A Research on the Applications of Supply Chain in Textile-Clothing Industry

Özlem Kaya and Fatma Öztürk

Abstract—Nowadays most of the firms understood the importance of obtaining competitive advantage of inter-enterprise relations and started to re-establish the relations of both suppliers and customers depending on basis of mutual cooperation and gain. Especially developing close coordination with suppliers is seen to provide quite positive contributions to the areas like increasing product quality, decreasing the cost of purchased products, developing the production and logistic flexibility, increasing customer satisfaction.

Constantly changing fashion, various shopping seasons, different materials, various accessories are the features which affect the process in textile industry. Besides constant increasing competition, price pressure, shortening the process of supply of products into markets, import/export, complex production structures, working with third parties are operation a factors which describe the structure of textile industry.

This study was prepared with the aim of determining the applications of supply chain of textile-clothing industry. The study was applied on 497 active textile-clothing firms which affiliated with TOBB (Union of Chambers and Commodity Exchanges of Turkey) in the last quarter of 2012. In this study supply chain applications were analysed in textile-clothing industry. Consequently in textile-clothing industry some variables have been reached in relation to supply chain applications.

Index Terms—Chain supply, competition, textile-clothing industry, technology.

I. INTRODUCTION

Textile supply chain is described as the chain of the firms being suppliers of each other which is formed in the process from the production of textile production material from cotton to delivering customers as end product. Each one of the firms is the supplier of others starting from the production of cotton to delivering to the customers of the textile products. Supply chain in textile industry consists of a lot of procedures, suppliers, middleman and customers. Knowledge and physical product flow are important in this chain [1].

New marketing approaches are completely customer oriented and firms have to be in interaction continuously and dynamically with their customers. The importance in competition is to be successful in competion among the supply chains which the firms are in, not the competition among firms. The ultimate person is the customer who forces this partnership of supply chain partners and want to

reach. Those who manage and build the management of supply chain in effective, economic and productive way to reach these goals will enjoy more market share [2].

At the same time suppliers represent the firms which supply necessary inputs to ensure the production of goods. According to porter, in the industries where suppliers are strong the competition will be high. It is natural that if the suppliers are strong, the cost of supply will be high and this being reflected on production costs the final cost of product together with market price will be high.

Even though they change from industry to industry, the main suppliers in textile industry are thread makers, dyeing plants, contract weaving plants, contract production clothing plants/teams, accessory merchants, packaging goods, sellers and transport companies. With this in mind, İt is clearly said that there aren't the power and industry guidance of suppliers in the textile industry. Only partial power of raw material suppliers may be mentioned. A few years ago while the thread makers had a strong supplier structure, today increasing supply because of increasing import and new investments caused them to lose this power. According to this, due to so many firms in textile industry, the power of suppliers are limited and textile firms are stronger against suppliers and weaker against consumers.

In textile and clothing industry especially the supply structure shows the characteristics like there isn't a known home base where the members have equal control and only there aren't distrubition centre prevailing in control mechanism in seller and buyer relationship. Therefore in the systems where supply chain philosophy is the norm, independent business entities are the distinct profit and decision centre in supply chain where the system is moves autonomously and there is physical and information transfer among themselves.

The main aim of supply chain is to maximize production value. The value which was produced by supply chain is the difference between the value which the customer sets and the cost of the efforts of supply chain to meet the needs of customer. How big this difference becomes the more successful the supply chain will be [3].

Supply chain management provides an important competitive advantage for the firms and is an important indicator of work performance of the firm [4]. Today not only the firms but in fact supply chains of these firms compete among themselves. To manage supply chain well means to provide in a fast way and with lowest cost products to the customers by providing both members of supply chain activities in themselves and connections among themselves in the most productive way [5].

To be able to have a successful supply chain, apart from being fast and having low cost products it is necessary to

have qualities like agility, easy to adapt and aiming the profitability of supply chains. The necessary things to do to have these qualities can be summarized as agility, adaption, and arranging profit share.

The aim in agility concept is that the supply chain is to be agile in other words to adapt the changes in supply and demand fast [6]. Some of the methods can be listed as follows:

- to enable knowledge transfer from suppliers to customers
- to develop cooperation relations with suppliers
- to determine postponement/ delay reasons
- to establish stock system which provides inventory tracking

The aim of adaption is the adaption of supply chain, in other words to adapt to changes and fluctuations, changes in supply network, changes which occur in product and technology. To be able to provide and attain this adaption it is necessary to follow world economy and supervise and follow new supply base and potential markets, to use middlemen for new suppliers and logistics infrastructure, to create flexible product designs and determine product life cycle and technologic life cycle [7]. For better performance it is necessary in organising profit share towards the aim of creating incentives, to provide information sharing among chain partners from suppliers to customers, to define the roles, duties and responsibilities of all chain partners from suppliers to customers, to provide the equality among chain partners in sharing risk, cost and profit.

