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A REVIEW ON MAIN CAUSES OF NOT IMPLEMENTING AN ON TIME PRODUCTION SYSTEM AT AUTOMOTIVE COMPANIES

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ABSTRACT

This study investigated the main causes of not implementing an on-time production system at the automotive companies. In this research, factors affecting the non-implementation of the on-time production system have been investigated in eight groups, which are: high-level management, supplier relationships, lack of infrastructure, middle management and supervision, staff resistance, technical factors of production, negative effects of on-time production and economic factors. The statistical population of the research is composed of 30 executives and experts in the automotive company. The relationships between the research variables were investigated using Decision Making Trial and Evaluation Laboratory (DEMATEL) method and ANP. The results of the research showed that the negative effects of production have the greatest impact on other elements of the system. Economic factors are also the second most influential factor. The negative effects of production, the technical production factors, and middle management and supervision have the most interaction with other elements in the organization. Top management, relationship with a supplier and causal economic factors. Negative impact measures also have the greatest impact on other elements of the system. Economic factors are also the second most influential factor. The negative effects of production, the technical production factors, and middle management and supervision have the most interaction with other elements in the organization. Top-level management, relationship with the supplier and causal economic factors. Also, the benchmark for a relationship with the supplier, top-level management, mid-management, and super-manager ranked first to third, respectively.

1. INTRODUCTION

The production system is presented in a timely manner in order to produce and deliver the products and services required with the minimum possible inventory (Farahmandjou, 2013;). The production system was first introduced to Toyota thirty years ago by Ijeevo Toyota and his colleagues, taking into account his underlying principles. The timing system can be defined as An ultra-harmonized production system in which goods and services are delivered as needed (Stevenson & Sam, 2009). The two basic principles on are the removal of waste and the full use of manpower (Aghazadeh, 2003). The components of a production system are flexible resources, cell deployment, tensile production, production control by the Kanban system, production in small groups, fast launch times, integrated production levels, quality in the source, maintenance of interest, and comprehensive distribution and network of suppliers (Russell & Taylor, 2008).

The main concept is to provide the product required at the right time and with the right quality. The production system can be thought of as a philosophy that seeks to integrate all aspects of production processes from input to production and delivery. This philosophy can improve productivity by reducing waste in production, increasing the added value of the product. One of the elements of the production system during Kanban, which is a tool for the tensile production system. Many scholars have argued that the link between the production system and other components of the production system is far more complicated than designing production and business strategies, to the extent that traditional texts discuss this production system (Lee And Lee, 2003). One of the ways of examining the various dimensions of this simulation system is to run a synchronization system that is very time consuming and costly to run.

Despite the many benefits that the production system has in the present time, the implementation of this system requires some infrastructure, which without the provision of these infrastructures and essentials, the implementation of the production system at an impossible time. Given the many benefits that the production system has and its implementation can be a source of positive development, the necessity of examining the reasons for not implementing such a system in domestic manufacturing companies is well understood (Mahdi Nejad et al., 2015).

Therefore, this research is looking for a thorough and comprehensive study of the main reasons for not implementing the production system at the Saipa automobile company. In this regard, the advantages and disadvantages of implementation of the production system during the investigation and in the next step to identify the causes of non-implementation of the production system at the time and by examining the causal relationships between these factors, and then determining the weight of each of these factors, the importance of each These factors are identified. Finally, based on the causal relationships between the factors as well as the weight and importance of these factors, there are some solutions to facilitate the implementation of the production system at the time

Research questions

Question 1: What are the main reasons for not implementing a production system while in the automotive company?

Question 2: What are the causal relationships between the major factors affecting the failure to implement a production system in the company at a time?

Question 3: What is the weight and importance of each of the major factors affecting the failure to implement a production system in the company?

Question 4: What are the solutions to implement properly and to meet the challenges of implementing a production system at a time in this company?

2. RESEARCH BACKGROUND

Several articles on the causes of the success of production philosophy have been written in Japanese companies (Worsu&Rappa, 2016; Kent et al., 2014). Despite the success of the manufacturing system in Japan, this philosophy of production in the American industry has not been successful (Machinick et al., 1990). Despite the failure of the system in the US manufacturing industry, the system has proven to be a major success in its service business. For example, Kay Mart and Wal-Mart (Collman and Jennings, 1998) are two examples of the impressive success of this philosophy in business. There are also many examples of the success of a timely production system in businesses other than retail. For example, in the healthcare and healthcare debate, which costs a lot to preserve medicines, medical equipment, patient care, etc., the use of the philosophy of the production system has attracted the attention of researchers (Amasaka, 2014).

The use of a timely production system as a new philosophy in planning is imperative not only in manufacturing systems but in all areas of business, and it is necessary to pay attention to having a business.

Nasari (2010), during the production system, is a timely management philosophy that originated in Japan, no raw material is purchased in this system, and no product is created unless necessary. It eliminates any waste and continuous improvement. Productivity focuses on the use of this system with a series of benefits that increase the quality and reduce the amount of inventory and consequently reduce costs. . The successful implementation of a timely production system requires the provision of a series of infrastructure and pre-requisites and requires careful planning. Despite its advantages, this system faces a number of constraints, including the lack of proper use of it in all countries pointed out in this research about goals, benefits, constraints, implementation stages, etc. This system was discussed using library studies.

