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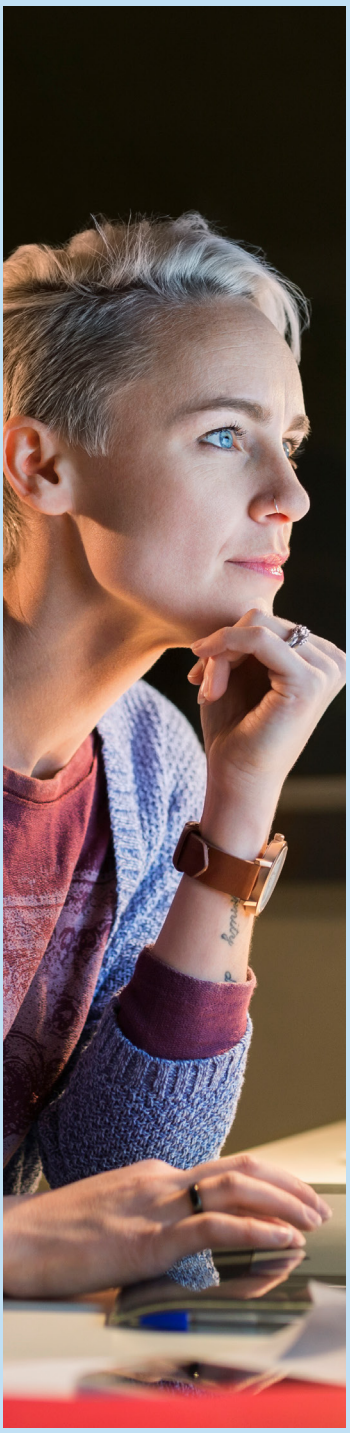

GETTING A HANDLE ON SUPPLIER RISK IN PROCUREMENT

Abstract

With organizations increasingly adopting lean supply chains to remain competitive, the resulting heightened risk factors make effective supplier risk management imperative and unavoidable. This paper discusses an effective approach to assess, monitor, and contain supplier risk using a forecasting model.