The firms which use these methods have become successful in competition. A supply chain with these characteristics will cause to drop the cost of transportation and outside transportation, decrease the inventories, shorten delivery time and increase efficient management and service life.

Supply chain when used properly is a management strategy which provides a new competitive advantage. In Turkey especially the textile clothing industry will benefit greatly from the improvement in the supply chain and hence create positive effect in the national economy [6].

Competition is taking place not only among firms but mostly supply chains. Each partner in the supply chain are players in the position to try to optimize the value of the same team. Members of supply chain however much they cooperate with each other, they can compete better with their rivals. This brings both different perspectives to the partnership and wider approach to the firm [8].

II. METHOD

The aim of this research is to present the applications of supply chain of textile clothing firms in Turkey. Therefore we used screening model. This research was done on active textile clothing firms which are affiliated with TOBB (Union of Chambers and Commodity Exchanges of Turkey) in the last quarter of 2012. Determined codes for production areas: 13- Textile goods production, 14- Clothing goods production (in clothing areas the codes of the firms are 14.13.13, 14.13.14, 14.13.31, 14.13.32, 14.13.33, 14.13.34, 14.13.35, in textile area the codes of the firms are 13.20.20, 13.20.31, 13.20.32, 13.20.33) the cities for the textile;

İstanbul, Bursa, Denizli, Tekirdağ, Uşak, Gaziantep, Adana ve Kahramanmaraş; the cities for the clothing İstanbul, Bursa, Ankara, Denizli, Konya, Tekirdağ, Kırklareli, İzmir, Gaziantep ve Adana were included in this study.

The content of this research were consisted of active firms which were affiliated with TOBB in 2012. For the sampling of this research, when sample size was being calculated it was calculated by taking into account that the number of units in the content are unknown. In this context, the sample size with 0,05 margin of error and 0,95 confidence level can be calculated with $n = \dfrac{z^2 \cdot \sigma_\pi^2}{e^2}$ this equation.

In this equation;

Z= Value of Standart Normal Variable which corresponds to confidence level

σ_π^2 = Variable of the ratio which belongs to population

e= Error magrin between statistics and parametre

Above Formula when used with 0,05 confidence level and 0,05 error magrin, the sample size can be calculated as

$$n = \left(\frac{(1,96)^2 \cdot \left[(0,5)(0,5) \right]}{(0,05)^2} \right) = 384$$

By thinking this value as minimum, surveys were sent to more firms that thought previously and the surveys which were unappropriate for our purposes left unevaluated and in total number of 497 was reached.

III. FINDINGS AND INTERPRETATION

In this section, with the aim of presenting supply chain applications of the textile and clothing firms, obtained findings will be evaluated in the study.

The values of the firms for the areas they operate in were given in Table I.

TABLE I: DISTRIBUTION FOR THE AREAS THE FIRMS OPERATE

Operational Area	Number of Firms	%
National market	56	11,3
International market	76	15,3
Both	365	73,4
Total	497	100,0

TABLE II: THE DISTRIBUTION RELATED TO THE AREAS WHERE FIRMS COOPERATE WITH SUPPLIERS

Cooperation Areas With Suppliers	Number of Firms	%
Forecasting	14	2,8
Planning	192	38,6
Maintenance	32	6,4
Design	140	28,2
Other	25	5,0
None	94	18,9
TOTAL	497	100,0

When Table I was evaluated, it is seen that %73,4 of the firms operate both nationally and internationally. The

distribution related to the areas where firms cooperate with suppliers was given in Table II.

When Table II was evaluated it is seen that the firms cooperate most at the areas of planning (%38,6) and design (%28,2). The planning of all means in supply chain can be supported with various technological infrastructures which are quite comprehensive and optimized.

Intensive competition environment forces firms to focus on planning works a great deal for the success. Therefore it is necessary for the firms to be sensitive about the developments which increase adaptation ability and new conditions for the success. For example, the shortening life cycle of the product forces the firms to use methods like decreasing stocks, producing low cost high quality products and flexible production which react rapidly for product changes in the market. A lot of firms want to utilise the advantages of both low cost and rapid response to the changes [9]. Hence, managers by determining their goals should prepare their plans to address these plans and should specify application methods. Besides managers by letting all parties to participate to planning stage can acquire minimum cost and maximum productivity. The cooperation among firms at the design stage for the raw material and materials they want to buy will provide to acquire smooth and required performance during the production stage. When performing design, it is necessary to take into account factor like the preferences and taste of the customers, firm's standards and market share, resources of the firm, etc. During designing stage a firm must be in close relationship with supplier and customer. To be able to produce right product a firm must take into account all of these complex relationships.

