

An Empirical Study on the Variables That Ensure Process Efficiency in the Logistic Activities of Manufacturing Companies in Trc1 Region*

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ABSTRACT: *In this study, the purpose is to determine the Supplier Relations Efficiency, Supply Efficiency, Environmental Responsibility, Flexibility, Logistic Coordination, CRM (Customer Relations Management), Change Management, Order Processing, Innovation, and Communicative Skills, which are accepted as the prominent and basic factors in ensuring the process efficiencies of the logistic activities of the manufacturing companies located in Adiyaman, Gaziantep and Kilis in TRC1 Region. For this purpose, a scale consisting of 36 statements was used to collect data from 298 manufacturing companies in TRC1 Region Organized Industrial Zones. The One Way ANOVA Test was used in order to determine whether there are significant differences between the demographical variables of the companies. At the end of the analyses it was determined that there was a significant difference between the cities, sectors, the number of their employees and activity durations.*

Keywords : *Logistic Activities, TRC1 Region, Logistic Koordination, EFA, Organized Industrial Zones.*

I. INTRODUCTION

Due to increasing competition in recent years, companies have started to consider the logistics concept as an extrovert strategic function, which is in fact an auxiliary tool for companies to go one step further in competition. In addition, this concept is also considered as one of the most important elements that define the company strategy to create values for customers, to save costs, to control the market and to ensure production flexibility. The companies that have comprehended the importance of customer satisfaction and the value created by logistic processes have also understood that competitive advantage does not only stem from their companies and their expertise but also from the important position of customer satisfaction, which is influenced by all of the logistic activities. According to Elmas (2013), companies try to sustain their existence in markets where excessive competition is observed by increasing customer satisfaction, decreasing costs without sacrificing quality of their products [1]. For this reason, the decrease in costs in companies in the context of economic structure and the focusing in customer satisfaction caused that logistics gained an importance. The purpose of the study is to determine whether there are significant differences between the factors that play important roles in process efficiency of the logistic activities in manufacturing companies that are active in TRC1 Region and their demographical structures, and to contribute to the literature.

II. THE VARIABLES THAT PLAY ROLES IN PROCESS EFFICIENCY OF LOGISTIC ACTIVITIES

According to Erturgut and Soyşekerci (2011), the success of logistic activities depend on job performance and on producing solutions that will support customer satisfaction, and on the establishment of any kinds of technologies that will contribute to the skills [2].

The factors that play roles in the success of logistic activities are; Efficiency in Supplier Relations Sepúlveda and Derpich (2014)[3], Pikousová and Průša (2013)[4], Naude, Ambe and Kling (2013)[5], Innovation Cui, Hertz and Su (2010)[6], Berg, Labuschagne and Berg (2013)[7], Acar and Günsel (2010)[8], Visser (2007)[9], Communication Poe, Mafini and Laury-Okoumba (2015)[10], Change Management, Order Processing Johnson et al., (1998)[11], Flexibility Jayant and Ghagra (2013)[12], Supply Efficiency, Noordewier et al., (1990)[13], Environmental Responsibility Corrêa and Xavier (2013)[14], Logistic Coordination Liu et al., (2013)[15], Schramm-Klein and Morschett (2006)[16] and CRM (Customer Relations Management) Bakan and Şekkeli (2015)[17], Talib and Hamid (2014)[18] variables.

Efficiency in Supplier Relations: In the context of global competition, as one of the important elements in logistic chain that has a holistic performance-increasing effect to enable the companies to adopt to fast-changing environmental conditions, supplier relations is one of the important activity areas that has to be emphasized.

Supply Efficiency: Procurement, or, in other words, purchasing performance is one of the most important parameters of an operator's competitive power [13]. Supplying the company resources is important to create values for customers in the activity field, to increase market share and to survive in severe competition conditions. Supplying company resources is realized in the context of a certain plan, budget, policies and strategies.

Environmental Responsibility: Increasing pressure on companies to take the responsibility of the environmental effects of their products have led them to reconsider the recycle, reuse or destroy the products whose expiry dates are due without damaging the environment. For this reason, companies have to design and plan Reverse Logistic Activities in order to sustain recycling programs in a successful manner [19].

