Determining the Optimum Level of Production in Carpet Production Workshops of Iran Carpet Co Based on the Global Supply Chain

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***Abstract*— In a competitive world of today's business, companies and organizations, utilizing various types of technology and management science, are creating competitive advantages of knowledge management tools and optimizing organizational processes. One of the most important managerial sciences that has raised usefulness in this field is logistics and supply chain. Despite the progress of technology in the present era and the development of the production and consumption of machine-made carpets, the handmade carpet, due to its beauty, elegance, natural materials and its original and valuable designs, has kept its popularity and continued to exist despite its many problems in the cycle of production and exports, and the presence of rivals such as China, Pakistan and India. Proper supply chain performance plays a crucial role in the success of the organization. Therefore, it is essential to use an appropriate supply chain performance assessment system to continuously improve it. The purpose of this study is to analyze the operation of the reciprocating chain in accordance with the operational reference model of the supply chain. First identified, which includes the ability, SCOR five criteria are based on the reliability model, flexibility, accountability, cost and asset. The present research is considered as an applied research in terms of type of the objective. The research field is the workshops of Iran Carpet Company active in 2014. The statistical population of this research includes all the carpet production workshops covered by Iran Carpet Company. Based on two documentary and survey methods, the data required has been collected. The results indicate that in some carpet production workshops, the production capacity has been optimal.**

***Keywords*—** *Optimum level, Carpet production workshops, Global supply chain, productivity, Iran Carpet Co*

1. Introduction

The revival of the carpet industry in the country and the development of its domestic and foreign markets have many benefits, such as rising employment rates, preserving this genuine and valuable art, and above all rising rural incomes and economic prosperity in the village, and ultimately the country. On the other hand, considering the existing conditions, one of the most urgent steps to boost this industry is to make its market competitive with reducing the costs of production, through the implementation of optimal management, and especially the efficient production method. Because the need for the success and growth of companies and institutions in today's world is the globalization of activity and the belief in being competitive with other companies and changing the look from the domestic markets towards foreign ones. Nowadays, the main role of success in business is determined by competitive ability [15].

2. Research Method

The present research is applied in terms of purpose. The results of this research can be applied to a wide range of shareholders, investors, planners, creditors, and researchers. Also, because it deals with investigating the relationship between variables and proving the existence of this relationship, this research is descriptive and correlative. In this research, the required information related to the literature of the research and the theoretical foundations is extracted from the library resources and scientific bases and domestic and foreign articles. In order to collect data on carpet manufacturing workshops, Iran Carpet Co., information was extracted from the

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financial statements of these companies. In addition, a questionnaire has been used based on the views of carpet experts. The statistical population of this research includes all carpet production workshops under the coverage of Iran Carpet Co., which had been active in 2014. The selected companies include the ones whose financial period ends at the end of March of 2013, and the required information is available; and the sample size has been selected by screening.

2. Research Background

In the several studies in Australian dairy farms to measure changes in inputs and output and to obtain total productivity, Kompas & Che used the Tornqvist-theil Index. The results of the studies showed that the productivity index was significantly in the 1990s, of a greater increase than the 1980s, and the annual productivity growth in livestock farms was appropriate [22].

Boussemart et al. calculated the optimal size and return to scale in Estonian animal production units and showed that the production process had a return to a constant scale and an optimum milk production rate of 700 tons [17].

In 2007, Bjarni Janson reported on 250 companies in a five-year period, titled "Does the size be important? The relationship between size and profitability of the Island enterprises" [6]. In his research, he measured the size of the trading houses by means of the trade size and turnover, as well as the total assets. Also, he obtained the profitability through the indices of return on assets (ROA), the return on investment (ROC) and the return on equity (ROE). He showed that with the existence of the positive relationship, the size of the trading house has not any statistical significant effect on profitability.

Gravis et al. examined the cost functions of the three Canadian agricultural sub-sectors (meat, cereals and dairy products) using the Translog functional form. The results showed the return to the ascending scale in all three activities [20].

Studying in the regions around the Mediterranean,Dagistan et al. measured the technical efficiency score of livestock farms by means of data analysis method and showed that only 15% of livestock farms were efficient in using inputs. The efficiency of livestock farms scale was also relatively low and equal to 75%. Each unit of increase in profit / cost ratio increases the scale efficiency by 2.5% [23].

