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COMPARING THE EFFECTS OF LEAN AND AGILE STRATEGIES ON IMPROVING COMPANY PERFORMANCE

Mohammad MIRABI[1], Tina ROOSTAPISHEH[2*], Mehrdad SHAHBAZI MANSHADI[2]

[1]Assistant Professor, Department of Industrial Engineering, Meybod University, Meybod, Iran,
[2]Ph.D. Student, Department of Industrial Management, Yazd Branch, Islamic Azad University, Yazd, Iran,

*Corresponding Author
E_mail: Tinaroostapisheh@yahoo.com

ABSTRACT

The purpose of this study was to compare the effects of Lean and Agile strategies on improving the performance of food and beverage companies in Shiraz. The present study was conducted on the basis of descriptive-survey design and it is an applied research, in term of purpose. The sampling was done randomly. The statistical population of the study consisted of managers and experts of the food and beverage companies in Shiraz. The required data for assessing and measuring were collected by questionnaires and in the form of fieldwork. In this regard, 178 questionnaires were collected. Data were analyzed using the structural equation modeling in LISLER software. In the present study, structural equations were used to test the first and second hypotheses to determine the magnitude and severity of lean and agile supply chain strategies on improving the performance of manufacturing companies, and t-test was used to test the third hypothesis to compare the effect of lean and agile supply chain strategies on improving the performance of manufacturing companies. After analyzing the hypotheses, it was concluded that the application and implementation of lean and agile supply chain strategies impacts the performance improvement of manufacturing companies, and there is a significant difference in terms of the superiority between the implementation of each of these two strategies. Finally, the output of the research shows that all hypotheses were confirmed.

Keywords: *Supply Chain, Performance, Lean Strategy and Agile Strategy.*

INTRODUCTION

In today's complex, dynamic, and highly variable environments, companies need to design and adopt strategies that can help them to improve their operations; because in such a competitive environment, companies are able to survive that continue to compete and keep pace with the changing and dynamic conditions of the competitive market. In the other words, corporate managers will see their decisions results in the form of selecting strategy in the mirror of performance criteria. Analysis and comparison of observed performance with past trends, rivals or medium industry provides a good feedback for decision making and future activities. For this reason, one of the most important goals of all companies is the continuous improvement of performance. Manufacturing companies need to continuously improve their performance in order to survive and be more effective in the competitive environment. In fact, what makes companies' performance improvement difficult is selecting the most effective and best strategy, given the organization's characteristics, which is of course, the biggest challenge reported in recent studies (Simons, 2006). Today, offering the best performance has become the most important concern of the managers in manufacturing companies and they are trying to achieve

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superior performance by utilizing various techniques. One of the requirements of a manufacturing company is to adopt a kind of supply chain strategy. These strategies focus on how to coordinate the internal and external processes of the business in order to provide the best service to end-users and consumers and to enhance the performance of the organization's members (Cox & Chicksand, 2005).

The transition from different periods of product and market orientation, and the emergence of the post-industrial era, in which knowledge and information are the main focus of the organization's movements, has made companies and organizations to face with new challenges. On this basis, competitive advantage is attributed to organizations that focus on value creation and customer orientation to improve their organizations and processes. Using a lean approach, the final cost of producing a product and its sales price will decrease, which will lead to customer satisfaction; because customer will be able to get the company's products at the same level of quality with lower price. Since the relationship between the company and the customers and their particular needs can be established through the market, agile culture can increase the flexibility and responsiveness for changing and diverse needs of customers and even organization are ready to bear more costs compared to their rivals for this purpose.

An agile organization with agile supply chain continuously monitors customer demands and tries to improve its performance by quick respond to these demands (Naylor, 1999). Therefore, according to above, the present research tries to compare the effects of lean and agile strategies on improving company performance by conducting research on effective strategies on performance and how a strategy with its various dimensions can affect company performance. The results of this study can be used to provide effective solutions to improve the performance of manufacturing companies and, in particular, those companies that operate in the food and beverage industry.

