The Strategic Impact of Information Technologies on Supply Chain and Business Performance

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Abstract

In this paper, the effect of a new supply chain design on the business performance was analyzed in the context of information technologies. For that purpose, by using case study method, a company that operates in fast-moving consumer goods industry (FMCG) in Turkey and possesses and uses a supporting tool named as SAP APO software as an information technology to perform supply chain operations was examined. Under the scope of the study, supply, production and distribution planning processes are modelled and implemented in short, medium and long terms. Implementation results demonstrate that restructuring of the supply chain by using information technologies has positive effects on business performances criterions like supply, production and distribution.

Keywords: Supply Chain Management, Information Technologies, Business Performance

1. Introduction

One of the most important points in FMCG industry is the availability of the goods in the market. When the product is not available the customers can easily replace their choices with another product or brand; therefore, the lack of availability of the products can usually cause loss of sales. The availability of the goods in the market can only be supplied by producing and shipping the right goods at the right quantity at the right time. These conditions are of critical importance for effective business performance and can only ensured with a right supply chain management that is supported by information technologies. Information-technology-based supply chain management enables both not to have missing and over stock with minimized cost. Besides, when the cost structure in FMCG industry is considered, logistics cost has a big share in the overall cost of the goods. Therefore, supply chain management can also have a positive impact on the cost of the goods by decreasing the logistics cost.

Concordantly, this study aims to seek analyze answers of the following questions: "Is supply chain management that is supported with information technology able to contribute companies' business performances?" and "Can information technology based on supply chain be an alternative solution to overcome the negative impacts of the

global recession?". Thus, a case study is conducted in a global company[1], which is performed in the FMCG/Beverage industry as a bottler of soft drinks producer, to answer the research questions of the study.

It is possible to assert that this study can be used as a reference for the further studies on these topics and also can be utilized by the companies that have similar dynamics with ABC Company as a model study.

2. Literature Review

2.1. Effects of Information Technologies on Business Performance

One of the most significant characteristics of the period in today's business world is continuous change in inner and outer environment of organizations. In such an environment, the success of the business depends more on obtaining information and using it in line with the aims of business than on factors like capital and labor force. In this context, the basic dynamics which entail the use of IT, which makes significant contributions to businesses to deal with increasing global competition, by businesses are technological, economic, political, cultural and environmental factors and change in business management (Çağlar et al., 2006:135).

IT is an implementation which importance is increasingly becoming important in the collection, procession, preservation and transmission of data. Thus, IT is also an effective means for businesses as it offers businesses new ways to perform better than their rivals and gain competitive edge.

According to Porter and Millar (1985), IT has a strong influence on the business cost structure and provides opportunities for differentiation. In this context, IT affects competition primarily in three ways, namely; by changing the structure of the industry (1) creating competitive edge (2) and creating new jobs (3) (Porter and Millar, 1985). Furthermore, Whiteley stated that IT can be used as a strategic means of obtaining competitive edge, improving efficiency and performance, and in the improvement of management and organization of the business and in the creation of new business opportunities by providing businesses significant new business and management opportunities (Whiteley, 1996:11).

IT applications, therefore, have positive impacts on the business performance by itself. Most of the companies are not able to sustain their business without the support of IT. Gathering, storing and processing data helps companies to increase their efficiency and effectiveness by improving decision making process (Güleş et al., 2003). Besides operational efficiency, companies also utilize IT for supplier, sales channel and customer collaboration in order to meet customer requirements in the most effective and fastest way (Gunasekaran and McGaughey, 2002). IT also enables companies to monitor operational and organizational performances and manage the complex processes like product development (Whiteley, 1996). Information plays a critical role in the success of the companies in the recent dynamically changing business environment. Accessing and processing information enables companies to sustain their competitiveness in this challenging environment (Caglar et al., 2006).

Under the light the explanations made so far, it can be argued that IT influences the competitive structure in a sector with the development of innovative products and

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[1] Regarding the confidentiality concerns the name of the company is replaced as ABC Company.

services, by supporting decision making, strengthening ties between businesses, decreasing costs and with its integration to products and services. IT is also very significant in terms of the improvement of the effectiveness of supply chain management applications.

