The Role of Marketing Department in Enhancement of Service Level for Customers Inside Internal Supply Chain

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Abstract

The role of marketing department within companies and organizations has great important in supply chain to exchange transactions with customers that depend primary driver to any supply chain.

The delay in the delivery of the demands incur a tardiness penalty due to customer dissatisfaction, a possible contractual cost for late delivery and potential loss of reputation, also the demands which are finished before its deadline and not delivered to customer could result in additional storage or insurance costs, or even product deterioration.

Customer service is a key objective for success and continuation of Wasit company, therefore demand forecasting accuracy will help decision maker in this company to right decision making for management of inventory levels and purchase best quantity from the materials then achieve the required customer service and increase of customer.

Key words: Service Level, Supply Chain, Forecasting, Elman Neural network.

1. INTRODUCTION:

The marketing division of a company is in charge of selling, advertising a seeking out any and all avenues and points of sale which may have demand for its product and creating a new demand in new markets[1].

The marketing department is responsible for identifying needs of customers through forecast with demands of customers, that will be forecasted with quantities of products.

Forecasting of future demand is essential for taking decisions related to supply chain. Forecasting is one of the most important topics in the field of supply chain management. Generally, forecasts for short term used for production scheduling and inventory control and long term forecasts are used for market planning [2].

Artificial intelligence predicting techniques have been receiving much consideration lately in order to solve the problems that are hardly solved by the usage of classical methods. ANNs have the ability to learn like humans, by accruing to knowledge through repetitive learning activities. Animal brain's cognitive learning process is simulated in ANNs [3].

Efendigil and et al (2008) [4] studies developed a comparative forecasting mechanism based on ANN and Adaptive Network-based Fuzzy Inference (ANFIS) techniques to manage the demand forecasting issue under fuzziness using real world data from a firm which is active in durable customer goods industry in Istanbul, Turkey.

Fernandes and Teixeira (2008) [5] develop models and apply them to sensitivity studies in order to predict the demand. It provides a deeper accepting of the tourism sector in Northern Portugal and contributes to already

existing econometric studies by using ANN methodology and showed a reasonably close result compared to the target data.

Veiga et al .(2013) [6]studies and analyze demand forecasting as a strategic sustainability tool as applied to a Brazilian SME, simultaneously describing the social, environmental and economic advantages that derive from the implementation of this process. This effect, economic performance is obtained via the possibility of addressing demand at optimized service levels and minimum inventory costs.

Candan et al. (2014) [7] studies predict future demands from previous sales quantity with considering effects of the external factors by using a neuro-fuzzy approach. This study applied in marketing department in supply chain where should predict the amount of product for each period in the company. Actual demands quantity of the product for six years period.

Albarune and Habib (2015) [8] study demonstrates forecasting practices in supply chain management at various areas, particularly Life science and Retail Chain, forecasting practices based on secondary data and represents SCM role coordination, demand management, collaborative, etc. In addition , the study reveals the limitation and little practical solutions on predicting to be useful in the business company.

2.CUSTOMER SERVICE:

Customer service is a main objective of operations management. The operating system must provide things to a specification, which can satisfy the consumer in terms of cost and timing. Thus, providing the 'right thing at a exact price at the correct time' can satisfy primary objective.

These aspects of customer service specification, timing and cost are described for four purposes in table (1). They are the main sources of satisfaction for customer and must therefore be the primary dimension of the service for customer is objective for operations managers. Generally, an organization will goal reliably and consistently to reach certain standards and operations manager will be influential in trying to achieve these standards. Hence, this impartial will influence the operations manager's decisions to achieve the required customer service[9].

Table (1) Aspects of Customer Service [9]

Principal function	Principal customer wants	
	Primary considerations	Other considerations
Manufacture	Goods of a given , requested or acceptable specification	Cost, *i.e.* purchase price or cost of obtaining goods. Timing, *i.e.* delivery delay from order or request to receipt of goods.
Transport	Management of a given, requested or acceptable specification	Cost, *i.e.* cost of movements. Timing, *i.e.* 1. Duration or time to move. 2. Wait or delay from requesting to its commencement.
Supply	Goods of a given, requested or acceptable specification	Cost, *i.e.* purchase price or cost of obtaining goods. Timing, *i.e.* delivery delay from order or request to receipt of goods
Service	Treatment of a given, requested or acceptable specification	Cost, *i.e.* cost of movements. Timing, *i.e.* 1. Duration or time required for treatment. 2. Wait or delay from requesting treatment to its Commencement

3.THE RELATIONSHIP BETWEEN MARKETING DEPARTMENT AND CUSTOMERS' DEMANDS:

Forecasting models from a marketing point of view can vary drastically depending on the outlook of the model. While each of the categories of models has its own benefits there is no formal demarcation between them. This means that some flexibility of customization is possible in order for a company to fit their specific market and needs [1]. Table (2) illustrated types of the customer's demand.