THEORETICAL FOUNDATIONS OF RESEARCH

Supply Chain

The supply chain is the alignment of companies and economic enterprises in order to import products and serve the market, and all stages that are involved directly or indirectly in fulfilling customer requirements (Jafari, 2007). Supply chain management is one of the philosophies that have been taken into account in recent decades due to the increase in competitiveness and the efforts of organizations for survival, drawing on the advancements from information technology and the proximity of communications. The secret of the organization's survival is to satisfy customers' needs, and the supply chain management's attitude not only delivers the ultimate entity in relationship with customer which is the final product, but also thinks that the sequence of the supplier in this direction is effective, and evaluates the integration of other organizations and coordination of material flow, information and financial analysis to improve the supply chain competitiveness (Hicks et al., 2000).

Each supply chain has its own operational requirements and challenges. However, there is a single pattern for the implementation of supply chain management, in which, companies in each supply chain should make decisions individually and collectively by considering the following five areas (Hoek, 2001):

Product: What kind of products does the target market have? How much product should be produced in the special period of time? These activities create a production schedule that identifies capacities, workload, quality control and equipment maintenance.

Inventory: How much inventory in the entire supply chain should be stored at any given time? Inventory is stored to reduce the effects of a change in sudden and unexpected demand, but it also creates costs. Therefore, it should be determined which level of inventory is optimal to be stored.

Place: Where the production equipment and inventory should be placed? Are the current capabilities enough to meet the needs? The answers to these questions identify the possible routes of goods flow until delivery to the customer.

Transportation: How inventory can be transported from place to place? What kind of transportation should be used for this purpose?

Information: Information must flow within and between the supply chain loops. It should be noted that the amount of information transmitted from inside of the loop to the outside should be in the way that it causes the improvement of performance and excess information are not transmitted to other competitors.

The results from decision making in the above cases will increase the ability of companies in the current competitive world. Considering sophisticated customers' expectations in today's competitive world, organizations find themselves facing customers who look for an increase in product diversity, lower cost, better quality, and faster access to the product. Organizations are turning to supply chain management for their success, because this approach focuses on activities that create value. The supply chain perspective is based on the fact that competition must exist between supply chains, rather than companies, and supply chain management is an approach to design, organize and implement these activities (Vonderembse et al., 2006, 228).

Lean strategy

Being Lean means to create a value stream to eliminate all waste, including time, inventory or unnecessary costs to create a smooth production plan (Hughes et al., 2008). The main focus of lean thinking is to eliminate all wastes or wasted material in the organization. In fact, the goal of lean production is to achieve a better result with less labor and cost; the concepts of lean production techniques work better in environments where demand is relatively stable and predictable and product diversity is relatively low (Christopher & Towill, 2000). The lean production method reduces half of the manpower available in the factory, the space required for production, the capital which is spent on the tools, the engineering force required to produce the product, and the time required to make the new product. Also, in lean production, the required inventory is less than half, and products are produced with more variety (Sahaie, 2008). The most important part of a lean production system is relationship with customers, so that Lean company sellers try to establish a relationship between factory and customers by creating an accurate information system, so that the factory can accurately identify the various needs of its customers and meets the needs of customers in different parts of the market by creating an appropriate product. Thus, in lean production, all components of the system are benefited in an optimal way (Gunasekaran et al., 2004).

In the lean production system, the identification and elimination of wastes in the production flow loops is considered as the main pillar of the implementation of this system. In order to achieve competitive advantage in this system, by reducing production costs and increasing the

quality in the production process, it returns back in one hand and establishes a close relationship with the supply chain, and on the other hand it goes forward to communicate with customers (Feizabadi, 2003).

Lean distribution system tries to create lifelong loyalty in customers and also tries not to not miss even a customer. In addition, it is always worried about its market share. When sales speed is low, sales forces work more hours, and when the sales go down at a certain level and the factory does not have enough order to continue its activity, the production employee are also transferred to the sales system, and they all do their best to fulfill customer satisfaction. Therefore, this production system considers customer as a complement part of the production process (Fisher et al., 1994).