Mahdi Nejad et al. (2015) reviewed an article on the timely production system and the benefits of implementing in manufacturing organizations. The study focused on the production system on time and the benefits of its implementation in manufacturing organizations.

Ashtari and Rezaei (2012) presented an example of a production model based on the Pulling approach in planning the production of heavy equipment for oil and gas industries. This article tries to provide a model that uses a timely production system based on the pulling approach in planning the production of heavy equipment for oil, gas, petrochemical and similar industries. Studies of this project have been carried out in the manufacturing department of the Arak Machine-Building Company. By implementing this model, the time lost due to the lack of timely delivery of parts to assembly workshops and, consequently, related costs is reduced. In addition, the bottleneck of the production system is largely overcome and the unrestricted increase in the volume of goods in the semi-manufactured warehouse is prevented. The model, in addition to the ability to run in the Arak Machine Manufacturing Company, can be extended to similar companies.

Sheikhan et al. (2012) investigated the status and prioritization of the goals of the production system at the time of the Taking Food Industry Company. In this article, the objectives of the implementation of the timely production system in Takayeh Food Company were studied. To this end, by identifying the objectives of the implementation of this system and collecting the views of five experts and managers of Taking Food Industry through a multi-criteria decision making and hierarchical process analysis process, these objectives and their sub-criteria are ranked and the results of this study indicate that the goals associated with organization and production are the most important in this company, and the goals of sales and revenue, and goals of inventory and competition are arranged in the order of priority.

2.1 DEFINITIONS OF CONCEPTS

Delay: Delay in performing an activity is equal to the time taken for an activity minus the standard duration required to complete an activity. In the present research, the main goal is to plan the time of construction and implementation of activities in groups. Delay in the implementation of activities in the group causes disruption and bottleneck in the entire system, and therefore the delay in carrying out activities in this issue is undesirable that we intend to minimize it.

If the time set for the completion of an activity and the T time taken to perform an action is considered, and the latency is called D, the latency is obtained from (Nasari, 2010)

D = T -

Early: The early performance of an activity is equal to the length of time before the normal and standard time of execution of an activity has lasted. In this research, since it is contemplating that a production system is implemented during implementation, early maturity is also undesirable, as it leads to increased storage costs. Therefore, in the research objective function, this variable is also minimized in working groups. (Mehdi Nejad et al., 2015).

If the considered standard time to complete an activity, as well as T, is the time taken to perform an action, and the speed of time is called D, the speed is obtained

D = - T

Production at the time: A philosophy and a comprehensive system for controlling production inventories, in which no raw material stock is purchased unless otherwise required. In this research, the system of production is used at the time, and therefore, in modeling the problem, the lateness and early maturity of both are unauthorized and subject to fines (Nasari, 2010).

3. RESEARCH MODEL

Considering the review of theoretical foundations and research background, the following model has been used to examine the variables.

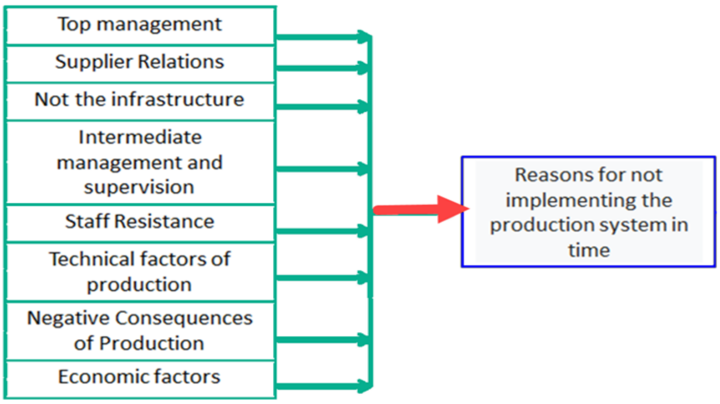

Figure 1: Conceptual model.

4. RESEARCH METHODOLOGY

The purpose of this research is descriptive-survey based on applied research and in terms of the method of work. The realm of research is the city of Tehran and the period of the first half of 1396. The subject area of research is one of the topics of manufacturing systems. The statistical population of the present study consists of managers and experts present in the automobile company. The community under study in this study should have the following conditions: Have at least a master's degree, have at least 5 years of work experience in the company, have a defined organizational position, are willing to cooperate in conducting research. The number of managers and experts in this study was 30. In the first step, a review of the literature was carried out, at which stage the research hypotheses were designed. Using experts' opinions, a questionnaire is designed to test the research hypotheses. In this regard, using standard questionnaires as well as experts' opinion about the design of the questionnaire from experts. Each of the questions in the questionnaire was designed as 5 options based on a Likert scale. On this scale, responses to yes and no are not limited, but its severity and weakness are also measured. At this scale, responses are divided into five groups; from very little to very much. Because the responses received are somewhat less responsive to the respondent's point of view, fuzzy data has been used instead of definitive data, and data and preferences are listed in Table 1.