Table (2) Types of Customer Demand [1]

Type of Customer Demand	Characteristics	Difficulty of Forecasting
Stationary Demand	Slight fluctuation per unit time, no apparent long-term growth or seasonal trends	Little Difficulty
Demand with Growth characteristics	Over a long period of time demand exhibits a growth characteristic, this growth maybe positive or negative .	Moderate Difficulty
Demand with Seasonal Characteristics	Demand remains near stationary except for one period which is influenced annually. Period is typically a month or quarter in which demand is higher or lower than all others	Moderate Difficulty
Random or Unknown Demand	Demand is random and is independent from one period to another.	High Difficulty

A visual representation of each of these demand types is shown in Figure (1) highlighting the major differences that exist between them[10].

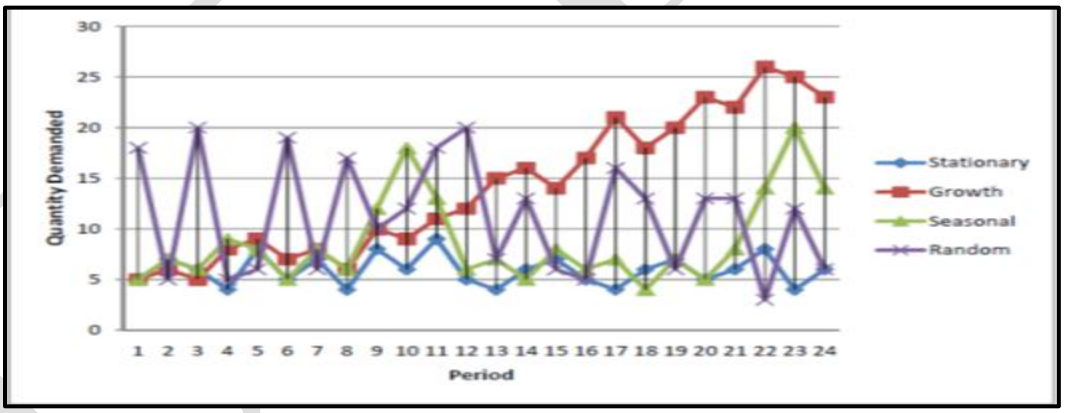

Figure (1) Comparison of Demand Types [11]

In last few years some other techniques , such as Artificial Neural Networks (ANN) have been widespread to solve prediction and forecasting problems.

3.1.ARTIFICIAL NEURAL NETWORKS (ANN):

Artificial neural networks (ANNs) have been used to solve different kinds of problems such as classification, optimization, regression, clustering, and forecasting. Based on its capacities, neural networks have been used to solve problems in several fields, e.g. time series prediction [12].

A neural network is a set of interconnected neural processing components that imitate the action of the brain. These elementary processing units are called neurons[13]. Figure (2) illustrates a single neuron in a neural network.

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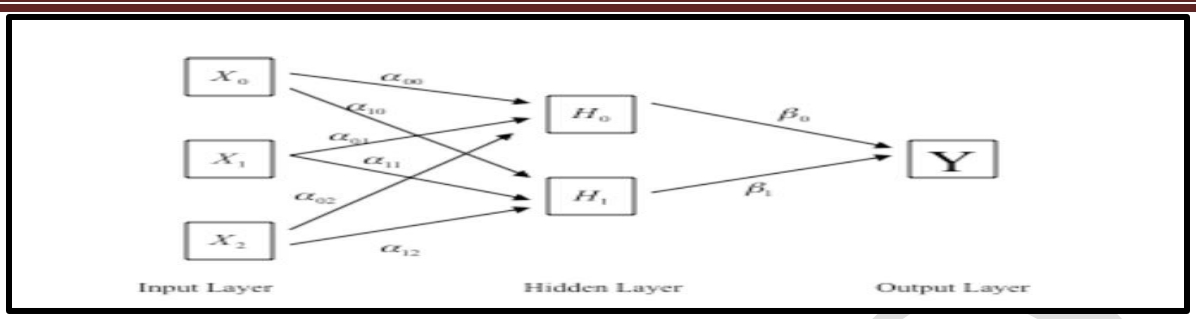

