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## **LEAN CO-CREATION: EFFECTIVE WAY TO ENHANCE PRODUCTIVITY**

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### **Abstract**

*In this paper research is done how lean manufacturing & co-creation both can be applied to emphasize the efficiency, productivity with eliminating the seven types of wastages. Lean manufacturing is helpful to eliminate the seven types of waste in any industry; co creation is emphasizing the generation and current realization of shared Company-Customer value. Main aim of this paper is to create a process lean co-creation to emphasize the efficiency, productivity with eliminating the waste. This paper is based on analytical study of past research of lean manufacturing and co-creation. Lean co creation could be more beneficial in manufacturing industries.*

### **Keywords**

*Lean Manufacturing, Co Creation, Lean Co Creation Etc*

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## 1. Introduction

Lean manufacturing is a practice which is used by manufacturing organizations to enhance their productivity, reduce cost, eliminating waste etc. Lean manufacturing provides continuous improvement as well as eliminating waste. It provides a culture to the organization to sustain for a long time with many benefits. Lean manufacturing involves never ending process to eliminate 'Muda' (any activity that consumes resources without adding value). Lean manufacturing adopted by Toyota executive (Taiichi Ohno, 1912-90) during post second world war in Japan. Five basic principles involved in lean manufacturing are:

- Specify value from the point of view of the customer. This means that the customer buys results, not products, and that any company needs to identify and begin product design and manufacture by focusing on what their customers need and want. It is as simple as the old expression "give the customer what they want" and not what is convenient for the manufacturer. (Achanga et. al ; 2006)
- Value Stream. Value Stream techniques focus on one object or product in the company not the viewpoint or the department of process step. The principle is to focus on the whole supply chain, from customers' orders, to the planning department, orders of raw material from different suppliers and then the value adding steps for the product, emphasizing economics of time rather than economics of scale. Value is added to a product while someone is working on the piece, non-value adding steps are when the product is waiting in batches or stocks, which is waste.
- Flow. This principle tries to describe that it is important to make the product move through one value adding step to the next one and keep the product in constant one piece flow. Companies should avoid batches and queues, or at least continuously reduce them and never delay a value adding step by a non-value adding step.
- Pull. Pull means meeting consumer's rates of demand with production but not over producing. Most organizations will have to push to a certain point and respond to a final customer from that point. The idea with Lean is to push this point as long upstream in the product making process as possible, wait for a demand and then make the product fast and with high quality. So if the delivered products have any defect, only a small batch of products will have been affected.
- Perfection. The last principle seems more possible after the other four principles. Perfection does not only mean quality, it also means producing exactly what the customer wants, exactly when they want it, to a fair price and with minimum waste.

## **1.1 Tools in Lean Production**

It is important to realize that Lean Production is not a tool that could be applied in a company and expect success straight away. It is a way of thinking to improve the process improvement. It is important to understand this concept and go the whole way in the company, with workers, suppliers and consumers to make it work. But this concept of Lean Production involves many tools that could be applied in a company to become Lean. The benefits in this concept are that the whole value chain are been focused, from the material comes in to it leaves as a product. There are three different kind of waste in any industry these are Muda, Mura, and Muri. All three fit together as a system and just focus only on the eight wastes of Muda could cause more problems to the production and its people than helping. Toyota is working with focus on all three important wastes. Muda means those Non value added or those wasteful activities that cause lengthen lead times, extra movements, excess inventory, or waiting Mura also means Unevenness which is waste from unevenness or variation caused by up and downs in the demand or production problems. Mura makes it necessary to have extra material, equipment, and operation on hand in anticipation of the highest demand, even though the average demand might be much less. Mura also causes the next kind of waste. Muri it means Overburdening people or equipment the waste resulting from overburdening people and equipment, and pushing them beyond natural limits. This would results in safety and quality problems in industry. Ohno mainly specified seven Muda wastes. An eight waste were later added over seven wastes. Let's discuss seven wastes, first waste is Overproduction; this is producing more or earlier than necessary. This waste is the worst of all the wastes because it causes several other wastes as overstaffing, storage, and transportation cost. Unnecessary Transportation is a second kind of waste it means moving work in process (WIP) items long distances from one stage of a process to another, moving materials, or inefficient transport, or finished goods into or out of storage or between processes. Waiting moving materials Delays because of equipment breakdowns, material work because of stock outs. Defects mean production of defective items and the cautions against with inspections, repair or rework, scrap, and consequences of producing them. Inventory or excessive inventory is Unnecessary or excessive raw materials, WIP, or finished goods causing longer lead times, obsolescence, damaged goods, transportation and storage cost Unnecessary Motion. Motion employees have to perform during the course of their work such as reaching for, looking for, turning for, etc. Also walking is a kind of waste over processing or incorrect processing. Steps or procedures in a process that is unnecessary, or ineffective due to poor tools or product design, also when providing higher-quality than necessary. Unused employee creativity is last waste that Losing time, ideas, skills, improvements, and learning opportunities by not engaging or listening to your employees.