Type of relationship values of the firms with the suppliers is given in Table III.

TABLE III: THE DISTRIBUTION OF TYPE OF RELATIONSHIP VALUES OF THE FIRMS WITH THE SUPPLIERS

Type of Relationships With Suppliers	Number of Firms	%	Cumulative %
Informal relationship	285	57,3	57,3
Contract	162	32,6	89,9
Strategic partnership	49	9,9	99,8
Investment with partners	1	0,2	100,0
TOTAL	497	100,0	

In today's market conditions where changes and competition take place fast and intensive there are a great deal of factors which the firms affect supply chain. These factors requires reorganization to provide to design supply chains, type of relationships with the suppliers, perform application and control stages, reversing the process, and adapt to changing factors. Type of relationship with the supplier which is one of these factors is important for the firm to sustain processing on time and supply activities. According to Table III, a great deal of firms (%57,3) establish informal relations with suppliers. The relations of firms with their suppliers without any protocol will cause a lot of problems in the future process. The preference of this path which is based on mutual trust is not seen a path which is sustained for a long time in today's conditions. Hence as

is seen in Table III another type of relation with the suppliers is the contract with the rate of %32,6. This rate takes the second place after the choice of informal relations.

While managing supply chain of the firms, the distributions of three effective methods which are used are given in Table IV.

TABLE IV: THE DISTRIBUTION OF THE USED METHODS WHEN FIRMS MANAGE SUPPLY CHAIN

Used Methods		Number of Firms	%
Partnership with suppliers	Unused Choice	429	86,3
	1.choice	22	4,4
	2. choice	33	6,6
	3. choice	13	2,6
Partnership with customers	Unused Choice	416	83,7
	1.choice	26	5,2
	2. choice	26	5,2
	3. choice	29	5,8
Once only supply	Unused Choice	156	31,4
	1.choice	248	49,9
	2. choice	35	7,0
	3. choice	58	11,7
E -supply	Unused Choice	450	90,5
	1.choice	11	2,2
	2. choice	34	6,8
	3. choice	2	0,4
Electronic data exchange	Unused Choice	495	99,6
	1.choice	1	0,2
	2. choice	1	0,2
	3. choice	-	-
Outsourcing	Unused Choice	393	79,1
	1.choice	18	3,6
	2.choice	21	4,2
	3. choice	65	13,1
Contract	Unused Choice	477	96,0
	1.choice	19	3,8
	2.choice	1	0,2
	3.choice	-	-
3 PL	Unused choice	497	100,0
	1. choice	-	-
	2. choice	-	-
	3. choice	-	-
Strategic planning	Unused Choice	324	65,2
	1. choice	34	6,8
	2. choice	73	14,7
	3. choice	66	13,3
Vertical integration	Unused Choice	491	98,8
	1.choice	-	-
	2. choice	6	1,2
	3. choice	-	-
Very few suppliers	Unused Choice	297	59,8
	1. choice	59	11,9
	2. choice	102	20,5
	3. choice	39	7,8
Plenty of suppliers	Unused Choice	306	61,6
	1.choice	32	6,4
	2. choice	99	19,9
	3.choice	60	12,1
Keeping safety stock	Unused Choice	252	50,7
	1.choice	27	5,4
	2. choice	66	13,3
	3. choice	152	30,6

When firms manage supply chains, by taking into account the most intensive methods they use, are asked to answer the survey. When Table IV was inspected, it is seen that the

first choice of method is full time supply (%49,9), and a few numbers of suppliers (%20,5), plenty of suppliers (%19,9), strategic planning (%14,7), e–supply (%6,8) and partnership with suppliers (% 6,6) as a second choice of method, outsourcing (%13,1) and keeping the stock (%30,6) as third choice method. When these results were taken into account it is seen that the firms choose working with full time supply as a first choice a few suppliers or plenty of suppliers as a second choice and keep safety stock by taking into account of the risks of industry.

Market share of electronic trade increase day by day. Every minute thousands of web sites are set up and millions of users visit these sites. The concept of supply chain management has also become more easily applicable because of developments in computer and communication technologies.

The approximating power of internet can be studied from two angles. The first one is the accessibility of information in more than one place at the same time and with the low cost KOBIs can access easily and the second uninterrupted and prompt communication and transfer can be acquired with rapid web transfer.