Figure (3.3) Artificial Neuron Model[14]

3.2.ELMAN NEURAL NETWORK (ENN):

Elman Neural Network (ENN) is a type of partial recurrent neural network, which consists of two-layer back propagation networks with an additional feedback connection from the output of the hidden layer to its input layer. This means that after training, interrelations between the current input and internal states are processed to produce the output and to represent the relevant past information in the internal states [15].
Also these improved modifications attempt to add other feedback connections factors to the model that will increase the capacity of the memory in order to overcome the tendency to sink into local minima. However, gradient descent (back propagation) used by ENN has the disadvantages of being trapped in local minima resulting in sub optimal solutions and calculations are not as straightforward since it requires functional derivatives[12].

4.DEMANDS FORECASTING OF CUSTOMERS IN MARKETING DEPARTMENT:

The marketing department is responsible for identifying needs of customers, the sub methodology for customer' demands will be forecasted with quantities of products that produce in line production for any industrial company, in this paper will explained proposed methodology for interaction between customer needs and marketing department , where Figure (3) represent outline for this methodology .
This paper focused on demands forecasting of customers in marketing department and generate algorithm for its ,that will called (DFC algorithm). The customer can be order single or multiple demands , this demands consist from one or more products and it has due date, quantity, type of product and price.
The marketing department receive customers' demands that will be real demand (normal or dispatch) and make forecast for customer's demands with different periods.
Forecasting is an integral part of supply chain management to make right decisions regarding manufacturing and inventory management.
The forecast with long time to help decision maker in strategic decisions making, while the forecast with medium time to help decision maker in tactical decision making as order material from suppliers.
The forecast with short time to help decision maker in operation decisions making as scheduling and sequence for products.
Dispatch demands has special treatment because it order with short time and it need to change polices production department and purchasing department, therefore described as red lines in proposed methodology.

4.1.ALGORITHM PROCEDURE FOR DEMANDS FORECASTING OF CUSTOMERS IN MARKETING DEPARTMENT:

The marketing department will coordinate its decisions with production, purchasing and inventory departments to make integrated decisions inside internal supply chain.
The steps of these algorithm can be described as following:
Step1. The customer's order single or multiple demands, each demand consist from one or more products and it have due date, price, quantity and quality. These requirements consider as **input** to marketing department.