Co-creation is a form of Economic strategy that emphasize the generation and current

realization of shared Company-Customer value. It views that markets as platforms for the firms and active customers to share unite and renew each other's resources and capabilities to make value through the new forms of communication, service and learning mechanisms. It is differs from the conventional inactive consumer market of the past.

Co-created value arises in the form of personalized, unique experiences for the customer (value-in-use) and current revenue, learning or enhanced market performance drivers for the firm (loyalty, relationships, customer word of mouth). Value is co-created with customers when a customer is able to personalize his or her experience using a firm's product-service proposition in the lifetime of its use to a level that is best appropriate to get their job or tasks done and which allows the firm to derive better value from its product-service investment in the form of new facts, higher revenues/productivity and/or superior brand value/loyalty.

Lean Co-creation is a new tool which is giving participation of customers and suppliers in the manufacturing and other industries like service industries where lean tools and techniques have been implemented. Lean co-creation can give a new platform to manufacturing industries to improve efficiency, productivity and performance of the workers, employees and machines. Lean is a tool which is giving important parameters to reduce different wastages in industries. Co-creation would impact more in lean manufacturing industries. It is not new the participation of different suppliers, customers and co-workers in the improvement of performance of quality, performance and efficiency of products.

There are some companies like Mahindra & Mahindra in the automobile sector, which is using lean co-creation by the participation of their TIER 1, TIER2 and TIER 3 suppliers. By the participation of different suppliers to improve the quality of the final product and reduce wastages, improve JIT, reduce lead time that would boost efficiency of the machines, workers and materials.

## **2. Literature Review**

Frederick Winslow Taylor, a manager from Philadelphia in the end of the 19th century, set up the foundation for mass production with his time and motion study, presented in his text "**The Principles of Scientific Management**". Taylor's system was to separating planning from production, standardized the work, identifying the best and easiest way to do the job reduce cycle time, the time it takes for a given process. In the beginning of the 20th century Henry Ford developed the ideas with the introduction of the moving assembly line and the T Ford (Dennis, 2002). Ford standardized the parts to the model so he could manufacture a large number of the parts and transport it to the very efficient assembly line. This system made this model become comparatively cheap to build and a product for normal people. But this also made that quality took a back seat to production and the defect rates were very high by current standards. Workers were

not involved in the organization of the work, in order to reduce the action required of each worker (Dennis, 2002).

In 1950 an engineer from Toyota Motor Company, Eiji Toyoda, visited one of the Fords plant in Detroit to study the plant in an exchange program between the occupying America and Japan after the WWII. The feeling he got from the final assembly line was that everything in the line was moving along in a smooth, synchronous pace. But Eiji noticed that this was just the case along the line, virtually every other stage of the process, parts and materials were produced in discrete large Stefan Anderson batches (Nicholas & Soni, 2006). The result was huge amounts of inventory everywhere, wasted motions, wasted materials and huge effort to organize everything. After the return to Japan, which at that time was a country in deep depression, Eiji and one production manager Taiichi Ohno concluded that Fords mass production would not work in Japan, also that there were some possibilities to improve the production system (Dennis, 2002). Japan had during this time very underprovided infrastructure, as constantly power losses, lack of good roads, etc. which demand that everything that was made really was necessary and with high quality. So Toyota developed procedures and modifications that made equipment multipurpose, movable, and easy to adapt to producing a range different parts for different products. They developed the capability to produce the parts efficiently in small batches, when they needed it, and synchronized the whole production, not just the final assembly line. The beginning of the Toyota Production System that Taiichi Ohno, explains the concept with: "All we are doing is looking at the time line from the moment the customer gives us an order to the point when we collect the cash. And we are reducing that time line by removing the non-value-added wastes." (Liker, 2004), It took Ohno almost 30 years to perfect the system and drive it through Toyota Motor Company and during the 1960s and 1970s they spread the system to suppliers and later other industries in Japan.