IT support companies to achieve better performance in the supply chain by restructuring customer and supplier relations, improving business processes, monitoring performance and increasing data visibility over the whole supply chain (Mclyor et al., 2000).

2.2. Effect of Information Technologies on Supply Chain Performance

Information technologies which matured in business life in time and based on more realistic bases and needs can today bring in significant incomes and enabled them to reach to promised efficiency levels. The Internet with its structure open to general use, low cost compared to value-added networks, its use without special rules and world wide access feature plays a strategic role in the spread of electronic processes among enterprises. At this point, it can be said that there are two main reasons for businesses to use the Internet. One of them is the low establishment and application cost of the Internet thanks to its characters by its nature. The other is that thanks to its high influential power on the environment, the Internet improves opportunities resulting from new cooperative relations more effectively (Manthou et al., 2004).

In recent years, with the development of computer systems and communication technologies, information technology supported supply chain applications (e-scm) started to be used more commonly considering the huge value add potential of supply chain (Presutti, 2003). Considering these two powerful solutions together, supply chain management model and processes that are supported by IT applications have more significant impacts on the business performance.

One of the most important IT applications in this area is the supply chain planning and optimization tools that enable visibility, finding optimized solutions for complex planning problems and integrating whole value chain. The visibility and synchronization of the information such as order and inventory, companies reach on time and effective purchasing, production, sales and delivery plans (Yüksel, 2002).

Another supporting application is Electronic Data Interchange (EDI) that enables real time data interchangeability between all parties in the supply chain (Peppard, 1993). A supplier portal with the information on price, order, quality, logistics and inventory indicator is an example how supply chain performance can be improved by leveraging internet applications (Manthou et al., 2004). With EVD, businesses make changes in one or more than one level can integrate information systems with the activities of their businesses. With IT based systems, businesses can continuously monitor their stock levels and stock needs can be automatically transferred to the supplier with EVD system. Such an application decreases safety stock for the products purchased and shortens circulation period. Besides, with coordination between supply chain members', on-time production applications can be realized. EVD makes it possible to monitor orders on the computer and to achieve on-time delivery (Yüksel, 2002:273). Besides the applications mentioned above some other IT tools like Product Data Management (PDM), Customer Relationship Management (CRM), Supply Chain Planning System, Supplier Relationship and Warehouse Management System, Geographic Informatics, etc. support companies for a better supply chain performance.

Product Data Management (PDM): PDM tools make production process integration easier by contributing design engineering and are used in supporting engineering based on cooperation. Besides, quality specifications in production, scraps, re-procession, stops and tools/equipments used for analyses about them can be described (Müftüoğlu, 2003).

Customer Relationship Management (CRM): CRM, which is an institutional approach to understanding customer behaviors via continuous and appropriate communication, makes it possible for the business to reach to the right customer with the right product or service through the right channels on right time (Alkan and Cantürk, 2000:3).

Supply Chain Planning System: The planning of raw material and materials to be supplied, supply chain planning systems like demand planning, advanced planning and scheduling are applications which coordinates limited material and capacity resources in line with changes common in a business environment. These systems are generally used in strategically and tactical planning covering long term (Patterson et al., 2003).

Depot Management Systems: Depot Management Systems are systems which are used in monitoring and controlling stock movements in the process from the reception of products sent till their purchasers. With a depot management system in which a number of depots are formed and monitored, all depots are easily managed on a system, input and output are saved and controlled (www.sistek.com.tr, 2008).

Geographical Information Systems: Information is accumulated in one system and transferred and saved on the computer, and their analysis using various scientific and practical models. And it is printed and displayed on sheets of any size on the map, data are shown with graphics and placed on the map make up geographical information systems. Correct and complete information entrance, this information is to include not only what is where but also properties which give details about physical structures (www.sakarya.gov.tr, 2008).

