientific journals and trade/technical publications	2.0	7.1	2.2	
		с.	Professional and industry associations	3.5	8.7	3.8	

Clients and internal sources are regarded as highly important as sources of information on innovation. MSMEs regard customers most at 14.1% while a third of large firms relies heavily on information within the enterprise.



2.4. Cooperation Partners on Innovation



Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies

Nearly **half** of innovation active firms are engaged in innovation cooperation with other establishments or non-commercial institutions. BPO **MSMEs** cooperated most (88.2%)



2.4. Cooperation Partners on Innovation

	Type of Cooperation Partner	РН	Other ASEAN	All Other Countries	All Countries			
	Other establishments within enterprise	86.6	2.2	9.5	89.8			Most
	Suppliers of equipment, materials,	80.6	10.1	21.8	93.2			Frequent
	components, or software					_ 1		Partners
	Clients or customers in private sector	78.1	2.3	8.5	85.2		L	
	Clients or customers in public sector	69.5	0.0	2.5	71.3			
	Competitors or other estab w/in sector	74.2	0.9	5.4	78.9			
	Consultants, commercial laboratories, or	67.2	0.0	2.9	68.8			
_	private R&D institutes						ſ	Least
	Universities/higher education institutions	63.5	0.0	0.6	63.7			Frequent
	Government or public research institutes	60.2	0.0	1.0	60.4			Partners

Among innovation active collaborators, most had agreements at a national level, and firms were least likely to cooperate on an 'other ASEAN' level.



2.5. Barriers to Innovation



About three in twenty firms had some abandoned or delayed innovation projects, especially among large establishments.

Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies



2.5. Barriers to Innovation

- Cost factors most common issue identified by firms as significant hindrance to innovation.
 - One-fourth of MSMEs , and innovative large firms considered direct costs of innovation being too high
 - About one in every five MSMEs, and innovative large firms cited lack of funds
- One in five firms, especially among MSMEs, also reported knowledge factors or market factors as barriers to innovation.
 - More than 10% cited lack of qualified personnel as well as difficulty in finding cooperation partners for innovation and uncertain demand for innovative goods/services
 - 16.6% of MSMEs reported market being dominated by established enterprises as a barrier to innovation



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- > Overall, only 3.1% of firms availed public financial support.
 - Highest proportion for large firms at 5.7%.
- One-fifths of firms were aware of government innovation policies: 46.6% of these firms availed of these interventions.
- Income tax holidays were most availed incentive, especially by large firms in BPO
 - Other very well availed support were also tax-related incentives (i.e., tax deduction, duty free importation, VAT exemption/credits)
 - In 2015, all financial incentives were roughly availed of by around 6-7% of firms, especially MSMEs.



Government Support Programs	MSME	Large	All firms	
R&D Funding	15.7	4.8	14.9	
Training	58.5	38.1	57.0	
Direct Subsidies	13.3	6.2	12.8	
Tax Deduction	42.2	32.5	41.5	
Tax Credits	30.4	28.5	30.3	
Tax Holidays	35.4	34.6	35.3	
Duty free importation	15.5	29.0	16.5	
Technical support/advice	25.9	8.1	24.6	
Infrastructure support	24.5	12.2	23.6	
Subsidized loans	27.0	8.7	25.7	
Loan Guarantees	27.4	7.4	25.9	
Others	4.5	0.0	4.2	

Top 3 Government Programs Regarded as "highly important"*

Training Tax deduction Tax holidays

*according to recipients of government support



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Proportion of MSMEs and Large Establishments by Registration at an Investment Promotion Agency (%).



Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies

Less than a third of firms are registered at an IPA. About a quarter of MSMEs are registered at either BOI, or PEZA or both; for large firms, as much 70.5% are registered with PEZA, 9.2% with BOI, and 3.4% with both.



