Discriminant Analysis of Supply Chain Sustainability Clusters Based on Leans Tools

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Extended Abstract

In recent years, the sustainability of the supply chain due to environmental, social and economic aspects has been considered by researchers. Sustainable supply chain can be considered as the management of materials, information, capital flow, as well as cooperation between supply chain companies to achieve the goals of sustainable development, including environmental, social and economic components. To achieve sustainability at the corporate level, various methods have been discussed in recent years, that one of them is to use the tools of the lean production system which is a production paradigm based on the elimination of waste. Lean production continuously improves resource efficiency and reduces materials use and energy consumption, which ultimately leads to reduced environmental pollution. Nowadays, lean tools are considered to create and improve the value of the customer in the process of eliminating waste. Elimination of wastes is a base to achieve economic, environmental and social sustainability. Although various studies have been conducted in recent years on the relationship between lean tools and supply chain sustainability, these studies have not shown how to achieve sustainability based on lean tools and the ability to distinguish strong sustainable companies from weak and unstable ones. This is seen as an important research gap in the impact of lean tools on sustainability; This is because empirical

studies supporting theories on the effects of lean tools on corporate sustainability have not clearly identified how to distinguish sustainable from unsustainable companies based on these tools. This research will help theoretical literature in this field from two points of view. First, based on cluster analysis, it will identify similar and homogeneous groups in terms of supply chain sustainability. Second, the effectiveness of each lean tool in identifying the sustainability of the company's supply chain and in general creating a function based on which the stability or instability of the supply chain of companies can be determined. In this regard, this research has been done in order to facilitate the achievement of sustainability of the supply chain through lean tools. Accordingly, the aim of this study is to do the audit analysis of the supply chain sustainability clusters based on the lean production tools.

This study is an applied one in terms of purpose and descriptive-analytical in terms of method. The statistical population of this study is all small and medium industrial units of East Azerbaijan province. Based on the available statistics, a total of 1373 active industrial units have been identified and the sample size is 301 industrial units. Data collection tools are two types of questionnaires that have been compiled to evaluate the components of supply chain sustainability and to evaluate lean production tools in small and medium industries of East Azerbaijan. To determine the validity and reliability of the questionnaires, the structure validity based on factor analysis and Cronbach's alpha coefficient were used respectively.

Cluster and audit analyses have been used to analyze the data. The results of the cluster analysis show that, companies can be put into three clusters, the first of which is not known as a stable cluster due to its low scores. The results of the audit analysis also show the audit function, which shows the share of each twelve lean tools (in this study) in distinguishing between sustainability clusters and classifies companies into two groups of complete and poor in terms of sustainability. The accuracy of this function is 98.1%.

 The results of the audit function indicate that, for the sustainability of supply chain, the most important variables based on their coefficients are visual workplace, comprehensive repairs and maintenance, and value flow mapping and the other variables with less importance coefficients are in the next ranks. In other words, the importance of variables shows that, companies that have based their lean production programs on these variables have achieved greater stability in their supply chain. Comparing these results with clustering results indicates that, only 43 companies performed well in these variables (the average score of these companies in pure tools was 3.97).

Also, the descriptive statistics of the variables for the next 119 companies, which are classified as weak cluster, show an average score of 2.98 in pure tools, which indicates poor performance in these variables. So all in all it can be concluded that, the supply chain of sample companies in this study will be stable when their performance is higher in each of the variables. Secondary analysis based on the characteristics of the companies, the highest number is allocated to food and beverage industries, machinery and equipment, and materials and chemical products respectively, and the other industrial groups are in weak and unstable clusters.

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