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Innovation practices at Vietnamese manufacturers: the impacts of innovation on profitability and growth

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Abstract

In an effort of the Vietnamese government to improve the country's innovativeness, the Ministry of Science and Technology (MOST) carried out a research to investigate Vietnamese companies' current state of innovation. Data of 510 manufacturers used in this paper was extracted from the survey campaign by the MOST. Via statistical analysis, findings indicated that only a humble share of Vietnamese companies is currently performing innovative activities. These firms invest the most on new technology. When it comes to the relationship between innovative performance and firm performance, significant regressive relationships have been found yet, the results are dissimilar across industries. Besides, innovative performance displayed mixed effects on performance, which seems to confirm previous literatures' diverse receptions about this topic.

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1. Introduction

Along its consistent economic development over the last decades, Vietnam has been witnessing improvements on various aspects, and innovation index was among those. In 2017, Vietnam was ranked 47 and 10 out of 127 countries respectively in the global innovation index (GII) and innovation efficiency (Global Innovation Index 2017 Report 2017) – a satisfying result for the country, given that it was at 76th position in GII 2013. Vietnam was also among the top performers compared to countries at similar income level, and ranked 9th in Asia in GII. The Vietnamese government is taking further measures to continue advancing the country's innovation practices as innovation is agreed to be vital for the expansion of any economy (Silva et al. 2017). The Ministry of Science and Technology (MOST) of Vietnam has been tasked with coordinating efforts. Extensive collaborations with the World Intellectual Property Organization (WIPO) have been held to address national issues in terms of innovation. Yet, while much has been discussed about macro environmental factors, investigations on the innovation practices of Vietnamese companies themselves are limited.

This paper aims to study the very activities that Vietnamese companies are performing to achieve their innovative outcomes. More importantly, in order to understand the impacts of such outcomes, relationship between them and the firms' key performance indicators namely profitability and growth was examined.

2. Literature Review

In one of the early studies on innovation, Burns and Stalker (1961) described innovation as a set of responses to new conditions and changes, or simply advancement efforts during stability. Utterback and Abernathy (1975) proposed product innovation and process innovation as the two common categories of firms' innovation. In a later paper, Kline and Rosenberg (1986) characterized innovation as a multi-dimensional terms covering a variety of activities. It could be new products, new process, new technologies, new designs, new systems, new markets, new means and methods of conducting different aspects of business (Kickul & Gundry 2002). The OECD (2005) coined four distinctive types of innovation namely product innovation, process innovation, marketing innovation and organizational innovation. Jiménez and Sanz-Valle (2011) claimed that there had been numerous ways to conceptualize innovation yet, the most fundamental component across all the existing definition in literature is that innovation involves new ideas or behavior.

A summary by Cohen and Levinthal (1990) suggested that the knowledge fueling innovative activities tends to come from borrowed external sources instead of organic inventions; emphasizing the critical role of firms' ability to absorb knowledge. Calantone et al. (2002) and Cavusgil et al. (2003) came to the same conclusions, suggesting that organizational learning is the key enabler for firm innovativeness, and boosting firm performance consequently. Adding to this same domain, Schilling and Phelps (2007) found that firms which are members of high clustering and high reach alliance networks have higher likelihood of better innovation performance due to the greater amount of accessible information. This reinforces the importance of knowledge when it comes to firms' innovation. On the other hand, looking at the inside of firms, Lin (2007) believed human resources play another key part in facilitating the knowledge-sharing processes within an organization, thus enabling better innovation capability.

Throughout literature, the role of innovation is almost unquestionable for firms' survival and competitiveness. It is not a challenge to find authors such as Thornhill (2006), who discovered a strong and positive relationship between innovation and firms' performance;

not only do firms' profitability but also growth rate are improved thanks to investments in innovation. Nonetheless, Simpson et al. (2006) pointed out that innovation is not always the most desirable path, as it requires a great deal of caution for all the possible risks and costs that come along with the changes it brings. This clearly implies that not all firms would experience the expected return from innovation as many studies have suggested; especially those with limited marketing competences, limited financial resources, or have had a record of being resistant to change. In fact, a number of studies have casted findings of innovation's inconsistent impacts. Studies by Wright et al. (2005), Mansury and Love (2008), Damanpour et al. (2009), Fritsch and Meschede (2001) have indicated that different types of innovation impacts firms differently; the impacts also varies across different environments, industries; features such as size would also moderates firms' innovation practices; firms embracing innovations may gain positive outcomes in some aspects yet, no or even detrimental outcomes in some others. It is fair to say that, while the relationship between innovation and performance is not entirely certain, what certain is the need to continue investigating this relationship in different settings.

