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THE IMPACTS OF THE BULLWHIP EFFECT ON CUSTOMER LOYALTY: AN EXAMPLE IN AUTOMOTIVE INDUSTRY

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Abstract

Recently in business environment, the competition is not only between the individual firms but also the networks of the companies. Therefore, the supply chain of the firms has a critical role in the success and also it is very important for supply chains to be cost-effective, high quality and be able to response quickly. Supply chain is an umbrella term used for the activities a business undertakes in order to link their supply of goods with customer demand. And the bullwhip effect is the phenomenon of increasing demand variability in the supply chain from downstream echelons (retail) to upstream echelons (manufacturing).

Loyalty means the positive trends of consumers towards a store or brand. And this consists after the result of the judgment or assessment from purchasing a particular product or service. The objective of this study is to analyze the impact of bullwhip effect on customer loyalty. Customer loyalty, supply chain and bullwhip effect in relation to each other contributes to the literature aimed.

"KAMÇI ETKİSİNİN" MÜŞTERİ SADAKATİ ÜZERİNDEKİ ETKİLERİ: OTOMOTİV ENDÜSTRİSİNDE BİR ÖRNEK

Özetçe

Son zamanlarda iş ortamında rekabet yalnızca firmalar arasında değil, aynı zamanda şirket ağları arasında oluşmaktadır. Bu nedenle tedarik zinciri; düşük maliyetli ve yüksek kaliteli olmalı aynı zamanda hızlı bir şekilde tepki verebilmelidir. Tedarik zinciri; bir iş kolunun ürün tedarikini müşteri talebi ile irtibatlandırmak için yerine getirdiği faaliyetlerin tümünü ifade etmek için kullanılan şemsiye bir terimdir. Kamçı etkisi ise; talep değişkenliğinin tedarik zincirinin alt kademelerinden (perakende) üst kademelerine (üretim) doğru artması durumudur.

Sadakat, bir mağaza ya da markaya karşı tüketicilerin olumlu eğilimler göstermesi anlamına gelir ve belirli bir ürün veya hizmetin satın alınması sonrası verilen hüküm veya yapılan değerlendirme ile oluşur. Bu çalışmanın amacı, müşteri sadakati üzerinde oluşan kamçı etkisini analiz etmektir. Müşteri sadakati, tedarik zinciri ve kamçı etkisinin birbirleri ile ilişkisi incelenerek literatüre katkıda bulunulması amaçlanmıştır.

Key words: *Bullwhip effect; supply chain, supply chain management; beer game, customer loyalty.*
Anahtar kelimeler: *Kamçı etkisi, tedarik zinciri, tedarik zinciri yönetimi, bira dağıtım oyunu, müşteri sadakati.*

1. INTRODUCTION

The antagonism among companies becomes stronger like economic globalization approaches. Enterprises attempt to re-compile the logistics, financial, material, and information flows along their supply chains to increase their market share while cutting down costs. Redescribing the limits among companies and the opnion of re-assembly employment flows is called supply chain management (SCM) [1].

Companies included in the supply chain, prefers new management approaches with low-cost, high customer service level to maintain profitability and survive on the face of a globalized market areas with

competitive market conditions. However, with the globalization of market segments the demands of the company is obscured as the results of the new market structure, consumer behavior and purchasing, suppliers, and competitive differentiation of the companies. As a result of this uncertainty, "bullwhip effect" emerges.

Bullwhip effects the customer satisfaction and the cost in supply chain[1]. This effect is very costly for the companies in competition. Also it triggers excessive inventories and unclear production planning [2].

2. LITERATURE REVIEW

2.1. Supply Chain

The Association for Operations Management (APICS) defined supply chain as ‘’The network used to deliver products and services from raw materials to end customers through an engineered flow of information, physical distribution and capital‘’. A traditional supply chain contains producers, suppliers, distributors and customers. And each location is accountable for determining the proportion of goods to order to gratify their demand independently of other units in the supply chain [3].

Subjects dominate a simulated inventory distribution system which consists of various actors, time delays, nonlinearities and feedbacks [4]. According to Sterman the decision makers find controlling the dynamics difficult when decisions have constructive and delayed feedback impacts. Moreover, multi-agents are involved in the continuum, whose performance depends on the quality of other supply chain members decisions, and therefore is subject to coordination risk that may starts unsteadiness in the system [2].

This area draws attention significantly in recent years and is seen as a tool for companies to achieve competitive advantage [5]. The basic idea is to think that the chain as a whole. All members in the chain effects the performance of chain and the other members in the chain directly or

indirectly [6]. If we consider that competition is not between companies, but between supply chains, the same elements in supply chain, must cooperate with customers and suppliers is a necessity once again emerges. Without considering the structure of supply chains in the system, all steps taken by the company itself is not sufficient to improve the whole supply chain. Any item within the supply chain to install the additional costs due to the chosen strategy is actually being detected is shared within the whole chain. Here it is very important for the companies, make up the supply chain, to avoid the bullwhip effect [7]. To achieve this they must supply the exchange of information forward and backward around a strategic plan required for the common interests of the chain.

