

# Key Factors in New Product Development in Automotive Industry's Trademark

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## ABSTRACT

New Product Development (New Product Development) is a complex process of bringing new products to market. Despite the success of lean thinking, and its principles of manufacturing. Adopting a novel approach for new product development and its importance for companies as a new approach has not been considered yet. Because this process has some mudas, therefore, applying the lean philosophy in various stages of new product development is essential. The use of the trademark in all phases of new product development is always engaged with business processes analyses in order to remove non-value added activities from value-added activities. In this paper, we combined the eight lesions with different grades of lean manufacturing in six phases of new product development process, and identified the factors and indicators of new product development. Since in Iranian automotive industry, level of changes in market and customers' needs and technological changes is more than other industries, therefore, this research is used in order to determine key factors in lean manufacturing from viewpoints of new product development project's managers in this industry. The research method in this study is survey and a questionnaire was used. The pre-test of 10 experts determined 36 factors and the importance of indicators were analyzed precisely, and responses from 40 managers and experts in the automotive industry in Iran has been collected. 22 reliable questionnaires were collected. Then, statistic T test based on responses from questionnaires was done using 20SPSS software which indicates that 13 original factors can have effects on new product development process.

**KEYWORDS** :New product developments, lean manufacturing, lean new product development, mudas

## 1. INTRODUCTION

Today, due to the rapid growth of production and competitiveness of the market, the need for products and services is increasing dramatically. Population increase and diversification of needs are the encouraging factors of achieving product and more new goods by organizations. In the product life cycle in period of its growth, net resulted from providing the product to the market reaches its maximum. Therefore, it is obvious that organizations and companies tend to maintain their benefits at this stage. Therefore, the fundamental solution is the preservation of life and survival of companies in today's competitive market, innovation and development of new products, and replacement which researchers consider the new product development concept (NPD). [1]

Each product is identified from an appropriate "life cycle" that means: the time from production concept through the product's decay, market introduction, growth and maturity. Nowadays, the product life cycle is getting shorter which is the conditional need in the sense that the new product development process is critical. Therefore, companies will start working on this phase, so they improve it and increase its performance while the consumed time decreases.

Changes in business in some years ago are impact of solutions in NPD process, which are done and managed. To summarize, we can list the main driving forces that determine the concentration on product development activity.

1-Increasing level of competition (more firms competition for similar markets) [4] 2.Rapidly changing market environment 3. Shorter product life cycle [5]

A primary effect of environmental factors on the company is to have some changes that lead to the overall efficiency and effectiveness of the NPD process. Since last decade, many of new techniques and tools has been proposed in order to improve product development particularly lean manufacturing which has been developed by specialists, consultants, and university professors, and it has been performed with one or many companies.

Lean thinking is a dynamic, knowledge-driven and customer-focused process through which all people in a venture eliminate all the muda continuously with the aim of creating value. [6]

A key element is the focus on the consumer who is always available. All activities must be worth something to a customer. All the work that is done onto a product and does not add any value is regarded as muda, Hence the pure model is in contact. While by identification of value added activities from the category of muda (waste in Japanese), both organization and supply chain begin. As Womak and Jones stated Lean thinking of eradicating waste and creating value is in organizations. Lean production creates value added from customer's perspective with the aim of eradicating all the waste in all the stages of the process.

In this study, impact of leaning thinking concept and leaning production waste as a powerful methodology in new product development process which is applied by identification of key factors for the success of new product development. Its result in improvement of new product development process was analyzed. In this research, in order to determine the main factors in development of lean new product, factor analysis approach was used.