Table 1: Likert Scale Table

Affectless	Little impact	Medium Impact	much impact	Very much impact
(1/1/1)	(3/2/1)	(4/3/2)	(5/4/3)	(5/5/4)

Since the questionnaire questions were identified and corrected by the opinion of the professors of the counsel and counselor, it can be said that it has an appropriate validity. Based on Table 2, the calculated alpha coefficient through statistical software for variables is all over 0.7. Therefore, it can be said that the above questionnaire is sufficiently reliable for the respondent, which means that the given responses are not due to chance and accident, but because of the variables that have been taken into account. Because, firstly, what the researcher is considering is precisely measured, and secondly, the mental perception of all respondents has been the same.

Table 2: Cronbach's Alpha Questionnaire

Dimensions	Cronbach's alpha
Top Category Manager	0.84
Relations with the supplier	0.775
Lack of infrastructure	0.724
Middle management and curated	0.872
Staff Resistance	0.805
Production technical factors	0.757
Negative manufacturing effects	0.903
Economic factors	0.81

In this research, the methods of wastewater and the process of fuzzy network analysis are applied to the analysis of questionnaires.

5. RESEARCH FINDINGS

5.1 IDENTIFY THE MODEL OF THE RELATIONSHIP OF VARIABLES

In order to reflect the internal relations among the main criteria, the DEMETL technique is used. The conventional process of codification does not fully reflect the style of human thinking. In other words, the use of fuzzy sets is more compatible with linguistic and sometimes vague human descriptions. Therefore, using fuzzy numbers, long-term predictions and decision-making have been addressed. The numbers used in this study are triangular fuzzy numbers. Fuzzy triangular numbers are defined by three real numbers expressed as (l, m, u). The fuzzy spectrum is used as given in Table 3.

Table 3: Fuzzy Range and Domestic Product Technique (after Wang, 2011).

language variable	definite language	Fuzzy equivalent
Affectless	0	(0.0, 0.1, 0.3)
Little impact	1	(0.1, 0.3, 0.5)
Medium Impact	2	(0.3, 0.5, 0.7)
much impact	3	(0.5, 0.7, 0.9)
Very much impact	4	(0.7, 0.9, 1.0)

5.2 CALCULATION OF THE CAUSAL RELATIONSHIP MODEL MAIN CRITERIA

Based on the research model, the next step is to calculate the relationships between the identified indicators. In this way, the matrix of relations will be obtained from the main criteria. The fuzzy demilitarization technique has been used to reflect the internal relations among the main criteria.

5.3 CALCULATE DIRECT CONTACT MATRIX ()

First, the views of the experts have been gathered and fused with the fuzzy range of Table 3. If the n-dimensional relations are investigated by the k-expert, the initial matrix for examining the n-criterion relations from the expert opinion k is

$$\begin{bmatrix} 0 & \tilde{X}_{12}^{(k)} & \cdots & \tilde{X}_{1n}^{(k)} \\ \tilde{X}_{21}^{(k)} & 0 & \cdots & \tilde{X}_{2n}^{(k)} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{X}_{n1}^{(k)} & \tilde{X}_{n2}^{(k)} & \cdots & 0 \end{bmatrix} \quad (1).$$

So that each element of this initial triangular fuzzy matrix is

$$\tilde{X}_{ij}^{(k)} = \left(\tilde{l}_{ij}^{(k)}, \tilde{m}_{ij}^{(k)}, \tilde{u}_{ij}^{(k)}\right) \quad (2).$$

When using a multi-expert approach, we use a simple arithmetic mean of the comments and form the fuzzy direct-matrix matrix. The fuzzy mean n of the triangular fuzzy number will be calculated as

$$F_{AVE} = \frac{\sum l}{n}, \frac{\sum m}{n}, \frac{\sum u}{n} \quad (3).$$

Table 4. Fuzzy Direct Contact Matrix Calculation

X	C1	C2	C3	C4	C5	C6	C7	C8
C1	(0, 0.1, 0.3)	(0.45, 0.64, 0.81)	(0.29, 0.46, 0.64)	(0.37, 0.56, 0.73)	(0.35, 0.54, 0.72)	(0.3, 0.48, 0.66)	(0.33, 0.52, 0.71)	(0.23, 0.4, 0.6)
C2	(0.51, 0.7, 0.87)	(0, 0.1, 0.3)	(0.26, 0.44, 0.63)	(0.32, 0.5, 0.69)	(0.16, 0.32, 0.51)	(0.3, 0.46, 0.63)	(0.43, 0.62, 0.79)	(0.21, 0.36, 0.55)
C3	(0.25, 0.4, 0.58)	(0.37, 0.56, 0.73)	(0, 0.1, 0.3)	(0.27, 0.46, 0.65)	(0.47, 0.66, 0.82)	(0.36, 0.54, 0.71)	(0.32, 0.5, 0.69)	(0.35, 0.52, 0.7)
C4	(0.27, 0.44, 0.62)	(0.27, 0.44, 0.62)	(0.27, 0.44, 0.63)	(0, 0.1, 0.3)	(0.31, 0.48, 0.67)	(0.37, 0.56, 0.73)	(0.37, 0.56, 0.74)	(0.33, 0.5, 0.67)
C5	(0.29, 0.46, 0.63)	(0.37, 0.56, 0.74)	(0.2, 0.36, 0.55)	(0.26, 0.42, 0.6)	(0, 0.1, 0.3)	(0.33, 0.52, 0.7)	(0.31, 0.48, 0.66)	(0.33, 0.5, 0.68)
C6	(0.15, 0.3, 0.5)	(0.33, 0.52, 0.7)	(0.42, 0.6, 0.77)	(0.25, 0.42, 0.61)	(0.31, 0.5, 0.68)	(0, 0.1, 0.3)	(0.4, 0.6, 0.76)	(0.27, 0.44, 0.63)
C7	(0.37, 0.56, 0.74)	(0.3, 0.48, 0.66)	(0.25, 0.42, 0.61)	(0.43, 0.62, 0.78)	(0.44, 0.62, 0.77)	(0.46, 0.66, 0.84)	(0, 0.1, 0.3)	(0.4, 0.6, 0.78)
C8	(0.39, 0.58, 0.74)	(0.33, 0.52, 0.7)	(0.36, 0.54, 0.72)	(0.37, 0.56, 0.74)	(0.26, 0.44, 0.63)	(0.32, 0.52, 0.71)	(0.4, 0.58, 0.75)	(0, 0.1, 0.3)