This study examines the situations of manufacturers in Vietnam, an emerging economy with characteristics unlike those of developed countries where a large proportion of innovation studies sampled. Innovative performance – the immediate outcomes of innovative activities consisting of various indicators such as quantity of new products and processes (Tuan et al. 2016; Hagedoorn & Cloodt 2003) – is the object of this study. Besides the two most common streams i.e. product and process innovation, technology innovation and personnel innovation also added, since adopting new technologies has always been essential for innovation (Feldman & Florida 1994; Dushnitsky & Lenox 2005), especially when it comes to firms in developing countries; and human resources were said to be the facilitator for transferring knowledge – the fuel of firms' innovation (Lin 2007). Figure 1 shows the proposed analytical framework.

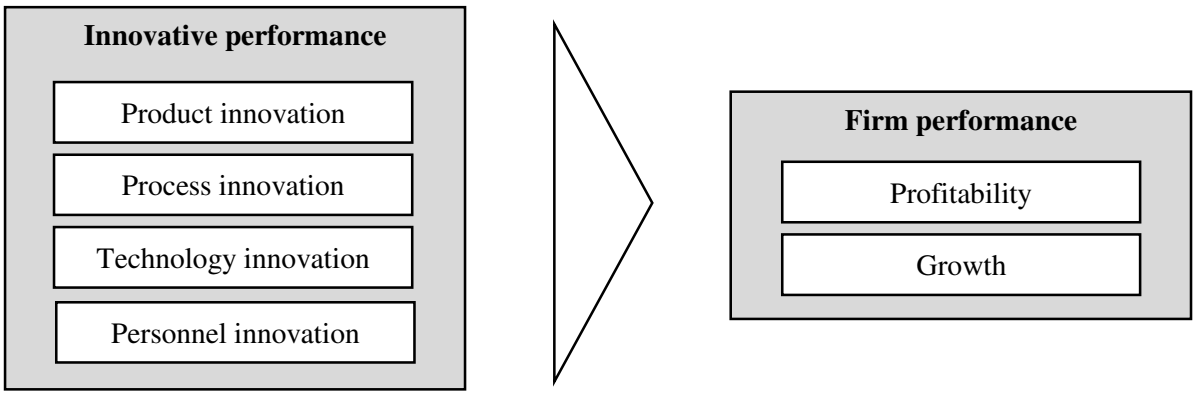

Figure 1. Analytical framework
Source: Authors' proposal based on literature review

Given this framework, the authors formulated the two following hypotheses based on what have been understood from theories and practices of firm's innovation.

H1: Firms' innovative performance have significant impacts on profitability
H2: Firms' innovative performance have significant impacts on growth

In addition, practices regarding how Vietnamese manufacturers are adopting different innovative activities and their investments in those are also examined. The findings are expected to enrich the current understanding of innovation practices with focus on the relationship between innovation and firm performance.

3. Data collection

The Vietnamese government issued Decision no. 677/QĐ-TTg on 10/05/2011 regarding the Program of National Technology and Innovation until year 2020. Within this program, the Ministry of Science and Technology (MOST) had a mission to survey the current practices of technology and innovation among the Vietnamese companies of which, the data collection of this study was a part. MOST employed the frameworks and guidance from the Oslo Manual (OECD 2015) to collect data on Vietnamese firms' innovation practices during the 2013 – 2015 period.

There are approximately 200,000 manufacturers in Vietnam. The surveys were sent to a sample of 1000 companies of which 821 replied. Firms were selected based on their locations from five major cities and provinces of Vietnam; of small (10 - 200 employees), medium (200 - 300 employees) and large size (more than 300 employees); they are private, foreign-invested and state-owned enterprises, operating in 8 different industries. Since January 2016, survey was constructed and sent for data collection. By December 2016, all collected responses were processed, standardized and refined by MOST. This study utilized a part of the database, taking year 2015 records of 510 firms operating in four industries due to their better data quality; the defective part of the database was filtered out.