In 2000 Harvard Business Review article, Scholars C.K. Prahalad and Venkat Ramaswamy popularized the concept of "co-opting customer competence". In their book named "The future of Competition", they further developed their arguments which was published by Harvard Business School Press where the examples of Napster and Netflix were taken by them which further explained that customer would not be pleased with changing their decisions again and again what a company offers.

They argued that rather than completely created within the firm, the value would gradually be more co-created by the customer and the firm .According to them, Lean Co-creation not only explains the creating of products jointly but also explained movement away from customers buying product and services as transaction to those purchases being made as part of an experience.

The author noticed that the consumers try to find the freedom of choice which must act together with the firm with the experience over a wide range. Customer wants to explain choices

in such a way that it shows the actual view of value and they went to communicate and transact in the language as they want.

Neeli Bendapudi and Robert P Leone found in their literature's review on "Customer participation in production" that the starting dates of academics are back to 1979. During this period i.e., from 1979 to 1990, firm center approach was focus by the papers and studies investigate customer participation as a source of improved productivity.

By the end of 1970s or starting of 1980s, productivity gains were the most important concerned to the scholars by passing the works from firm to the consumer. At that time, the self-source model was very much popular. By observing, we noticed that in the mid-1980s a slow shift started: less accounting type metrics were used to understand the participation of the customers. The customers are partial employees for (Mills and Morris, 1986) and it was later on understood by (Goodwin, 1988) for increasing quality, participation of customers is necessary.

New themes emerged from 1990 onwards; customer's satisfaction can be achieved by greater customer's participation as suggested by John Czepiel. Productivity was carried out by James Donnelly, Steven J. Skinner and Scott Kelly but they also suggested many other ways to look at customer participation i.e., emotional responses, quality and employee's performance. Under the aspect of cost minimization, customer participation should not be examined as suggested by the (Song and Adams, 1993). Instead of it, it can also be seen as an opportunity to distinguish.

An article by R Ramirez and R. Noramnn suggests that the companies which are successful do not concentrate on their industry or on themselves but they focus on value-creating system. This was not reviewed by Bendapuli and Leone. This idea is nearly close to the ideas of (Vargo et. al, 2008) i.e., that of "service systems". Normann and Ramirez proposed that the linearity of value chain be replaced by "value constellation" after when they were disagreed with Porter's ideas as earlier mentioned in this paper.

In this manner, the authors understands and defines the company's task as the "reconfiguration of roles and relationship among this constellation"

In 2004, Prahalad and Rama Swami kept working on their original idea which was published four year earlier. In the other groundbreaking paper, "value co-creation" is being used extensively". Irregularities or occasionally used by other authors like Schrage in 1995, we can conclude that the official debut of "value co-creation" takes place in 2004. As recognized by the author, one sidedness of marketing offer cannot be sustained. According to them the origin of this shift is to be seen in the increasing bargaining power to buyers due to the emergence of communication between customers.

The co-creation of value can be seen as the first steps of the customers who are "not happy

with available choices want to co-create value are thus co-create value". A model called DART (for dialogue, access, risk benefits, transparency) is used to conceptualize the co-creation of value.

Need for "tools to analyze co-creation" is stressed after Schrage (1995). On the basis of S-D logic, a framework around value co-creation was proposed by Frow, Payne and Storbacka. The framework is based on processes which the author sees as central in value co-creation.

It has three components:

- First, where value depends on practices and hence also known as customer value-creating processes, in which routine actions the suppliers can enhance the value.
- Second, supplier value creation processes which is based on co-creation opportunities (through technological breakthrough, changes in industry logics, changes in customer's preferences and lifestyles), planning, implementation and metrics.
- Third are encounter processes.

Now on third stage of co-creation, Rama Swami and Gouivart advises the companies that tries to find to improve that how companies being operated throughout their organization and all in their system and processes.