Agile strategy

Agility means maximum flexibility, which not only responds to changes in product, market and customer requirements, but also provides opportunities that can highlight an organization among its other competitors. The goal of agile production is to enable the organization to respond to the constant and unpredictable changes in competitive environments. In fact, the source of agility rests in flexible production systems (Mottaqi, 2010). In addition to the technical dimension, the agile organization uses new forms of organizing, utilizing resources, manpower, and technologies in which benefits from skills and human resources knowledge in term of time and while maintaining the integrity between the three factors of human resources, technology and the organization creates an integrated and coordinated system (Beamon, 1999).

The agile supply chain approach is related to the confrontation between the company and the market and in an external perspective to flexibility. Successful implementation of this approach requires rapid and continuous responds to market changes, organization's dynamics, attention to the growth and flexibility of organizations, and customer expectations. This approach focuses on quick responding to unpredictable market changes and tries to solve unpredictable problems by providing fast transportation and making delay time flexible and adopting new technologies (Christopher, 2000). Agile supply chain can be considered as a structure designed to satisfy customers and employees, in which each organization can design its business strategies, processes, structure and information systems. The agility wants the organization to accelerate the integration of technology, staff and management with communication infrastructure to respond to customers' changing needs in a market environment that has a continuous and unpredictable change. Fundamentally, an institute possesses a set of capabilities for responding appropriately to changes in its business environment, and the goal of an agile institution is enrichment or satisfaction of customers (Yusuf, 2004).

Performance

Performance can be considered as the behavior or method that organizations, groups, and individuals perform a job (Rousta et al., 2004). Brumrach believes that performance means both behaviors and results. Behaviors arise from the executors and bring performance from an abstract concept to action. Behaviors are not just tools for results, but they are somehow result by themselves. (The product of the physical and mental effort which is done to the duties) and can be judged separate from the results. This definition of performance leads to the conclusion that along with performance management, groups and individuals, both inputs (behaviors) and outputs (results and outcomes) should be considered; the model is called a combined

performance management model. This model covers levels of ability or qualities and successes like targeting and reviewing goals (Armstrong, 2006).

Effective implementation of programs and performance evaluation is essential in every organization; performance evaluation is the manner in which the organization can perform its tasks or jobs perfectly. Performance evaluation is development process usage of measurable indicators that provides the opportunity for systematic evaluation of predetermined goals. The performance gaps are gaps between what the customers and stakeholders expect and what processes and sub-processes provide in terms of quality, quantity, time and cost of the product. Assessing the control performance and continuous reporting are stages for achievement of the programs specially predetermined goals (Ronaq & Afati Dariani, 2007).

CONCEPTUAL FRAMEWORK OF RESEARCH

After reviewing the literature, we considered the framework presented in Figure 1 as the conceptual model of this study. Based on the considered conceptual model, the research hypotheses can be summarized as follows:

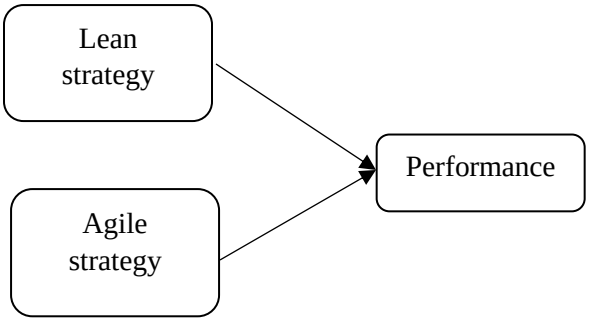

Figure 1. Research conceptual model

Research hypotheses are provided as follows, based on the conceptual model:

H1: Lean Supply Chain Strategy has a direct impact on improving company performance.

H2: Agile supply chain strategy has a direct impact on improving company performance.