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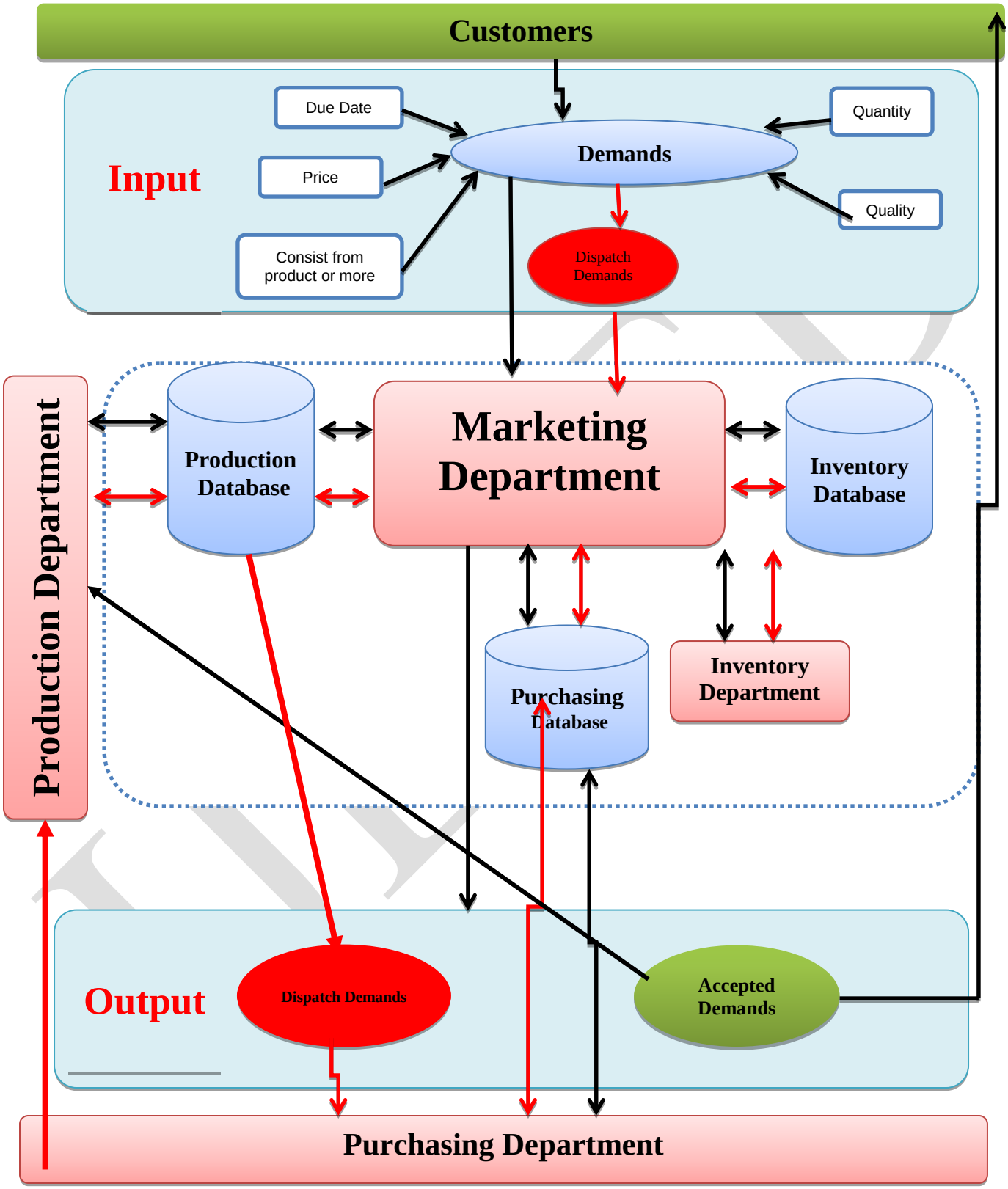

Figure (3) Block diagram for Interaction Between Customer Needs and Marketing Department

Step2. The marketing department will study customers' demands that divided to normal demand and dispatch demand.

Step3.The decision maker will accept or rejected normal demands for customer with cooperate purchasing, production and inventory departments to coordinate its decisions, while the dispatch demand send to purchasing department and inventory departments then production department to study ability execution this demands.

Step4. Collect acceptable demand and send to purchasing department production department and to execute this demands. .

Step5. Marketing department will negotiate with customers to change price , quantity, quality, due date for unaccepted demands.

Step6.Make forecast for acceptable demands and calculate accuracy of forecast, if is unacceptable will repeat forecast process or change some parameters for ANN as number of layers or increase iteration of epochs until become accuracy acceptable then update collected data for Customer's demands, that focus in this paper and called DFC algorithm.

Step7. Accepted demands and dispatch demands will consider as **output** from marketing department and **input** to purchasing department.

The detail of interaction between customer needs and marketing department as shown in Figure (4).

4.2. DFC ALGORITHM:

Demand Forecasting is one of the main processes of planning in supply chain. Its objective is to determine which products are purchased, where, when, and in what quantities.

DFC algorithm consider from quantities methods where depend on time series that treat with historical data , while another qualitative methods.

DFC algorithm consider the part that focused thereon in the first sub-proposed methodology, where collect the acceptable demands as historical data to make forecast for future demands depend on time series approach and using Elman Neural Network (ENN) ,that is a type of partial Artificial neural network (ANN) algorithms.

ANN is suitable for all types of demand of customer as level, trend, seasonal variations, cyclical movements and irregular random fluctuations, where ***train stage*** that consider first stage in this algorithm will treat the data and try understand pattern of this data.

