

## **Global Sourcing: lessons from lean companies to improve supply chain performances**

**Alberto Portioli Staudacher<sup>1</sup>, Marco Tantardini<sup>1</sup>**

<sup>1</sup> Department of Management, Economics and Industrial Engineering. Politecnico di Milano. Piazza Leonardo da Vinci, 32. 20133 Milano, Italy. alberto.portioli@polimi.it, marco.tantardini@polimi.it

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### **Abstract**

*In recent years European companies are facing the most important competitive challenge since the second world war. The competition forces companies to increase technology innovation, but also to exploit the managerial and organizational innovation. Two main managerial approaches have emerged in the last years. The first one is the Lean Approach, which aims at improving performances by eliminating wastes and non value added activities. The second one is the Global Sourcing, which aims at exploiting the global arena to take advantages from the purchasing lever. Several companies are trying to improve their competitiveness by implementing both Lean Approach and Global Sourcing. But the two approaches seems not to be fully consistent, since Global Sourcing often implies purchasing large quantities from far away producers, and this increases stocks, exposes companies to an higher variability, etc. This research aims at investigating on the one hand Global Sourcing within Italian Lean companies, in terms of impact, product typologies that are globally sourced, and advantages and problems from the use of Global Sourcing. On the other hand, we want to highlight some of the countermeasures that Lean companies have adopted to reduce the impact of Global Sourcing on wastes and hidden costs. Such countermeasures are not limited to Lean companies. In order to reach our main aim, a survey on 95 companies and 9 case studies were carried out in Italian Lean companies stating the use of Global Sourcing. A validation of results was given by further 9 firms both implementing Lean Approach and Global Sourcing.*

### **1. Introduction**

European companies have been facing the most important competitive challenge since the second world war. It is well known that they can stay ahead of low cost countries' companies only through innovation. Large investments and attention are devoted to technology innovation, but this is not enough: organizational and managerial innovation is an additional lever, that must be exploited. Most companies have 40-70% of total activities carried out which do not add value to the customer (waste). Thus, competitive advantage can be achieved through waste reduction (Ohno, 1988; Womack and Jones, 1996).

Lean Approach, the approach of the Toyota Production System, focuses on waste reduction to improve operations' performances, and shows interesting results in many implementations. That's why in recent years a lot of interest from companies and researchers has focused on it.

On the other hand, in recent years many companies have been searching the global arena to take advantage from cost reduction in the purchase of raw materials, components, sub-assemblies and products. In fact, companies have understood that a competitive advantage can

be achieved from the strategic use of the supply lever, in terms of where to purchase raw materials, components and sub-assemblies.

From the '80s, several companies have extended their supply areas looking at East Europe countries and Asian Countries as China, India, Indonesia, Malaysia and Thailand (Nassimbeni, 2006). Such countries, offering low cost and quite skilled manpower, can offer good opportunities for companies looking at low acquisition prices (Choe and Kang, 2000). Parallel to this trend, also the interest of the academic world for the Global Sourcing has increased, as demonstrated by the considerable amount of papers published on Global Sourcing topics from mid '80s.

Global Sourcing is particularly adopted in case of products or components characterized by an high impact of the manpower cost, such as articles of clothing or toys (Agrawal *et al.*, 2003).

During the last years, the phenomenon of Global Sourcing was facilitated by the ICT (Information and communication technology) development, by the simultaneous reduction in logistic costs, together with the improvement of the transport infrastructures, and by the improvement in quality and in the efficiency of the global suppliers (Nassimbeni, 2006). Liberalization of trade also gave a strong contribution (Christopher *et al.* 2006). China became the key country for Global Sourcing (Nassimbeni, 2006; Salmi, 2006; Zeng, 2000), in particular after reforms that led China to a market economy and after the recent admission in the WTO (*World Trade Organization*) (Nassimbeni, 2006). Thus, Italy and the other West Europe countries increased their imports from China during the last 10 years (Nassimbeni, 2006).

Global Sourcing refers to source a component from outside the traditional sourcing areas (Nellore *et al.*, 2001). In particular, we refer to Global Sourcing when a component is sourced from countries outside western Europe to supply production in western Europe, regardless supplier nationality. The focus of this paper is on components and raw material sourcing. This means that services and indirect materials are excluded from this analysis.