5.4 CALCULATION OF THE NORMAL DIRECT-RELATION MATRIX

Normalization of values must be calculated by values (relationship 3) and (relation 4). By dividing the matrix styles, we obtain the maximal values of the fuzzy normal matrix:

Relationship 4

$$\tilde{a}_i^{(k)} = \sum \tilde{X}_{ij}^{(k)} = \left(\sum_{j=1}^{n} \tilde{l}_{ij}^{(k)}, \sum_{j=1}^{n} \tilde{m}_{ij}^{(k)}, \sum_{j=1}^{n} \tilde{u}_{ij}^{(k)}\right) \quad (4),$$

where $\tilde{b}^{(k)} = max\left(\sum_{j=1}^{n} \mathrm{u}_{ij}^{(k)}\right); 1 \leq i \leq n.$

So the normalized matrix will be

$$\begin{bmatrix} \tilde{N}_{11}^{(k)} & \tilde{N}_{12}^{(k)} & \cdots & \tilde{N}_{1n}^{(k)} \\ \tilde{N}_{21}^{(k)} & \tilde{N}_{22}^{(k)} & \cdots & \tilde{N}_{2n}^{(k)} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{N}_{n1}^{(k)} & \tilde{N}_{n2}^{(k)} & \cdots & \tilde{N}_{nn}^{(k)} \end{bmatrix} \quad (5).$$

Each of the normal matrices is

$$\tilde{N}_{ij}^{(k)} = \left(\tilde{X}_{ij}^{(j)}\right) \Big/ \tilde{b}^{(k)} = \left(\frac{\tilde{l}_{ij}^{(k)}}{\tilde{b}^{(k)}}, \frac{\tilde{m}_{ij}^{(k)}}{\tilde{b}^{(k)}}, \frac{\tilde{u}_{ij}^{(k)}}{\tilde{b}^{(k)}}\right) \quad (6).$$

According to Equations (3) and (4), the normal matrix is obtained.

Each row must be calculated to normalize the values. By dividing the matrix styles, we obtain the maximal values of the fuzzy normal matrix:

$$k = max\left(\sum_{j=1}^{n} u_{ij}\right) = 5.48$$

$$\tilde{N} = \frac{1}{k} * \tilde{X}$$

Table 5: Calculation of Fuzzy Normal Direct Link Matrix

N	C1	C2	C3	C4	C5	C6	C7	C8
C1	(0, 0.02, 0.05)	(0.08, 0.12, 0.15)	(0.05, 0.08, 0.12)	(0.07, 0.1, 0.13)	(0.06, 0.1, 0.13)	(0.05, 0.09, 0.12)	(0.06, 0.09, 0.13)	(0.04, 0.07, 0.11)
C2	(0.09, 0.13, 0.16)	(0, 0.02, 0.05)	(0.05, 0.08, 0.11)	(0.06, 0.09, 0.13)	(0.03, 0.06, 0.09)	(0.05, 0.08, 0.11)	(0.08, 0.11, 0.14)	(0.04, 0.07, 0.1)
C3	(0.05, 0.07, 0.11)	(0.07, 0.1, 0.13)	(0, 0.02, 0.05)	(0.05, 0.08, 0.12)	(0.09, 0.12, 0.15)	(0.07, 0.1, 0.13)	(0.06, 0.09, 0.13)	(0.06, 0.09, 0.13)
C4	(0.05, 0.08, 0.11)	(0.05, 0.08, 0.11)	(0.05, 0.08, 0.11)	(0, 0.02, 0.05)	(0.06, 0.09, 0.12)	(0.07, 0.1, 0.13)	(0.07, 0.1, 0.14)	(0.06, 0.09, 0.12)
C5	(0.05, 0.08, 0.11)	(0.07, 0.1, 0.14)	(0.04, 0.07, 0.1)	(0.05, 0.08, 0.11)	(0, 0.02, 0.05)	(0.06, 0.09, 0.13)	(0.06, 0.09, 0.12)	(0.06, 0.09, 0.12)
C6	(0.03, 0.05, 0.09)	(0.06, 0.09, 0.13)	(0.08, 0.11, 0.14)	(0.05, 0.08, 0.11)	(0.06, 0.09, 0.12)	(0, 0.02, 0.05)	(0.07, 0.11, 0.14)	(0.05, 0.08, 0.11)
C7	(0.07, 0.1, 0.14)	(0.05, 0.09, 0.12)	(0.05, 0.08, 0.11)	(0.08, 0.11, 0.14)	(0.08, 0.11, 0.14)	(0.08, 0.12, 0.15)	(0, 0.02, 0.05)	(0.07, 0.11, 0.14)
C8	(0.07, 0.11, 0.14)	(0.06, 0.09, 0.13)	(0.07, 0.1, 0.13)	(0.07, 0.1, 0.14)	(0.05, 0.08, 0.11)	(0.06, 0.09, 0.13)	(0.07, 0.11, 0.14)	(0, 0.02, 0.05)