H3: Lean and agile supply chain strategies have different impacts on improving company performance.

RESEARCH METHOD

This is an applied research in terms of purpose and descriptive-survey in terms of method (Sarmad et al., 2009). Also, data in the present study were collected during the summer in 2013. The Statistical population was selected randomly from Shiraz industrial town and consists of managers and experts of food and beverage manufacturing units. A simple random sampling method was used to select the subjects. Since the sample size of the sample was limited for this purpose; since the sample population size was limited, the required sample population size for the study was calculated by population sampling formula with a 5% error; the sample size was equal to 178. However, in order to obtain more information about the samples and appropriately generalize the results of the statistical sample to the statistical population, about 300

questionnaires were distributed. Finally, 200 completed and usable questionnaires were gathered.

The questionnaire consisted of 36 questions. The questions were measured with a 5 options Likert scale ranged from "very low" to "very much". The method of data collection is library and field type in which the questionnaire has been used. To test the reliability of the questionnaire, a pre-test was carried out on 35 members of the statistical population and calculated using the Cronbach's alpha coefficient which is presented in table 1.

Table 1. Reliability and separation of questionnaire questions

No	Variables	No of questions	Cronbach's alpha coefficient	
			the reliability of the dimensions	Total reliability
1	Lean strategy	16	0.884	0.936
2	Agile strategy	16	0.887	
3	performance	4	0.725	

These numbers and figures indicate that the questionnaire have the appropriate level of reliability. In order to make the research sample completely homogeneous, the questionnaire was distributed in two days and different working hours and distributed randomly among the managers and experts of the food and beverage manufacturing units.

RESEARCH FINDINGS

Estimating research model

Structural equations modeling were used in order to analyze the data and test the hypotheses of the research. An important point to consider in the modeling of structural equations is the relevance of the research model for examining the relationships between variables, which is apparent through fit indexes that are presented in the final output of LISREL software. In Table 2, fit indexes for the present research model are presented.

Table 2. Model fit indexes

Indexes	Allowed value	Results
The ratio of chi-square to degree of freedom	$\chi^2/df < 3$	2.27
P-Value	p-value <0.05	0.0000
RMSEA	0≤ & ≤ 0.1	0.085
GFI	0≤ & ≤ 0.1	0.90
CFI	0≤ & ≤ 0.1	0.94
AGFI	0≤ & ≤ 0.1	0.90

As it can be seen in table 2, all fit indexes are in their allowed value range including the ratio of chi-square to degree of freedom is equal to 0.27; P-value is equal to 0.000; RMSEA is equal to 0.085; and the GFI is equal to 90.0; and CFI is equal to 94.0; and AGFI is equal to 90.0; thus, these indexes indicate that the research model is suitable. In order to investigate the research hypotheses, we used the results of LISREL software calculations in two states including research model in the standard state (Fig. 2) and the research model in a significant state (Fig. 3).