Several companies are trying to improve their competitiveness by implementing both Lean Approach and Global Sourcing. But the two approaches seems not to be fully consistent since Global Sourcing implies purchasing large quantitative from far away producers, and this increases stocks, exposes to an higher variability, etc. Thus, this paper will go through the use of Global Sourcing into companies that have been implementing Lean Approach, by investigating global supplies and global supply chain management.

The remainder of this paper is organized as follows. In section 2 literature review and problem formulation are presented. In section 3 objectives of the paper and the methodology are provided. In section 4 main findings are shown and discussed, while in section 5 conclusions about the research are summarized. References are in section 6.

## **2. Literature review and problem formulation**

The main reason for Global Sourcing is the lower price of components that can be found in low cost countries (Lavy, 1997; Salmi, 2006; Das and Handfield, 1997; Nassimbeni and Sartor, 2007; Carter *et al.*, 1997; Nassimbeni, 2006; Kotabe and Murray, 2004, Cho and Kang, 2001; Christopher *et al.*, 2006; Trent and Monczka, 2003; Rajagopal and Bernard, 1994; Zeng, 2000). Trent and Monczka (2003) state that global supplies could reduce the purchasing price of components by 15% on average, with peaks of more than 30%.

However, when a company sources globally has to face specific problems that can offset gains from lower price. Excluding transportation cost and tariffs, most of the other costs connected with Global Sourcing are hidden, so cost savings may not be as great as they seem

(Carter *et al.*, 1997; Christopher *et al.*, 2006; Song *et al.*, 2007). Examples of these costs are the costs related to difficult communication, different context, difficult logistics and problematic suppliers.

Global communication is difficult. Different time zones, lack of English language skills, cultural differences make global communication not just difficult but costly (Nassimbeni, 2006; Nassimbeni and Sartor, 2007; Lavy, 1997; Das and Handfield, 1997; Salmi, 2006; Trent and Monczka, 2003; Cho and Kang, 2001; Song *et al.*, 2007).

Context is another source of problems. Inflation, risk of currency fluctuations, political and economical instability can affect Global Sourcing activities (Das and Handfield, 1997; Nellore *et al.*, 2001; Kotabe and Murray, 2004; Trent and Monczka, 2003; Cho and Kang, 2001; Rajagopal and Bernard, 1994; Song *et al.*, 2007).

But logistics problems are the most critical ones (Carter *et al.*, 1997). Transportation lead time, in a global context, is not just longer but more variable (Lavy, 1997; Das and Handfield, 1997; Salmi, 2006; Christopher *et al.*, 2006; Trent and Monczka, 2003; Cho and Kang, 2001; Rajagopal and Bernard, 1994). This variability is due to such elements as unstable weather conditions that affect shipment by sea, customs bureaucracy, strikes and lack of transportation infrastructure (Carter *et al.*, 1997; Levy, 1997). The long and variable lead time, on one hand, leads companies to be more dependent on forecasts. On the other hand, it increases the bullwhip effect (Christopher *et al.*, 2006; Kim *et al.*, 2005). Both elements lead to higher inventory levels.

In addition, global suppliers can be a source of problems too. Literature notice that frequently global suppliers don't understand customer needs (Nassimbeni, 2006; Carter *et al.*, 1997), that they are not flexible (Carter *et al.*, 1997), that they have poor quality levels (Das and Handfield, 1997) and that they have poor industrial culture (Nassimbeni, 2006).

Even if literature presents several actions to reduce some of the problems mentioned above (Kotabe and Murray, 2004; Carter *et al.*, 1997; Salmi, 2006; Lavy, 1997; Nassimbeni and Sartor, 2007; Das and Handfield, 1997; Trent and Monczka, 2003) the problem of how to decide the right supply location, considering all hidden costs, is still open.

Song *et al.* (2007) suggest a framework for total acquisition cost of Global Sourcing: the total sourcing cost model. This model lists all the possible cost items that may occur during the Global Sourcing process and suggests, through a case study, a way to calculate them. However, the systematic use of this model in practice is quite rare because it needs time and resources to collect all the input data required (Song *et al.*, 2007).

Standard components are more suited to be sourced globally (Salmi, 2006; Nellore *et al.*, 2001; Christopher *et al.*, 2006) while innovative components and components that need a specific supplier knowledge should not be sourced globally.

