

# Lean Thinking and Lean Production the Required Tools to Improve National Economy and Their Effect on the Price of Products Ready for Selling

Mansour Alilou<sup>1</sup>, Amir Alipour<sup>2</sup>, Magsoud Alilou<sup>3</sup>

<sup>1</sup>Young researchers club, Salmas branch, Islamic Azad university, Salmas, Iran

<sup>2</sup>Department of Economic, Salmas Branch, Islamic Azad University, Salmas, Iran

<sup>3</sup>Department of Accounting, Salmas Branch, Islamic Azad University, Salmas, Iran

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## ABSTRACT

Today's, competing in the global market requires the use of all lean techniques, tools and ideas. Certainly the dominant global methods as lean thought are necessary in order to improve efficiency and to lower the present costs of an organization. This method has been conducted by hardworking people all around the world and they identified the wastages by forming cooperative groups. They could solve many problem and upgrade their company. In the second half of twenty century, the globe producers faced with new competitors who provided products with better quality, more varieties and less price while they were using half of the required asset and facilities. This paper attempts to philosophically integrate two main tools (Lean thought and Production) that have fundamental role in improving and developing national economy and studies the used solutions in industrial countries and tries to present the applying ways of these tools in the subdivisions of Production by using the experience of industrial countries in this field.

**KEYWORDS:** Lean Production, Lean Thought, sigma six, Lean system, Economy.

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## INTRODUCTION

In lean thought, it is tried to tackle and get ideal perfection, and to delete eat activity that consumes resources but doesn't create any value for the customer. By using this though, it is possible to go beyond the field of Production and uses it in completing new products and production and services. Actually lean though needs some requirements to reach the Lean Production which is used in some countries as Germany, China, Japan and many other industrial countries. Using traditional Production ways which is popular in nonindustrial have no positions in the present world, as a result by maintaining traditional ways there will be less request and finally cause the manufacturer unit to be closed. So Production institutes need to produce with lower costs and high quality and quantity in order to compete in the world and this is just possible by integrating lean though and use of Lean Production technology. Lean though and Production study the existent conditions and available resources to produce those products with better quality and quantity than previous ones. Regarding the point that fixed costs can be decreased by producing more products we can present our products with lower prices and gain much profit. We will study it more in the following.

**What is Lean?** :Most primary principles were invented by Henry Fourd . He coordinated the whole Production system under the title of "production including movement". Basically, there are two definitions of "Lean". One is systematical theory to delete wastages by continuous improvement and another one is the process of comprehensive working and not only Production. Lean management isn't only restricted to one special activity but it covers all working activities from product planning time to the after selling services. Different organizations must understand that "Lean" is a journey, no body reaches its destination. Lean company is a occupational system to organize and mange the genesis process of product, Production operation, suppliers and communications with customer. Lean companies use lean principles, methods and tools to produce the concerned value of customer which contains high quality and fewer defects, fewer workforce, lass space and asset and time in comparing to those companies which work based on the principles of traditional system.

**Lean thinking:** The present field of working, provides a new image of organization, with this new theory the organization is a collection of process that their goals are to create value for the customer and it requires value creating inside the organization. An organization which wants to follow the above approach, it should first enter into the sigma field and then traverse the improvement steps to reach the six level of sigma, i.e it will have 3,4 errors in one million opportunities. The primary concept of lean thinking is underlined in removing wastages and creating value. Lean thinking is a theory to increase efficiency and continually create value and minimize the costs and wastages, so the entrance to sigma field can mean removing of defects, wastages and clean errors through quick methods as concept and techniques of lean thinking. Because the increase of sigma rate needs to decrease the defects and wastages .This though provides a method by which many results can be obtained wild fewer resources, equipment's and less time and space. By this theory a Lean Production system can be used in

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\*Corresponding Author: Mansour Alilou, Young researchers club, Salmas branch, Islamic Azad university, Salmas, Iran,  
Email: m.alilou@yahoo.com

the organization. Remarkable decrease of costs, quality improvement of products, delivering the products on time and services to the customers, increase of staff's safety and improving their status are some indices of efficient processes. A company can reach above aims whose current processes are at acceptable rate of efficiency. Organizations can make their processes efficient by accepting the pattern of lean thinking. Figure 1 shows the forming of lean thinking.