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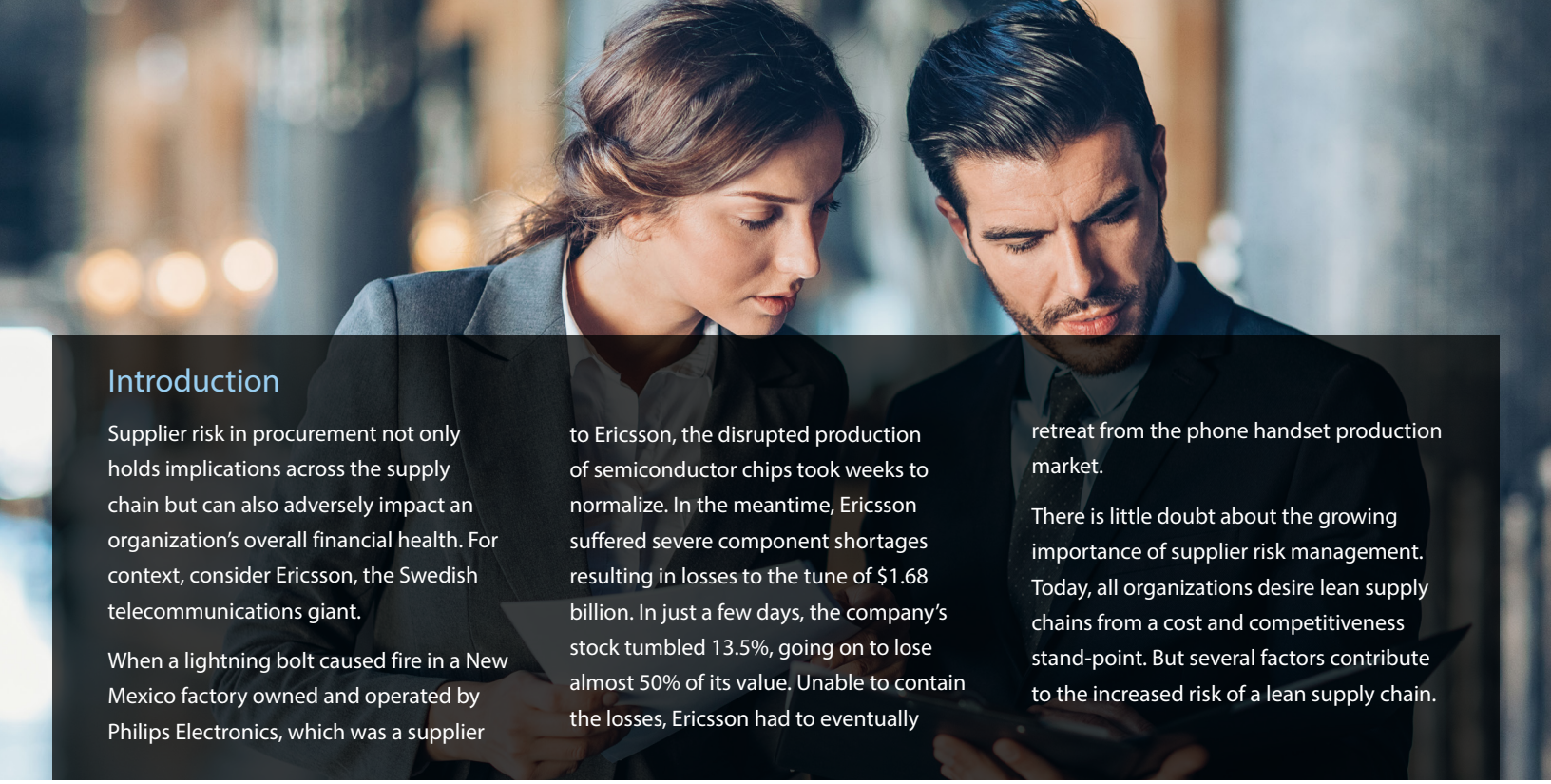
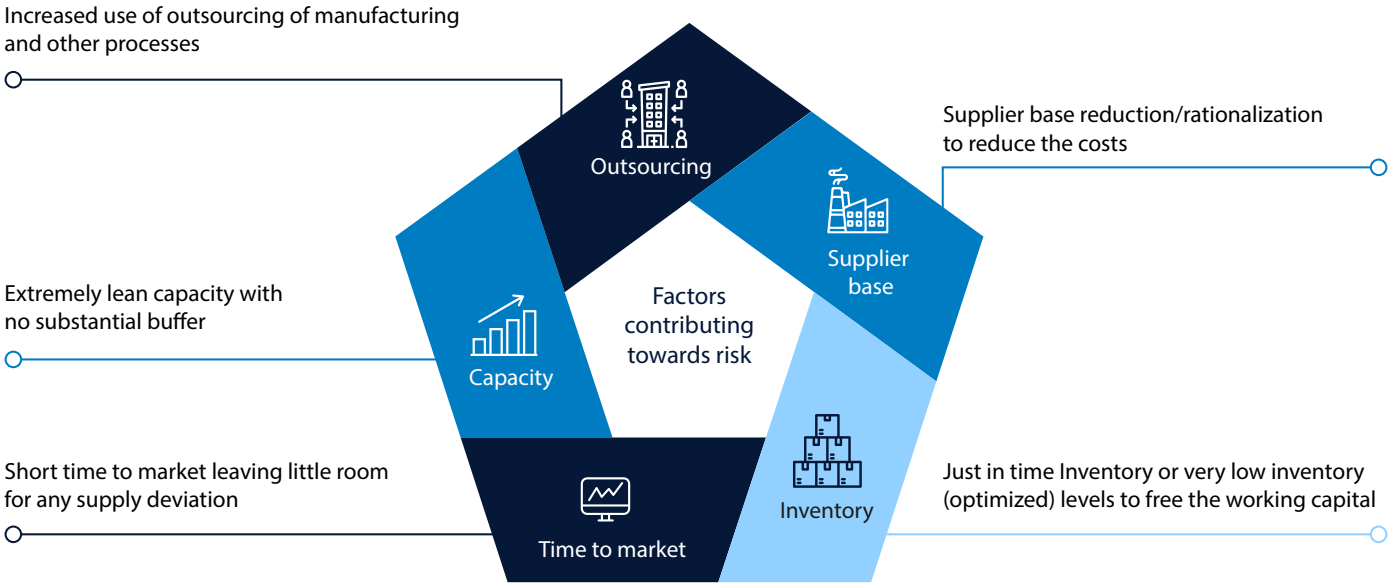


Introduction

Supplier risk in procurement not only holds implications across the supply chain but can also adversely impact an organization's overall financial health. For context, consider Ericsson, the Swedish telecommunications giant.