Thanks to its cutting edge in data collection, procession and distribution, it makes it easier to integrate independent supply chain components, contribute to the improvement of cost, time, quality and service and makes contributions to supply chain performance. Especially, developments in network technology lead to radical changes in commercial affairs and increases the performance of the supply chain by offering new methods to businesses for growing their markets, presenting their products and services, increasing their efficiency and for earning customers and preserving them (Papazoğlu and Tsalgatidou, 2000).

2.3. Effect of Supply Chain Management Business Performance

By improving only the process and model of the supply chain it is possible to reduce many cost elements like warehousing, transportation cost, inventory carrying cost etc. (Aytekin et al., 2004). Also the companies that integrate processes like product innovation and quality with the supply chain, get benefit by reducing product development times, cost of the good sold and cost of poor quality (Chen and Kai-ling, 2004, Erdil et al., 2003). It has also positive impacts on order to delivery lead times by optimizing the whole process and attacking the problems in the process therefore helps to improve companies' cash to cash cycle.

The firms operating must manage the value network effectively. Because of this, the importance of Supply Chain Management (SCM) including supplier-manufacturer and manufacturer-customer relations grow rapidly nowadays. It can be said that the supplier enterprises contribute to the basic performance criteria of the enterprise in basic financial indicators, indicators of productivity, indicators for the quality and also it can be said that these contributions depending on developing buyer-supplier relations become more important. As it is seen in Table-1 there are many studies on indicating the impact of SCM practice on the company performance.

Table 1. Literature on the Impact of Supply Chain Management On Company Performance

Performance Criteria	Literature
Improving quality	Flynn et al.,1996; Adam et al., 1997; Hendricks and Singhal, 1997; Choi and Eboch, 1998; Easton and Jarrell, 1998; Samson and Terziovski, 1999; Fynes and Voss, 2001; Şen, 2006;
Reducing in costs	Hahn et al., 1986; Trevelen, 1987; Carr and Pearson, 1999; Stock et al., 2000; Zsidisin and Ellram, 2001; Şen, 2006,
Improving delivery	Noordewier et al., 1990; Roth and Miller, 1990; Handfield and Pannesi, 1992; Heide and John, 1992; Handfield, 1995; Hicks et al., 2000;
Reducing delay time	Bozarth et al., 1998; Hicks et al. 2000; Wu and Choi 2005;
Reducing purchasing costs	Bozarth et al., 1998; Carr and Pearson, 1999; Zsidisin and Ellram, 2001; Narasimhan and Das, 2001; Wu and Choi 2005;
Taking part in product innovation activities and reducing new product development time	Vickery et al.,1995; De Toni and Nassimbeni, 1999; Chung and Kim, 2003; Wu and Choi 2005; Petersen et al., 2005.
Reducing transportation costs	Williamson, 1985; Cox, 1996; Dyer, 1997; Noteboom et al., 1997; Saxton, 1997; Heide and John, 1990; Zajac and Olsen, 1993.
Long term relations	Dyer and Ouchi, 1993; Zajac and Olsen, 1993; Dyer and Singh, 1998;
Reducing production delay time	Handfield and Pannesi, 1995; Bertolinia et al., 2007.
Increasing customer satisfaction and rapid responding to customers.	Anderson and Narus, 1990; Hendrick, 1994; Anderson et al.,1995; Mohr et al., 1996; Samson and Terziovski, 1999; Das et al., 2002; Yeung et al., 2003;

Resource: Adapted from Güleş et al., 2008.

In today's global markets, competitive atmosphere for the development of innovative product development directs consumers to low cost but high quality products. In this context, long-term and sustainable performances of the businesses operating in international markets depend on their abilities to develop innovative products and processes (Chen and Kai-ling, 2004). Studies carried out on this issue, have revealed that product and process innovation is a source of profitable competitive edge in many international markets and global market. In this context, suppliers who are included in product innovation activities in the supply chain have a positive effect on business performance with their benefits in time, cost and design period.