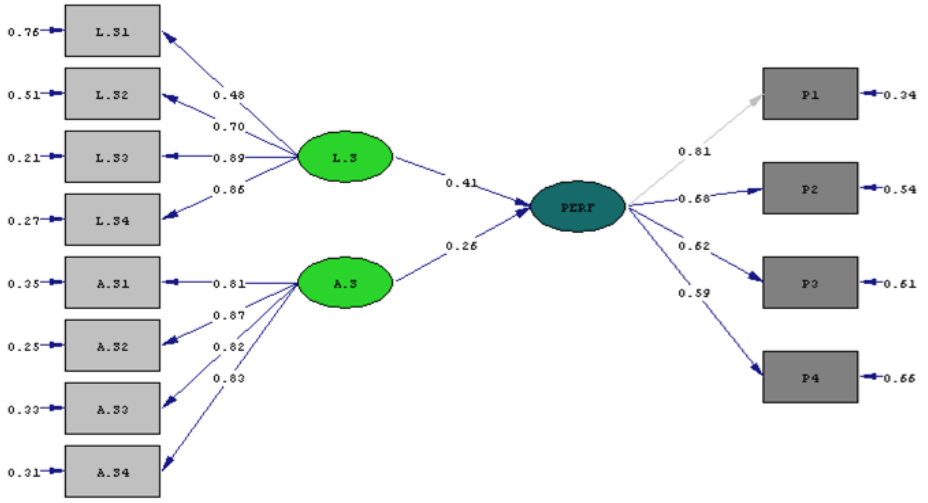

Figure 2. Research model in the standard state

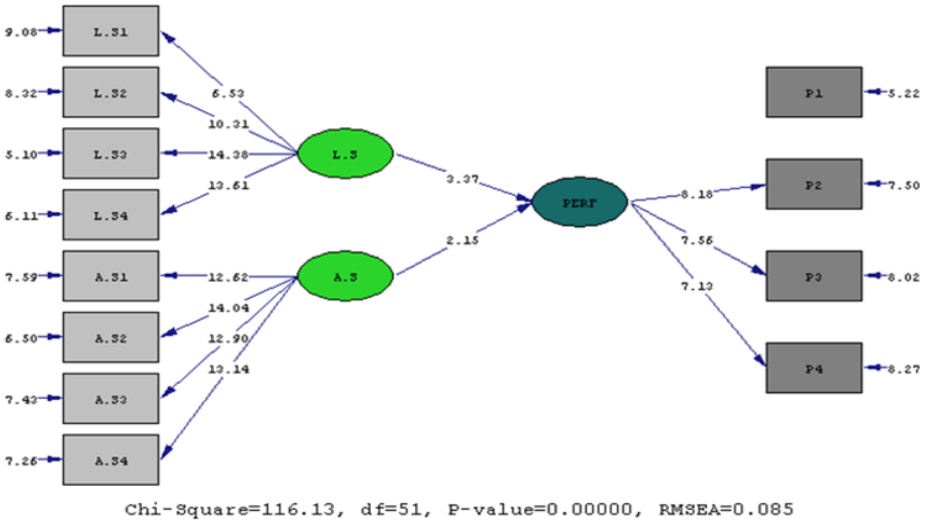

Figure 3. Research model in a significant state

Considering that 0.95% of confidence level was considered for testing hypotheses, all hypotheses which are out of the range 1.96+ and 1.95- are acceptable. In the following, we examine the research hypotheses according to the research model in a significant state and standard state.

Testing the research hypotheses

H1: Lean Supply Chain Strategy has a direct impact on improving company performance. The results of our research indicate that existence of lean supply chain strategy with a standard load factor equal to 0.41 and t=3.37 affects company performance improvement, which confirms the first hypothesis. In other words, the greater the use of lean strategy in the supply chain, the more positive and direct impacts there will be on the performance of the company.

First sub-hypothesis: Flexibility dimension of lean strategy is effective in improving company performance.

According to table 3, it can be seen that the value of the significance level is less than 0.05, therefore the effect is significant; so the first sub-hypothesis is confirmed. The severity of the flexibility effect of the lean strategy on performance is equal to +27.8 which are considered positive based on the beta coefficient sign. Also, the coefficient of determination between the two variables is also 0.077, which indicates that the flexibility variable of the lean strategy could predict 77% of the performance variable.

Table 3. Regression Test between Flexibility of lean strategy and Performance

	R value (relationship intensity)	R^2 (Coefficient of Determination)	Beta	Significance level	results
Constant value	0.278	0.077		0.000	Confirmed
Flexibility (Lean)			0.278	0.000	

Second sub hypothesis: Production dimension of lean strategy is effective in improving company performance.

According to Table 4, it can be seen that the value of the significance level is less than 0.05, therefore the effect is significant and the second sub-hypothesis is confirmed. The severity of the effect of production of lean strategy on performance is equal to + 36%, which is a sign of the beta coefficient for this positive effect. Also, the coefficient of determination between the two variables is also equal to 0.13, which indicates that the production variable of lean strategy could predict 13% of the performance variable.