Lean Approach aims at improving flexibility, lead time, quality and can reduce wastes such as excess stock, excess waiting and excess transportation (Womack and Jones, 1996). Lean principles affect sourcing too: Lean sourcing is based on a close customer-supplier relationship. Customer and supplier share not just process and cost information but also risks and benefits (Liker and Wu, 2000; Womack and Jones, 1996b; Zeng, 2000). Suppliers are selected mainly on price, but other characteristics as quality, accuracy, flexibility, ability to shorten lead times, and innovation capabilities are becoming part of the evaluation (Das and Handfield, 1997). The Lean Supply Chain is based on a *Just in Time*, pull, system (Womack and Jones, 1996b; Wu, 2003). This system needs flexible production systems, low set-up time and small production and delivery lot size (Womack and Jones, 1996b). A technique used to

increase delivery frequency is the *milk run*, which involves stopping at several suppliers (Wu, 2003).

Several incompatibilities exist between Lean and Global Sourcing. Close customer-supplier relationships in a global context are difficult, due to communication problems, and information sharing is risky (Das and Handfield, 1997; Nellore *et al.*, 2001; Lavy, 1997).

Moreover, *just in time* deliveries of small batches of products are not compatible with longer and more variable lead times and with poorer flexibility and quality (Das and Handfield, 1997; Lavy, 1997; Womack and Jones, 1996b).

Literature suggests some techniques to reduce Global Sourcing logistics problems, in particular techniques that are in line with the Lean Approach. For instance, Das and Handfield (1997) suggest the creation of consolidation centers in order to consolidate deliveries coming from global suppliers. They also suggest to stipulate agreements with other customers in order to consolidate deliveries. Both these techniques allow to increase delivery frequency. Salmi (2006) suggests to control quality at supplier location in order to avoid deliveries of poor quality components. In addition, Carter *et al.* (1997) suggest to support the supplier in order to increase its flexibility and quality.

Lean principles stress the importance to see the whole by focusing on hidden costs and waste reduction. Global Sourcing, on the other hand, is a lever to reduce direct purchasing costs, but may increase inefficiencies and hidden costs because of the problems highlighted before. Table 1 below presents differences and incompatibilities between Lean Supply Chain and Global Sourcing.

**Table 1.** Differences between Lean Supply Chain and Global Sourcing

<b>Lean Supply Chain</b>	<b>Global Sourcing</b>
Frequent, small size lots deliveries	Low frequency, deliveries of big size batches to minimize transportation costs.
Orders made in a <i>pull</i> logic	Long transportation <i>lead times</i> prevent from implementing a <i>pull</i> system
Suppliers have flexible production systems	Suppliers tendentially have lower flexibility and produce with big batches
Low-quality problems	Tendentially lower quality levels
Close relationship with suppliers and <i>single sourcing</i>	Communication problems makes difficult the close relationship customer-supplier. Single sourcing is risky

### **3. Objectives of the paper and methodology**

This paper aims at presenting several countermeasures, that are consistent with the Lean Approach, that could be adopted by companies in order to mitigate the problems of Global Sourcing and the apparent incompatibility between Global Sourcing and the Lean Approach. The Supply Chain Management point of view is used. Even if the analysis is focused on Lean companies, results are not limited to these companies. In fact, the countermeasures that we are going to present can be adopted by non Lean implementers too. We choose to focus our research on Lean companies because Lean Approach stresses the focus on hidden costs and wastes, and thus it is likely to present innovative solutions to Global Sourcing problems.

In addition to the countermeasures adopted to reduce the impact of Global Sourcing problems, this study also aims at answering to the following research questions: (1) Do Italian Lean

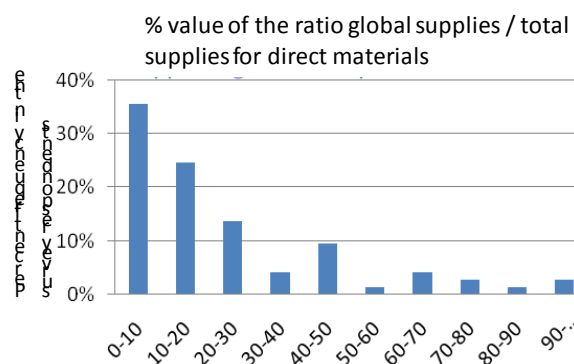
implementers use Global Sourcing, since the contrast that exists between Lean and Global Sourcing? (2) Which kind of products are globally purchased by Lean companies, and which kind of problems do they perceive in Global Sourcing? (3) Which managerial and organizational solutions did Lean Implementers adopted in order to mitigate problems of global purchases and in order to make global purchases more consistent with the Lean Approach?