Flexibility: The term flexibility may be expressed as the behaviors of a company or a manufacturing system to adopt to changes in the manufacturing market, in other words, the ability of a company to adapt to unexpected conditions [20]. Flexibility is commonly used as the indicator of the ability of a company to respond to market dynamics. Operational flexibility shows the ability of a company to respond to situations like the decreases in the inventory stemming due to product changes, covering the inclinations in customer demands or solving the problems that appear in production. The behavior of a company towards the changing environment has become to be considered as the priority of many companies [21].

Change Management: Logistic chain, which brings employees, customers, suppliers and shareholders together, requires an efficient Change Management. Especially technological changes increase the efficiency of process activities at a maximum level. For this reason, ensuring the adaptation to technological and infrastructural changes that will increase the performances of logistic activities is important.

Order Processing: The basic aim of Order Processing is transferring the orders received to the customers as soon as possible. By doing so, the company will make a different advantage in competition for itself. In this step, the other activities in logistic chain also gain great importance. The running of the order cycle in an efficient manner is related with its close interaction with transportation and storage activities [11].

Innovation: The fast development in innovations cause that companies feel the need to renew their products and services in a continuous manner. There are various definitions on the concept of innovation, which has become the most important competition tool in today's ever-changing and developing economic conditions. Innovation may be defined as all of the activities in creating a product or a production process from the field of scientific research to inventions, and from developments to commercializing.

Bourne et al. (2000) reported that the innovation capacity of the company depended on many abilities [22]. Weerawardena (2003) published a paper and recommended to develop the innovation intensity to ensure a sustainable competition advantage [23]. Acar and Günsel (2010) wrote an article and concluded that there was a relation between the innovation in logistic services (especially process innovation), logistic abilities, competition advantage, and performance [8].

Communication: The communication concept is important in terms of covering the needs of current customers in an efficient manner. The technology factor was developed to succeed in becoming more efficient. In later stages, it has been given an administrative concept with the development of information technologies in the direction of the strategic importance in the form of obtaining developing and transferring the knowledge. Especially parallel to the development of internet technology, new channels like production, distribution, promotion and similar activities, which bring major benefits to companies, have emerged. In addition, logistic systems, which are important networks among company units, have also ensured that the raw materials are converted into products and delivered to the customers in the light of the customer expectations in a rational manner [24].

Logistic Coordination: It is the ability of realization of organizational coordination and cooperation in such a way that will include all shareholders along the channel. In other words, it is also possible to define Logistic Coordination Ability as the ability of ensuring the coordination of the activities and the shareholders (supplier, transporter, third party logistics companies, retailers, etc.) along the logistic process [15][16].

Schillo and Walter published an article in 2010 and investigated the factors that influenced the size of the sales in the existence of technology (network coordination ability, market uncertainty and being open to innovation idea) [25]. It was reported that market uncertainty influenced the being open to innovation variable in a negative way, and influenced network coordination ability in a positive manner. Daugherty et al. (2009) conducted a study and investigated the relation between the integrated logistic concepts, which constituted the basis of

ensuring the coordination and logistic performance. It was concluded in this study that integrated logistics had a major importance in ensuring the efficiency of the channels [26].

Customer Relations Management (CRM): It is the company strategy applied for the purpose of selecting and managing the customers in a way that will produce values for the company in the long run. With the help of an efficient CRM management, new customers are acquired or existing customers are satisfied and their loyalty is ensured. Customer relationship systems are seen as providing support for submitting a service to a customer with a support for optimizing a function within the organization [27].

III. METHOD

The Purpose of the Study

The purpose of the study is to determine the abilities of the manufacturing companies that are active in TRC1 Region on the variables that played role in logistic activity process efficiency, and to see whether there are significant differences between the sub-dimensions formed as a result of the factor analysis and the demographical properties of these companies and to contribute to the literature.