TABLE V: The State Related to Firm's Activity Area Together with Preferred Way about Ordering and Purchasing from Suppliers

Preferred Way About Ordering and Purchasing From Suppliers		Activity Area						TOTAL	
		National market		International market		Both			
		No. Firm	/ %	No. Firm	/ %	No. Firm	/ %		
One to one meeting with supplier firms χ^2 =49,541 p=0,000	1. choice	17	30,4	64	84,2	247	67,7	328	66,0
	2. choice	25	44,6	5	6,6	66	18,1	96	19,3
	3. choice	14	25,0	7	9,2	45	12,3	66	13,3
Bargaining with supplier firms χ^2 =51,158 p=0,000	1. choice	0	0,0	0	0,0	25	6,8	25	5,0
	2. choice	15	26,8	53	69,7	165	45,2	233	46,9
	3. choice	34	60,7	23	30,3	168	46,0	225	45,3
Taking quotas from supplier firms χ^2 =48,606 p=0,000	1. choice	32	57,1	12	15,8	84	23,0	128	25,8
	2. choice	16	28,6	18	23,7	127	34,8	161	32,4
	3. choice	8	14,3	46	60,5	145	39,7	199	40,0
Ordering from internet χ^2 =23,315 p=0,001	1. choice	7	12,5	0	0,0	9	2,5	16	3,2
	2. choice	0	0,0	0	0,0	7	1,9	7	1,4
	3. choice	0	0,0	0	0,0	6	1,6	6	1,2
Purchasing from supplier catalogues on internet χ^2 =,362 p=0,834	1. choice	-	-	-	-	-	-	-	-
	2. choice	-	-	-	-	-	-	-	-
	3. choice	0	0,0	0	0,0	1	0,3	1	0,2

Apart from this, even though there are advantages like giving the opportunity to contact promptly with the customers about the problems which occur during the delay of delivery, stock control, change of delivery and order times and to be able to check this situation in their data bases, and giving the opportunity to control the situation from their firms of orders which were given to the suppliers, it is seen that e-supply and softwares (electronic data transfer) are not generally opted by the firms.

In clothing industry especially used internet applications is in a limited area. These are mostly the applications like selling the products over the internet, buying over the internet, intranet applications for information management.

Values related to the state of activity area together with preferred way about ordering and purchasing of the firms were given in Table V.

When Table V is studied, it is seen that the first three choices about ordering and purchasing from suppliers of the firms which operate in both national and international arena is one to one meeting (%67,7), bargaining with supplier firms (%45,2), and taking quotas from supplier firms (%39,7). In this sense it is possible to say that firms get in touch with suppliers firstly. Firms have to provide especially information sharing among all chain partners from suppliers to customers, define roles, duties and responsibilities of all chain partners from suppliers to customers, provide equality in sharing risk, cost and profit among chain partners, and improve cooperatine relations with suppliers. This obligation will create a faster and more competitive purchasing process.

When Table V is studied, it is possible to say that there is a statistical relationship among the variables except the choice of buying from supplier catalogues on internet at the 0,01 rational level.

IV. Conclusion and Proposals

When supply chain management literature is studied, it can be seen that a well designed supply chain is an important competitive advantage. Well combined supply chains create value for the firms and shareholders in supply chain providing more than by reducing costs and increasing market share. The firms in which incorporate supply chain well, it is seen that there is less investment in the stocks, less time in cash flow, decrease in material purchasing cost, increase in worker productivity, lower logistics costs and the ability to adapt to customer demand increase in short time.

Manufacturers in textile clothing industry don't produce all of their own products themselves in general. For example if a shirt will be produced, to be able finish this product, it is necessary to go through a lot of processes like weaving the cloth, dying, buttonhole, stiching buttons, printing labels, ironing and packaging. When we think that all of these processes are made in different places, to be able to manufacture the right product and deliver the order on time, it is necessary that the firms communicate with each other and work together on the order. The break down of one of the processes or a production fault may be able to affect all the other processes. If the manufacture of a shirt will be made four various phases at the end of different processes, a manufacturing fault of a firm or delay will affect others. If there isn't an apparent supply chain management system, occured faults and lack of information will probably cause to delay delivery or manufacture faulty products.

In increasing competitive environment, textile manufacturers try to create competitive advantage by utilising information technologies. To be able to meet the fast changing consumer demand quick response was defined in the supply chain management. Quick response is expressed as a marketing strategy which was defined for an effective supply chain management from thread production to distribution activities. With this strategy as both product and information transfer was made correctly and fast, it may provide to shorten production and distribution time [10]. Therefore customer satisfaction can be obtained by adressing changing customer needs promptly.

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