In this research, we have carried out both case studies and a telephone survey. We have interviewed purchasing managers, logistics managers and supply chain managers of Italian companies. Telephone survey involved 95 Lean implementers; 9 further firms were involved in the case study activity. In order to validate results, 9 firms neither participating to case studies nor to the survey, were contacted.

Companies considered in this research are both Italian companies and subsidiaries of non Italian companies. Respondents are from a wide range of industries and are both repetitive and non repetitive companies. Both big companies and small companies were contacted. The smallest company interviewed employs about 100 employees. The bigger one about 35000. All the companies interviewed have been implementing the Lean Approach for at least 1 year and state a quite deep use of Lean methodologies and concepts. Companies selected for the case study activity have been implementing Lean for at least 3 years. All the 9 companies selected for the case study activity are from the Northern part of Italy.

#### 4. Findings

The survey highlights that the vast majority of the Lean companies interviewed (88%) implement Global Sourcing. The rate between the globally sourced components value on the total value of products purchased is, in the vast majority of the cases, lower than 10%. Rarely it goes beyond the 25-30%, as reported in Figure 1 below.



**Figure 1.** Phone survey results on the ration between value of components globally sourced and total value of purchases. (73 respondents).

Survey results show that bigger Lean companies (in terms of number of employees) tend to have an higher impact of the value of products globally sourced on the total value of products purchased. This is due to the fact that global context is more difficult, if compared to the local one. In fact, global context requires higher efforts in terms of financial and human resources to face problems (Rajagopal and Bernard, 1994). Moreover, the higher international experience of bigger companies makes communication problems less critic, as also stated by Cho and Kang (2001). Thus, it's clear that bigger companies, which can count on greater financial and human resources, are facilitated in global purchases.

Italian Lean companies do Global Sourcing because of the lower acquisition price of products and components on the global market. Lower purchasing price is the main reason for buying from low cost countries' suppliers. In particular, all the companies in the case studies stated lower price as the first reason, and 97% of the survey respondents chose lower acquisition price as the first reason (87 respondents out of 90 respondents). Two of the 9 companies from the case studies also reported the unavailability of the component/product on the local market as an important reason for the Global Sourcing. These motivations are in line with those also reported in literature (e.g. by Das e Handfield, 1997).

An interesting finding from case studies is that quality level from global suppliers is actually not much lower than quality of local suppliers. On the other hand, protecting from quality problems in case of Global Sourcing is more costly. In fact, it implies higher stock levels, higher rework costs and higher transportation costs.

Results from case studies and survey show that the decision on where to buy the specific product / component doesn't take into account all the differential costs of the purchase localization problem. In the vast majority of the cases, just evident differential costs are taken into account (e.g. transportation costs or duty costs). Thus, costs having to do with products obsolescence, inventory levels increase, etc. are often neglected by Lean companies, even if the Lean Approach stresses the focus on hidden costs and the elimination of wastes. We can partly explain this with the fact that purchasing managers interviewed in case studies are often evaluated considering as main driver the acquisition price of the product. Inventories are in fact often in charge to the logistics manager. However it is worth noticing that some companies redesigned responsibilities of purchasing manager after their adoption of the Lean principles: sometimes logistics manager and purchase manager are co-responsible for inventory costs, in other cases cooperation between purchases and logistics has increased and in other cases logistics is more involved in the process of purchasing decisions, even if responsibilities on purchasing costs remain to the purchasing manager and responsibilities on inventory costs remain to the logistics manager. Also in these cases acquisition price and evident differential costs has remained the most important factors that are taken into account, and hidden costs are generally not taken into account.

Our research highlights that no substantial changes in the management of global suppliers' were adopted after the Lean principles implementation in supply area. Even if two respondents from case studies activity stated a little increase in the importance of flexibility, price remains definitively the most important factor. It is also to be noticed that 3 respondents expect an increase in future importance of flexibility, deliveries' accuracy and on time deliveries.