When businesses purchase low quality products, they have to bear higher costs due to re- process, junks and wastes, time loss. Besides, as low cost products have effect on end product quality, there will be an increase in production and control costs. Products' quality performance can be improved by using intra-business quality information, worker participation and quality applications in design (Erdil et al., 2003). Concordantly, quality and high performing inputs provided by suppliers will decrease

business costs and make it possible to improve their financial performance. Besides, suppliers will have a positive effect on achieving customer satisfaction and increase general performance of business by contributing to the production of quality products with the qualified products they supply.

Another way to contribute to business performance in the global economy is the flexibility of suppliers. Supplier flexibility can be defined as suppliers' being ready and volunteered to meet changing needs of customers. A flexible supplier is to be able to approve and apply exceptions to meet customers' changing needs (Aytekin et al., 2004). In this context, the flexible relationship established among businesses will contribute to businesses competitive skills and thus increase their performance.

The supplier can offer prices at least equal to similar products. The prerequisite to achieve this is to keep product unit cost. Another important issue is logistic cost, which covers purchasing and shipment costs. The main expenditure items for logistics include order tracking and informing, shipment, storing, customers' services and stock keeping costs. Logistic costs are ultimately reflected in the end product price. In this context, suppliers will reduce company costs by pulling logistic costs down and therefore will contribute to financial performances (Aytekin et al., 2004).

3. Methods

In this section, firstly the aim, limitation and then the methodology of the study will be explained. Detailed information about the system, which will be used to applied new supply chain, will be provided to make the issue clearer. Detail of the supply chain developed under the light of this information is explained with the rationale behind them. Finally, results of application are assessed to reach a conclusion by questioning the validity of this information from various aspects.

3.1. The aim and Scope of the Study

Businesses reach to the best level in the supply chain they can decrease many visible (production, purchasing, storing, shipment….) and invisible (missed sales, extra costs caused by the changeability of production) (Davidson, 2004).

In this paper, the effect of a new supply chain design on the business performance was analyzed in the context of information technologies. In line with this, this study seeks to demonstrate benefits business acquired in various aspects by examining remodeling of ABC business's supply chain and applying technological application.

Within the scope, different models were developed by considering changing aims of demand, production and distribution planning processes. The scope of the study includes all plants, contract manufacturing locations, depots and all branches in the system. All end products in the system of the business are also within the scope of the study.

3.2. Limitations of the Study

The limitations of the study can be grouped under three headings.

Limited Scope: The study explains only one business structure as it was carried out in ABC business. Therefore, not being able generalize the results to be obtained can be considered as a limitation.

Time Limitation: As it took almost 8 months to apply the design, the completion of the study also took 8 months.

Limited Budget: There was system licensing cost, counselling cost, and cost of using domestic sources, costs for technical infrastructure to describe the model and establish the system. However, they could be managed well to the extent that the budget.

3.3. Study Plan and Method

In this study, since it is aimed to investigate the impacts of new IT supported supply chain model in detail and understand how it effects the company's business performance, case study methodology is determined as the most appropriate approach.

The case study is performed with interviews, quantitative and qualitative analysis. Following the project, performance indicators are monitored continuously in order to compare the progress before and after the project. Mainly, following indicators are analyzed and monitored: Stock level, direct shipment level, material inventory level, month end load factor and stock out ratio.

To deal with deficiencies in case studies, the following actions were taken:

Risk	Preventive Action
1- Data Collection	Ensuring the business that the study is confidential
2- Objectivity	Concrete data were used

4. Findings & Conclusion

4.1. Findings of the Study

4.1.1. General Information about the Business

ABC is in fast moving consumer goods industry and is one of the leading global players in its sector. As part of their strategy ABC Company has decided to focus on supply chain management in order to overcome the negative effects of the global recession by taking into consideration the whole value chain rather than a specific cost element. Therefore, the company head toward to optimize the whole value chain with advanced supply chain planning application. In the scope of the project, a new model for supply chain network and processes for demand planning, production planning and deployment are designed considering different requirements of different time frames. All finished products and all production plants, outsourcing locations, distribution centers, warehouses and dealers are considered within the scope of the study. There were > 5 plants, > 5 distribution centers, > 300 distributors, > 1500 direct sales points in the network of the company.