In the supply chain switching one stage to another stage, degradation and loss of information caused a significant influence on the performance of the supply chain. In addition, the last customer in the supply chain, the manufacturer and its suppliers in order to, demand, capacity, and other information sharing, managing the stock of customer by the supplier and the centralization of the supply chain inventory management, shortening the duration of the supply and ordering lower rapidly inventory costs in the supply chain and play a major role in prevention of the bullwhip effect [7].

Supply chain management is a set of techniques used for integrating suppliers, manufacturers, warehouses, and stores, so that trade is produced and distributed in the right quantities, to the right locations, and at the right time, for decreasing system wide costs while satisfying the service-level requirements [8].

2.2. Bull Whip Effect

Among economists, Clark (1917) is the foremost who starts a dynamic discussion when he indicates that capital formation is amplified as it improves supply chain. Metzler (1941) is credited by Blinder and Maccini (1991) to have initiated the similar argument, but with a center point on inventory. Lee, et al. (1997) have done the most in the operations administration context, to declare on the topic [9].

The Bullwhip Effect is an major incident seen in most forecast-driven supply chains. As we displace from retailers to manufacturers or from downwards to upwards in the supply chain when require variability increases, this effect is seen. Bullwhip effect has a minus effect on constancy of orders placed in the supply chain steps and the regularity mostly [10].

The bullwhip effect symbolizes a market pathology in which knowledge about require becomes increasingly defected while moving upstream in the supply-chain. Such a defect can lead to armoury throughout the supply-chain system, inedaquated or extravagant capacities, product unavailability, and excessive prices in the main[11].

Baby nappies or diapers is a usual example of this effect. In nappies using they are properly tidy. For example when they feed, they have a fresh nappy generally. As we know there is seasonal mutation in the childbearing rates as more babies are intented in spring. Neither the less, this seasonal mutation is small contrasted to the broadly floating and erratic procurement rates experienced by the diaper producer after the commissions have passed through the shopping markets and dispersion centres [12].

Also Hewlett-Packard (HP) company is another example of this effect. Hewlett-Packard (HP) found that there were some undulations over time, as expected when the managers examined the sales of one of its printers at a significant reseller. And the company observed much larger wobbles when they investigated the orders from the reseller. They explored that the commands from the printer splitting to the company’s integrated circuit division had even bigger undulations also, to their surprise [13].

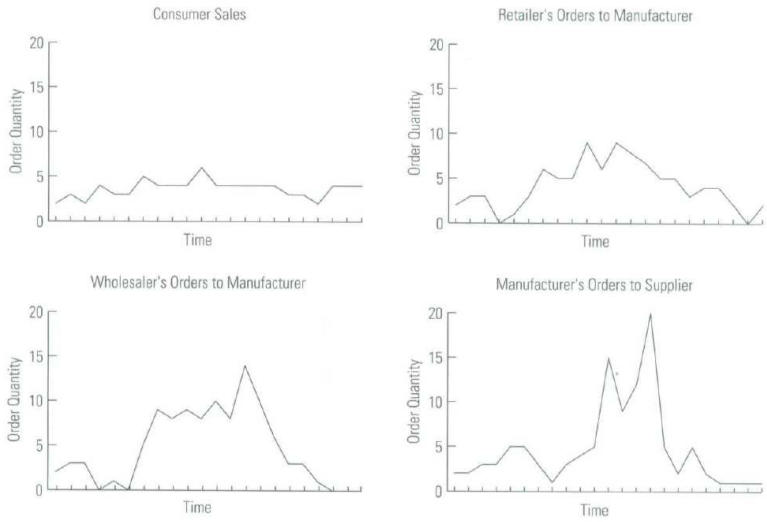


Figure 1. Increasing Variability of Orders Up The Supply Chain [14].

Variation in demand at every level of the supply chain, depending on order from aprevious level as shown in the figure exponentially increasing. Along the chain BWE effects each member. Therefore, it is difficult to quantify the bullwhip effect. In order to reduce and eliminate this effect, first companies must identify the situations that cause it. We can see that causes and solutions of the causes in the figure ;

Causes	Proposed Solutions	Authors
Demand forecast updating	Information sharing	[14], [15]
Order batching	EDI (Electronic Data Interchange) and Internet technologies	[14], [15], [16],
Price fluctuation	EDLP(Every Day Low Pricing)	[14], [15]
Rationing and shortoge gaming	Allocation based on past sales	[14], [15]
Misperception of feedbacks	Giving a better understanding of the supply chain Dynamics to managers	[17] [18], [19], [20], [4]
Local optimization without global vision	None	[21], [22], [23], [1]
Company processes	None	[16]

Figure 2. Proposed Causes And Solutions Of Bullwhıp Effect [24].