Demircn assessed the technical efficiency of dairy livestock farms of the province Bur in Turkey using a comprehensive data analysis and showed that dairy livestock farms have a technical efficiency of between 28.6% and 100%, and their average technical efficiency is 64.2%. It has also been shown that the feed and labor inputs are used inefficiently, and there is a positive and significant correlation between herd size and efficiency; the larger livestock farms have more economic benefits [18].

In an article entitled "The relationship between the size and profitability of Icelandic firms," Johnson (2007) examined 250 trading houses in a five-year period. In this research, he measured the size of trading houses measured by the size of the transaction and the workflow as well as the total assets. Also, the profitability was achieved by the indices of return on investment, return on assets and return on ordinary shares or equity. He showed that despite the positive relationship, the trading house size has no statistically significant effect on profitability.

Dashti and Yazdani investigated the optimal productivity and optimal allocation of the factors of production in the poultry industry of Iran (Tabriz) by estimating the production function; they concluded that at the level of units of breeding broiler chickens in the region, the inputs of chicken feed and labor force are the most important factors affecting the chicken meat production. In addition, the productivity and allocation of production factors are better in units with lower capacity [4].

Kiani and Nemati used the cost of translog and crop year data (1993-94) to determine the optimal demand and consumption pattern of wheat inputs [6].

To study the cost structure of wheat production and supply in Iran, Zolnour applied the binary relations between production and cost functions [7]. In this study, Allen substitutive elasticity coefficients as well as elasticity coefficients of demand elasticity are investigated for the production factors relative to price, based on the existence of four production factors of area under cultivation, labor force, machineryservices and seed; he used the trnaslog cost function and demand function system for production factors by the systemic method; the coefficients are calculated at the average point of the share of production factors and the relationship between complementarity of inputs is discussed.

Khazaei used the Cobb-Douglas function to estimate the function of producing the small dairy industries [8]. The results showed that the impact of labor and capital inputs on the amount of

production is positive. Hassanpour and Nemati also estimated the production function of Cobb-Douglas in order to evaluate the technical efficiency of dairy cattle farm. The results showed that forage consumption, concentrate consumption and dairy cattle number had a positive effect on milk production and the ratio of return/scale is ascending.

In a research entitled analyzing the structure of production and demand equations of irrigated wheat share in Iran, Mahmoudi has studied in the framework of the normalized translog profit function, the production structure and the extraction of supply demand equations for inputs [9].

Sarzeei et al. (2002) studied the structure of rice production and cost in Guilan province using translog cost function and cross-sectional statistics of 1999.

Javanbakht and Salami used the Translog cost function form to study the existence or absence of economies of scale in the units of the Agricultural Bank. The results of the study showed that the ratio of return/scale in these units was 1.25 times higher than other banks [1].

Shokri investigated the structure of production in the units of breeding broiler chickens and determined the ratio of return to scale in the poultry industry of Iran through the estimation of the cost function of Translog. The results showed that the amount of return to scale at different levels of production was different in different poultry units. Also, a poultry farm with 50,000 piece of capacity in each period is considered to be the most appropriate poultry farm size [10].

Daneshvar Kakhaki et al. have determined the productivity index of dairy cows as well as the optimum use of the inputs resulting from industrial livestock in the milk production unit of Astan Quds Razavi. It indicates the high level of milk yield is the basis of the results of the productivity of each dairy cow of this unit. The use of the inputs of dried lucerne, corn, dry matter, corn and barley is in the second region, and the use of molasses in the first region, and the use of bran and the number of dairy cows in the third area [5].

In an article entitled "Factors Affecting the profitability of the companies Accepted in the Tehran Stock Exchange", Sajjadi and Dastgir have investigated the effect of the factors of the type of industry, size, life, ratio of the capital on assets, ratio of the debt on assets, and the ratio of costs of advertising on the profitability of the companies accepted in the Tehran Stock Exchange [11]. They found that if the two criteria, the asset return and the adjusted returns on the asset, are defined, the variables such as size, ratio of capital to asset, and ratio of asset to profitability will have an impact, but the type of industry, life and cost of advertising are not of any significant impact on the profitability.