When a lightning bolt caused fire in a New Mexico factory owned and operated by Philips Electronics, which was a supplier to Ericsson, the disrupted production of semiconductor chips took weeks to normalize. In the meantime, Ericsson suffered severe component shortages resulting in losses to the tune of $1.68 billion. In just a few days, the company's stock tumbled 13.5%, going on to lose almost 50% of its value. Unable to contain the losses, Ericsson had to eventually retreat from the phone handset production market.

There is little doubt about the growing importance of supplier risk management. Today, all organizations desire lean supply chains from a cost and competitiveness stand-point. But several factors contribute to the increased risk of a lean supply chain.



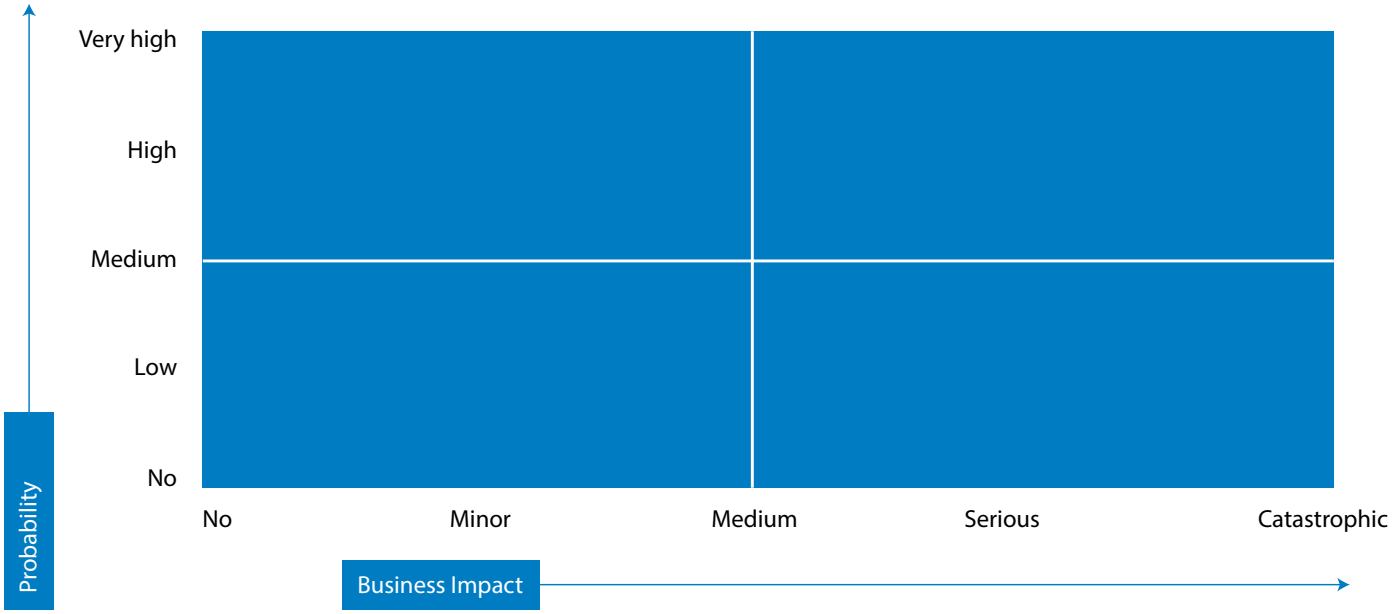
Factors contributing to increased supplier risk

Challenges in risk assessment

Risk can be defined as a quantitative measure of a hazard occurring. It therefore combines the probability of the occurrence of event(s) with the severity of its/their consequence(s). However, there are challenges to assessing risk.