The forms of co-creation of experience of customer and co-creation of products and services were lagging behind by the "full theory of interactions". Transformation of traditional corporate practices from training, communication and performance management into co-creative interactions, cut costs, increase in employee engagement, generate value and spark innovation. Some examples of the above transformation by the companies include Nike, Nokia, IBM and credit Agricola.

Radio and television which are considered as traditional media, act as a messenger for the families to come together and experience the consumption as one entity said by Leveious Rolando, a co-creation facilitator. Due to declining of entertainment's technologies and consumption to physical site from business sites, this led to new configuration in design and convergence. The iPod as the descendant of the Walkman phenomenon celebrates both the body and movement while stressing the elements of individualization and personalization of content whereby the moving body can create a library of sounds and content unique to itself.

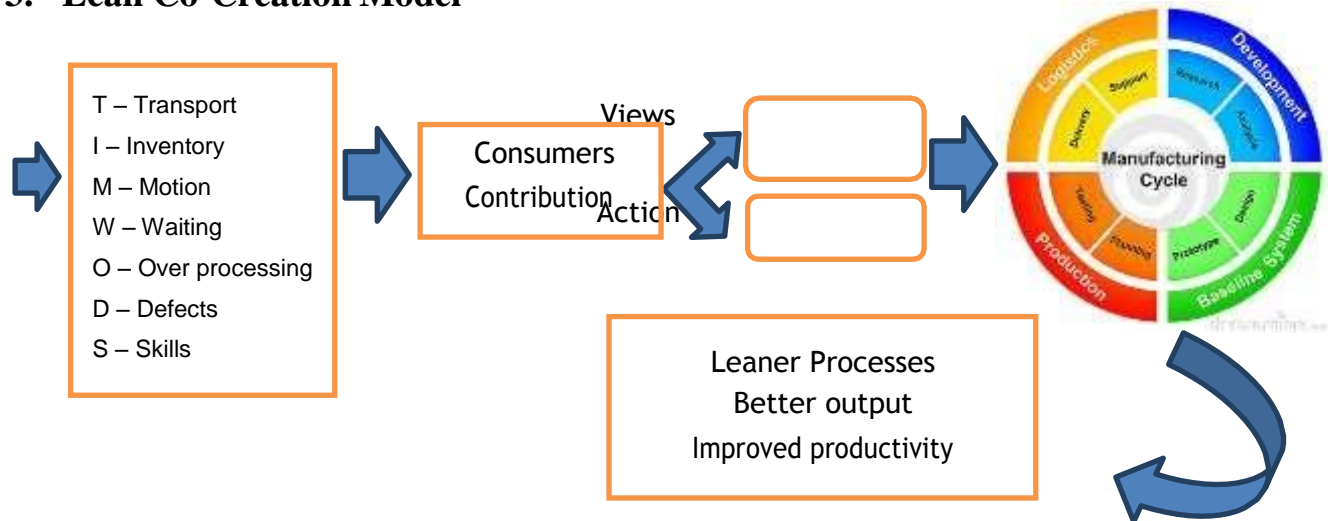
Lean co-creation is being used by the companies of automobile sector like Mahindra and Mahindra by the participation of their TIER1, TIER 2 and TIER3 suppliers.

In automobiles sector, after applying lean co-creation participation of different suppliers results in improved quality of final product and reduce wastages, reduce lead time, improve JIT, this will boost efficiency of machine, materials and workers.

Companies like Mahindra & Mahindra in the automobile sector, which are using lean co-creation by the participation of their TIER 1, TIER2 and TIER 3 suppliers. By applying lean co-

creation in automobile sector participation of different suppliers results the improved quality of the final product and reduce wastages, improve JIT, reduce lead time that would boost efficiency of the machines, workers and materials.

### 3. Lean Co-Creation Model



**Figure 1:** *Lean Co-Creation Model*

Lean Manufacturing is a technique by which seven types of wastages and other unproductive methods can be eliminated but with the help of co creation of consumers in manufacturing cells and different sections of production further improvements can be done in lean manufacturing also. Co creation can be done by the participation of customers by two dissimilar methods and every dissimilar method is having different result in the final value. Consumers can contribute by sharing their views with the company also consumers can be directly involve with their action in the company and play their important role in the development and progress in production.