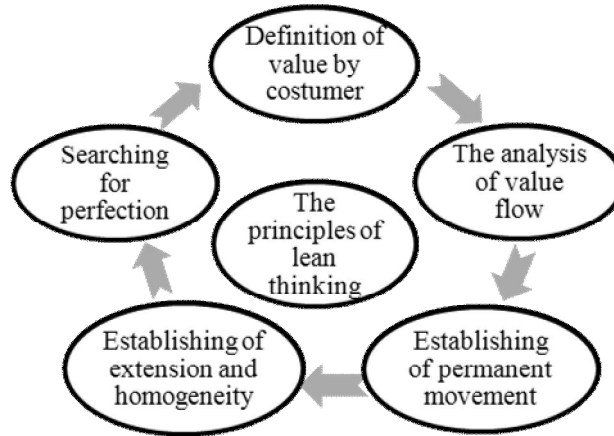


Figure 1.the forming of lean thinking

**Improvement of organizational culture by lean thinking:** Organizations should provide suitable ways to internalize lean thinking all levels; internalizing this through a close relationship with the type of theory and values governing the organization and its staff. Lean thinking must be changed to a culture in the organization and we must know the more commitment the staff are to basic value of organization (as lean thinking) the more effective that culture have on their behavior; there is a strong agreement about the responsibility of an organization in a culture, and unity of aim causes cohesion, loyalty, organizational commitment and desertion decrease; in a strong culture, management needs to fewer formal rules and procedures in order to lead the staffs' behavior because when staffs accept the culture of organization, the behavior conductors will be internal; on the other hand they should understand the cultural values in order to accept them. So the first practical action in order to internalize lean thinking in an organization is to teach these concepts to the staffs and to get this belief that:

**Changing the results means:** we should change our behaviors and in order to change them we must change our thought. And because every thing is derived from human thought and not technology and science, human is located in the center of the new method of Production and signifies it.

**A general review of sigma 6:** Sigma 6 is a management philosophy of improvement that is highly efficient due to it organized principles and human relationships. Sigma 6 theory is based on this issue that the use of strong and complicated tools results in deleting of nonrandom causes and deleting of random and inner causes resulted in decrease of standard deviation of a process. According the limits of process characteristics will be ranged about six sigma from the mean. In this position the high and low control limit covers about %99, 999999 & from the bottom level of round an the number of defects is 0/001 in each one million opportunity.

**The theory of sigma six:** In this theory, the quality isn't considered as a cost and a procedure with any added value. But it is believed that quality increase causes improvement of speed and decrease of production sidelong expenses and finally satisfies the customer. Figure2.is the major goals of Six Sigma.