Also the number and typology of products globally purchased didn't change after the Lean principles implementation. Most globally purchased products and components could be grouped in 4 categories: *standard* components, products made on customer specs (however, these products/components will be demanded to the supplier for a long period), raw materials and special components/products (these components are purchased globally because of their unavailability on local markets. Usually these components come from USA or Japan).

The 4 categories highlighted before are characterized by a very low collaboration required with the supplier. This is in line with the communication problems highlighted before. The exploitation of global markets for special products not found in local markets was also argued by Handfield (1994) and Nassimbeni (2006). Global Sourcing of standard components is also confirmed by Salmi (2006) and Nallore *et al.* (2001).

When we ask respondents about the relationship with suppliers, a 60% of the companies interviewed in the survey state to purchase products and components in a direct way. 28% of

the respondents uses commercial dealers, while the remaining 12% uses both the methods. On the contrary, when we asked to the survey respondents about the 4 most critical problems in Global Sourcing (table below), high and variable lead times emerge as the most critical issue. Long and variable lead times is stated by 80% of the companies interviewed.

**Table 2.** Problems stated by survey respondents in the Global Sourcing

<b>Problems of Global Sourcing</b>	
Long and variable lead times	80%
Late deliveries + wrong deliveries in terms of products delivered	40%
Low innovation	1,6%
Lower quality	23%
Poor communication	18,5%
Difficult quality controls	4,6%
High transportation costs	32,3%

Moreover, the characteristics to make the component a good candidate for the Global Sourcing in Lean companies are: high level of standardization, the fact that the component will be purchased for a quite long period in medium-high volumes, the low volatility of demand for that component, the high manpower content and a low-medium value of the component/the product.

Thus, in case the company can decide whether to buy a component in a local market or in a global market, will tend to buy in a global market when the demand volume for the component (i.e. yearly volume of demand for the component in the medium-long term) is high, the volatility of demand (considered as the difficulty in forecasting demand and misalignment from what planned) is low, and the quality required (considered as skills level to produce what is required) is not critic. This statement comes from results of case studies and was validated by the companies interviewed at the end of the research.

Global Sourcing increases lead times for components, increases variability in lead times and forces companies to order big batches of products. Also quality problems are more critic in case of Global Sourcing. All these factors imply increasing stock levels (both cycle stock and safety stock) and increasing dependency on forecasts. Definitively, higher wastes in the system.

Thus, we aimed to investigate how Lean principles implementation affected the supply chain management in case of Global Sourcing. In particular, we wanted to understand if management of global suppliers has changed in terms of: delivery frequency and delivery batch, collaboration with the supplier, information exchange with the supplier and development of common managerial methodologies with suppliers.

Case studies show how collaboration with global suppliers has not increased or changed since the Lean principles implementation. The same could be said about communication and informative systems required to support the global suppliers management (for local suppliers the contrary could be said), as also noticed by Das and Handfield (1997). In fact, authors argue that there is no significant difference in terms of communication and information systems needed with global suppliers from companies that have implemented Lean Approach and companies that have not implemented the Lean Approach.

Instead, when we consider logistics aspects, specific activities were carried out to limit the impact of stock levels increases (both cycle stock and safety stock), the increase in dependency on forecasts, etc. Such countermeasures are in line with the Lean Approach and aim at reducing the impact of Global Sourcing problems. Even if not all the companies

interviewed in the case studies have implemented all the activities described below, we will present them together, as a whole set of alternatives to alleviate some of the problems highlighted before.