From the original data, new scales were computed to create the innovative performance and firm performance variables.

Table I. Construction of scales.

Scales	Description	No. of questi-ons	Formula
Innovative Performance Scales			
Product innovation	Measures the degree to which firm's products are upgrade	2	No. of new product ÷ Total no. of products
Process innovation	Measures the degree to which firm's processes are improved	2	No. of new processes ÷ Total no. of processes
Technology innovation	Measures the degree to which firm's production lines are technologically renovated	2	No. of upgraded production lines ÷ Total no. of production lines
Personnel innovation	Measures the degree to which firm's personnel is dedicated to technological innovation	2	No. of personnel working in tech. innovation ÷ Total number of personnel
Firm Performance Scales			
Profitability	Measures based on financial data	2	Profit ÷ Revenue
Growth	Measures based on financial data	2	Average Growth rate

Source: Authors' summarization

Regarding the Innovative Performance scales, each were constructed to find out the innovative percentages within the company's total number of products, processes, technologies and personnel in 2015. Profitability scale was measured as year 2015 Profit divided by Revenue; Growth scale was measured by the average of company's revenue growth rate from year 2013 to 2015. Based on these scales, statistical analyses were performed to investigate the current practices of Vietnamese firms' innovation, testing the proposed hypotheses.

4. Data analysis

The 510 surveyed companies are categorized according to their type, size and industries:

- *Type*: 61% are private; 34% are foreign-invested; and 5% are state-owned;
- *Size*: 35% are small; 52% are medium; 13% are large;
- *Industry*: 47% works in ready-made metals manufacturing; 10% works in electronics manufacturing; 34% works in food processing; 9% works in transportation manufacturing.

When asked about the specific activities taken in terms of innovation, the sampled firms indicated their limited efforts as seen in Figure 2.

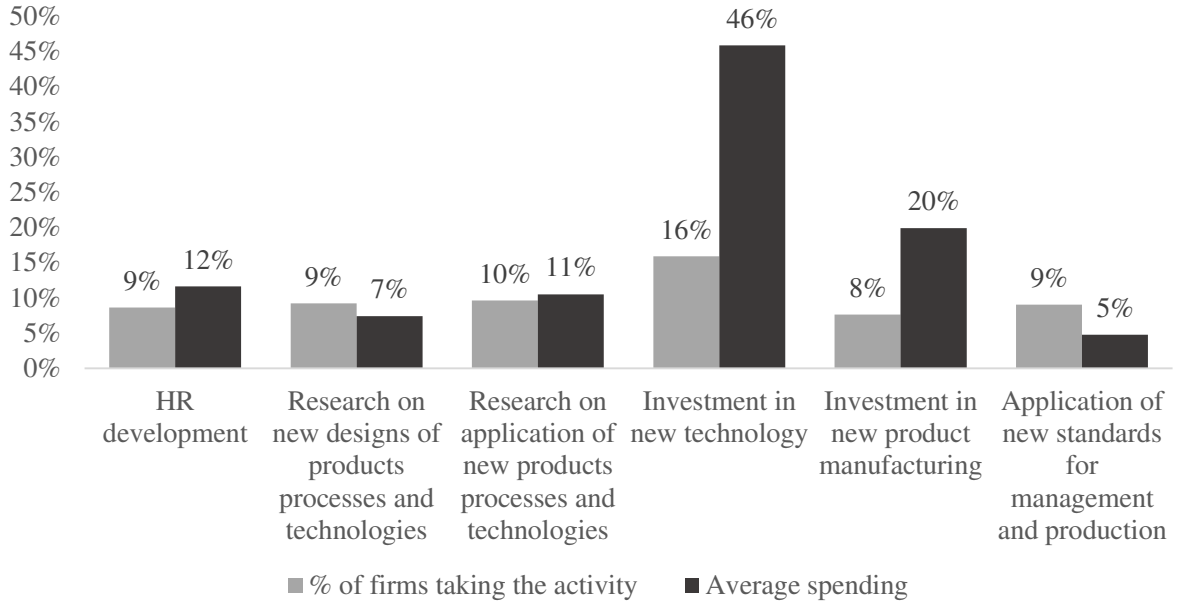

Figure 2. Innovative activities taken by sampled firms and their average spending
Source: Authors' calculation