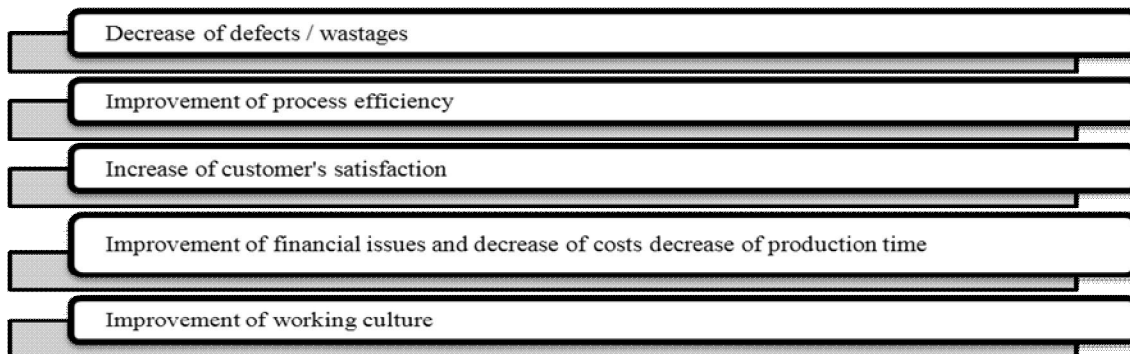


Figure2. the major goals of Six Sigma

**Figure 3.**shows a simple application of Six Sigma is discussed :



Figure3.simple application of Six Sigma is discussed

**Presenting lean in practical:** In identifying the price and analyzing the expenses, first a lean assembly line determines a price for a product in a frame to get reasonable profit. To get this final price assembly line and presents use techniques of value engineering; then they get the final price by keeping the reasonable profit of presenter. Because the lean approach gets its results, presenter should provide. Some basic parts of this inclusive information about expenses and productive techniques to the assembly line; they analyze the Production process of presenter step by step in order to find a way to lower expenses and improve the quality. The second characteristic of lean presentation, is the constant decrease of prices in the life time of a model. Because the prices are identified based on a reasonable frame. Assembly liners know that there is a learning cycloid for each product. So, they know that prices should decrease for the next year; actually, in Lean Production companies the improvements are done very fast, it means that learning cycloids have more pendant in comparing to learning cycloids in the was production companies. One of the important differences is the way of structure delivering to assembly liners. Now the presenter companies put structures directly and for several times in a day on assembly line. Meanwhile these presented pieces aren't analyzed. After using the pieces to the presenter who sends again the requires pieces in this system another one of Lean Production characteristics called production homogeneity is presented. In this system which its staffs are considered as fixed expenses, the importance of Production homogeneity is increased. So the pioneers of Lean Production for (Hey Joan K) or Production homogeneity try a lot to maintain the whole rate of product construction which is resulted by active selling system of lean companies.

### MATERIALS AND METHODS

**Lean system in service organizations:** In official operations of an Production company or of a service organization, most of tools and lean methods are useable with occasional application. In those processes instead of hardware a person must follow creating added value and using of information. For example, in a hospital complex processes can be optimized by some methods as decreasing of circle time and its components (means definition of procedures, cooperation, standardization, use of resources, visual system and ...)

**Mass production:** This production method was firstly analyzed by Adam Smith in 18 century, it focuses on specialty and job dividing and concepts as the economical scale of production and analysis methods and analysis of expenses and profit and activity capacity. Another characteristics of this Production method is this that product is designed by experts and produced by unskilled workers. The work force need less training and organizing is as vertical integration. The product varieties are limited but the prices are declining due to high capacity of production.

**Where is the birthplace of Lean Production? :**The birthplace of Lean Production is Japan and firstly its industries presented and used it. It maybe because of natural and geographical situation of Japan and its culture governing people behaviors . Japanese disagree with ineffective jobs resulted in wastages of natural and human resources. The know wastages production as working in vein and try to produce those productions without defects and with complete quality. The first victory of Toyota was in industry of textile plants and in the 1930s due to strong need to government, the company entered the industry of vehicles, in those years this company faced with problem as small internal market, fixed workforce, lack of enough asset and foreign competitors interested in Japan market. In that time (A.J Toyota) traveled to America with The chi Ohenu and visited automobile Production of (FOURD) and finally they concluded that the principles of mass production cannot be applied in Japan and this system is full of MUDA. Accordingly, they created a new method of Production which

was called later as Lean Production. A lean producer integrates the advantages of manual and mass production together and avoid the high price of the former and inflexibility of the latter one and uses those plants that are automatic and flexible. Figure 4. Some characteristics of Lean Production are:

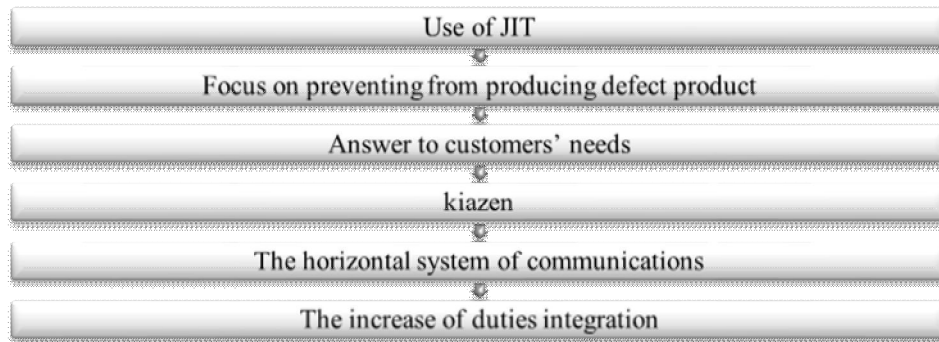


Figure 4. characteristics of Lean Production

**The principles of Lean Production:** In order to get Lean Production some principles must be learned and apply them. These principle are:

- 1) **Cooperation:** Cooperation is one of the important principles of Lean Production and when a part of a production in a factory with Lean Production faces problem, a worker can stop the line to get help from other workers. This is opposite to mass production.
- 2) **Communications:** In lean system the members of a group make commitment that do exactly the same thing that all of the members agree on it. The leader has effective role in the group, the leader has an effective role in relating the members to each other.
- 3) **The optimum use of resources and deletion of MUDA:** Everything that isn't adapted to value definition or doesn't add to value is called MUDA.
- 4) **The staff's empowerment:** Because they are staffs who are directly related to the concerned job and opine about it better than anyone else and determine MUDA faster than anybody.
- 5) **Focus on the term of value at the point of customer's view:** The responsibility of each producer is to satisfy the customer by providing value. For example when you increase the value, actually you change the unsuitable form of the product and if you don't know what is value, you will usually face with problems resulted by lower quality of producers. And you should notice this important point in Lean Production that workers answer to Lean Production when there will be mutual sense of commitment. This sense that management value skilled workers and authorize the duties to their group working. Figure 5. arrangement of elements to achieve the principles of Lean Production shows.

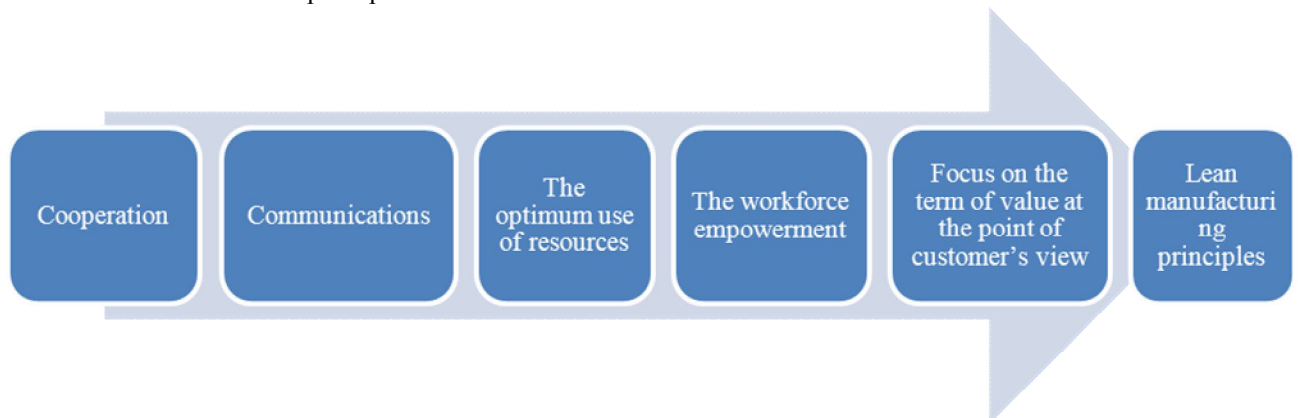


Figure 5. Arrangement of elements to achieve the principles of Lean Production

**Acquaintance with some terms in Lean Production:**

**MUDA:** it refers to some components of productions which don't add any values to work.

**MURA:** it limits the expenses of production while keeping the quality. MURA is created due to informal production capacities and production planning, it means that operational capacities of each machine isn't balanced, in these conditions the capacity is done based on the slowest working level which in turn increases the production expenses.