4.1.2. Present Structure of Business's Planning

Before the model was applied, supply chain planning in the business was carried out with Microsoft Excel and Microsoft Access software. However, considering the network structure and product variety, it is seen that carrying out the model on these applications will bring about some difficulties. Some of the difficulties are:

- It is not possible to make network simulations with the systems they use, which does not allow studying alternative scenarios.

- As there is not a means of optimization in these systems, it is not possible to reach optimal solutions.

- As these systems are not designed to integrate information about such complex structures as database product tree and rotating, there are problems in saving and using such data.

- In advanced supply chain planning, data from all processes from demand phase to distribution phase are to be used. However, in systems saved in different databases and disconnected from one another, this integration is not possible.

4.1.3. The Properties of the Software Used in the Business

Today, businesses have difficulty in managing increasing product variety and customers fast changing demands with traditional supply chain methods. Businesses, which realized that they cannot solve these problems by focusing only on a certain part of the supply chain and thus they cannot compete, considered the processes that add value to the product as a whole and inclined to optimize this process. As a result of these, an effective supply chain management (SCM) has become a significant component of competitive power. In this context, the subject of this study is SAP APO (Advanced Planning & Optimization) software. SCM, SAP APO, which is a tool for SCM, is an integrated solution which enables planning all processes effectively. It is possible to include all actors in all processes from suppliers to customers in the solution and interaction between them is possible.

SAP APO (Advanced Planning and Optimization): SAP APO is an advanced planning and optimization tool used in supply chain processes. One of its most significant features is to be able to plan and apply supply chain processes and it is a comprehensive and integrated solution. IT basic features are as follow (http://help.sap.com, 2009):

- It supports strategic, tactical and operational planning.

- It enables integrated management of all processes in the supply chain. It enables planning and monitoring of all process after an order is prepared and it is shipped to end user.

- As it enables integration and data consistency, it contributes to the development of cooperation between customers and suppliers.

- It enables to assess the efficiency of supply chain network and thus lead to continuous development and optimization.

Within the framework of the application of the SAP APO solution include Demand Planning (DP), Supply Network Planning (SNP), Distribution Planning (DIP), Production Planning (PP) and Vendor Managed Inventory (VMI). Information about these applications are summarized below (Table 2).

4.1.4. Details of the Model Applied

The case study is based on a supply chain restructuring project which is performed in 2008 and last for 8 months. The main steps of the project were as follows: As-Is Analysis, design of new Model and processes, design of IT application, implementation of system and monitoring results. In the supply chain model; different levels of network are defined and the planning rules for each level are determined, the production and VMI requirements are calculated, the production planning process for generating an unconstrained capacity plan for investment decisions and a feasible production plan is designed and an optimized and executable deployment plan is generated.

Table 2. Basic Processes of SAP APO

Processes	Features
Demand Planning (DP)	The DP module helps the development of a sensitive demand plan by considering various causative factors that can affect demand. Basically, it makes it possible to predict middle and long term demand for all product ranges. One of the most important features of DP module is to be able to keep data with their different aspects and transferring data from lower levels to higher levels.
Supply Network Planning (SNP)	SNP integrates purchasing, production, distribution and shipment processes and enables make comprehensive tactical planning and make right purchasing decisions. This module considers the limitations and punishments that can be defined in the system and plans the flow of product in the supply chain by using advanced optimization techniques. Besides developing optimum purchasing, production and distribution plans, helps to shorten demand meeting periods and decrease inventory levels. Starting from request plan, SNP develops plans to meet short and medium term to meet sale predictions and orders. This plan covers both shipment needs between locations and purchasing needs. Distribution function within SNP module decides what the extent of the inventory will be delivered to which customer, distribution center, branches or VMI point. Considering defined limitations (such as distribution capacity) and process rules (such as minimum cost or replacement strategies), it makes an optimized distribution plan.
Distribution Planning (DIP)	Distribution planning aims to make an integrated distribution plan for short, medium and long term by considering many inputs such as stock, production plan, stock in transit. Distribution planning basically helps making decisions about which product will be sent where and at what amounts.
Delivery Planning (DEP)	The aim of DEP is to realize distribution plans of businesses as real sends. Basically, it determines which vehicles and how many of them will be used and which palette will be used for loading to realize send. The main aim of loading planning is to create a shipment plan for multiple-product by

	using the results of distribution planning.
Vendor Managed Inventory – VMI	VMI holds supplier responsible for stock level of the purchaser and thus contribute to optimize the supply chain. VMI balances supply and demand and increases the availability of the inventory in the customer's location, which lead to a better customer service. An efficient VIM solution aims to create a win-win relationship from which both the supplier and customer benefit.