The second stage is ***test stage*** that check accuracy this algorithm through calculate the forecasting error between actual data and forecasting data then calculate mean absolute error (MAE). Repeat forecast process or change some parameters for as number of layers or increase iteration of epochs if forecast unacceptable and work changes until become accuracy acceptable then forecast for future demands in **forecast stage**, this algorithm can be illustrated in Figure (5).

After making of demands forecasting will evaluate forecast process and update this data continuously because its work in dynamic environment.

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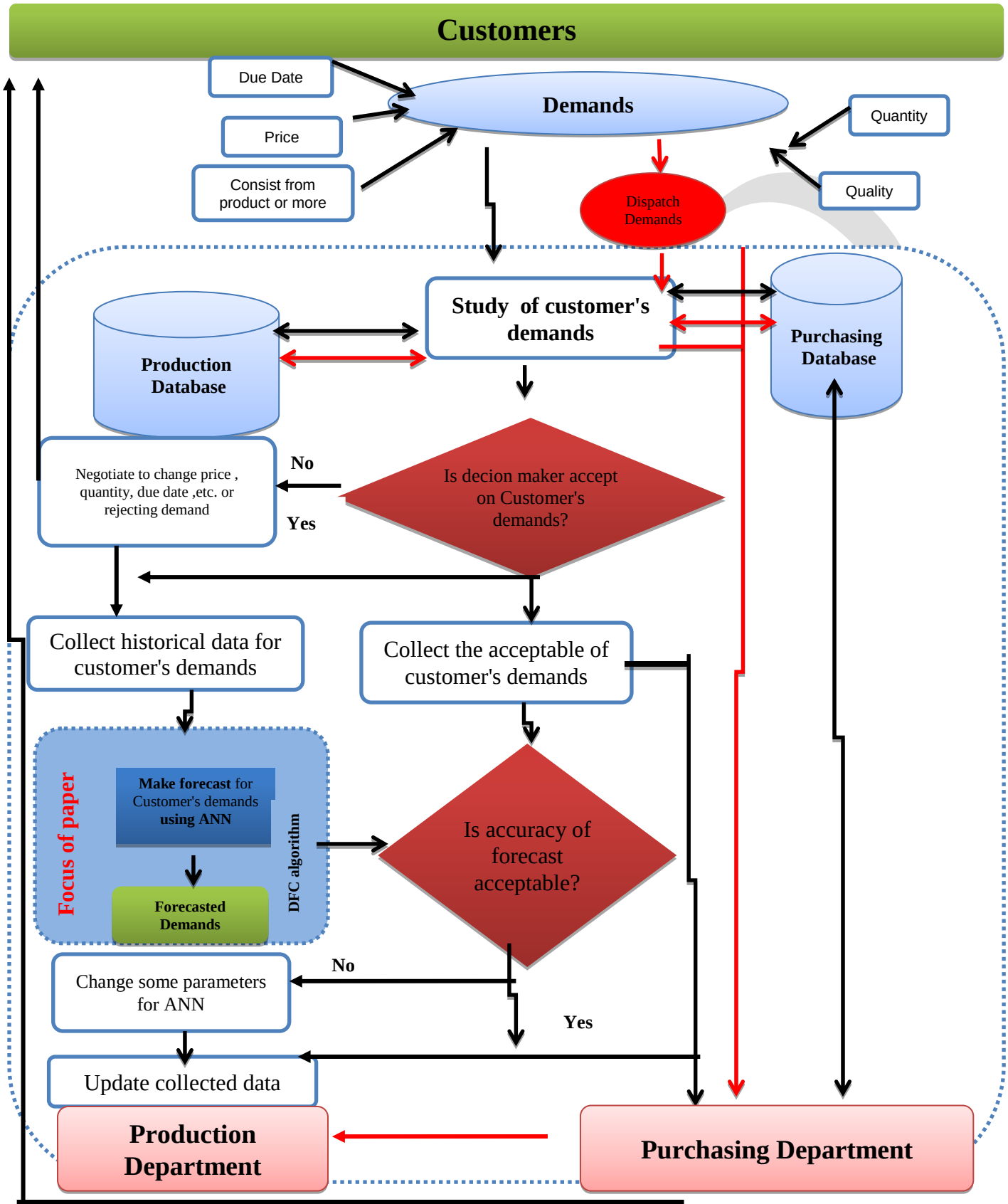