**MURI:** it refers to expanding the limits of power and capacity for workforce and plants and equipments. For example, more use of workforce’s ability causes stress and tension which in turn cause decrease of products quality and unsuitable profit.

Table (1) a general comparison of two solution tools, (six sigma), (lean thinking)shows :

**Table (1) a general comparison of two solution tools, (six sigma), (lean thinking)**

Lean thinking	Six sigma	Improvement plan
<b>Remove waste</b>	<b>Reduce variation</b>	<b>Theory</b>
1) <b>Identify value</b>	1) Defining phase	Administrative phase
2) <b>Value stream identify</b>	2) Measuring phase	
3) <b>Flow</b>	3) Analyzing phase	
4) <b>Pull system establishment</b>	4) Improving phase	
5) <b>Perfection tackle</b>	5) Controlling phase	
<b>Flow focuses</b>	<b>Problem focused</b>	<b>Focus</b>
1) <b>Waste deletion improves work efficiency</b>	1) The problem existence is clear	Hypotheses
2) <b>Establishing several small improvements actualize bigger improvements</b>	2) Variations can be measured	
	3) Output of system is improve if variation will be decreased in all of the processes	
<b>Reduce flow time</b>	<b>Uniform process output</b>	<b>Primary results</b>
1) <b>Variations decrease</b>	1) Waste decrease	Secondary results
2) <b>Assimilation of processes output</b>	2) Increase of operational ability	
3) <b>Decrease of stock level</b>	3) Decrease of stock level	
4) <b>Establishing of a new accounting system</b>	4) Quality upgrade	
5) <b>Quality upgrade</b>		
<b>Statistical techniques and measurement don't have much application.</b>	<b>Improvement of processes independently</b>	<b>Weak points</b>

**Workmanship of factory:** Ohono created the system of k an ban that in one step those pikes are made that they must be delivered in the next step. So the trucks take the pieces to those places where these pieces are used, when their burdens are completely used they come back and their coming back is a sign to produce new process. According to this idea the stock in the store isn't a matter and if a piece has a problem, the whole producing line is stopped. This topic was the strong point of this idea at the point of Ohono’s view, because where this idea was actualized, all of the networks that guaranteed the production maintain would be disappeared. In the last assembly line the pieces are presented continually and the job dividing is balanced and when a worker faces with a defect pierce, be labels it carefully and sends to quality controlling unit to receive a replacing one. The workers of quality controlling unit apply the five questions about the defected pierce to find main origin of defect. In mass production each worker can stop the production line, but in this system it is never stopped. Because the problem are solved in advance and a problem is never happened for the second time. Actually, focusing permanently on the problem and preventing them to occur again remove most of the reasons that result in stopping a production line. In the last part of production line, two Production methods, i.e. mass and lean have remarkable differences, in lean factory there aren't any field of working again but in mass one there are many defected products which finally result in increasing of final product price and decreasing of lower quality for a customer and also decreasing of competition ability of factory.

**RESULTS AND DISCUSSION**

**The reccessing of application lean technology in countries with one production:** Production in non-industrial countries with on products is in a traditional way and by use of old facilities. The products has lower demand because they aren't matched with global level and this causes out competition markets in the world to be dominated by industrial countries. According to the economical status of countries with on product that get the Holland disease which causes cash increasing in the society and finally it increases demands to the consuming products by people. And because the Production factories inside the country don't satisfy the people’s demand, so the government imports the products with prices less than those produced inside, so it cause that these factories can't sell their products and finally they are closed and unemployment is increases. According, the use of lean technology can help the non-industrial countries to get their positions in exporting demand is satisfied and as a result the unemployment rate is remarkably decreased. Figure 6.illustrate the mechanism of Lean Production applying in the country.