5.5 CALCULATE THE COMPLETE COMMUNICATION MATRIX

A relationship is used to calculate the relationship of the relationship. In the fuzzy demultiple method, the fuzzy normal matrix is divided into three definite matrices:

$$N_l = \begin{bmatrix} 0 & l_{12} & \cdots & l_{1n} \\ l_{21} & 0 & \cdots & l_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ l_{n1} & l_{n2} & \cdots & 0 \end{bmatrix}$$

$$N_m = \begin{bmatrix} 0 & m_{12} & \cdots & m_{1n} \\ m_{21} & 0 & \cdots & m_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ m_{n1} & m_{n2} & \cdots & 0 \end{bmatrix}$$

$$N_u = \begin{bmatrix} 0 & u_{12} & \cdots & u_{1n} \\ u_{21} & 0 & \cdots & u_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ u_{n1} & u_{n2} & \cdots & 0 \end{bmatrix}$$

5.6 CALCULATE THE COMPLETE COMMUNICATION MATRIX

A relationship is used to calculate the relationship of the relationship. In the fuzzy demultiple method, the fuzzy normal matrix is divided into three definite matrices:

$$\left.\begin{aligned} T_l &= N_l \times (I - N_l)^{-1} \\ T_m &= N_m \times (I - N_m)^{-1} \\ T_u &= N_u \times (I - N_u)^{-1} \\ \tilde{t}_{ij} &= \left(t_{ij}^{l}, t_{ij}^{m}, t_{ij}^{u}\right) \end{aligned}\right\} \quad (7).$$

Table 6: Computation of Fuzzy Complete Matrix

T	C1	C2	C3	C4	C5	C6	C7	C8
C1	(0.04, 0.19, 1.65)	(0.12, 0.29, 1.81)	(0.09, 0.24, 1.66)	(0.1, 0.27, 1.76)	(0.1, 0.27, 1.75)	(0.1, 0.26, 1.8)	(0.1, 0.28, 1.84)	(0.08, 0.23, 1.68)
C2	(0.12, 0.28, 1.69)	(0.04, 0.19, 1.67)	(0.08, 0.23, 1.61)	(0.09, 0.25, 1.7)	(0.07, 0.22, 1.66)	(0.09, 0.25, 1.74)	(0.12, 0.28, 1.8)	(0.07, 0.22, 1.62)
C3	(0.09, 0.24, 1.7)	(0.11, 0.28, 1.8)	(0.04, 0.18, 1.61)	(0.09, 0.25, 1.74)	(0.12, 0.29, 1.77)	(0.11, 0.28, 1.81)	(0.1, 0.27, 1.84)	(0.1, 0.25, 1.7)
C4	(0.08, 0.24, 1.65)	(0.09, 0.25, 1.73)	(0.08, 0.23, 1.61)	(0.04, 0.18, 1.63)	(0.09, 0.25, 1.69)	(0.1, 0.27, 1.75)	(0.11, 0.27, 1.79)	(0.09, 0.24, 1.64)
C5	(0.09, 0.24, 1.62)	(0.1, 0.26, 1.71)	(0.07, 0.21, 1.56)	(0.08, 0.23, 1.64)	(0.04, 0.18, 1.59)	(0.1, 0.26, 1.71)	(0.1, 0.26, 1.74)	(0.09, 0.24, 1.6)
C6	(0.06, 0.21, 1.62)	(0.1, 0.26, 1.73)	(0.11, 0.25, 1.63)	(0.08, 0.24, 1.67)	(0.09, 0.25, 1.68)	(0.04, 0.19, 1.67)	(0.11, 0.28, 1.78)	(0.08, 0.23, 1.62)
C7	(0.11, 0.28, 1.81)	(0.1, 0.28, 1.88)	(0.09, 0.25, 1.75)	(0.12, 0.29, 1.85)	(0.12, 0.29, 1.85)	(0.13, 0.31, 1.92)	(0.05, 0.22, 1.87)	(0.11, 0.28, 1.79)
C8	(0.11, 0.27, 1.76)	(0.1, 0.28, 1.84)	(0.1, 0.26, 1.71)	(0.11, 0.28, 1.8)	(0.09, 0.26, 1.78)	(0.1, 0.28, 1.85)	(0.12, 0.29, 1.89)	(0.04, 0.19, 1.66)

After calculating the full-matrix, it is possible to apply phases. The obtained matrix, the same matrix of complete communication, is definite and can be used to calculate the causal relationship model. There are several solutions for defuzzification in which the proposed method is used.