- *Consolidation centers*: this countermeasure consists in introducing a consolidation center for deliveries near global suppliers in order to consolidate load units with products from multiple suppliers. Thus, suppliers in the consolidation centre area, instead of sending products directly to the customer, send products more frequently to the consolidation centre. This allows more frequent deliveries to the customer for smaller batches of products. A similar solution was also highlighted by Das and Handfield (1997) and Wu (2003). One of the companies interviewed was facilitated in applying this countermeasure because it has a manufacturing plant in China to serve the local market. Thus, this company has used some of the plant space for the consolidation of deliveries in order to increase frequency of deliveries.
- *Use of a Local supplier next to the global supplier*: several companies stated they have maintained, in the case of components and products globally sourced, a local supplier. The local supplier could guarantee the supplies continuity in case of problems. This also makes the customer less dependent from the global supplier. Nonetheless, this countermeasure seems to be very useful to face the problem of demand peaks and to reduce inventory levels to face demand variability. The use of a local supplier is also useful to set-up and to test for quality components before sending them to the global supplier for massive production. In addition, local supplier is also used for possible reworks and to reduce non quality costs. Moreover, Salmi (2006) highlights the reduction of the dependency on the global supplier as a further advantage of the use of a local supplier next to the global supplier. In our research, the main motivations for adopting this solution are the higher flexibility to demand peaks and the possibility to reduce quality costs and products' ramp-up costs.
- *Quality control at supplier location*: aims at reducing non quality costs, by avoiding useless long travels of goods. For instance, one of the companies interviewed exploits its Chinese facility to carry out quality control before sending products to Italy. This solution was also highlighted by Salmi (2006). For future, a possible extension may be to carry out quality control in the consolidation center, in order to create a sort of quality control pooling for products with similar characteristics.
- *Milk runs*: this countermeasure seems to be more an opportunity than a solution. For instance, in one of the cases investigated a company could enlarge its milk runs, in order to include also Eastern Europe countries (Czech Republic and Hungary) by exploiting products flows of both companies of the group and of several suppliers from East Europe countries. Thus, the company could introduce frequent milk runs including both companies of the group and some suppliers from East Europe countries with a saturated truck during the whole run.
- *Flexibility and frequency increase of the supplier*: the increase of flexibility and frequency of deliveries from suppliers is stated by respondents as a measure to reduce stock levels. Such countermeasure is easier when global suppliers are not very far-off (e.g. Turkey, or East Europe). In fact, 4 of the 9 companies investigated in the case studies asked their Chinese suppliers to increase the flexibility and delivery frequency with scarce results. Das and Handfield (1997) state that frequency of deliveries of global suppliers in Lean companies is not so higher than the one among non Lean implementers.



- *Company send Moulds to the global supplier*: this countermeasure allows higher quality levels for melted components. One of the companies interviewed supplies moulds to its global supplier, because product quality is related with mould quality.
- *Delivery services*: reducing and focusing just on more reliable delivery companies is a countermeasure employed in one of the case studies and was also found in Wu (2003). Instead, none of the firms investigated stipulated agreements with other companies to consolidate deliveries. This countermeasure was found by Das and Handfield (1997).

As a result of the countermeasures summarized before, companies state reductions in inventory levels, reduction in the lead time from purchasing and delivery, reduction in stock-outs, reduction in space required for inventories. All the countermeasures stated by the companies are in line with the Lean principles, but could be used by non Lean companies as well in order to reduce impacts of Global Sourcing.

## 5. Conclusions

Global Sourcing within Lean companies is widespread because of the lower acquisition prices of components and products. About 88% of Lean companies interviewed stated the use of Global Sourcing for recurrent typologies of products/components, whose typical characteristics were discussed in the paper.

The Just in time pull system is not applied in Global Sourcing, because of the distance between supplier and customer. Lean companies didn't modify significantly the management of global suppliers after approaching Lean principles. In fact, rating logics for global suppliers didn't changed a lot after Lean Approach introduction, even if some company stated that for future, accuracy, punctuality and flexibility will increase in importance. Also collaboration and communication between global suppliers and customers seems not to be increased after the introduction of the Lean Approach. Neither the informative flow with global suppliers nor informative systems used were changed.

When considering the number and the typology of items to be globally purchased, just evident costs are quantified and considered. No hidden costs or wastes introduced by the Global Sourcing are expressly taken into account by Lean companies interviewed in global purchasing decision process. On the other hand, lead times, accuracy of deliveries, both in terms of punctuality and quality, and high transportation cost, are key issues for Lean companies.

In order to reduce such problems several countermeasures observed from Italian companies and in line with the Lean Approach were presented in this paper. Such countermeasures can reduce the impact of Global Sourcing both in Lean and in Non Lean companies and demonstrated interesting results in the companies analyzed.

Lean Supply and Global Sourcing are two distinct approaches to achieve competitive advantages, whose complete integration is difficult. However, the possibility to exploit managerial countermeasures to reduce the impact of Global Sourcing seems to be possible and to produce interesting results.

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