Figure (4) Interaction Between Customer Needs and Marketing Department

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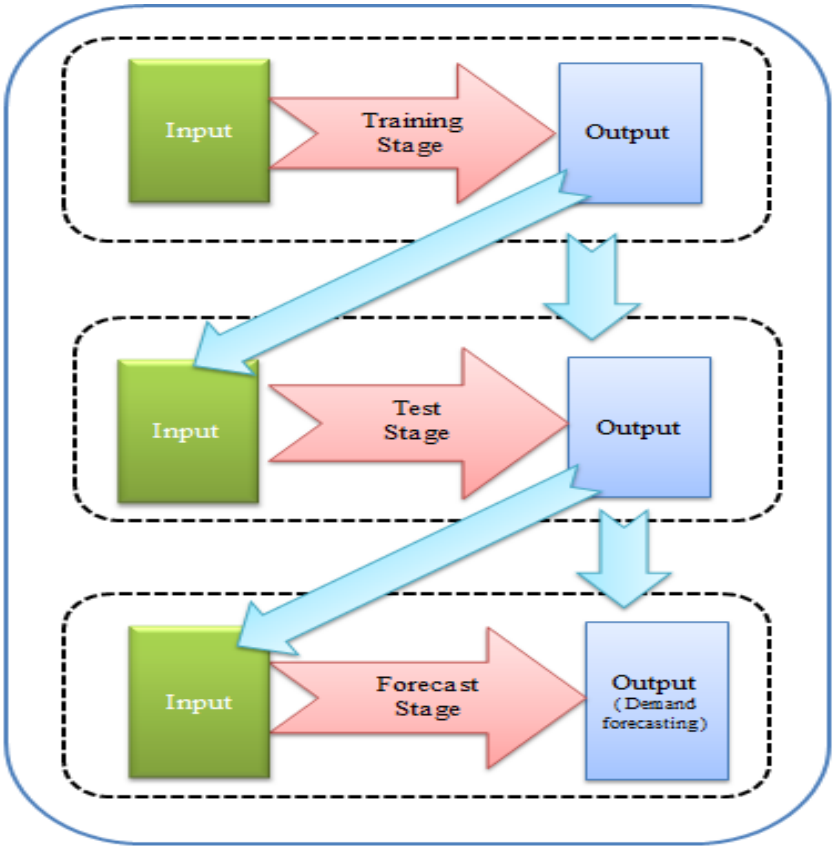

Figure (5) Forecast Process in DFC Algorithm Using Elman Network

5.APPLICATION OF PROPOSED METHODOLOGY:

This paper applied in Wasit company for textile industries as case study to integrate decision making in inside textile factory under umbrella of supply chain management.

Proposed methodology will forecast with customer's demand on Nuba Weave Dyed Poplin weave , that produce in this company.

There are assumptions for products forecasting in this factory as following:

1.Demands are deterministic and stationary.

2. Demands are variable for each product and for each month.

3.The data of sales are correct and accurate.

4.Demand Forecasting to product or more using Elman Neural Network (ENN) is a type of partial Artificial neural network (ANN) algorithms.

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5.1. SALES DEMAND FORECASTING FOR NUBA WEAVE:

Table (3) represent real data for sales Nuba Weave from year (2012 to 2015) and forecasting for year 2016 after applied Elman network in Matlab program.

The result explain is mean absolute error (MAE=6.75), Figure (6) represent absolute error in the test stage and Figure (7) represent forecasting for years 2015 and 2016 for this product .

Table (3) Data of product Nuba Weave (Meter)

Month	Actual values				Forecast values		Absolute Error
	2012	2013	2014	2015	2015	2016	
January	39400	9600	10670	12140	12153	12938	13
February	18220	17820	9720	8600	8612	6339	12
March	11440	12960	0	0	0	0	0
April	38730	37740	0	0	0	0	0
May	28640	32940	35160	38000	38014	39574	14
June	6000	7100	12970	15600	15589	17923	11
July	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0
October	31680	18680	14760	12700	12684	11034	16
November	20010	18600	17450	16600	16585	16024	15
December	0	0	0	0	0	0	0
Total Absolute Error							81