In an article entitled "Scale advantages in Iran's Economy: The Case of Industry",Khodadad Kashi measured, by introducing the theoretical aspects of the scale advantages, the advantages of the scale, the scale advantages being benefited by Iran's industrial markets. His findings suggest that the economy of Iran, because of its small size, has not benefited from the scale advantages: increasing the size of trading house and becoming near to the level of optimal production will increase the production of (MES) [3].

Imami Meybodi states in a study that under competitive conditions, the survival of the trading houses or production and service units depends on their productivity compared to other trading houses or units; so measuring productivity and informing about its quantity and quality, are considered as the Essentialneeds for understanding the strengths and weaknesses of performance. Thus, increasing productivity is considered to be the most important factor in the survival of an enterprise or organization in the society [19].

Using the data envelopment analysis method in the province of Khuzestan, Hemmati et al. calculated the efficiency of the units of breeding the dairy cow. The results imply that the mean technical efficiency of the products of these units is 0.88, by using the factor of the labor force and fixed capital and working capital; these units should economize nearly 0.12 per cent of their labor force, working capital, and fixed capital [21].

Malekan examined the effects of theratio of concentration and advantages resulting from scale/profitability in the Iranian industry. His research findings show that, in general, the variables of advantages resulting from the scale and the concentration ratio have a significant effect on the profitability of the industry, as well as the relation between theadvantages resulting from the scale and the profitability was evaluated to be negative [12].

In a research entitled analyzing the cost structure and economic advantages of industry scale of breeding broiler chickens,Haji Rahimi et al. investigated their costs in 68 production units of Kurdistan province. The results of their research showed that Don had the highest share of the cost. Estimating the criterion return/scale indicates that the ratio of return/scale is increasing among the manufacturing units [13].

In a research entitled analyzing the structure of production and economic advantages in sugar beet production in Iran, Hosseini analyzed the relationship between the inputs and the economic advantages in sugar beet production using a dual cost approach [2].

Rastegar et al. investigated the relationship between agency costs and company size on the one hand and the profitability ratios on the other. The results of the research show that there is not a significant relationship between the costs of agency and the ratio of asset turnover and the ratio of operational costs to sales on the one hand and the margin of profit on the other. But there is a significant relationship between the firm size and profit margin [14].

4. Research Findings

Typical supply chain consists of suppliers and manufacturers, who convert raw materials into finished materials, and distribution centers and warehouses, form which finished products are distributed to customers. This implies that inventory appears in the supply chain. The trade-off of holding and ordering costs is illustrated in the following figure.

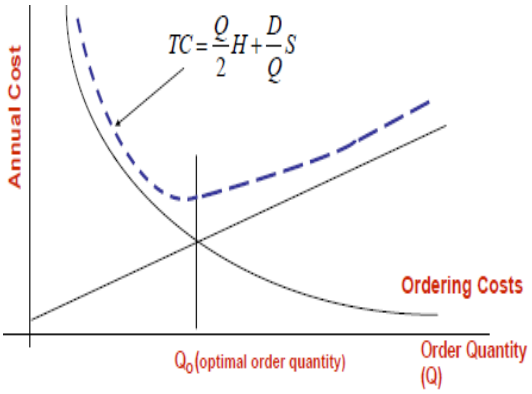


Figure 1. The Total-Cost Curve is U-Shaped

Descriptive statistics of the research variables

In the descriptive statistics, the data analysis was performed using central indices such as mean and standard deviation dispersion indices, skewness and kurtosis. A summary of the status of the descriptive statistics of the research variables after screening and deletion of irrelevant data has been given in **[Table].**

Table 1. Descriptive statistics of the research variables

variable	Observations	Mean	Standard deviation	Minimum	Maximum	Skewness	kurtosis
C	29	0.5739	0.3718	0.0000	1.7537	-0.159	2.120
Y1	29	0.8878	4.3772	0.0000	51.920	7.503	68.070
Y2	29	0.1745	0.2973	0.0000	1.6519	2.183	7.460
P1	29	0.4982	0.5002	0	1	0.006	1.000
P2	29	0.1346	0.1358	-0.2983	0.7016	0.570	3.973
P3	29	0.0017	0.1345	-0.6433	0.9722	0.911	10.269

Correlation test between research variables

Using the Pearson correlation coefficient,in this section we investigate the relationship between the research variables and the correlation between them. The matrix of correlation coefficients between the variables of the research has been presented in **[Table 2**].