Each of the innovative items received roughly one tenth of the firms' attention. Among them, Investment in new technology topped the list as being conducted by 16% of the firms while interestingly, Investment in new product manufacturing was the least taken at 8%. As Bertoni et al. (2014) suggested, innovation is heavily dependent on a firm's financial conditions, it is important to look at how companies allocate their financial resources to these innovative acitivities. Investment in new technology also was the most heavily spent activity by the firms, taking nearly half of their total innovation spending on this item. Coming second is surprisingly Investment in new product manufacturing at 20% of total innovation spending, despite the fact that the least number of firms conducted this activity. Application of new standards for management and production seems the least costly item, as surveyed firms spent a humble 5% on this activity.

Of the 510 surveyed firms, only 23% reported taking at least one innovation activity. The degree varied according to the firm size: only 9.7% of small firms reported innovation; while for medium and large firms, the figures are respectively 27.5% and 38.7%. According to Eurostat's (2017a) results on Community Innovation Survey (CIS), during year 2012-2014, roughly half of the investigated enterprises (in all sectors) in European Union reported

innovation activity. Among the EU countries, Germany (67.0%), Luxembourg (65.1%) and Belgium (64.2%) are the three top performers; while Hungary (25.6%), Poland (21.0%) and Romania (12.8%) are at the lowest positions. In Germany's CIS results for manufacturing enterprises: 37.7% reported product innovation (small-sized reported 31%; medium-sized reported 49%; large-sized reported 75%) and 24.2% reported process innovation (small-sized reported 19%; medium-sized reported 30%; large-sized reported 58%) in year 2014. Meanwhile in Vietnam only around 10% of the surveyed manufacturers reported having either product, process or technology innovation (small-sized reported 5%; medium-sized reported 14%; large-sized reported 23%) in 2015. Vietnam clearly have been performing poorly in terms of innovation activity. According to the Vietnamese Ministry of Finance (2018), a great many Vietnamese firms seriously lack innovative capability despite seeing innovating as an important mission. Interestingly, a vast majority of non-innovators in EU indicated that their inaction was because innovation was not seen necessary for them (Eurostat 2017b).

The correlation analysis between spending on different innovative activities and the innovative performance revealed clear linkages. In essence, firms' investments in all the innovative activities do yield returns to some extents. One observation is that investments in one field may correlate with seemingly non-related performance indicators. Table II gives further details on this matter.

Table II. Correlation between innovative activities spending and innovative performance.

		1. Product innovation	**2. Process innovation**	**3. Technology innovation**	**4. Personnel innovation**
HR development	Pearson Correlation	.193	.164	,057	.171
	Sig. (2-tailed)	,000	,000	,198	,000
Research on new designs of products processes and technologies	Pearson Correlation	.154	.150	.105	.117
	Sig. (2-tailed)	,001	,001	,018	,008
Research on application of new products processes and technologies	Pearson Correlation	.112	,043	.162	.137
	Sig. (2-tailed)	,011	,335	,000	,002
Investment in new technology	Pearson Correlation	.218	.273	.270	.103
	Sig. (2-tailed)	,000	,000	,000	,020
Investment in new product manufacturing	Pearson Correlation	.248	.263	.304	.185
	Sig. (2-tailed)	,000	,000	,000	,000
Application of new standards for management and production	Pearson Correlation	.087	,037	,020	,055
	Sig. (2-tailed)	,050	,401	,648	,217

Source: Authors' calculation

An interesting finding is that the strongest links are between two spending items: 1) Investment in new technology and 2) Investment in new product manufacturing and the four innovative performance. This could be due to the fact that average spending on these two items are much higher than the others; or the two are indeed effective in yielding innovative returns so that firms tend to spend more on them.

In the next step, regression tests were conducted to examine how innovative performance impacts firm performances. However, the models' results were not statistically meaningful (Sig. > 0.05). Output then was split according to the firms' industries within which,

results show significant regressive relationship between the variables. The statistically meaningful outcomes are presented in Table III and IV.

Table III. Impacts of innovative performance on firm's profitability by industries.