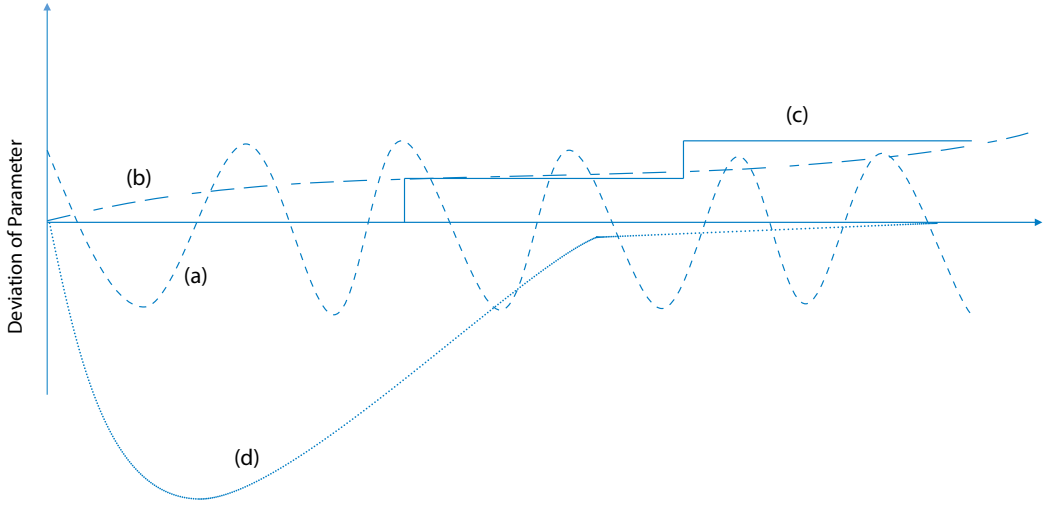
The probability trap

The probabilistic nature of risk makes it difficult to objectively quantify. A generally followed approach is to first assess the risk factor and then quantify it by assigning its probability of occurrence and severity of impact. However, a major drawback is the assignment of the probability factor, since it does not lend itself to dynamic calculations and because it involves some amount of personal bias. The financially quantifiable business impact however is more reliable as a factor.



Uncertainty profiles

Another approach is to identify the triggers which will impact important parameters to deviate beyond the normal. For example, one parameter can be quality deterioration and the trigger might be a supplier sub-contracting its processes thereby impacting supply quality. Though a good approach, the complexity lies in correctly identifying the potential trigger and then trying to predict if it will follow a disruptive path.



Different deviation profiles after potential trigger

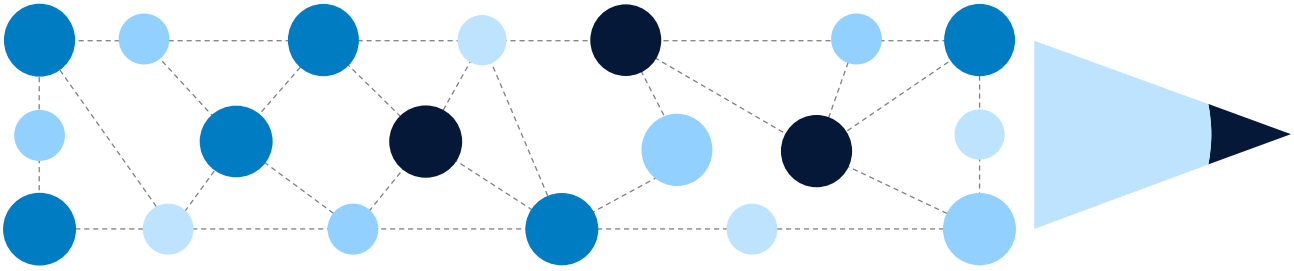
A potential trigger becomes disruptive if it causes an important parameter to deviate beyond normal. In the figure, (a), (b), and (c) are potential triggers as these triggers do cause parameter deviations but not significantly enough to disrupt the overall process. However, (d) is disruptive because it causes an abnormal deviation in the parameter which will cause serious overall process disruptions.

Observing the characteristics of the parameter deviation caused by (d) we can notice rapid and significant deterioration, which takes some time to normalize. This is typical of a seriously disruptive event. In the other cases we see that the deviations are either cyclical or within limits even if they are not reversible.