Table 2. Matrix of Pearson correlation coefficients between variables of research

Correlation Probability	C	Y1	Y2	P1	P2	P3
C	1 -----					
Y1	0.008 0.8	1 -----				
Y2	-0.173 0.000	0.018 0. 581	1 -----			
P1	0.305 0.000	-0.014 0.671	-0.082 0.015	1 -----		
P2	0.019 0.570	-0.019 0.569	-0.020 0.546	-0.523 0.000	1 -----	
P3	-0.350 0.000	-0.09 0.007	0.140 0.002	-0.299 0.000	-0.091 0.006	1 -----

Durability test of variables

In order to examine the Durability of variables in the panel data approach, the Lane, Levine and Chu Durability tests are used. Non-Durability of variables cause false regression. If there is a false regression, the relation between the dependent variable and the independent variables is false. In fact, the results of the t and F statistics are not real and there is a possibility of occurrence oferrors of the first and second type.

H_0: Non-Durability of the variable under study.

H_1: Durability of the variable under study.

In the Lane, Levin and Chu test, the assumption zero means the Non-Durability of the variables, and the alternative assumption means the Durability of the variables. If the probability of an estimation is more than 0.05, then the variable is non-durable in the confidence interval of 95%, otherwise the variable is durable. In the **[Table 3**], the results of theDurability test of Lane, Levine, and Chu are observed.

Table 3. Durability test of Lean, Levin and Chu

Variable	Statistic	Probability	Result
A	-2.32	1.01	durable
Y1	-1.86	0.031	durable
Y2	-4.79	0.0	durable
P1	-1.85	0.031	durable
P2	-3.39	0.0003	durable
P3	-17.77	0.0	durable

Source: researcher's finding

According to the results of the above table, since the probability of estimation for all variables is less than 0.05, all variables are durable in the confidence interval of 95%. Therefore, there is no false regression problem and the estimation coefficients are reliable using panel data.

Testing the research hypothesis

Choosing the research hypothesis test model

Research hypothesis: Production in carpet production workshops of Iran Carpet Company is optimal in **[Table 4**].

This hypothesis has been tested using the following model:

$$Lnc = \alpha_0 + \sum_{i=1}^{2} \alpha_i Lny_i + \sum_{i=1}^{2} \beta_i Lnp_i + \frac{1}{2} \sum_{i=1}^{2} \sum_{j=1}^{2} \delta_{ij} Lny_i Lny_j + \frac{1}{2} \sum_{i=1}^{2} \sum_{j=1}^{2} \gamma_{ij} Lnp_i p_j + \sum_{i=1}^{2} \sum_{j=1}^{2} P_{IJ} Lny_i Lnp_i$$

Table 4. Results of good fitness of the optimal carpet production model

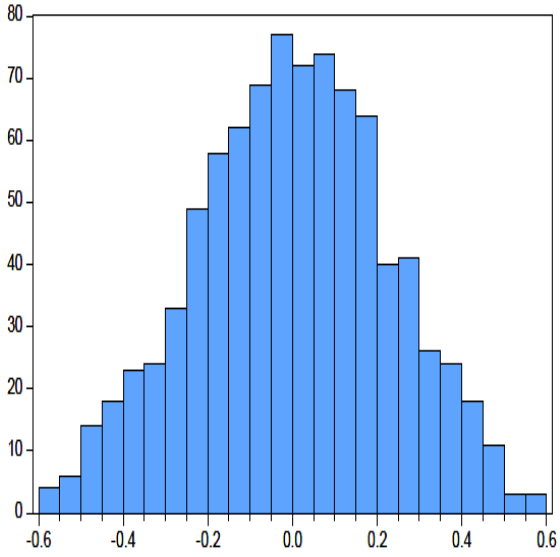
Workshop/City	Coefficient of efficiency	Result	Economization Index of scale	Result
Tabriz	0116666 .1	+	212 .1	+
Meshkinshahr	8490268 .0	-	002 .1	+
Heris	0446672 .1	+	004 .1	+
Nayin	1087240 .1	+	124 .1	+
Derakhsh	0021663 .1	+	0065 .1	+
Yazd	9147885 .0	-	0092 .1	+
Ravar	7274234 .0	-	987 .0	-
Abadeh	9546735 .0	-	998 .0	-
Nourabad	9452707 .0	-	758 .0	-
Kashan	9446091 .0	-	1009 .1	-
Qom	9554781 .0	-	869 .0	-
Farrokhshahr	000000 .1	+	786 .0	+
Chaleshtar	000000 .1	+	769 .0	+
Shahreza	3260227 .1	+	852 .0	+
Arak Sarayand	0642417 .1	+	0213 .1	-
Borougerd	5798514 .0	-	679 .0	-
Nahavand	8387230 .0	-	587 .0	-