The Study Population and the Sampling

The study is limited with the questions developed to measure the variables in the study and with the data collected in the context. The borders of the study consist of the manufacturing companies that are active in OIZs¹ in TRC1 Region. The TRC1 Region consists of the cities of Gaziantep, Adiyaman and Kilis, which are located in Southeastern Anatolian Region. There are 8 Organized Industrial Zones (OIZs) in Gaziantep, 4 in Adiyaman, and 1 in Kilis in TRC1 Region, which makes 13 in total. 11 of these zones are active. 1.126 companies are active in current OIZs, and 95.749 people are employed in them [28].

The borders of the study consisted of the manufacturing companies that are active in OIZs in TRC1 Region. It was determined that the minimum sampling size was 287 according to 5% error rate within 95% confidence interval [29]. Firstly, the necessary permissions were received from the OIZ Managements, and the managers of the companies were interviewed face to face to collect the data. In this context 298 questionnaires were applied. It was determined that all of the questionnaires were proper for analysis.

The Data Collection Tool and the Analyses to be applied

The data collection tool consists of 2 sections. In the first section, there are questions that aim to determine the sectoral distribution of the companies. In the second section where there are the variables that play active role in process efficiency. In the second section in which there are variables that play roles in process efficiency of Logistic Activities, the scale that was prepared by Kayabaşı (2007) was made use of [30]; and for the Flexibility dimension, the scale prepared by Öz (2011) was used [31]; for Logistic Coordination, a part of Innovation Dimension and for Customer Relations Management Dimension the scale prepared by Bakan and Şekkeli (2015) was used [17]; and for Communication Dimension, the scale prepared by Pooe, Mafini and Loury- Okoumba (2015) was used [10]. The scale consisted of 40 questions in order to measure the effects of these variables.

Firstly, the Exploratory Factor Analysis was used in order to determine the factor loads of “Logistic Activities Scale”, and then the Confirmatory Factor Analysis was applied in order to determine whether the data are consistent with the dataset or not. The reliability analysis of the scale was made, and then the One Way ANOVA test was applied in order to determine whether there were significant differences between the dimensions of the companies and their demographical variables.

IV. FINDINGS

Demographical Findings

The sector of the companies, which participated in the study, their personnel numbers, and the properties about the cities they were active in were determined in this section. In this context, 53,4% of the companies in which the questionnaires were applied were in the textile sector; 14,4% were in the construction sector; 13,8% were in the food sector; 7,0% were in the chemistry sector; 4,4% were in the marble sector; 3,4% were in the plastic sector; 3,4% were in the machinery sector and 0,3% were in the furniture sector. It was determined that 34,2% of the companies had 50-99 employees; 26,8% of the companies had 1-49 employees; 17,4% of the companies had 100-149 employees; 15,1% of the companies had 150-249 employees; 4,4% of the companies had 250-499 employees; and 2,0% of the companies had 500 and over employees. It was also determined that 82,6% of the companies which participated in the study were active in the OIZs in Gaziantep; 14,4% were in Adiyaman and 3,0% were in Kilis.

¹ OIZs: Organized Industrial Zones (OSB in Turkish Language)

The Findings on “the Variables that Play Active Roles in Logistic Activities Process Efficiency Scale”

In order to determine the structural validity of the “The Variables that Play Active Roles in Logistic Activities Process Efficiency Scale”, firstly the Exploratory Factor Analysis was applied. In addition to this, the KMO (Kaiser-Meyer-Olkin) Test and Bartlett’s Sphericity Tests were made use of in order to test whether the factor analysis could be applied to the dataset or not. As a result of the KMO Analysis of the scale, the sampling adequacy value was determined as 0,836, and the Bartlett’s Sphericity Test gave meaningful result [χ^2 (780) =3926,688, $p < 0.001$], which shows that the correlation relation between the items is proper for factor analysis.

Rotated Components Matrix table shows to which factors the items are loaded, and the factor loads. As a result of the Exploratory Factor Analysis, the V3 and V26 statements in the scale were removed from the scale because of low factor loads, and V15 statement was also removed because there was a cross loading in it. After these 3 statements were removed from the scale, the Exploratory Factor Analysis was repeated. The results that were obtained as a result of the latest EFA are given in Table 1 above.