Also the role that human attitude plays in the bullwhip effect is still disregarded[25]. However, regardless of cause to reduce the bullwip effect, we must provide the information sharing between the members of chain. If the exact cause of a problem is undefined, the method you apply mostly fails. Therefore before selecting a method or methods, the system should be reviewed in detail. Considering that the main cause of the bullwhip effect is human factor, the reasons and results of the bullwhip effect and solution methods can be much more addressed in this study [6].

To understand the bullwhip effect better, the review of "Beer Game" may be useful.

BEER GAME

The beer game was created at the beginning of the sixties in Sloan School of Management, Massachusetts Institute of Technology (MIT).The game shows the bullwhip effect by modelling a make-to-stock supply chain with four tiers. As seen in the figure the participants in the beer distribution game get a part of either the wholesaler, the retailer, the distributor or the factory as seen in the figure [25].

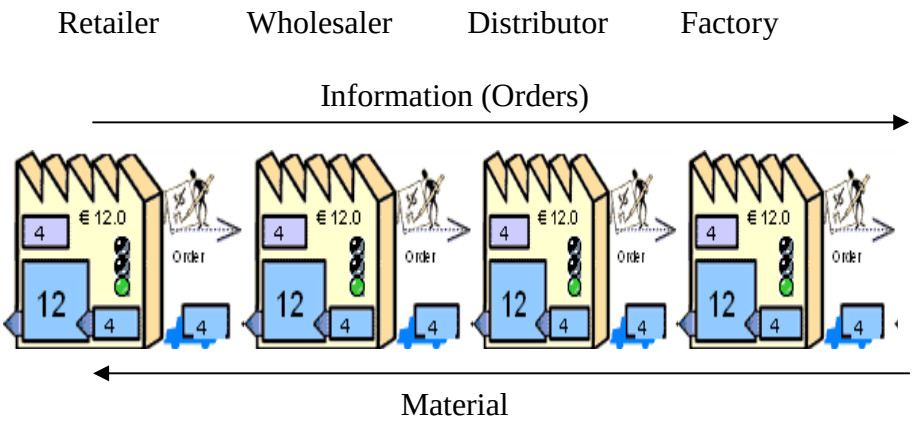


Figure 3. The four-tier supply chain simulated in the beer distribution game [25].

In beer game there are three players including a retailer, a wholesaler, and a marketing director [26]. The aim for every player is to increase maximum profit. A truck driver distrubutes beer to the retailer once each week. Then the retailer places an order with the trucker who returns the order to the wholesaler. Between providing and ordering the beer, there's a four week delay. The retailer and wholesaler do not correspond directly. The wholesaler delivers many products to a large number of consumers and the retailer gives hundreds of products away [27].

For decreasing the bullwhip effect with beer distribution game, following researchers have tested different strategies. Joint strategies incorporate contaning order lead times, sharing POS data, and centralizing ordering decisions. Anderson and Morrice (2000) work on a novel about service-oriented supply chain game in a common way, pointing that sharing consumer request can conduct to developments in capacity surge and price [28].

The beer game is a presentment of a business supply chain that imitates the actual world demeanours which cause the bullwhip effect. And game will be used as a presentment of a supply chain for examinating the impacts of anti-price gouging legislation on the bullwhip effect [3]. As a result the beer distribution game online proves that especially two types of excessive behaviour, called as “safe harbour” and “panic”. These behaviours have a minus effect on the effectuation of supply chains [25].

Customer Loyalty

Throw out a chicken to catch a goose! Our ancestors did not say in vain. Whether you accept or not, it is a quite proverb that applies in our daily lives. Sometimes we are the side who takes the chicken and sometimes the other side chasing excavation. That proverbs defines customer satisfation and customer loyalty well. You must not grudge chicken to win others customer, retaining customer, build long term relationships and to create commitment. For these you must not escape direct and indirect costs and you must throw out a chicken to catch a goose [29].

In a globalizing world, the companies re-examine their strategies for the changeable structure of the customer. In today's conditions, the most important competitive tool for companies is customer relation resulting in customer loyalty. Never forget that the cost of winning new customers, is higher than the cost of holding old customers [30].

Namely, consumers show a behavioral intention willing to continue the relationship with a certain brand or a company. Actually, in the field of marketing science, customer loyalty is vested with highly mature conceptions. With past effort made by several scholars, we have known much about the definition of customer satisfaction [31].