Proportion of Firms by suggestion on how govt can foster innovation (%)



Source: 2015 Survey of Innovation Activities, Philippine Institute for Development Studies

- While about two-fifths (41.8%) did not provide specific suggestions, most firms, whether MSMEs (17.8%) or large firms (13.6%), suggested need for capacity building to encourage innovation.
- Next in rank were financial support and ease of doing business, respectively.



- Fostering innovation through education and training :
 - A better understanding of linkages between skills and innovation is needed. While higher levels of human capital are needed, simple "more-is-better" prescriptions may not achieve desired outcomes
- Targeting assistance to MSMEs : MSMEs need to be supported to become larger-sized, more productive firms.
- Strengthening linkages between knowledge producers and users:

Govt needs to promote free exchange of ideas and flow of knowledge from outside companies while large firms need to cooperate for innovation.

Decline in innovation in BPO sector as cause for concern: PH must continue to expand its market share while moving up the global value chain through more complex and higher value services.



- Harnessing government procurement as a catalyst for innovation.
 - Given volume and range of public sector needs as well as current initiative to 'right size' govt (HB 5707), the potential of govt procurement as a tool to spur innovation should not be ignored.

Recognizing role of regulatory frameworks in promoting or inhibiting innovation

Regulators and legislators have to examine extent to which regulations are barriers to innovation, and encouraging monopolistic positions in a market (e.g., current regulatory scrutiny for Uber).

>Adopting a whole of government approach

Govt needs to work with academic and business sectors to advocate for innovation, providing more leadership, bringing people and institutions together.



ROLE OF GOVERNMENT AS GARDENER

- "prepares the ground" (i.e. building up the human resources needed to drive innovation forward);
- "fertilizes the soil" (i.e. boosting Research and Development and access to most up-to-date-information);
- "waters the plant" (i.e., assists innovators by providing financial support and other measures to incentivize innovation); and
- "" "removes weeds and pests" (i.e., removes regulatory, institutional, or competitive obstacles to innovation).



Innovation Ecosystem in Developing Countries



Source: World Bank (2010)

CAUTION THAT FOSTERING INNOVATION IS COMPLEX

Returns to R&D Trace an Inverted U-Shape across the Dev't Process



Note: Graph uses guinguennials of cross-country data from 1960 to 2010 to estimate the rates of return to research ment (R&D) across the development process: 0 is the frontier, and moving left represents progressively less developed

- ROI on Innovation/R&D Spending rate of return begins to fall and may even be negative for quite poor countries
- Explanation: when countries are far from the technological frontier, the potential gains from "catch-up" increases but when stock of complementarity factors (human capital, firm and management capabilities, financial markets) are missing, returns will be low **SOURCE: Innovation Paradox**



3.1. Legislative Agenda

- Key legislative measures currently being considered independently in both the House of Representatives and the Senate to spur innovation.
 - A Senate bill, called the Philippine Innovation Act, has been passed this May 2017 which provides for the establishment of a National Innovation Council (NIC) headed by the President and the NEDA DG, with members including several cabinet ministers, researchers, and private sector representatives. NIC to be given 1B PHP budget.
 - House Bill (HB) 4581, also called the "Science for Change Program (S4CP) Act, increases R&D budgets from 5.8B PHP to 21B PHP, more or less doubling yearly over the next five-year period to reach 672 B PHP by 2022.



3.2. Final Words

- Innovation investments broader than support for S&T, R&D
 Government support must be focused on:
 - removing barriers/bottlenecks to innovations in regulatory frameworks;
 - providing meaningful and impactful support to innovators (esp MSMEs);
 - investing in required technology, research infra, and R&D researchers
 - instituting reforms in education, investment climate and trade
- A national innovation framework and plan of action is required to facilitate interactions of players in innovation ecosystems
- Important to regularly monitor the extent of innovation activities to manage innovation ecosystem



Philippine Institute for Development Studies Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas

Service through policy research

PIDS Discussion Paper 2017-28 on "Measuring and Examining Innovation in Philippine Business and Industry"

Thank you!



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