Table 7: Complete decontamination matrix (definitive)

T	C1	C2	C3	C4	C5	C6	C7	C8
C1	0.5157	0.6273	0.5574	0.5989	0.5954	0.6057	0.6242	0.5552
C2	0.5933	0.5238	0.5377	0.5737	0.5452	0.5848	0.6203	0.5322
C3	0.5662	0.6165	0.5013	0.5851	0.6159	0.6169	0.6232	0.5758
C4	0.5523	0.5783	0.5386	0.5086	0.5702	0.5999	0.6114	0.5538
C5	0.5439	0.5840	0.5142	0.5481	0.4951	0.5804	0.5864	0.5415
C6	0.5288	0.5869	0.5598	0.5572	0.5694	0.5240	0.6131	0.5423
C7	0.6189	0.6358	0.5825	0.6399	0.6397	0.6670	0.5911	0.6162
C8	0.6040	0.6227	0.5832	0.6133	0.5948	0.6262	0.6477	0.5194

5.7 MAP THE NETWORK RELATIONS MAP

To determine the network relationship map (NRM), the threshold value must be calculated. In this way, partial relations can be discarded and the network draws on meaningful relationships. Only relationships whose values in the matrix T of a larger threshold value will be displayed in the NRM. To calculate the threshold value of the relationships, it is sufficient to calculate the average values of the matrix T. The threshold is calculated to be 0.58. After the threshold intensity is set, all values of the T-matrix, which is smaller than the threshold, are zeroed, that is, the causal relationship is not considered.

Table 8: Matrix of meaningful relationships between study variables

T	C1	C2	C3	C4	C5	C6	C7	C8
C1	×	0.63	×	0.60	0.60	0.61	0.62	×
C2	0.59	×	×	×	×	0.58	0.62	×
C3	×	0.62	×	0.59	0.62	0.62	0.62	×
C4	×	×	×	×	×	0.60	0.61	×
C5	×	0.58	×	×	×	0.58	0.59	×
C6	×	0.59	×	×	×	×	0.61	×
C7	0.62	0.64	0.58	0.64	0.64	0.67	0.59	0.62
C8	0.60	0.62	0.58	0.61	0.59	0.63	0.65	×

Table 9: Completely Degraded Relationship Matrix (Definitive)

Main Dimension		D	R	D+R	D-R
C1	Top Category Management	4.68	4.52	9.2	0.16
C2	Middle management and curated	4.511	4.78	9.29	-0.26
C3	Relations with the supplier	4.701	4.37	9.08	0.33
C4	Lack of infrastructure	4.513	4.62	9.14	-0.11
C5	Staff Resistance	4.394	4.63	9.02	-0.23
C6	Production technical factors	4.481	4.8	9.29	-0.32
C7	Negative manufacturing effects	4.991	4.92	9.91	0.07
C8	Economic factors	4.811	4.44	9.25	0.37

With regard to the relationship model, one can determine the set of influences and impacts, Table 9.

The sum of the elements of each row (D) indicates its effect on other system factors. It is clear that the negative effects produced have the greatest impact on other elements of the system. Economic factors are also the second most influential factor.

The sum of the column elements (R) for each factor indicates its effect on other factors of the system. The negative effects of production have the most impact from other factors and the product of the interaction of other elements.

Horizontal vector (D + R) is the amount of impact and effect of the agent in the system. The negative effects of production, the technical production factors, and middle management and supervision have the most interaction with other elements in the organization.

Vertical vector (D-R) shows the power of each agent. In general, if D-R is positive, the variable is a causal variable, and if negative, it is considered an effect. Top management, relationship with the supplier and causal economic factors. The negative effects of production are in the middle position. Other model elements are also disabled.