Table 4. Regression test between production of lean strategy and performance

	R value (relationship intensity)	R^2 (Coefficient of Determination)	Beta	Significance level	results
Constant value	0.36	0.13		0.000	Confirmed
Production (Lean)			20.36	0.000	

Third sub-hypothesis: The product design dimension of Lean strategy is effective in improving company performance.

According to Table 5 it can be seen that the significance value level is less than 0.05, therefore the effect is significant and the third sub-hypothesis is confirmed. The effect severity of the product design of lean strategy is equal to +36.6% which is positive for the effect based on beta coefficient sign. Also, the coefficient of determination between the two variables is equal to 0.134, which indicates that the product design variable of the lean strategy can predict 13.4% of the performance variable.

Table 5. Regression test between product design of lean strategy and performance

	R value (relationship intensity)	R^2 (Coefficient of Determination)	Beta	Significance level	results
Constant value	0.366	0.134		0.000	Confirmed
product design (Lean)			0.366	0.000	

The fourth hypothesis: supplying material dimension of Lean strategy is effective in improving company performance.

According to Table 6 it can be seen that the significance value level is less than 0.05, therefore the effect is significant and the fourth sub-hypothesis is confirmed. The effect severity of the

product design of lean strategy is equal to +39.4% which is positive for the effect based on beta coefficient sign. Also, the coefficient of determination between the two variables is equal to 0.155, which indicates that the supplying material variable of the lean strategy can predict 15.5% of the performance variable.

Table 6. Regression test between supplying material of lean strategic and performance

	R value (relationship intensity)	R^2 (Coefficient of Determination)	Beta	Significance level	results
Constant value	0.394	0.155		0.000	Confirmed
supplying material (Lean)			3660.394	0.000	

H2: Agile supply chain strategy has a direct impact on improving company performance.

The results of our research indicate that existence of agile supply chain strategy with a standard load factor equal to 0.26 and t=2.15 affects company performance improvement, which confirms the second hypothesis. In other words, the greater the use of agile strategy in the supply chain, the more positive and direct impacts there will be on the performance of the company.

First sub-hypothesis: Quality dimension of agile strategy is effective in improving company performance.

According to Table 7 it can be seen that the significance value level is less than 0.05, therefore the effect is significant and the fifth sub-hypothesis is confirmed. The effect severity of the quality of agile strategy is equal to +51.9% which is positive for the effect based on beta coefficient sign. Also, the coefficient of determination between the two variables is equal to 0.269, which indicates that the quality variable of the agile strategy can predict 15.5% of the performance variable.

Second sub-hypothesis: Flexibility dimension of agile strategy is effective in improving company performance.

Table 7. Regression Test between quality of agile strategy and Performance

	R value (relationship intensity)	R^2 (Coefficient of Determination)	Beta	Significance level	results
Constant value	0.519	0.269		0.000	Confirmed
Quality (Agile)			0.519	0.000	

According to Table 8 it can be seen that the significance value level is less than 0.05, therefore the effect is significant and the 6th sub-hypothesis is confirmed. The effect severity of the Flexibility of agile strategy is equal to +55.5% which is positive for the effect based on beta coefficient sign. Also, the coefficient of determination between the two variables is equal to 0.308, which indicates that the Flexibility variable of the agile strategy can predict 30.8% of the performance variable.

Table 8. Regression Test between Flexibility of agile strategy and Performance

	R value (relationship intensity)	R^2 (Coefficient of Determination)	Beta	Significance level	results
Constant value	0.555	0.308		0.000	Confirmed
Flexibility (Agile)			0.555	0.000	

Third sub-hypothesis: Service dimension of agile strategy is effective in improving company performance.