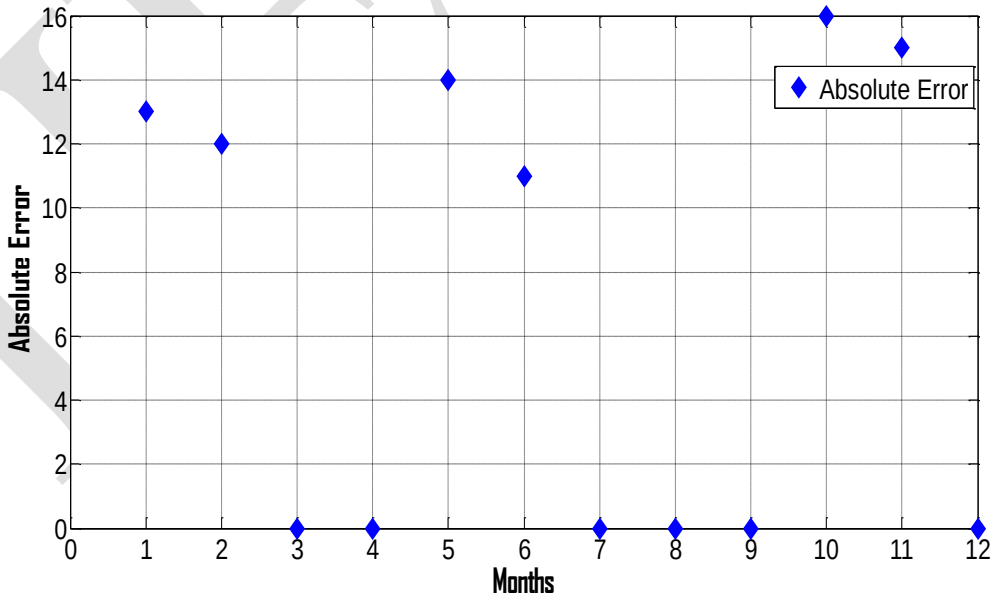

Figure (6) Absolute Error for Naba Weave

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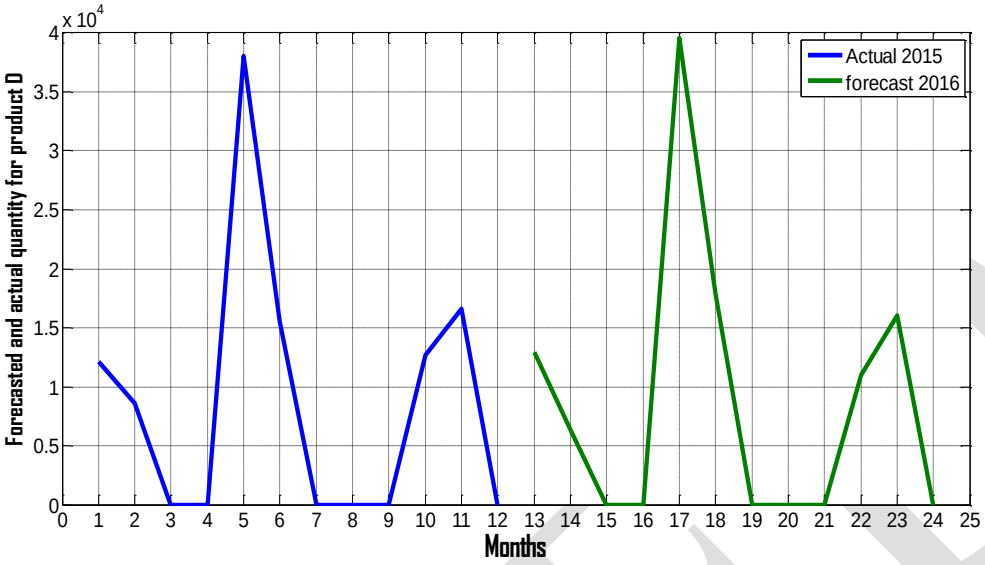

Figure (7) Forecasting for Years 2015 and 2016 for Naba Weave

5.2. SALES DEMAND FORECASTING FOR DYED POPLIN WEAVE:

Real data for sales Dyed Poplin weave represent in Table (4) from year (2012 to 2015) and forecasting for year 2016 in Matlab program.