Industry	Adj. R Square	ANOVA		Regression Analysis			Collinearity Stats.	
		F	Sig.	Independent Variables	Beta	Sig.	Tolerance	VIF
Food processing (N = 176)	.034	2.55	.041	Product inn.	-.122	.167	.717	1.394
				Process inn.	.282	.004	.585	1.710
				Technology inn.	-.019	.832	.675	1.481
				Personnel inn.	-.037	.621	.969	1.032
Transport-ation manufactu-ring (N = 44)	.399	8.13	.000	Product inn.	.687	.008	.230	4.353
				Process inn.	-.648	.012	.232	4.310
				Technology inn.	.693	.000	.785	1.274
				Personnel inn.	-.312	.027	.760	1.316

Source: Authors' calculation

When it comes to the regressive relationship between innovative performance and firm's profitability, only two industries indicated statistically meaningful models: Food processing and Transportation manufacturing at p value respectively .041 and .000. In the regression model of food processing companies, Adjusted R Square valued at .034 showed that only 3.4% of a firm's profitability in this industry can be predicted by innovative performance variables. Besides, of the four innovative performance variables, only Process innovation shows significant impacts on firm's profitability. The Collinearity statistics shows no sign of multicollinearity in the model of food processing companies.

On the other hand, the regression model of Transportation manufacturing industry showed strong relationships between the variables. Adjusted R Square at moderate level of .399 indicates that the innovative performance variables can predict nearly 40% of firm's profitability variation. All the four innovative performance variables displayed significant impacts on the dependent variable. Nonetheless, interesting remarks came along: only Product innovation and Technology innovation are positively impacting firm's profitability; while Process innovation and Personnel innovation move in the opposite direction. It means that when firms in Transportation manufacturing industry conduct innovative activities, their higher their performance in production innovation and technology innovation lead to better profitability yet, their higher performance in process innovation and personnel innovation negatively impact profitability. These results confirmed Hypothesis 1 to a complex extent.

The next regression analysis is between the four innovative performance variables and firm's growth rate. Interestingly, statistically meaningful models were found only among the two other industries: Ready-made metals manufacturing and Electronics manufacturing.

Table IV. Impacts of innovative performance on firm's growth by industries.

Industry	Adj. R Square	ANOVA		Regression Analysis			Collinearity Stats.	
		F	Sig.	Independent Variables	Beta	Sig.	Tolerance	VIF
Ready-made metals	.205	16.32	.000	Product inn.	.020	.819	.455	2.198
				Process inn.	.430	.000	.470	2.128
				Technology inn.	.071	.279	.771	1.297

manufactu-ring (N = 239)				Personnel inn.	-.163	.008	.910	1.099
Electronics manufactu-ring (N = 51)	.427	10.33	.000	Product inn.	-.050	.744	.504	1.984
				Process inn.	.181	.413	.238	4.201
				Technology inn.	.789	.001	.257	3.895
				Personnel inn.	-.506	.001	.545	1.834

Source: Authors' calculation

The results of sampled firms in ready-made metals manufacturing yielded Adjusted R Square of .205 meaning that roughly 20.5% of firm growth variation can be predicted by the four innovative performance variables. Among those, only Process innovation and Personnel innovation significantly impact growth. However, unlike Process innovation which positively influence, Personnel innovation impacts growth negatively. No sign of multicollinearity was found in this model.

In terms of regression analysis for companies in Electronics manufacturing, the model indicated strong statistical meaning at p value of .000 and Adjusted R Square of .427, meaning innovative performance could predict 42% of company's growth movements. However, only two innovative performance variables showed significant impacts on growth. More specifically, Technology innovation displayed strong positive impacts, while Personnel innovation again had negative impacts on growth. It means for firms in these two industries, the more personnel working in innovation activities, the poorer their growths. Thus, similar to Hypothesis 1, the second hypothesis was also confirmed yet, to a complex extent.

One important remark from both Table 3 and 4 is that the VIF values (at approximately 4) of Transportation manufacturing and Electronics manufacturing results demonstrated possibility that there may have been multicollinearity effects among the independent variables. However, a study by Hair et al. (1995) suggested that 10 should be used as the maximum threshold for acceptable VIF value. Kock and Lynn (2012), in an extensive review, found that the most common thresholds being proposed throughout literature are 10, 5 and 3.3. In a recent work, Ringle et al. (2015) advised 5 as a tolerable threshold for VIF value. Though not absolutely without the risks of collinearity when VIF values are above 3.3, the results of this study can be considered adequately trustworthy.