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## 2. Using a pure concept of the new product development process

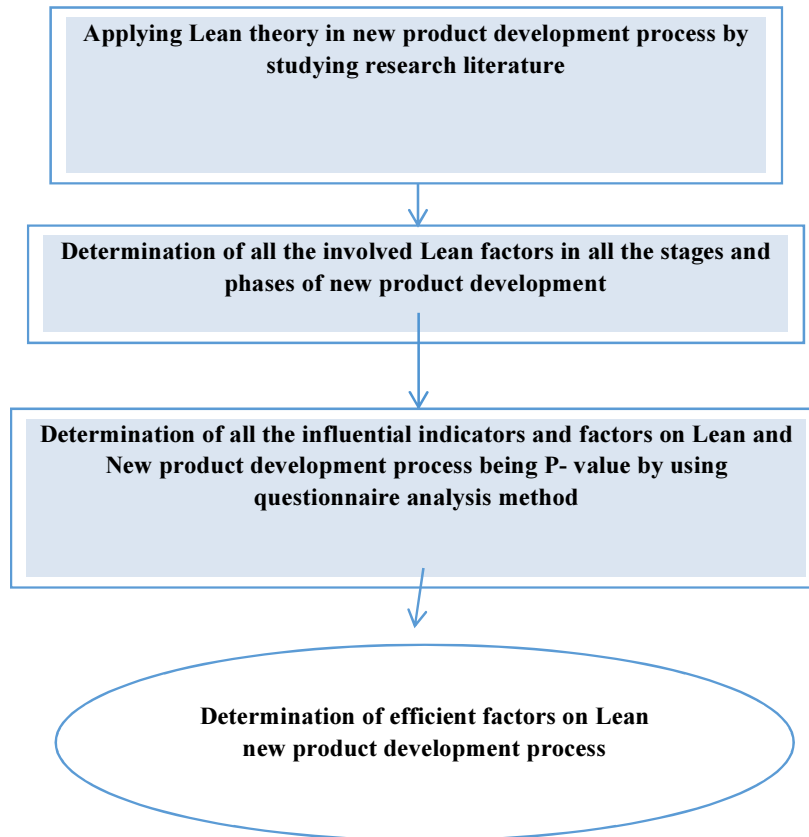
Interdisciplinary nature of new product development is a concept which has been drawn from several disciplines. Authors of management and marketing in new product development used two terms; design with innovation or they have used both. Many studies in the literature on new product development indicate the importance of this issue. The companies have considered it an essential issue for success. From a broader perspective, the development of new products is a key factor in the economic development of a country. [8] Today, reliance and dependency on traditional competitive axis like; quality increase, cost reduction, and uniqueness in introduction of products and services are not enough, and in turn, concepts like speed, flexibility in competition, creating value by removing non-value activities are becoming noticeable, and tendency to this supply of new products and services to market is the reason for this changing attitude. Manufacturers of new products consider all the cycle of production from conceptualization and creativity to launching of the product into the market overlapped and simultaneous to expedite supply of products, accordingly, a concept like concurrent engineering (CE) can be found so as to discuss how the integration of project activities with a focus on product development has been the subject literature. Moreover, dynamics and complexity of new product development concept and interdisciplinary nature on the one hand, and an increase in competitiveness of markets along with discovery of science and new tools for production and fundamental changes in needs and interests of customers on the other hand, have challenged the new products development and caused the researchers to hold different approaches and find more useful findings.

Although different models have been provided regarding new product development, findings of researchers in this field in more than four decades indicate that one complete model does not exist that would be applicable for all the items or does not have flexibility and complete accordance with conditions of organizations. In general, as Saren stated in 1984: models of new products are classified in five categories-stage model of organizational units, process models, activity models of decisions, reaction models and process models. Although there are several models to introduce the new product development process, one new product development process is generally a 6-step process which all of the steps are connected:

1 - Opportunity identification stage 2 – The concept development and its evaluation stage 3. The new product idea generation and evaluation stage 4. New product development stage 5. The market test stage 6. - Massing and commercialization of new product stage [1] The process of new product development has always been associated with a high level of uncertainty and complexity. Rate of increasing changes in competitive markets indicates that it is time for NPD specialists to hold new tactics and strategies in order to deal with successful development of new products with minimum cost and time, and maximum quality in accordance with pleasant flexibility, reduction of complexity and losses. [9] The application of lean techniques and principles has been scattered in many companies today. However, they are running it alone during the production phase. The real competition is spread of lean thinking to all the companies that are starting new product development. Lean management of one process is not with one start and one finish, its implementation includes continuous research for improvement, it is even more noticeably short compared to the current environment cycle, and technology is rapidly progressing. Therefore, applying lean- making strategies in production chain and NPD process is an essential and important issue. Being lean in the process means the rapid capability of organization for eliminating muda and losses during production and presentation of a new product in terms of cost, quality and quantity and zero losses. [10] Lean manufacturing use the philosophy of continuous improvement. By using the custom of teamwork, it tries to find the muda in the process and analyze them, then destroy them. The effect of such a system can cause a reduction in time of production, improved employee performance, higher quality, more flexibility than the market life of machinery, inventory levels and reduction of overhead costs. Lean manufacturing that works on the basis that a high quality product does not necessarily have high cost of production. In lean manufacturing, overhead costs, especially indirect costs by compliance with quality standards and lowering the cycle time of production are spontaneously reduced. In 1996 Womak and Jens introduced a new class of products that has been used by people ability. These wastes have be modified again in new product development, and its main contribution is provided by Leiker. Overproduction, waiting, transportation, or transmission, processing, inventory, defects and reform movements, Unused employee creativity. [11]

## 3. RESEARCH METHODOLOGY

This research is conducted to determine and analyze the efficient factors on Leanness of new product development process. As stated above, we initially analyzed the literature research of using lean thinking in all the steps of new product development and combined the eight lesions with different grades of lean manufacturing in six phases of new product development process. All the factors and indicators of new product development analysis were detected, then by using factor analysis and T test and survey analysis through SPSS 20 software, key factors in new product development process were determined.



**Figure 1- Methodology of research**

Determination of efficient factors on Leanness of new product development process using T test

In order to determine the effective factors on Leanness of new product development process, we initially analyzed the research literature to find the factors influencing leanness of new product development process which are gained from applying all the mudas of lean production in all the stages of new product development process.

All these factors are presented in Table (1). In the next step, to extract the main and influential factors, several questionnaires were initially developed based on the factors listed in figure 1. The questionnaire was sent to 40 managers, consultants and engineers of new product projects who were more successful in the automotive industry and we received 22 proper replies.

In order to evaluate the expert’s opinions regarding each influential factor, Likret 5 scale was used in which number 5 means very high and number 1 means very low.

Table 1. Factors and indicators of lean new product development, and analysis of the factors affecting new product development process using T-test statistics and P-Value

P-Value	Items
0.285	1. Removal of excessive information waste for
0.018	2. Removal of waiting waste for data processing in initial studying phase of the market
0.086	3. Removal of waiting waste for data processing in opportunity analysis phase
0.009	4. Removal of waiting waste for data processing in strategic programming phase
0.010	5. Removal of unused staff’s creativity waste (Bad knowledge management) in initial studying phase of the market
0.062	6. Removal of unused staff’s creativity waste( bad knowledge management) in disorganized information failure phase Applying Lean production wastes in creation of new products and their evaluation phase
	7. Removal of excessive information waste for idea-creation phase
0.381	8. Removal of waiting waste for data processing in new idea-creation phase
0.090	9. Removal of wastes of movements in session or unnecessary trips in idea-creation phase
0.088	10. Removal of unused staff’s creativity waste (bad knowledge management) in idea-creation phase ( in recognizing sources for new and creative ideas)
0.002	11. Removal of unused staff’s creativity waste (bad knowledge management) in idea-creation phase ( in activating ideas)