Source: http://help.sap.com, 2009

Basic details and information with regard to the basic variables **of SAP APO Basic Processes** are given below in Table 3

Table 3. Details of SAP APO Basic Processes

Variable	Explanation
Demand Planning (DP)	The first step in the application in DP module is to reduce data to desired levels. It is not very possible to make daily predictions for each product code. As predictions to be made at this level changes a lot, the results are not expected to be very reliable. Therefore, weekly or monthly predictions are made at a significant level above the product code. However, the products are to be followed at the lowest level to make production or distribution planning with these predictions. With this aim mind, data sent to the system are reduced to the desired dimensions with rules determined by DP. After that, by considering prediction brought to desired level daily sales and daily targets revised accordingly, inventory levels in transit and in the branches, maximum and minimum stock levels determined for branches, daily production and VMI needs are calculated.
Supply Network Planning (SNP)	Considering the different levels of parties (production locations, outsourcing locations, distribution centers, primary dealers, secondary dealers, direct customers etc.) in the supply chain of ABC Company, it is clear that different approaches and rules are required for different levels of the network. Therefore, as the first step of the project, the different levels of network are defined and the planning rules for each level are determined. Also the exceptions that cannot be managed within the model are defined and the processes and rules in order to manage the exceptions are identified.
Distribution Planning (DIP)	Transport planner mainly utilizes the outputs of the deployment plan. The aim is to generate an executable transportation plan by grouping the shipments, taking into consideration the vehicle and pallet constraints. TLB considers maximum vehicle and pallet load in order to reach an optimum transportation plan.
Delivery Planning (DEP)	Two different alternative planning runs are designed. The first one was for the long term with unconstrained capacity in order to determine investment decisions. The second run was for short and medium term in order to create a feasible constrained production plan based on the defined priorities. The main reason for this is the difference between the characteristics of these two processes and outputs expected from the processes are completely different.
Vendor Managed Inventory – VMI	As in the case of production planning, supplier managed inventory and distribution planning is modelled differently for two different time spans, namely, short/medium and long term. By identifying the necessary cost elements an optimization algorithm is utilized in the deployment process.

4.2. Assessment of Application

This study which was carried out as a case study in a business producing fast moving consumer goods seeks to investigate improvements realized in the supply chain processes of the business chosen as a sample and positive effects of the use of technological applications to support these innovative processes on financial performance of the business. Quantitative findings obtained as a result of the study can be basically summarized as follow.

In the table below, the data chosen in the framework of the study and improvement in them through the years are summarized considering the date when the application is started: Basically, the level of total stocks of the business in all locations, the rate of direct shipment business makes from production centers to the branches, raw material inventory level, month end loading rate, which shows the distribution of all loads within a month, and used up stock rates are examined.

Table 4 Comparison of Performance Criteria

	Before Project			After Project	
	2006	**2007**	**2008**	**2009 Actual**	**2009 Estimated**
Stock Level (days)	8.21	7.02	9.14	8.32	8.05
Direct Shipment Ratio	64%	67%	71%	81%	78%
Material Inventory Level (days)	34	41	37	36	35
Month End Load Factor (ratio[*])	1.23	1.41	1.28	1.22	1.15
Stock Out	-	15%	5%	3%	3%

* Rates closer to 1 indicate increasing efficiency of business distribution planning.