In any manufacturing cell or manufacturing system there are different types of systems are working these are development, baseline system, production and logistics department. There are further more departments in these four categories like research, analysis, design, prototype, planning, testing, delivery and support. In these different departments consumer’s participation can be very crucial for the further development of the company and different departments. Lean manufacturing is a technique by which wastages can be reduced like in the form of waiting, overproduction, over processing, extra motion, extra inventory, rework and wastage in skills. Lean is an effective tool to reduce these wastages but co creation can be useful from entry level to the final level of production.

When Lean would be combined with co-creation than there are certain important issues on which it would need modifications. Lean Co-creation is also a modified method in which value stream mapping of the current process would be modified to future state value stream mapping



and there would be involvement of suppliers as well as customers in the modified value stream mapping and other lean techniques by which wastage can be minimized and it would give satisfaction to customers as well as suppliers.

In the value co-creation it is important to know about the value for the customer. Customers can be directly involved in the mechanism by which companies can increase more value added activities and decrease non value added activities. Value is co-created by the experience. Since value is defined by its beneficiary.

With the help of DART Technique, Suppliers and customers both can contribute in the lean co-creation which would enhance performance of the whole value stream mapping and also make lean techniques more effective.

Value stream mapping is a process which reduces the non-value added activities and increase the value added activities. Co-creation activities improve the involvement of suppliers and customers which would contribute in different processes in the whole manufacturing and supply chain process.

Value stream mapping would be modified to future state value stream mapping. Already there are many modifications done in the future state of value stream mapping like replacement of supermarket on place of inventory, lead time reduction, kaizen, levelling of manufacturing cells, Kanban techniques, forecasting done much more earlier as compare to weekly forecasting. These all are modifications done in the future state value stream mapping.

Co-creation of suppliers and customers would impact more in the future state of value stream mapping like there is more quality of raw materials sent by suppliers, suppliers are also adopting lean principles which implemented and adopted by Core Company. For example, Automobile Company is having 40 different suppliers, all these suppliers also using lean techniques which improve further quality of final product.

Lean co-creation by suppliers would lead to fewer defects in the manufacturing process of the core company. Main reason behind this is that lean techniques implied by the suppliers which would improve the standards of the materials which received by the core company. Co-creation by the customers also makes a huge difference in the performance and quality of the final products of manufacturing industries. One of the famous processes of the co-creation of customers is the feedback received by the company from its customers. Customers can directly involve in the manufacturing activities and discuss about the drawback of some processes which would create non value added activities.

There are different types of companies exist at different levels like TIER 1, TIER 2 and TIER 3 companies most of the TIER 2 & TIER 3 companies are working as the suppliers for TIER 1 or multinational industries. Co-creation is an extremely important for these TIER 1 companies