Table 1: Factor Analysis Results of Participants

Rotated Component Matrix ^a										
	Component									
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
V38	,670									
V39	,658									
V40	,652	,375								
V34	,587									
V31	,561									
V32	,546			,327						
V33	,507									
V5		,717								
V6		,662								
V7		,640								
V4		,539								
V8		,539		,395						
V24			,715							
V23			,714							
V22			,579						,403	
V25			,519			,407				
V27			,408							
V17	,321			,682						
V18				,630						
V19				,563		,323				
V16				,451	,335					
V28					,813					
V30					,684					
V29					,633					
V13						,740				
V12						,564		,382		
V14						,479				
V36							,775			
V37							,733			
V35							,713			
V10								,740		
V9								,670		
V11						,457		,607		
V21									,821	
V20									,758	
V1										,756
V2										,747
KMO	0.836									
Bartlett's Tests	χ^2 (780) =3926.688, $p < 0.001$									

After the factor structure of the scale was determined with the Exploratory Factor Analysis, the Confirmatory Factor Analysis (CFA) was made in order to test the structural validity of the scale. The Goodness of Fit values showed that the scale had a good fitness with the data. Right at this point, the Standardized Regression Weights were examined, and V16 statement was also removed from the scale due to low regression value. The Modification Indices (MI) of the CFA were also examined, and associations were made in the error

covariance of some statements in order to improve the goodness of fit value of the model. Modifications were made between V39 and V40 statements, between V5 and V4 statements, between V24 and V25 statements, between V5 and V6 statements, between V13 and V14 statements, between V32 and V33 statements, between V6 and V7 statements. After each modification, the CFA was repeated again and again, and the obtained values showed that the data fit the 10-factor structure of the scale. The Goodness of Fit values are given in Table 2.

Table 2: Goodness of Fit Values of Scales

	χ^2	df	CMIN/ DF \square 5	GFI \square .85	AGFI \square .80	CFI \square .90	NFI \square .90	TLI \square .90	RMSEA \square .08
LAPEVPARS	853.5	542	1.58	.87	.84	.90	.77	.88	.04

Reliability Analyses were made for each factor in the scale, and the Cronbach's Alpha Reliability Coefficients are given in Table 3. As it is stated in Table 3, the Cronbach's Alpha Value of the scale, which consisted of 36 statements, was found to be 0.898. This value shows the Internal Consistency Reliability of the 36 statements, which constituted the scale.

Table 3: Reliability (α) Findings of Factors

Factors	(\square)	Factors	(\square)
Factor 1 Customer Relations Management	0.806	Factor 6 Change Management	0.621
Factor 2 Order Processing	0.773	Factor 7 Communication	0.684
Factor 3 Environmental Responsibility	0.751	Factor 8 Flexibility	0.642
Factor 4 Efficiency in Supplier Relations	0.704	Factor 9 Innovation	0.709
Factor 5 Logistic Coordination	0.693	Factor 10 Supply Efficiency	0.693
The Variables That Play Active Roles in Logistic Activities Process Efficiency Scale (α): 0.898			

The averages of the sub-dimensions in the scale and the findings on standard deviations are given in Table 4.

Table 4: Descriptive Findings for the Major Variables

Factors	Mean	SD
Customer Relations Management	4.26	,464
Order Processing	4.24	,508
Environmental Responsibility	4.19	,514
Efficiency in Supplier Relations	4.29	,539
Logistic Coordination	4.08	,566
Change Management	4.18	,522
Communication	4.15	,552
Flexibility	4.18	,544
Innovation	4.10	,582
Supply Efficiency	4.18	,704

V. CROSS ANALYSES

Table 5: The Results of the Analyses according to the Activation City of the Companies

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Customer Relations Management	Between Groups	2,989	2	1,494	7,225	,001
	Within Groups	61,013	295	,207		
	Total	64,002	297			
Order Processing	Between Groups	1,728	2	,864	3,398	,035
	Within Groups	75,012	295	,254		
	Total	76,741	297			
Environmental Responsibility	Between Groups	1,083	2	,541	2,061	,129
	Within Groups	77,469	295	,263		
	Total	78,552	297			
Efficiency in Supplier Relations	Between Groups	,661	2	,331	1,138	,322
	Within Groups	85,649	295	,290		
	Total	86,311	297			
Logistic Coordination	Between Groups	1,082	2	,541	1,697	,185
	Within Groups	94,039	295	,319		
	Total	95,120	297			
Change Management	Between Groups	,528	2	,264	,969	,381
	Within Groups	80,372	295	,272		
	Total	80,899	297			
Communication	Between Groups	,029	2	,015	,048	,953
	Within Groups	90,350	295	,306		
	Total	90,379	297			