Considering the performance criteria selected to monitor the performance of the company compared with 2008 to 2009 the following results are achieved (for the details please see Table 4):

- Stock level in the whole supply chain that effects warehousing and inventory carrying costs decreased from 9.14 days to 8.32 days

- The month end load factor that addresses the fluctuations during the month decreased from1. 28 to 1.22 and direct shipment ratio that directly affects the transportation costs sharply increased from 71% to 81%.

- Finally stock out ratio has decreased from 5% to 3%.

Because of the confidentiality agreement with the business, it was not possible to publish all findings. Besides these quantitative findings, the qualitative findings can summarized as below:

Production Planning

- Significant improvements were achieved in line capacity use with line prioritize and balancing.

- Parameters and limitations such as lot sizes and pre-production defined in the system made it possible to increase efficiency in production lines.

- It was provided to production of demands within optimal quantities by considering the necessity.

- Product stock levels decreased by using them more efficiently by considering all stocks in the supply chain.

- It made is possible to make more sensitive medium and long term material planning.

- By increasing visibility on supply chain, it was possible to predict possible problems and take preventive measures.

- Losses in critical sales were decreased by prioritizing demands.

- With warning mechanisms it was possible to determine probable users' problems (type of the demand which cannot be met) and thus it became possible to take preventive measures.

Distribution Planning and VMI

- With the updated data flow, the effectiveness of supply chain activities increased and thus changes in demand in the market could be met faster.

- Considering stocks in all points on the network and the stocks in transit, the optimal distribution plan was created and the optimal distribution plan was created to use stocks on the network with maximum efficiency. Thus, better service level is attained with lower amounts of stocks.

- Besides, unmet demands and thus sales loses were decreased by using stocks more efficiently.

- With the optimization of shipment routes and vehicle/pallete occupancy rates, distribution costs were decreased.

- With the integration of a more sensitive supply chain planning, a more flexible supply chain network was obtained, which enabled the business to respond to changes in the market without being directly influenced by them.

- Warning mechanisms in distribution planning, as in the case of production planning users are enabled to take necessary precautions by noticing probable problems beforehand.

- With the new model, long-term distribution planning was achieved. In this way, decision making mechanisms for long-term distribution plan were supported and a more sensitive distribution budget could be made.

5. Assessment and Conclusion

In this study which seeks to investigate the effects of IT-based supply chain applications on business performance, it is revealed upon institutional basis examinations that markets have become global as a result of economic, technological and political developments and as a result competition has become more intense in terms of both quality and quantity. In globalizing markets, business can have competitive edge depending on their being able to develop their ability to keep up with changes to provide goods and services customers need at the desired time, place, amount, quality and price and their making organizational (in and out of the business)

and technological regulations. At this point, under the light of the findings out the study and of the examinations at institutional level;

(i)   IT applications have significant contributions to financial performance by making information flow more effective in and out of the business with its superiorities in processing, storing and transmission of information in and out of business,

(ii)   Supply chain applications also have significant contributions to financial performances of businesses with their contributions to competitive priorities like quality, price, time and flexibility and to the business applications like total quality management, just in time production, flexible production etc.

When the project implementation period is considered, it is also critical to mention the deep economical crisis in this period in Turkey. Based on this fact; the result achieved in the supply chain project will be more valuable.

With the assessment at the end of the study, the new model has made very significant contributions to supply, production and distribution planning of the business in spite of the global recession. These contributions can be as expressed follow:

1. Inventory shipment and stocking costs can be decreased by decreasing stock levels in business locations. Visibility on the network is increased and available inventory is used more efficiently. Improvements in prediction and production planning process can prevent unnecessary productions and thus excessive stocks.

2. With the new model in distribution planning has increased direct shipment rate with the rules determined and optimization and thus distribution costs could be decreased.

3. Changes in production plan are reflected in the direct supply plan lead to improvement in this process and made it possible to decrease raw material inventory level.

4. The monthly distribution plan was balanced and source plans became more visible and costs resulting from changes decreased.

5. Changes in demands were taken into consideration and simultaneously reflected in production and distribution plans lead to create supply-demand balance and thus decreased shortness in stocks, which leads to decrease in sales missed due to lack of stock sales and have a positive effect on market share.

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