According to Table 9 it can be seen that the significance value level is less than 0.05, therefore the effect is significant and the 7th sub-hypothesis is confirmed. The effect severity of the service of agile strategy is equal to +49% which is positive for the effect based on beta coefficient sign. Also, the coefficient of determination between the two variables is equal to 0.24, which indicates that the service variable of the agile strategy can predict 24% of the performance variable.

Table 9. Regression Test between service of agile strategy and Performance

	R value (relationship intensity)	R^2 (Coefficient of Determination)	Beta	Significance level	results
Constant value	0.49	0.24		0.000	Confirmed
service (Agile)			0.49	0.000	

Fourth sub-hypothesis: production dimension of agile strategy is effective in improving company performance.

According to Table 10 it can be seen that the significance value level is less than 0.05, therefore the effect is significant and the 8th sub-hypothesis is confirmed. The effect severity of the production of agile strategy is equal to +59.2% which is positive for the effect based on beta coefficient sign. Also, the coefficient of determination between the two variables is equal to 0.351, which indicates that the production variable of the agile strategy can predict 35.1% of the performance variable.

Table 10. Regression Test between production of agile strategy and Performance

	R value (relationship intensity)	R^2 (Coefficient of Determination)	Beta	Significance level	results
Constant value	0.592	0.351		0.000	Confirmed
production (Agile)			0.592	0.000	

H3: Lean and agile supply chain strategies have different impacts on improving company performance.

The results of our research indicate that the effect of agile and lean supply chain strategies are at the significant level equal to 0.001 and t=3.523 which confirms the third hypothesis. As a result, there is no significant difference between the averages of lean and agile strategies variables.

According to Table 11, it can be seen that the significance level obtained for the strategy variable is less than 0.05 (0.001> 0.05). As a result, there is a significant difference between the mean variable of agile and lean strategies in the performance variable. Thus, the third main hypothesis is confirmed.

Table 11. The t-test between the lean and agile strategies variables

		Number	Mean	The standard deviation	t-statistic	The degree of freedome	Significance level
Strategy	Agile	75	3.4533	0.58224	3.523	176	0.001
	Lean	103	3.1335	0.60918			

CONCLUSIONS AND RECOMMENDATIONS

Today, one of the key characteristics of business in the world is the focus on competition between supply chains rather than competition among companies. Therefore, performance measurement has become an important issue. In order to calculate and determine the adoption of the best types of supply chain strategy, many qualitative and quantitative variables such as cost, flexibility, response speed, etc. should be considered; in other words, considering the different characteristics and conditions of manufacturing organizations and systems, one or both of these strategies can be used. The practices and ideas for improving the supply chain performance have been designed to coordinate supply and demand, thus it necessarily leads to cost reductions and improved customer satisfaction at the same time. Based on the results of this study, we found that two lean and agile strategies are effective in improving the performance of manufacturing companies, but since there is no significant difference between these two strategies in terms of the superiority, companies can develop and implement any of these two strategies based on their main objective and the type of environment they operate in.

It is therefore recommended that corporate executives use a lean strategy that allows them to react quickly to changes in designing their products and based on the demands of their customers, even if these changes are very small. Companies can increase their performance by developing and implementing a comprehensive quality management system, time management, continuous reduction of costs by identifying and eliminating parallel activities, reworks and knowledge management in order to maximize the use of equipment to reduce the cost. Also, conducting a survey from suppliers about the way of communication, as well as the way of sharing important supply chain information with them and keeping suppliers satisfied can improve the performance of the company compared to other competitors.

These companies can also use agile strategy by managing the flow of goods, information, or any other resource such as energy or humans between the place of manufacturing and the place of inventory up to the point of consumption or required point to meet the consumption needs in term of the ability of the supply chain members to respond. Food and beverage companies should establish a fast and timely delivery operation and fulfill their commitments to minimize the time of delivery of the goods to the customer by using specific methods, and this must be planned in such a way that No extra charge is created for company. In addition, the process of companies that implement agile strategy should be flexible enough to change the products and goods based on customer' needs and orders.

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