Flexibility	Between Groups	1,475	2	,737	2,522	,082
	Within Groups	86,275	295	,292		
	Total	87,749	297			
Innovation	Between Groups	4,807	2	2,403	7,407	,001
	Within Groups	95,718	295	,324		
	Total	100,524	297			
Supply Efficiency	Between Groups	,345	2	,173	,346	,707
	Within Groups	147,004	295	,498		
	Total	147,349	297			

The One-Way Anova test was applied in order to determine whether the variables that played active roles in process efficiency of the *Logistic Activities* of the companies differed according to activation cities. The results show that the *Customer Relations Management* ($\rho = 0.001 < 0.01$), *Order Processing* ($\rho = 0.035 < 0.05$) ve *Innovation* ($\rho = 0.001 < 0.01$) alt *Dimensions* differed at a significant level according to the activation city of the companies. The Tukey HSD Multiple Comparison Test was made use of in order to determine between which groups the significant differences were observed. In this context, it was observed that the companies that were active in OIZ in Adiyaman were superior in *Customer Relations Management* (Average difference 0,253, $\rho < 0.01$). On the other hand, the LSD Multiple Comparison Test was made use of in determining between which groups the differences were observed in *Order Processing* and *Innovation* dimensions. In this context, it was observed that the companies that were active in the OIZs in Adiyaman were superior in both dimensions to the companies in OIZs in Gaziantep (Average difference 0,169, $\rho < 0.05$; Average difference 0,357, $\rho < 0.01$).

The Results Of The Analyses According To The Sector Of The Companies Variable The One-Way Anova test was applied in order to determine whether there were significant differences among the variables that played active roles in process efficiency of the *Logistic Activities* of the companies in terms of the sector of the companies variable, and it was determined that there were no significant differences. It was observed that the ρ values of the variables are higher than 0,05. This result shows that the manufacturing companies in all sectors in TRC 1 Region have similar properties in terms of the variables that are important for *Logistic Activities Process Efficiency*. This is also an indication showing that the companies have comprehended the importance of these variables at the same rate.

Table 6: The Results Of The Analyses According To Number Of The Employees Of The Companies

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Customer Relations Management	Between Groups	1,537	5	,307	1,437	,211
	Within Groups	62,465	292	,214		
	Total	64,002	297			
Order Processing	Between Groups	2,308	5	,462	1,811	,111
	Within Groups	74,433	292	,255		
	Total	76,741	297			
Environmental Responsibility	Between Groups	2,907	5	,581	2,244	,050
	Within Groups	75,645	292	,259		
	Total	78,552	297			
Efficiency in Supplier Relations	Between Groups	6,072	5	1,214	4,419	,001
	Within Groups	80,239	292	,275		
	Total	86,311	297			
Logistic Coordination	Between Groups	3,544	5	,709	2,260	,049
	Within Groups	91,576	292	,314		
	Total	95,120	297			
Change Management	Between Groups	4,340	5	,868	3,311	,006
	Within Groups	76,559	292	,262		
	Total	80,899	297			
Communication	Between Groups	1,109	5	,222	,725	,605
	Within Groups	89,271	292	,306		
	Total	90,379	297			
Flexibility	Between Groups	6,102	5	1,220	4,364	,001
	Within Groups	81,648	292	,280		
	Total	87,749	297			
Innovation	Between Groups	1,607	5	,321	,949	,450
	Within Groups	98,918	292	,339		
	Total	100,524	297			
Supply Efficiency	Between Groups	3,595	5	,719	1,460	,203
	Within Groups	143,754	292	,492		
	Total	147,349	297			