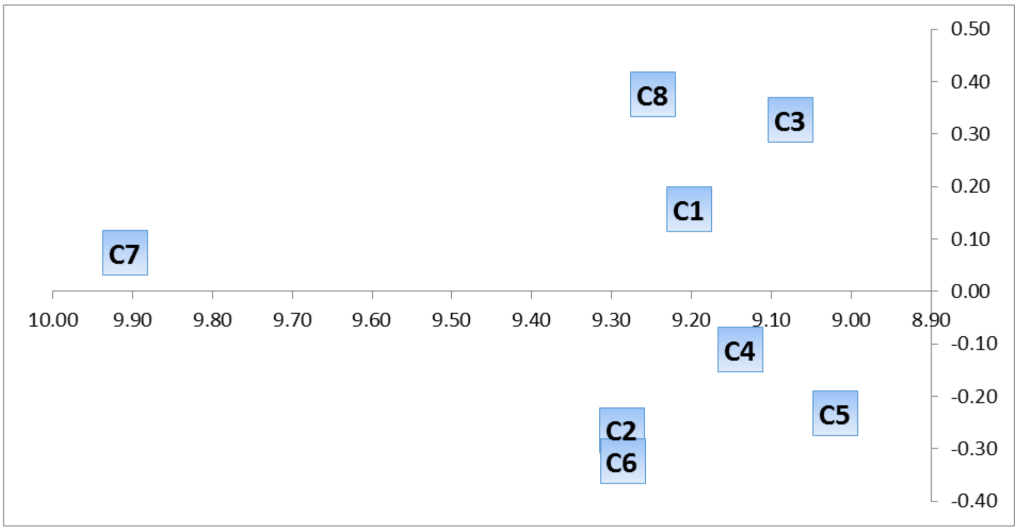

Figure 2: Cartesian coordinates diagram of DEMATEL output for the main criteria

5.8 PRIORITIZING THE MAIN CRITERIA BASED ON THE ANP TECHNIQUE

To perform the network analysis, the primary criteria are matched according to the goal in a pairwise manner. The ANP technique is a rating technique, and the ranking in this technique is based on paired comparisons. A paired comparison is very simple and all the elements of each cluster should be compared in two to two. So, if there is an element in a cluster, the comparison will take place. Because there are no criteria, so the number of comparisons performed equals to $\frac{n(n-1)}{2} = \frac{8(8-1)}{2} = 28$.

Therefore 36 comparative comparisons were conducted from a team of experts. Using the geometric mean technique, the experts' perspective has been combined and used to calculate the final weight of the criteria. The pair comparison matrix derived from the aggregation of experts' views is presented in Table 4.

Table 10: Determine the priority of the main criteria.

	C1	C2	C3	C4	C5	C6	C7	C8
C1	1	1.040	0.570	1.426	3.85	3.176	1.767	0.778
C2	0.961	1	0.514	1.838	3.355	2.383	1.367	2.553
C3	1.754	1.947	1	1.068	0.99	2.634	2.812	2.208
C4	0.701	0.544	0.936	1	1.919	1.438	2.052	1.942
C5	0.26	1.01	1.01	0.521	1	0.465	0.243	0.245
C6	0.315	0.42	0.38	0.696	2.153	1	0.354	0.385
C7	0.566	0.732	0.356	0.487	4.115	2.822	1	0.747
C8	1.286	0.392	0.515	0.515	4.076	2.598	1.339	1

The next step is to calculate the geometric mean of each row for determining the weight of the criteria:

$$\pi_1 = \sqrt[8]{1 * 1.040 * 0.570 * 1.426 * 3.850 * 3.176 * 1.767 * 0.778} = 1.393$$

Similarly, the geometric mean of other rows is calculated.

$\pi_1 = 1.393$ $\pi_5 = 0.498$

$\pi_2 = 1.455$ $\pi_6 = 0.565$

$\pi_3 = 1.652$ $\pi_7 = 0.945$

$\pi_4 = 1.186$ $\pi_8 = 1.082$

Then the total geometric mean of all rows is calculated. By dividing the geometric mean of each row on the total geometric mean of the rows, the value of the normal weight is obtained, which is also called the special vector. The summary of the results is shown in Table 11:

Table 11: Determine the priority of the main criteria

	C1	C2	C3	C4	C5	C6	C7	C8	Geometric mean	Eigenvector
C1	1	1.04	0.57	1.426	3.85	3.176	1.767	0.778	1.393	0.158
C2	0.961	1	0.514	1.838	3.355	2.383	1.367	2.553	1.445	0.164
C3	1.754	1.947	1	1.068	0.99	2.634	2.812	2.208	1.652	0.188
C4	0.701	0.544	0.936	1	1.919	1.438	2.052	1.942	1.186	0.135
C5	0.26	1.01	1.01	0.521	1	0.465	0.243	0.245	0.498	0.056
C6	0.315	0.42	0.38	0.696	2.153	1	0.354	0.385	0.564	0.064
C7	0.566	0.732	0.356	0.487	4.115	2.822	1	0.747	0.945	0.107
C8	1.286	0.392	0.515	0.515	4.076	2.598	1.339	1	1.082	0.123

Based on the special vector table, the priority criterion will be W_1,

$$W_1 = \begin{bmatrix} C1 \\ C2 \\ C3 \\ C4 \\ C5 \\ C6 \\ C7 \\ C8 \end{bmatrix} = \begin{bmatrix} 0.158 \\ 0.164 \\ 0.188 \\ 0.135 \\ 0.056 \\ 0.064 \\ 0.107 \\ 0.123 \end{bmatrix}$$

Based on the special vector obtained: The ratio of relations with the supplier with a normal weight of 0.18 is the highest priority.

The middle management benchmark and supervised weight with a normal weight of 0.16 are in the middle priority.

The top-level management criterion with a normal weight of 0.15 is in the third priority.

The lacks of infrastructure, employee resistance, technical factors of production, negative production, economic factors, are in the middle priorities.