But in summary, due to the interplay of various factors it becomes very challenging to forecast the effects of a potential trigger and predict if it will indeed become disruptive.

Suggested approach for risk management

Although there is periodic monitoring of suppliers (let's say every quarter to six months), there is still a need to assess the supplier from the perspective of risk right at the sourcing selection process itself. This will not only provide a robust input into the monitoring aspect (which we will discuss shortly) but also strengthen the whole process. As we discussed in the earlier section on challenges, it is difficult to quantify risk in an analytical model since traditionally risk has only been estimated. We can however forecast the supplier risk based on parameter data, so as to bring in some objectivity and improve the whole process through a combination of technology and human expertise.



Supplier Selection

There needs to be a framework of risk assessment during the supplier selection process itself

Supplier Monitoring

Once the Supplier is selected and on boarded, the most critical component is risk monitoring

Risk related parameters for supplier selection

01 Supplier and it's Sub
Evaluating the tiers of the supplier is important as the risk is higher with more supplier tiers

02 Capacity Management
Proven ability (at least for the past 3 years) to meet the capacity requirements with some buffer

03 Major Events
Supplier undergoing major changes such as factory expansion or relocation

04 Location
The supplier's location and associated political and environmental conditions

05 Financial Health
The listing status of the supplier and its current financial health

06 Dependence
The organization's dependence on the supplier and vice-versa

The risk parameters in the figure can be weighted and clubbed with an overall sourcing score and used for supplier selection. It is recommended to assign values to these parameters on a scale of 1-5 with 1 indicating no risk anticipated w.r.t. the parameter and 5 indicating the highest anticipated risk. For example, if a supplier location is prone to natural disasters then a risk score of 4 or 5 could be assigned to the location parameter. Similarly, in the case of a supplier caught up in an ongoing legal dispute, then parameter 3 (major event) could be assigned a higher risk score. Scoring guidelines for all the parameters would help make the process as objective as possible.

Supplier risk monitoring

From the viewpoint of a purchasing firm, the sources of supplier risk comprise unfavorable market developments, and suppliers' bankruptcy or operational failure. If for example, the market for a particular part is monopolized by a supplier with a large number of clients, the purchaser could be exposed to the supplier's opportunistic behavior, with its operations at risk of disruption. Therefore, the larger the number of suppliers, the lesser the purchasing firm's risk to its supply chain. However, even if there are multiple suppliers it may take considerable time and switching cost for delivery of the item from a new source. This would be particularly so if the item in question is technologically sophisticated and consequently requires extensive manufacturer–supplier collaboration. So, there is some risk associated with this scenario as well.

Variables in supplier risk

Although bankruptcy is the most critical source of supply chain risk (SCR), caused by mistaken decisions and unfavorable market developments, it is impractical to enumerate all its sources. Nevertheless, the final outcomes of mistakes in a firm's decisions and unfavorable market developments would eventually be reflected — after a time lag — in its financial indicators. This is why financial indicators are indispensable in estimating the risk of supplier bankruptcy. Financial indicators, however, are quite slow with varying time lags. They are also incomplete in manifesting the influence of non-financial variables on the risk of supplier bankruptcy. This suggests that operational failure should be introduced as a separate source of supplier risk; operational problems of suppliers, such as delivery delays, cost hikes, high failure rates, quality deterioration, and technological obsoleteness, will immediately pose a great risk to the purchasing firm.

Keeping this in mind, the list below details potential financial and non-financial variables which can be part of the risk model. However, the variables on this list which are significant for supplier risk can differ from organization to organization depending on their financial structure.