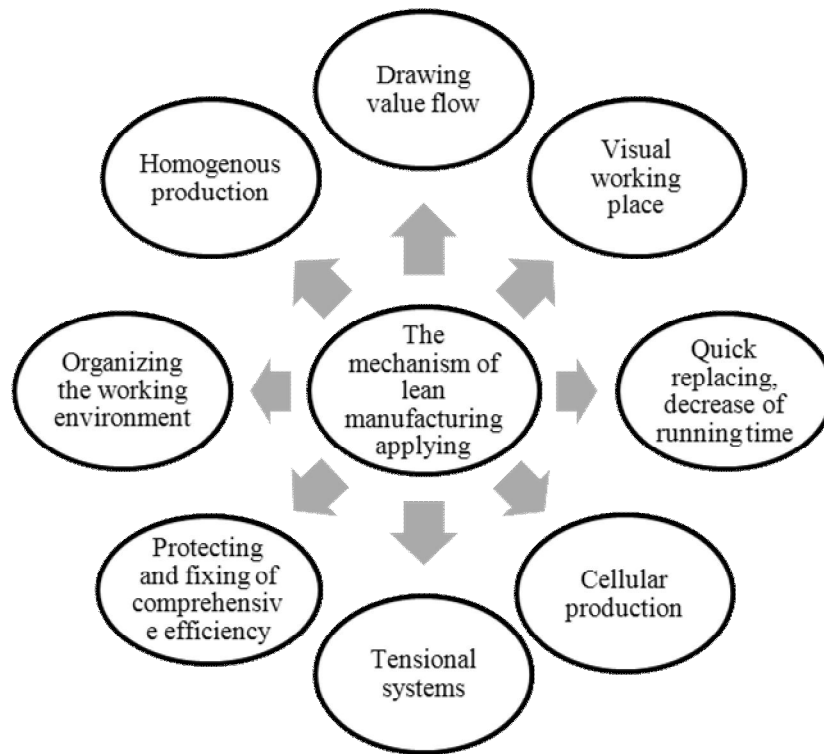


Figure 6.illustrate the mechanism of Lean Production in country

**The management's responsibility in applying lean principles (lean thinking and Production):** The proper planning and administrative management are the keys to get a permanent success in the use of Lean Production. To apply the lean principles successfully. As well as management function, it is necessary to coordinate Lean Production with all of the organization guidelines. The management main responsibilities in lean system are:

- Making change in organizational culture equal to the principles and procedures of lean
- Designing a comprehensive plan instead of mono purpose solutions
- Supplying necessary resources
- Protecting lean principles and having long term commitment to them
- Authorizing the staffs and focusing on cooperation.

However, most companies that use manual and mass production methods, have their own reasons: first is this fact that running a lean system takes time and cost. Second is that lean systems change the organization processes and procedures fundamentally which needs to have proper cultural, technological and information potentials and also it needs logical and social requirements. Third, changing an organization from mass production to lean one is only possible in a condition raised by management.

The weak points of lean system:

In order to get a comprehensive view the weak points should be noticed according to the value engineering.

Some of those weak points are:

- Lean system may increase risk without evaluating the results logically.
- Lean system probably can't provide enough evidence for a traditional accounting in order to get profit in the business market.
- Facing with repeated complicated problems has some limits because it follows the method of trial and error
- Lean selling system and training the staffs and coordinating organization system with lean goals increase the expenses.

### Conclusions and Suggestions

According to the previous discussions about lean thinking and Production at the level of management and production, it can be found out that the use of lean technology can decrease the unemployment rate as well as the obtained profit by exporting and also it can absorb the inner primary resources and change them to consuming products and this can prevent cash outgoing. The most important principle in lean thinking is removing of production wastages. To understand a topic one should notice the deep and original theory underlying that method. Lean thinking follows the customer and believes that in order to optimize the system status and focus on customer and upgrade the value we have to ignore the competitors and focus on ourselves.

We must identify and delete the wastages and be in continuous improvement by following perfection-oriented approach. So it is possible to dominate the exclusive competing market by training the managers and establish proper situation in order to invest in Production unit by lean technology. We know that fixed expenses can be lowered by producing a lot and in order to actualize this we must localize sigma six based on the experience of industrial countries.

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