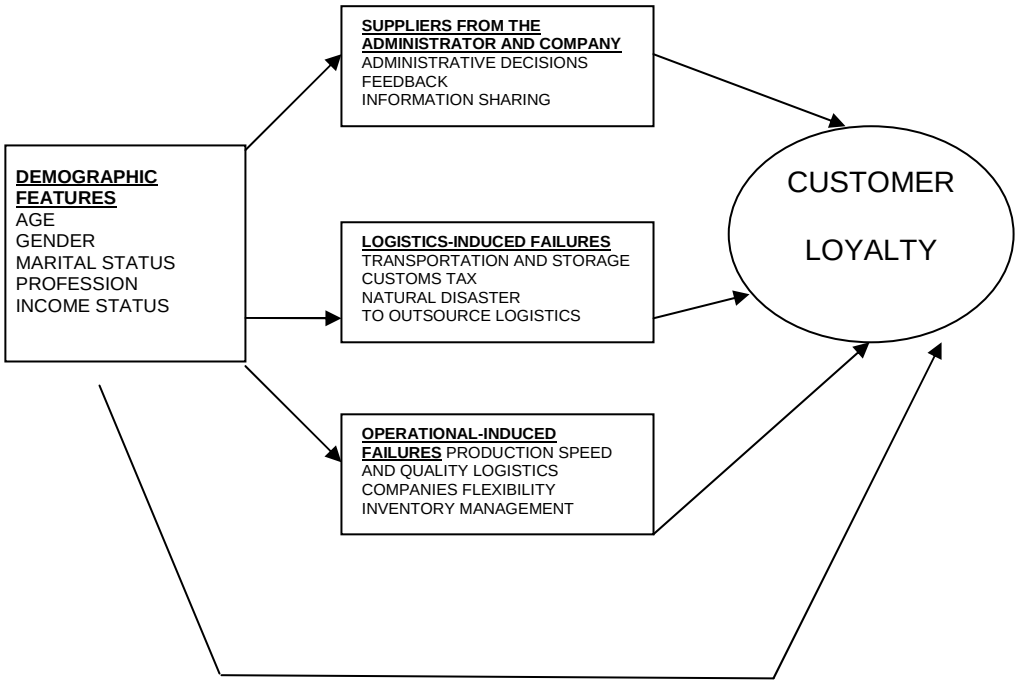
Chaudhuri and Holbrook (2001) exposed customer loyalty is created by attitude loyalty and behaviour loyalty. We can define behaviour loyalty as non-stop purchase and recommendation behaviors. And attitude loyalty means the loyalty in position or the tolerance to cost. Indicated customer

loyalty is composed of customers' repurchase target, forbearance to costs, the willing to recommend a marque or a enterprice and the willing to conduct cross purchase. Also, the said 4 items can play as the measurement indicators for customer loyalty.

Finally we can direct customer loyalty measurement approximately in 5 levels:
(1) re-purchase willing,
(2) derivatively positive oral administration,
(3) recommendation willing,
(4) tolerance to price adjustment,
(5) consumption frequency [32].

3. RESEARCH METHODOLOGY

Our methodology is to evaluate the relationsip model with statistical analysis between customer loyalty, which is independent variable and dependent variable, the factors that causes the bullwhip effect.



The research process consists of four phases. The first stage is preparation of the survey; the second stage is pre-test step, the third step is to collect the data and the final stage is analyzing the data.

The survey format consists of three parts. In the first chapter, we asked participants which brand of automobile they most prefer, why they prefer this brand and also how long they renew their cars. In the second chapter, we requested participants to tick the variables in the research model which is effective in automobile production by severity with 5 Likert scale.

In the third chapter, we asked participants how much they join loyalty variables with 5 Likert scale. And the last chapter consists of questions designed to measure the demographic characteristics of participants.

In order to measure the applicability of the survey, a small pre-test was conducted after the survey questions which was prepared as a result of variables and observations in the literature. After the small test, we removed multiple questions.

The application time of the survey is 1 month and was applied to 410 people.

3.1. Analyzing the data

Analysis of the data collected as a result of the implementation of the survey, which is at 95% confidence level. All datas have been analyzed in the statistics package SPSS 11.5 (Statistical Package for Social Sciences).

3.1.1. Demographic Characteristics

Gender	F	%
Female	157	38,29
Male	253	61,71
Total	410	100,00
Marital Status	F	%
Single	271	66,10
Married	128	31,22
Widow	11	2,68
Total	410	100,00
Age	F	%
<20	49	11,95
21-25	82	20,00
26-30	68	16,59
31-40	84	20,49
41-50	72	17,56
>51	55	13,41
Total	410	100,00

Educational Status	F	%
Secondary School Or Equivalent Graduates	3	0,73
High School Graduates	91	22,20
Üniversity	250	60,98
Master/Phd	66	16,10
Total	410	100,00
Professıon	F	%
Prıvate Sector Offıcer	27	6,59
Prıvate Sector Workers	38	9,27
Publıc Sector Offıcer	66	16,10
Publıc Sector Workers	20	4,88
Housewıfe	6	1,46
Retıred	8	1,95
Unemployed/Lookıng For Work	17	4,15
Unemployed But Income Owner	6	1,46
Senıor Executıve	10	2,44
Small/Medıum Busıness Free Professıons	19	4,63
Specıalızed Professıons (Read About College)	120	29,27
Sports, Artıst	45	10,98
Student	28	6,83
Total	410	100,00
AVERAGE MONTHLY INCOME	F	%
<500 TL	5	1,22
501-1000	29	7,07
1001-1500	46	11,22
1501-2000	62	15,12
2001-2500	53	12,93
2501-3000	72	17,56
3001-3500	40	9,76
3501 4000	28	6,83
4001-4500	27	6,59
4501-5000	25	6,10
>5000 TL	23	5,61