6. DISCUSSION

In recent years, many companies have turned to lean production to face competitive pressures. Companies ranging from mass production to production in small, custom-tailored categories tailored to customers' demands. This change in the production environment has led many managers and researchers to make an explanation as to why increasing efficiency is not accompanied by increased profitability and competition. Many lean companies suffer financial problems, not because of bad products and services, but because of the inadequate cost accounting system, the emphasis of the traditional costing system on labor productivity and inefficient utilization of the promotion of non-lean products, such as the manufacture of products in large categories, high inventory, hidden waste, focus on financial criteria, rather than operating efficiency measures. In this research, the main components affecting timely production, based on research literature in eight groups: high-level management, middle management, and supervisor, relations with the supplier, lack of infrastructure, staff resistance, technical factors of production, negative effects of production and factors Economic has been extracted. According to the Cartesian Coordinates of DEMATEL, the causal relationships between factors that influence the failure to implement a production system at the time indicate that accepting pure production primarily requires major changes in the thinking of managers and employees of the organization. Organizations need to shift from production in large volumes to production in small groups and reduce inventory levels. The processes must be performed efficiently and without error, and the displacement and movements of individuals, tools, and materials should be minimized. All of this reduces the waiting time for materials, individuals, and products. From the organizational point of view, the adoption of lean production involves the implementation of many changes, such as structural changes. It is necessary to organize tasks instead of task areas based on product categories. The classification of the workforce based on the task should be converted into a cell-based classification of labor, and each cell must have the capacity to produce a complete product, which requires a multiplicity of labor force. In addition, the multi-skill workers in a production cell need to work as a team and teams should ideally be self-contained. Workers must focus on continuous improvement of processes and constantly work to evolve. Conversion and change, for the creation of work teams, means a restoration of the organization, which is often accompanied by staff resistance and fear. Based on the special vector obtained: the criterion of relations with the supplier with a normal weight of 0.18 is the highest priority. The middle management benchmark and supervised weight with a normal weight of 0.16 are in the middle priority. The top-level management criterion with a normal weight of 0.15 is in the third priority. The lacks of infrastructure, employee resistance, technical factors of production, negative production, economic factors, are in the middle priorities.

Several articles have been written about the causes of the success of the philosophy of production at the time in Japanese companies (Worsuo and Rapha, 2016; Kent et al., 2014). Despite the success of the manufacturing system in Japan, this philosophy of production in the American industry has not been successful (Machinick et al., 1990). Despite the failure of the system in the US manufacturing industry, the system has proven to be a major success in its service business. For example, Kay Mart and Wal-Mart (Collman and Jennings, 1998) are two examples of the impressive success of this philosophy in business. There are also many examples of the success of a timely production system in businesses other than retail. For example, in the health and hygiene sector, which costs a lot to preserve medicines, medical equipment, maintenance of patients, etc., the use of the philosophy of the production system has attracted the attention of researchers. (2012) That the goals related to the organization and production are of the highest importance in this company, and the goals of sales and revenue, and the goals of inventory and competition are placed in the next order respectively. Marodin et al. (2015) showed that three process management groups, middle and senior managers support and workshop interference are examples of the risk of lean manufacturing implementation.

7. CONCLUSION

The business world has witnessed emerging paradigms such as customerism, business excellence, engineering degradation and technical superiority over the past three decades. The lean production strategy is a new philosophy and approach to production and the next paradigm of the future business. From the term production, this involves the process of converting or changing resources and materials that refer to goods or services. The goods or services may include riding cars, computers, medical care or financial transactions. Lean production is a new philosophy and approach to production, originated from the Toyota Japan company, an approach that was invented by AJ Tovda and Tychy Uhano, which later became popular in Europe and the United States, and was welcomed by many manufacturing plants. In this way, it attempts to minimize waste and maximize the efficiency of all facilities, manpower, and capital. Achieving a pure strategy involves making operational changes and organizational changes. According to the results of the research, the following suggestions are presented:

It is suggested that the technical knowledge and skills necessary to direct the staff to managers.

It is suggested that, for the proper implementation and implementation of the production system at the time, the executives formally state their support and commitment in implementing this system.

It is suggested that, in order to implement a timely production system in the company, from the outset, a long-term program in the company will be developed and implemented in order to determine the direction of implementation of the timely production system.

In order to implement an on-time production system, the company will strengthen the company's Tommy chain. It is recommended that the company co-operate with suppliers to meet the needs of the company in the shortest time and in the best quality.

To properly implement lean production programs, appropriate human resources should be used to allocate appropriate funds. Top managers of the organization will give the middle managers the appropriate authority to implement pure management. Organizational support is clearly expressed among the organizational staff in the field of lean production. The level of responsibility of individuals in the implementation of pure production is clearly explained. Personnel participation in company decisions and the explanation of the benefits of lean manufacturing for employees will make the new system in the organization well accepted.

To properly implement lean production programs, use of appropriate human resources should be used to allocate appropriate funds. Top managers of the organization will give the middle managers the appropriate authority to implement pure management. Organizational support is clearly expressed among the organizational staff in the field of lean production. The level of responsibility of individuals in the implementation of pure production is clearly explained. Personnel participation in company decisions and the explanation of the benefits of lean manufacturing for employees will make the new system in the organization well accepted.

8. AVAILABILITY OF DATA AND MATERIAL

Data can be made available by contacting the corresponding authors

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