Figure (8) represent absolute error in the test stage and Figure (9) represent forecasting for years 2015 and 2016 for this product. The result explain is mean absolute error (MAE=1),

Table (4) Data of Dyed Poplin weave (Meter)

Month	Actual values				Forecast values		Absolute Error
	2012	2013	2014	2015	2015	2016	
January	0	0	1460	660	663	670	3
February	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0
April	4440	5640	3400	4770	4768	4922	2
May	1800	2310	1500	330	326	402	4
June	2500	3660	0	2660	2659	2712	1
July	380	155	0	0	0	0	0
August	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0
October	0	0	2100	270	268	287	2
November	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0
Total Absolute Error							12

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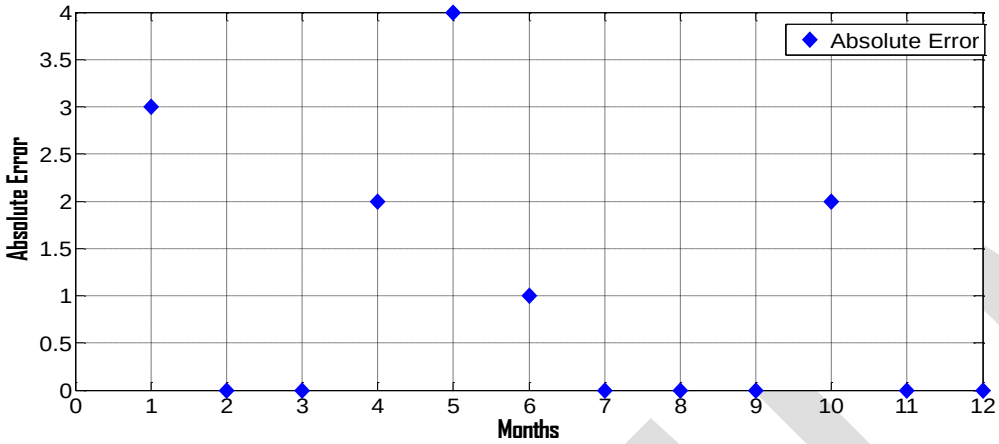

Figure (8) Absolute Error for Dyed Poplin Weave

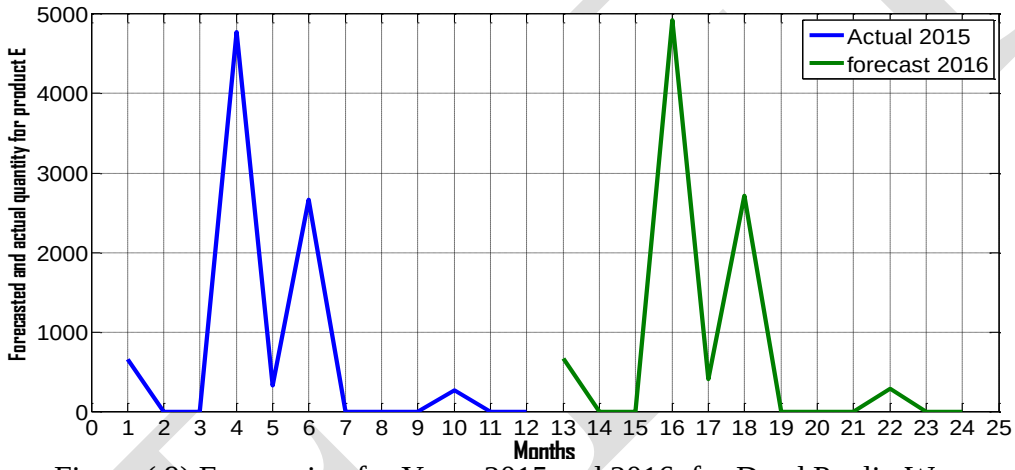

Figure (9) Forecasting for Years 2015 and 2016 for Dyed Poplin Weave

6.CONCLUSIONS:

Marketing department should predict the amount of product for each period in Wasit company to understand Customer's demands and good planning to achieve this demands in other departments inside company.
This work aims at applying Elman ANN (ENN) to forecast the sales demand in a textile factory. The performance is compared to the real sales data and the forecast data to calculate forecast error using mean absolute error (MAE). This model used the monthly sales data from the years (2012 to 2015), considered year 2013 as output to year 2012 and input to year 2014 and considered year 2014 as output to year 2013 in train stage , while considered year 2014 as output to year 2015 in test stage then forecasted to year 2016 in forecast stage.

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