As seen in the table 157 female and 253 male participated the survey. If it is expressed as a percentage, 38.2% were women, 61.71% were men. The distribution of age analyze participants is; 49 people are 20 years and under, 82 people between the ages of 21-25, 68 people between the ages of 26-30, 84 people between the ages of 31-40, 72 people between the ages of 41-50, 51 and over 55 people is located. Also 128 participants are

married, 271 single, while the remaining 11 people are widow. 120 participants are specıalızed professions (read about college), 66 percent are publıc sector offıcer, 45 's sports / artist. If we look the educational status, we see the largest percentage of university graduates with 60.98% percentile, second 22.19% percentile with a high school graduate and third as a percentage of 16.09% with a master graduates. The largest ıncome levels of participants percentage is 17.56% with 2,501-3000 TL, between 1,500-2000 TL is second and third with 12.92% are between 2001 -2,500 TL.

3.1.2. General Findings

RENTAL OWNER	F	%
Yes	305	74,39
No	105	25,61
Total	410	100,00
RENEWAL PERIOD OF CAR	F	%
Every year	17	4,15
Between 1-3 YEAR	107	26,10
Between 4-6 YEAR	162	39,51
Between 7-9 YEAR	88	21,46
10 year and up	36	8,78
Total	410	100,00
CAR BRAND THAT YOU CHOOSE (LİSTED THREE HIGH RESULTS)	F	%
Vlolkswagen	63	15,37
Audi	49	11,95
BMW	47	11,46
BRAND OF YOUR CAR (LİSTED THREE HIGH RESULTS)	F	%
Renault	70	17,07
Opel	40	9,76
Peugeot	30	7,32

As seen in the table 305 participants have their own car, 105 are not. When you look auto refresh times of persons, with 39.51% percentile 162 people 4-6 years, with a percentile of 26.09% 107 people ticked between 1-3 years and with 21.46% percentile 88 people ticked between 7-9 years. We asked surveyed which brand of car they most preferred, then 63 percent chose Volkswagen, 49 percent chose BMW, and 47 percent chose the Audi brand automobiles. The reason for choosing these cars 332 people marked

the "quality" , secondly 255 people marked the "Reliability" and 248 people marked the " Operation Peace of Mind" . What I mean is that people are at the forefront of quality, reliability and convenience in addition to automobile brands. Looking at people who currently use the brand of vehicle, 70 person chose Renault, 40 person chose Opel and 30 person chose Peugeot brand automobiles.

3.1.3. Factor Analysis

Factor analysis is an important statistical method used to analyze the relation between a large number of the variables.

One certain prerequisite to be able to execute factor analysis is the correlation between variables must be rough enough. If the value of KMO is above 0.60, the sampling is in enough level. Be the value of KMO 0,773 the factor analysis of the variables in the compliance is good. It also is 0.05 significance degrees low Barlett test p variables is the relationship between factor analysis to an adequate level.

While test results are meaningfull, data set (KMO and Bartlett) was appropriate for factor analysis (**KMO=0,773, x^2Bartlett test (120)= 4276,612, p=0,000**)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,773
Bartlett's Test of Sphericity	Approx. Chi-Square	4276,612
	df	561
	Sig.	,000

Varimax rotation method is applied to survey, the entire questionnaire 41 questions (before extracted from the questions) in factor analysis. 7 questions are extracted whizch were under the value of 0.50 sampling adequacy, the only remaining variable close together or under factor weights. The remaining 34 question variable in the analysis of all

questions were collected under 10 factors. Described total variance of these factors are % 62,923.

Sitting under the same factor as the similarity to each other are named new factors ; "Inventory Management", "Transportation and Storage", "Production Speed and Quality", " Administrative Decisions", "Information Sharing", "To Outsource logistics" and "Feedback" and "Natural Disaster", "Customs Tax'' and " Logistics Companies Flexibility". The weights of all of the factors, as shown in the table is greater than 0.50 values.

Name of the Factors	**Explanation of the Factors (%)**	**The Confidence**
1. Inventory Management	9,778	0,8441
2. Transportation and storage	9,031	0,8267
3. Production speed and quality	8,819	0,8259
4. Administrative Decisions	6,339	0,6773
5. Information Sharing	5,952	0,6353
6. To Outsource Logistics	4,991	0,5414
7. Feedback	4,933	0,7316
8. Natural Disaster	4,708	0,7165
9. Customs Tax	4,457	0,5602
10.Logistics Companies Flexibility	3,917	0,5001

3.1.4. Regression Analyses

Model	R	R Square Kare	Adjusted R^2 Square	Standart Error of the Estimate
1	,431(a)	,185	,165	,40062

The above table shows the effects of independent variables to dependent variables in the model research and participants loyalty levels as a result of regression analysis. The R-squared value is below the value of 0.50 and it means that the loyalty level of the car customers is not very strong.