5. Findings and Conclusion

The investigation of current innovation practices from the data sample of 510 companies collected by the Vietnamese Ministry of Science and Technology has yielded interesting results. It was found that innovative activities are still limited within the surveyed firms. Results displayed Vietnamese manufacturers' poor innovation performance compared to their European counterparts. On the other hand, the companies seems to focus the most on Technology investment and spend slightly less than half their innovation budget on this activity. The other large spending is on new product manufacturing. This two items of spending also have the strongest correlation to the innovative performance outcomes of the companies. This suggests that though companies are not yet fully focusing on innovative activities, their investments in the items have been showing positive results.

When it comes to testing the two hypotheses to explore whether innovative performance have significant impacts on firms profitability and growth, results were mixed and complex. Yet, this is generally expectable as the links between innovative activities and firm's financial performance are not direct and immediate. There could be intermediaries namely accumulated

know-hows, efficiency and productivities (Hashi & Stojčić 2013). It is however, still useful to see the current practices of innovation-performance relationships within the Vietnamese manufacturers. The key findings of this study are summarized in Table V.

Table V. Impacts of innovative performance on firm performance by industries.

	Impacts on Profitability		**Impacts on Growth**	
	Food processing	Transportation manufacturing	Ready-made metals manufacturing	Electronics manufacturing
Product innovation		**Positive**		
Process innovation	**Positive**	*Negative*	**Positive**	
Technology innovation		**Positive**		**Positive**
Personnel innovation		*Negative*	*Negative*	*Negative*

Source: Authors' summarization

Though there have been minor signs of multicollinearity in the regression analysis, outcomes are under acceptable threshold. The Table displayed that all innovative performance dimensions had impacts on firm performance however, impacts could be both positive and negative. Product innovation has positive impacts on firm profitability only in Transportation manufacturing industry. Technology innovation has positive on both profitability and growth yet, also industry-dependent: for Transportation manufacturing industry and Electronics manufacturing industry respectively. Note that Technology innovation has very strong positive impact on growth when it comes to Electronics manufacturing industry. It seems that management should pay better attention to firms' performance in terms of product and technology innovation. In fact, investments in new technology and new product manufacturing have been the most significant as mentioned. It could also be that the two items yielded positive results because of their more significant investments. This assumption would need further research with a different set of data to clarify.

Process innovation also has positive impacts on profitability in Food processing industry, and positive impacts on growth in Ready-made metals manufacturing industry. However, Process innovation has negative impacts on profitability in Transportation manufacturing industry. The focus on Process innovation outcomes thus, need caution from firms. Personnel innovation is shown to have Negative impacts on both profitability and growth of firms in three out of four industries – beside food processing industry with not impacts. The number of people working in innovation is thus, advised to be reviewed and revised by companies as they might hurt firm performance.

The results indicating mixed impacts that innovative performance has on firm performance implied that either innovation might not have been working to its full effects in Vietnam, or Vietnamese companies have not been fully exploiting the advantages of innovation. However, these outcomes, to certain extent, have been in line with authors such as Wright et al. (2005), Mansury and Love (2008), Damanpour et al. (2009), Fritsch and Meschede (2001), whose findings also showed the mixed and complex effects of innovation. It can be concluded that innovation should still be employed with caution, and further examinations are still well in need, especially in emerging countries like Vietnam, where companies are on various levels of innovation.

This study does come with certain limitations. First, the lack of standardization in defining how much innovativeness a product, process and technology needs in order to be considered "new" may distort respondents' answers when counting the number of new products, processes and technologies. Second, due to the fact that data collection was done on large scale, control over data quality might have been imperfect. Third, the construction of innovative performance variables has been based on purely numerical data as percentage calculation rather than a different type of measurement which could exhibit the depth and quality of innovation. Last but not least, even though VIF values are within the acceptable thresholds, risks of multicollinearity are still probable, impacting the trustworthiness of the study's outcomes. Therefore, it is recommended that future research take into account these limitations to have better designs on data collection and employ further technique to resolve the multicollinearity-related issues.

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