Estimation results of the research hypothesis test modelin **[Table 5**].

Table 5. Results of the research model estimation

Dependent variable: cost Number of observations: 29 companies					
Variable	Symbol	Coefficient	t-statistic	p-value	VIF
Fixed coefficient	A	0.719	24.565	0.000	-
Product 1	Y1	-0.023	-2/096	0.036	1.016
Product 2	Y2	0.015	0.288	0.772	1.782
Cost of salary	P1	-0.081	-1.847	0.061	1.525
Cost of raw materials	P2	-0.257	-6.175	0.000	1.247
Water, electricity, oil, rent etc.	P3	0.160	2.688	0.007	1.173
Adjusted Determination coefficient of model of 95%					
f-statistic of model p-value		91.796 0.0000	Jarque-Bera statistic p-value		5.95 0.051
Breusch-Pagan statistic p-value		1.460 0.131	Durbin-Watson statistic		2.046

Considering that the probability of F statistics is smaller than 0.05 (0.000), the significance of the total model is confirmedwith 95% of confidence. The determination coefficient of the model also indicates that 95% of the variations in the dependent variable are explained by the independent variables entered in the model. In examining the model's statistical assumptions, the results of the Jarque-Bera test indicate that the remainders of the estimation of the research model have anormal distribution at the confidence level of 95%, so that the probability of this test is greater than 0.05 (0.0510) in **[Figure 2]**.



In terms of the correlation with the independence test of the remainders, the value of Durbin-Watson statistic is between 1.5 and 2.5 (2.046), hence the independence of the remainders is accepted. To test the consistency of variance of remainders, the Bruce-Pagan statistic was used. According to the results of this test and the P-value of F statistic (0.1317) which is more than 0.05, the zero hypothesis on the consistency of the variance

of the remainders is confirmed at the confidence level of 95% and indicates the consistency of the variance of the remainders. Also, in the study of the collinearity of variables, based on the results, the VIF index for all variables is less than five, so the lack of collinearity between the variables of the research model is confirmed.

Conclusion on the rejection or confirmation of the research hypothesis

Figure 2. Distribution of the research model remainders

According to the results presented in **[Table 5**] of the model estimation, the probability of t statistic for the variableP1 is less than 0.053 (0.0363) and its coefficient is negative (-0.0230). As a result, the results of the research hypothesis test is confirmed with the confidence of 95%.

5. Conclusion

Table 6. Summary of the results of the research hypothesis (Tabriz)

Research hypothesis: Production in carpet production workshops of IranCarpet Company is optimal.					
Variable	Coefficient	Statistic	Value of statistic	Importance level	Test result
C	-0.0230	t	-2.096	0.0363	confirmed

According to the in **Table 6** and the results presented in the above mentioned sample table, which was tested for all cities, the production in carpet companies of Tabriz, Harris, Nayin, Derakhsh, Farrokhshahr, Chaleshtar and Shahreza was optimal, but it is not so in Meshkinshahr, Yazd, Ravar, Abadeh, Nourabad, Qom, Boroujerd and Nahavand. If the production of an economic unit is carried out in the best and most profitable situation, it actually means that the production is efficient, and the efficiency in each economic sector is especially important in preventing the loss of resources. The point is that in order to evaluate the efficiency, it is necessary to determine the efficiency of a production unit in comparison with another production unit.

The results of this research show that there is a positive and direct correlation between all factors of supply chain management (efficiency, integrity, trust and accountability) and improvement of product quality, also, with the optimal supply chain management system the company can achieve the optimum production for the maximum benefits.

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