		Beta	Std. Error	Std. Beta	t	P value (Sig.)
	Constant	4,267	,020		215,647	,000
1	Inventory Management	,016	,020	,037	,818	,414
2	Transportation and storage	,121	,020	,276	6,116	,000
3	Production speed and quality	,050	,020	,114	2,517	,012
4	Administrative Decisions	,024	,020	,055	1,208	,228
5	Information Sharing	,072	,020	,165	3,654	,000
6	To Outsource Logistics	,087	,020	,198	4,373	,000
7	Feedback	,005	,020	,011	,237	,813
8	Natural Disaster	,013	,020	,030	,657	,511
9	Customs Tax	,069	,020	,157	3,468	,001
10	Logistics Companies Flexibility	,001	,020	,003	,069	,945

Regression Analysis Of Coefficients

By selecting the ones less than 0.05 p values of factor groups on results table of regression analysis, we found the factors that contributes to the model and established the value of loyalty. These factors are; Transportation and storage, Production speedand quality, Information Sharing, To Outsource Logistics, Customs Tax. The maximum contribution to the value of loyalty in the model that 2. Factor is the Transportation and storage. As a result, 5 of the independent variables does not contribute to the model, while 5 of them contributing to the model.

3.1.5. Research Hypotheses

Research on the relationship between the dependent and independent variables in the model to test the following in all research. Research developed the following hypotheses to be tested. Investigation of the factor analysis results obtained with t-test and anova tests by demographic factors, dependent and independent variables tested the clocks show the differ. Research t test and anova analysis was founded two hypotheses:

H0: There are no significant relationship between the independent variables and the customer loyalty.

H1: There are significant relationship between the independent variables and the customer loyalty.

As a result of analysis if p value is bigger than 0,05, H0 hypothesis is accepted. Notice that the result column in the test results as a statistical table and see the most significant difference in hypothesis is considered in more detail at the table's last raw.

H1 hypothesis is rejected. Include the individually in header for all the research hypotheses were analyzed whether they're statistically meaningful or not.

THE METHODS USED IN THE RESEARCH AND HYPOTHESES TESTS		
Hypothes	**Method**	**Result**
Hypotheses between dependent variables and non-dependent variables.		
HA1: There is a meaningful relationship between inventory management, customer loyalty in the automotive industry .	Regression Analysis	REJECTED
HA2: There is a meaningful relationship between Transportation and storage, customer loyalty in the automotive industry.	Regression Analysis	ACCEPTANCE
HA3: There is a meaningful relationship between Production speed and quality, customer loyalty in the automotive industry.	Regression Analysis	ACCEPTANCE
HA4: There is a meaningful relationship between Administrative Decisions and Customer Loyalty in the automotive industry.	Regression Analysis	REJECTED

HA5: There is a meaningful relationship between Information Sharing and Customer Loyalty in the automotive industry.	Regression Analysis	ACCEPTANCE
HA6: There is a meaningful relationship between Outsourcing of Logistics and Customer Loyalty in the automotive industry.	Regression Analysis	ACCEPTANCE
HA7: There is a meaningful relationship between Feedback and Customer Loyalty in the automotive industry.	Regression Analysis	REJECTED
HA8: There is a meaningful relationship between Natural Disaster and Customer Loyalty in the automotive industry.	Regression Analysis	REJECTED
HA9: There is a meaningful relationship between Customs Tax and Customer Loyalty in the automotive industry.	Regression Analysis	ACCEPTANCE
HA10: There is a meaningful relationship between Logistics Companies Flexibility and Customer Loyalty in the automotive industry.	Regression Analysis	REJECTED
Hypotheses between demographic features and dependent variables.		
HB1: There is a meaningful relationship between men and women, in terms of the crucial importance of customer loyalty.	T-test	REJECTED
HB2: According to participants' level of education there is a meaningful relationship in terms of the crucial importance of customer loyalty.	Anova	REJECTED
HB3: According to participants' age there is a meaningful relationship in terms of the crucial importance of customer loyalty.	Anova	ACCEPTANCE
HB4: According to participants' maritul status there is a meaningful relationship in terms of the crucial importance of customer loyalty.	Anova	REJECTED
HB5: According to participants' income there is a meaningful relationship in terms of the crucial importance of customer loyalty.	Anova	ACCEPTANCE
HB6: According to participants' profession there is a meaningful relationship in terms of the crucial importance of customer loyalty.	Anova	ACCEPTANCE
Hypotheses between demographic features and independent variables.		
HC1:There is a meaningful difference between men and women in terms of their importance to the management of inventory in automotive industry.	T-test	ACCEPTANCE
HC2:There is a meaningful difference between men and women in terms of their importance to the transportation and storage in automotive industry.	T-test	REJECTED
HC3:There is a meaningful difference between men and women in terms of their importance to the production speed and quality in automotive industry.	T-test	REJECTED
HC4:There is a meaningful difference between men and women in terms of their importance to the administrative Decisions in automotive industry.	T-test	REJECTED
HC5:There is a meaningful difference between men and women in terms of their importance to the information sharing in automotive industry.	T-test	REJECTED
HC6:There is a meaningful difference between men and women in terms of their importance to the outsourcing logistics in automotive industry.	T-test	REJECTED