The One-Way Anova test was applied in order to determine whether there were significant differences among the variables that played active roles in process efficiency of the Logistic Activities of the companies in terms of the number of the employees in these companies variable. According to the results, show that the *Environmental Responsibility* ($\rho = 0.05 \leq 0.05$), *Supplier Relations Efficiency* ($\rho = 0.001 < 0.01$), *Logistic Coordination* ($\rho = 0.05 \leq 0.05$), *Change Management* ($\rho = 0.006 < 0.01$) and *Flexibility* ($\rho = 0.001 < 0.01$) sub-dimensions of the companies differed at a significant level according to the number of the employees. The Tukey HSD and LSD Multiple Comparison Test was made use of in order to determine between which groups the significant differences were observed. In this context, it was determined that the companies that had 150-249 employees were more sensitive in *Environmental Responsibility* dimension than those which had 1-49, 50-99 and 100-149 employees. It was also determined that the *Supplier Relations Efficiencies* of the companies that had 500 and over employees were higher than those which had 1-49 employees, 50-99 employees, 100-149 employees and 150-249 employees. It was determined in the *Logistic Coordination* item that the companies that had 1-49 employees had lower skills than those which had 100-149 employees and 150-249 employees. The companies that had 100-149 employees and the ones that had 150-249 employees were superior to those which had 1-49 employees and 50-99 employees in *Change Management*. As the last item, the companies that had 1-49 employees in *Flexibility* dimension. On the other hand, it was also observed that the companies that had 250-499, 500 and over employees had a more flexible structure than those which had 50-99 employees.

Table 7: The Results of the Analyses of the Companies according to Activity Years Variable

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Customer Relations Management	Between Groups	1,256	4	,314	1,466	,212
	Within Groups	62,746	293	,214		
	Total	64,002	297			
Order Processing	Between Groups	1,251	4	,313	1,214	,305
	Within Groups	75,489	293	,258		
	Total	76,741	297			
Environmental Responsibility	Between Groups	2,472	4	,618	2,380	,052
	Within Groups	76,079	293	,260		
	Total	78,552	297			
Efficiency in Supplier Relations	Between Groups	2,719	4	,680	2,382	,052
	Within Groups	83,592	293	,285		
	Total	86,311	297			
Logistic Coordination	Between Groups	2,284	4	,571	1,802	,128
	Within Groups	92,836	293	,317		
	Total	95,120	297			
Change Management	Between Groups	2,577	4	,644	2,410	,049
	Within Groups	78,322	293	,267		
	Total	80,899	297			
Communication	Between Groups	2,146	4	,536	1,781	,133
	Within Groups	88,234	293	,301		
	Total	90,379	297			
Flexibility	Between Groups	7,033	4	1,758	6,382	,000
	Within Groups	80,717	293	,275		
	Total	87,749	297			
Innovation	Between Groups	1,327	4	,332	,980	,419
	Within Groups	99,197	293	,339		
	Total	100,524	297			
Supply Efficiency	Between Groups	3,632	4	,908	1,851	,119
	Within Groups	143,717	293	,491		
	Total	147,349	297			

The One-Way Anova test was applied in order to determine whether there were significant differences among the variables that played active roles in process efficiency of the Logistic Activities of the companies in terms of the activity years of the companies variable. The results show that there are significant differences among the *Environmental Responsibility* ($\rho = 0.05 \leq 0.05$), *Supplier Relations Efficiency* ($\rho = 0.05 \leq 0.05$), *Change Management* ($\rho = 0.049 < 0.05$), and *Flexibility* ($\rho = 0.000 < 0.01$) sub-dimensions in terms of the activity durations of the companies. The Tukey HSD and LSD Multiple Comparison Test was made use of in order to determine between which groups the significant differences were observed. In this context, the companies that had 21 and over activity years were more sensitive than those which had 1-5 and 5-10 years of experience in *Environmental Responsibility* dimension. The companies that had 21 and over activity years had a superior structure to the companies that had 1-5 activity years, 6-10 activity years and 11-15 activity years in *Supplier Relations Efficiency* dimension. The companies that had 16-20 years and 21 and over years activity

years had superior skills than the ones that had 1-5 activity in *Change Management* dimension. In addition, it was also determined that the companies that had 1-5 activity years were not good at Flexibility dimension when compared with the ones that had 11-15 years, 16-20 years and 21 and over activity years.

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