Classification	Variable	Description	Comments
Financial / Independent	EBITTA (A)	Earnings before Interest and Taxes to Total Assets	Taken from Income statement and Balance Sheet
Financial / Independent	COGS (B)	Cost of goods sold by Net sales	Taken from Income statement
Financial / Independent	STA (C)	Sales to Total Assets	Taken from Income statement and Balance sheet
Non-Financial / Independent	Technology (D)	Technology capability of suppliers	Scale of 1-5 and to be assessed by vendor managers in supply chain
Non-Financial / Independent	Quality (E)	Quality capability/Quality Initiatives	Scale of 1-5 depending upon the data captured by supplier performance team
Non-Financial / Independent	Delivery (F)	On-time delivery of Goods/ Services	Delivery data taken from ERP
Dependent	Supplier Risk (Y)		0 – Normal or anticipated less serious operational state

Risk forecast model specification

Considering the nature of the dependent variables, we select a logit model for forecasting the supplier risk (because of the nature of dependent variable supplier risk)

$Y = \alpha + AX1 + BX2 + CX3 + DX4 + EX5 + FX6$

Since we need Y to be between 0 and 1, we will need to transform the above equation

$P(Y = 1 | X) = e^{Y} / e^{Y} + 1$

$P = e^{Y} / e^{Y} + 1$

$P / 1\text{-}P \models e^{Y}$

In $(P / 1\text{-}P)$ [Log of Odds] = Y

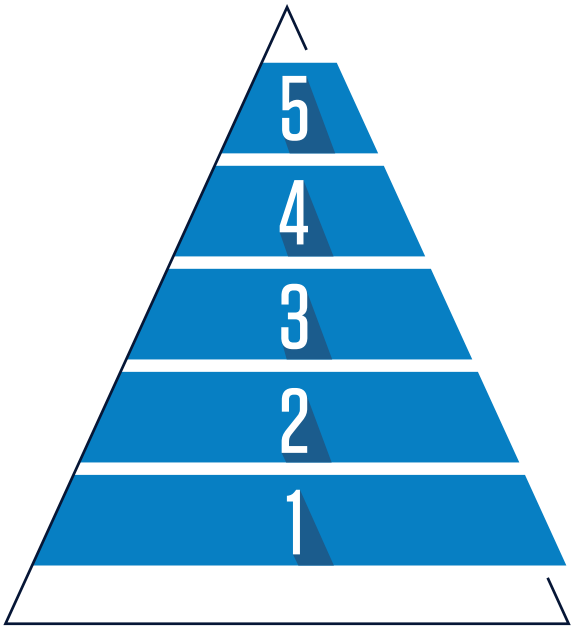
So, the interpretation is, a unit change in the input reflects a change in the odds ratio which is what we wanted.

Goodness of fit

To measure the goodness of the fit of selected variables, we need to check with historical test data to see if the selected variables indeed contributed towards identifying high-risk suppliers. The coefficients in the model will either be significantly positive or negative to provide an indication that the variables are good indicators of supplier risk. Depending on the outcome, we can modify the list of financial variables. As an example, FCFTA (free cash flow by total assets) might prove to be more significant than EBITTA. Although the above variables have been chosen after some analysis, each industry is different and so it makes sense to try a different set of financial variables and check their correlation for predicting supplier risk.

Steps for deployment

The following steps need to be undertaken to select and deploy the model.



Deploy Model

Deploy the model to forecast supplier risk.

Test Model

Test the model with the historical data to check the accuracy of the supplier risk prediction. Prepare a confusion matrix and make final adjustments as required.

Model Selection

Based on the test data, align the variables in the model. Select those Financial variables which are significant in risk prediction.

Model Verification

Test the model with historical data to check the accuracy of the supplier risk prediction. Prepare a confusion matrix and make final adjustments as required.

Collect Data

Collect data for Independent (Financial and non-Financial) and dependent (Supplier risk) variables.

Tying it all up together

Supplier risk being an unavoidable part of procurement, it is imperative to monitor at least the top 10% of your suppliers. Manual expertise within the organization as well as a robust technology solution to help model and forecast supplier risk will go a long way towards managing the risks involved in keeping your supply chain proactive and competitive.

Author

Saurabh Malhotra – *Principal Consultant, Digital Transformation Services, Infosys BPM*

Saurabh has over 13 years of experience which is a mix of Consulting and hands-on Procurement experience. During his consulting experience, he has worked with a range of clients spanning industry verticals like manufacturing, FMCG, mining and telecom. He has led several business transformation engagements in his career to deliver significant value to the clients. Recently, his work has been focused on Digital transformation in the procurement space where he is engaged to offer digital solutions to clients in the areas of analytics, automation and artificial intelligence.

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