HC7:There is a meaningful difference between men and women in terms of their importance to the feedback in automotive industry.	T-test	REJECTED
HC8:There is a meaningful difference between men and women in terms of their importance to the natural disaster in automotive industry.	T-test	ACCEPTANCE
HC9:There is a meaningful difference between men and women in terms of their importance to the customs tax in automotive industry.	T-test	REJECTED
HC10:There is a meaningful difference between men and women in terms of their importance to the flexibility of logistics companies in automotive industry.	T-test	REJECTED
HD1:There is a meaningful difference according to participants' age in terms of their importance to the management of inventory in automotive industry.	Anova	ACCEPTANCE
HD2:There is a meaningful difference according to participants' age in terms of their importance to the transportation and storage in automotive industry.	Anova	REJECTED
HD3:There is a meaningful difference according to participants' age in terms of their importance to the production speed and quality in automotive industry.	Anova	ACCEPTANCE
HD4:There is a meaningful difference according to participants' age in terms of their importance to the administrative Decisions in automotive industry.	Anova	ACCEPTANCE
HD5:There is a meaningful difference according to participants' age in terms of their importance to the information sharing in automotive industry.	Anova	REJECTED
HD6:There is a meaningful difference according to participants' age in terms of their importance to the outsourcing logistics in automotive industry.	Anova	ACCEPTANCE
HD7:There is a meaningful difference according to participants' age in terms of their importance to the feedback in automotive industry.	Anova	REJECTED
HD8:There is a meaningful difference according to participants' age in terms of their importance to the natural disaster in automotive industry.	Anova	ACCEPTANCE
HD9:There is a meaningful difference according to participants' age in terms of their importance to the customs tax in automotive industry.	Anova	REJECTED
HD10:There is a meaningful difference according to participants' age in terms of their importance to the flexibility of logistics companies in automotive industry.	Anova	ACCEPTANCE
HE1:There is a meaningful difference according to participants' marital status in terms of their importance to the management of inventory in automotive industry.	Anova	ACCEPTANCE
HE2:There is a meaningful difference according to participants' marital status in terms of their importance to the transportation and storage in automotive industry.	Anova	ACCEPTANCE

HE3:There is a meaningful difference according to participants' marital status in terms of their importance to the production speed and quality in automotive industry.	Anova	ACCEPTANCE
HE4:There is a meaningful difference according to participants' marital status in terms of their importance to the administrative Decisions in automotive industry.	Anova	ACCEPTANCE
HE5:There is a meaningful difference according to participants' marital status in terms of their importance to the information sharing in automotive industry.	Anova	ACCEPTANCE
HE6:There is a meaningful difference according to participants' marital status in terms of their importance to the outsourcing logistics in automotive industry.	Anova	ACCEPTANCE
HE7:There is a meaningful difference according to participants' marital status in terms of their importance to the feedback in automotive industry.	Anova	REJECTED
HE8:There is a meaningful difference according to participants' marital status in terms of their importance to the natural disaster in automotive industry.	Anova	REJECTED
HE9:There is a meaningful difference according to participants' marital status in terms of their importance to the customs tax in automotive industry.	Anova	ACCEPTANCE
HE10:There is a meaningful difference according to participants' marital status in terms of their importance to the flexibility of logistics companies in automotive industry.	Anova	REJECTED
HF1:There is a meaningful difference according to participants' monthly income in terms of their importance to the management of inventory in automotive industry.	Anova	ACCEPTANCE
HF2:There is a meaningful difference according to participants' monthly income in terms of their importance to the transportation and storage in automotive industry.	Anova	REJECTED
HF3:There is a meaningful difference according to participants' monthly income in terms of their importance to the production speed and quality in automotive industry.	Anova	ACCEPTANCE
HF4:There is a meaningful difference according to participants' monthly income in terms of their importance to the administrative Decisions in automotive industry.	Anova	ACCEPTANCE
HF5:There is a meaningful difference according to participants' monthly income in terms of their importance to the information sharing in automotive industry.	Anova	REJECTED
HF6:There is a meaningful difference according to participants' monthly income in terms of their importance to the outsourcing logistics in automotive industry.	Anova	REJECTED
HF7:There is a meaningful difference according to participants' monthly income in terms of their importance to the feedback in automotive industry.	Anova	REJECTED