	and sources) and their evaluations
0.024	Applying Lean production waste in new product development phase and its evaluation
	12. Removal of excessive design waste for new product development and its evaluation phase
0.088	13. Removal of excessive specifications waste in express phase and recognition of standards for new product concept evaluation
0.090	14. Removal of excessive information waste in express phase of new product development
0.229	15. Removal of inappropriate process waste ( in an excessively improper process) in new product development concept phase in idea-analysis sector
1.000	16. Removal of inappropriate process waste ( in an excessively improper process) in new product development concept phase ( cost and quality) in guaranteeing new product success
0.204	17. Removal of reform waste and replication ( weak design) in new product development concept
0.825	18. Removal of wastes of movements in session or unnecessary trips in new product development concept and its analysis phase Applying Lean production waste in designing and development of new products and their evaluation
0.137	19. Removal of waste of unnecessary or excessive activities ( in an excessively improper processing) during new product development in the physical sample
0.137	20. Removal of unnecessary or excessive activities ( in an excessively improper processing) during new product development in designing sector
0.013	21. Removal of inappropriate process waste ( in an excessively improper processing) in new product development concept phase and its evaluation in sample product development sector
0.840	22. Removal of inappropriate process waste ( in an excessively improper processing) in new product development concept phase and its evaluation in designing sector
0.504	23. Removal of inventory ( bad pile-up) in new product development phase and its evaluation in resources-designing phase
0.186	24. Removal of wastes of movements in sessions or unnecessary trips in new product development and its evaluation phase Applying Lean production waste in test markets of new products and its evaluation phase
1.000	25. Removal of waste of unnecessary or excessive activities ( in an excessively improper processing) during test markets phases in unnecessary and useful sectors
1.000	26. Removal of waste of unnecessary or excessive activities ( in an excessively improper processing) during testing of the markets during Beta and Gamma Tests
0.715	27. Removal of waste of unnecessary or excessive activities ( in an excessively improper processing) during testing of the markets during marketing test
0.825	28. Removal of wastes of movements in session or unnecessary trips during test of market phase
0.825	29. Removal of reformation waste and replication (weak design) in test of market phase before use of product
0.025	30. Removal of reformation waste and replication (weak design) in test of market phase of primary use of product Applying Lean production waste in commercialization of new product phase ( start of mass production) and its evaluation
0.012	31. Removal of parts and excessive materials' waste at the start of mass production of new product phase (in- line)
0.045	32. Removal of transportation and manual carrying waste at the start of mass production of new product phase ( in-line)
0.009	33. Removal of improper process waste ( in an excessively improper processing) at the start of mass production phase in new products in the sector of determining proper guidelines to begin production
0.019	
0.088	34. Removal of wastes of movements in session or unnecessary trips at the mass- production of new products phase
0.000	35. Removal of inventory waste (weak pile-up) at the start of mass production of new product phase
0.047	36. Removal of reformation waste and replication of production at the mass production of new product phase

However, in order to determine the influential factors on leanness of the process of new product development, we initially used factor analysis, T test and P value test in a way that all the factors are considered as non-zero elements of the field, while they have P-value more than 0.05. The zero assumption is confirmed which means there is no difference between sample values and society values, and consequently is not considered a major factor. As seen in table 1, several factors have P-value more than 0.05. Therefore, although these factors at first sight by analysis of research literature are considered influential factors on Lean new product development, from experts' views, these factors do not have much influence on Lean new product development in Iran's automotive industry, and applying them can improve NPD process of other aspects rather than Lean. Thus, by removing these several factors from the 36 factors, the involved factors in Lean new product development in Iran's automotive industry can be identified, and these factors are presented in red in the table.

## **Conclusion**

As mentioned above, the aim of Lean technique in NPD process was to concentrate on creating value and eliminating non-value added activities throughout the process. To this purpose, in this research, by applying Lean production waste in all the stages of new product development process, and factors and effective major causes of Lean new product development were identified. Then, the importance of these factors regarding new product development projects of Iran's automotive companies was analyzed and determined by using content-analysis method and statistical T test. So applying Lean strategies in production chain and NPD process is an important and essential issue. Leanness of process is for the purpose of reduction and removal of waste and losses during new product development and production process. Having a viewpoint about inner subject of a team is very significant. Everyone should know what wastes are major and for determining the quantity of these wastes during material, time and cost period are useful and proper. Providing tools for management of various projects and obtaining graphs for instant understanding of the wastes that are very important to them, is very interesting.

The next challenging question is that: Why are their statuses dangerous to our NPD process?

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