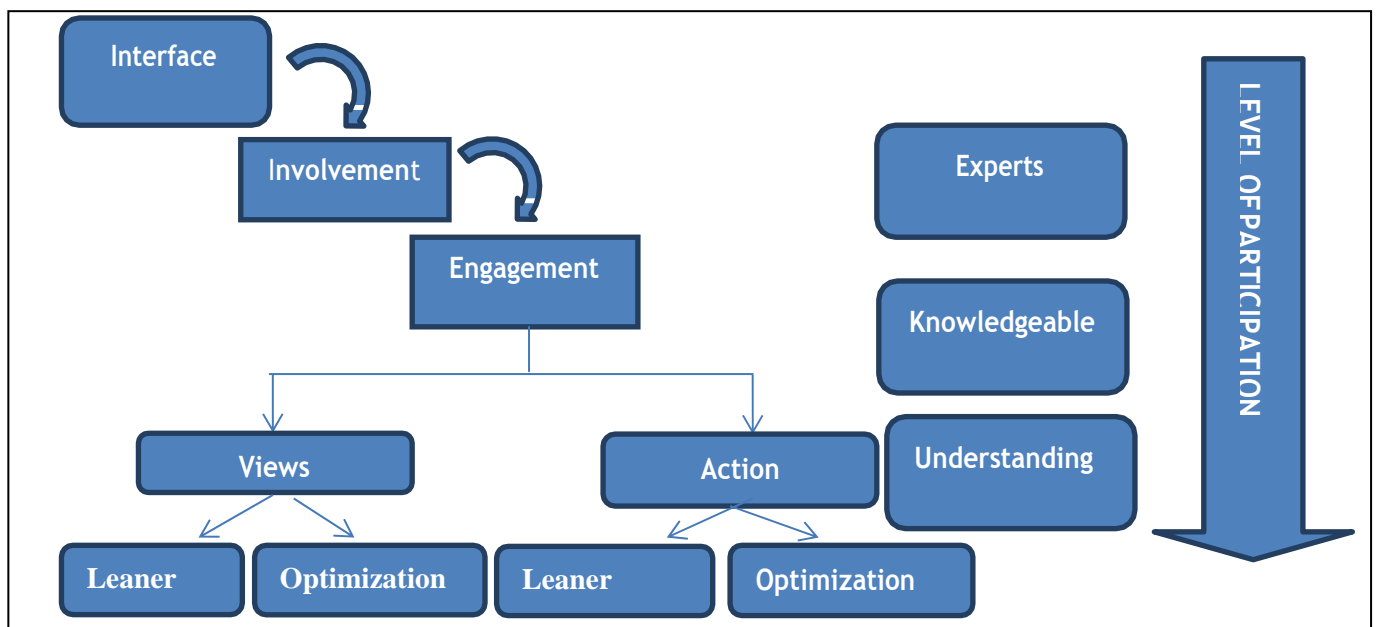
with the help of TIER2 and TIER 3 industries. If suppliers are involved in different processes of TIER 1 industry. Suppliers should participate and improve their own process also and then suggest important areas in production and manufacturing for further improvement.

Lean Co-creation is giving chance to suppliers and customers to participate in the development from initial level of production to the final chain of the supply chain management. Co-creation would be implemented through DART technique, with the help of dialogue, access, risk and benefits, lean co-creation would be implemented.

Co-creation by the suppliers and customers can play an extremely important role to improve value stream mapping and also to modify it to different chart. Current state of the value stream mapping is having different drawbacks regarding to lead time reduction, extra wastage which can be related to overproduction, excess motion, over processing etc.

If suppliers and customers would be involved to improve value stream mapping than in the future state mapping it would be huge improvement which can lead to reduction in lead time, supply chain improvement, cycle time improvement also reduction of excessive wastages which would affect efficiency of workers as well as machines.

In both states of value stream mapping suggestions by the customers and suppliers plays an important role to discuss about the SWOT analysis and with the help of SWOT analysis and lean manufacturing techniques, efficiency of process would be increased.



**Figure 2:** Processes Chart by which Consumer can participate in the Lean Co Creation or to Increase the Efficiency of the System

According to above model there are three types of processes by which consumer can participate in the lean co creation or to increase the efficiency of the system. These three processes

are interface, involvement and engagement of the consumers in the different process of the company by which they can enhance the value of the product and value of the process. Consumers can participate by their views and also with their action to implement lean and to optimize the process.

Consumers can give their views it can in the way of external form or internal form but these views are very crucial for the company. Participation can be done by the action also but it varies from strategy and flexibility of the companies whether they would allow consumers to take action in any form to increase the efficiency of the process.

According to the model the level of participation is also of different types like what is the extent of knowledge of consumers and also it depend on the factor that what is the expert level of participating consumers. If consumers are having expert knowledge of lean tools and techniques than they can easily share their views ad participate in the process of the company. For example if consumers are having expertise knowledge in design than they can share their knowledge with the design department and improve design and it will not lead to any defect.

#### **4. Conclusion**

When Lean combined with co-creation than there are certain important issues on which it would need modifications. Lean Co-creation is also a modified method in which value stream mapping of the current process would be modified to future state value stream mapping and there would be involvement of suppliers as well as customers in the modified value stream mapping and other lean techniques by which wastage can be minimized and it would give satisfaction to customers as well as suppliers. By lean co- creation not only the seven types of wastages can be eliminated but also it helps to enhance the efficiency, productivity and also improve the performance of workers and machines.

This new tool lean co-creation would help customers to participate in the manufacturing part of the company also company would be more keen to know about the value of customers and their opinions through which companies can give participation to customers to improve lean techniques in their companies and give new suggestions to improve efficiency and quality of the company and products of companies.

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