HF8:There is a meaningful difference according to participants' monthly income in terms of their importance to the natural disaster in automotive industry.	Anova	REJECTED
HF9:There is a meaningful difference according to participants' monthly income in terms of their importance to the customs tax in automotive industry.	Anova	ACCEPTANCE
HF10:There is a meaningful difference according to participants' monthly income in terms of their importance to the flexibility of logistics companies in automotive industry.	Anova	ACCEPTANCE
HG1:There is a meaningful difference according to participants' profession in terms of their importance to the management of inventory in automotive industry.	Anova	REJECTED
HG2:There is a meaningful difference according to participants' profession in terms of their importance to the transportation and storage in automotive industry.	Anova	REJECTED
HG3:There is a meaningful difference according to participants' profession in terms of their importance to the production speed and quality in automotive industry.	Anova	ACCEPTANCE
HG4:There is a meaningful difference according to participants' profession in terms of their importance to the administrative Decisions in automotive industry.	Anova	ACCEPTANCE
HG5:There is a meaningful difference according to participants' profession in terms of their importance to the information sharing in automotive industry.	Anova	ACCEPTANCE
HG6:There is a meaningful difference according to participants' profession in terms of their importance to the outsourcing logistics in automotive industry.	Anova	ACCEPTANCE
HG7:There is a meaningful difference according to participants' profession in terms of their importance to the feedback in automotive industry.	Anova	REJECTED
HG8:There is a meaningful difference according to participants' profession in terms of their importance to the natural disaster in automotive industry.	Anova	REJECTED
HG9:There is a meaningful difference according to participants' profession in terms of their importance to the customs tax in automotive industry.	Anova	ACCEPTANCE
HG10:There is a meaningful difference according to participants' profession in terms of their importance to the flexibility of logistics companies in automotive industry.	Anova	ACCEPTANCE
HH1:There is a meaningful difference according to participants' level of education in terms of their importance to the management of inventory in automotive industry.	Anova	REJECTED
HH2:There is a meaningful difference according to participants' level of education in terms of their importance to the transportation and storage in automotive industry.	Anova	ACCEPTANCE

HH3:There is a meaningful difference according to participants' level of education in terms of their importance to the production speed and quality in automotive industry.	Anova	ACCEPTANCE
HH4:There is a meaningful difference according to participants' level of education in terms of their importance to the administrative Decisions in automotive industry.	Anova	REJECTED
HH5:There is a meaningful difference according to participants' level of education in terms of their importance to the information sharing in automotive industry.	Anova	REJECTED
HH6:There is a meaningful difference according to participants' level of education in terms of their importance to the outsourcing logistics in automotive industry.	Anova	REJECTED
HH7:There is a meaningful difference according to participants' level of education in terms of their importance to the feedback in automotive industry.	Anova	REJECTED
HH8:There is a meaningful difference according to participants' level of education in terms of their importance to the natural disaster in automotive industry.	Anova	REJECTED
HH9:There is a meaningful difference according to participants' level of education in terms of their importance to the customs tax in automotive industry.	Anova	REJECTED
HH10:There is a meaningful difference according to participants' level of education in terms of their importance to the flexibility of logistics companies in automotive industry.	Anova	REJECTED

4. RESULTS AND EVALUATION

An integrated supply chain, requires knowledge, production, storage, transportation and distribution information for sharing and communication, at all stages of the chain.

However, in a highly competitive environment, firms must also improve their supply chains. Recently in business environment, the competition is not only between the individual firms but also the networks of the companies. Therefore, the supply chain of the firms has a critical role in the success, and the relationships among the suppliers, producers and dealers have a strategic role in their market success. The benefits of these strategic alliances can be listed as adding customer value, decreasing costs, improving business processes, learning new capabilities, focusing core

competencies, improving the range and quality of the services and the flexibility of production etc.

In the experimental research survey was conducted in 402 people. Frequency analysis, factor analysis, regression analysis and interpreted the statistical program SPSS. In the research model, the effect of demographic characteristics on "Inventory Management", "Transportation and Storage", "Production Speed and Quality", " Administrative Decisions", "Information Sharing", "To Outsource logistics" and "Feedback" and "Natural Disaster", "Customs Tax'' and " Logistics Companies Flexibility" were analyzed. And also examined the effect of customer loyalty as a dependent variable. As a result of the factor analysis, according to the results of the participants in the research, questions gathered under 10 factors. Then T-test and ANOVA tests were examined in whether a significant relationship between Factor groups and the demographic characteristics. In the hypothesis tests, loyalty variable and factor groups were examined individually. And a meaningful relationship between the average of the factor groups of loyalty was not found. It means that the loyalty level of the car customers is not very strong. But it is not very low in the Turkey market can also be added. In the Regression analysis the factor that provides maximum value to the contribution of loyalty is 2. Factor 'Transportation and storage'.2. As a result of the qualitative and quantitative models are consistent with research and meaningful. This literature review and application in model's work is meaningful, safe and valid.

The results of this research will be helpfull in creating customer loyalty especially to investors who led the way in the industry. In the light of variables and the results of the research, businesses can examine the factors causing the bullwhip effect on customer loyalty in automotive industry and they can achieve higher profits with effective inventory management.

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