Establishing Methodology for Integrating Decision Making in Internal Supply Chain

Watheq Hayawi Laith, Sawsan Sabeeh Al-Zubaidy and Mahmoud Abbas Mahmoud

College of Administration, Economics -University Of Sumer, wahe36 @ yahoo.com
Department of Production Engineering, Metallurgy-University Of Technology , Sawsan2006@yahoo.com
Department of Production Engineering, Metallurgy-University Of Technology , dr.mahmoudalnaimi@yahoo.com

---

Abstract

Hard competition have forced companies for seeking how to integrate decisions through supply chain functions, functional integration involving decisions about purchasing, manufacturing, and distribution activities within the company, also among the company and its suppliers and customers.

The work in this methodology mainly aims to integrate decision making in internal supply chain to meet the demands of customers within industrial environments.

The proposed methodology was divided into three sub-methodologies. The first sub-methodology focused on forecasting customers' demands in the marketing department, which are used in the planning process within the company.

The second sub-methodology focused on the best order quantity from the suppliers, which reduces the total cost, which composed from holding, purchase and transportation costs.

Finally, sub-methodology focused on the sequence of the demands products specified by the marketing department and finding the best sequence of products based on setup time for production lines in the production department.

Keywords: Customer's Demand, Marketing Department, Order Quantity, Sequence of Product's Problems.

---

1. Introduction

The supply chain members perform different functions or activities similar to logistics, inventory management, ordering, forecasting, scheduling and product design involved in management of flow of information, goods and money.

The individual members of supply chain have been acting these activities independently. The supply chain members may earn benefits by integrating various departments as discussed in the following subsections. Every company does business in order to serve customers and make profit [1].

Customer service is the final objective, the output of the logistics and therefore it is situated on the top of the logistics chain of activities. For logistics, the customer is any delivery destination.

This means that customers might be ordinary consumers, wholesalers or just companies, manufacturing plants and warehouses, which appear to be customers of their suppliers [2].

Demand forecasting is essential for taking decisions related to supply chain. Forecasting is being used for a firm to plan its capacity to be able to meet the customer demand in the best possible way. Prediction have also daily influences on different levels within a company, levels such as strategic, operational and tactical. The primary demand is affecting the rest of the supply chain since they are anticipating its production towards it [3].

Huin et al. (2002) [4] used the phrase 'internal supply chain' to describe work aimed at breaking down the barriers among functions within organizations.

Fawcett and Magnan (2002) [5] identified four levels of integration in practice:
1. Internal cross-functional integration.
2. Backward integration with valued first-tier suppliers.
3. Forward integration with valued first-tier customers.
4. Complete backward and forward integration ('from the supplier's supplier to the customer's customer).

Edward S.(2011) [6] implementation of integrated SCM has the potential to generate significant improvements in the performance of firms. The concept of supply chain integration (SCI) is based on documented evidence which suggests that much of the waste throughout businesses is a consequence of fragmented supply chain configurations.

The outline of the proposed methodology is shown in Figure (1). The proposal methodology is provided to help the managers in the process of integrating decision-making in the supply chain for an industrial environment.

This methodology is designed to solve the problems of scheduling and sequencing for multi-product in production line combined with demand forecasting that will enable the companies to involve all necessary functions and requirement planning to determine the target inventory level and determining ordering quantity from a supplier that will impact on target inventory level to customers satisfaction.

The aim of this methodology is to integrate decisions across the internal supply chain, where it will involve decisions about purchasing, manufacturing, and distribution activities within the company.

2. Customers' Demands Forecasting in Marketing Department

The marketing department is responsible for identifying needs of customers. The sub-methodology for customers' demands will forecast quantities of products that be produce in production line for any industrial company, that will be called Customers, Demands Forecasting (CDF) algorithm. The outline of interaction between customer needs and marketing department as shown in Figure (2) where CDF algorithm is considered as a part of first sub-methodology.

This sub-methodology focused on demands, forecasting of customers in marketing department. The customer can order single or multiple demands. These demands consist from one or more products and it has due date, quantity, type of product and price.

The marketing department receives customers' demands which are real demands (normal or urgent) and makes forecasts 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 the large range to help decision makers in strategic decisions making, while the forecast with medium range to help decision maker in tactical decision making as order material from suppliers, that focused in Best Order Quantity (BOQ) algorithm is a part of the second sub-methodology.

The forecast with short range to help decision maker in operations decisions making as scheduling and sequence for products, that focused in an Optimum Sequence (OS) algorithm is a part of the third sub-methodology.

Urgent demands have special treatment because of its order with short time and it needs to change policies production department and purchasing department, therefore they are described as red lines proposed methodology.
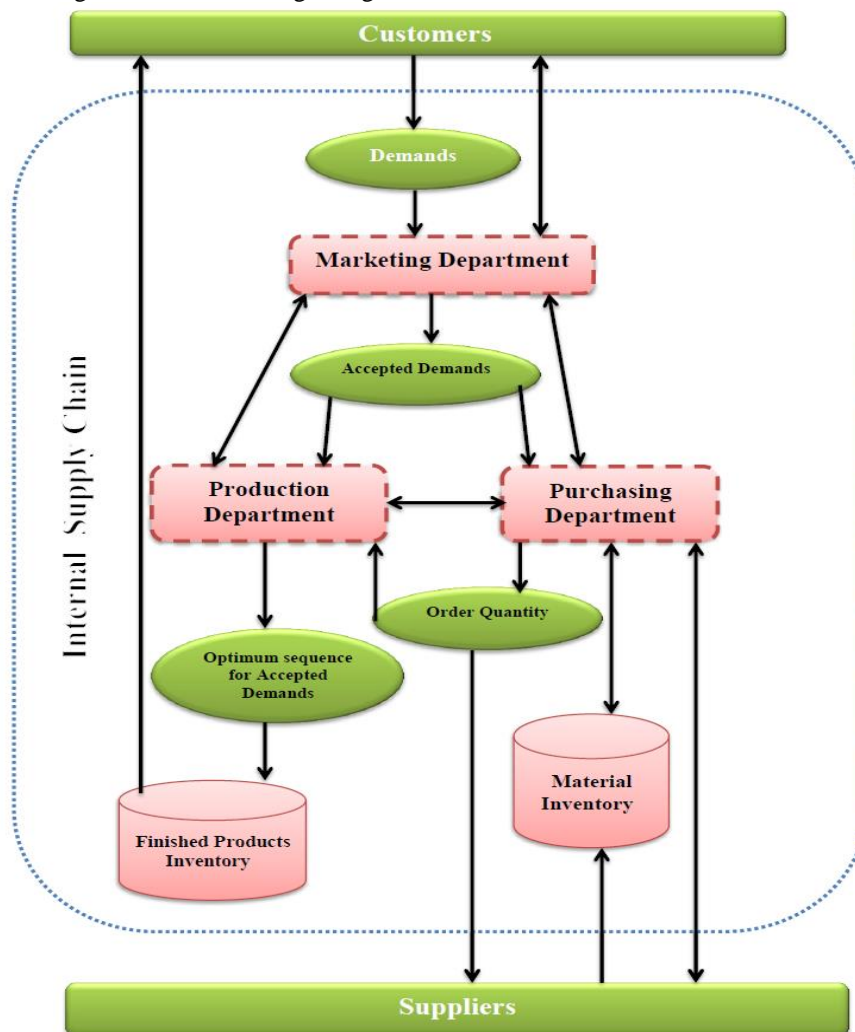

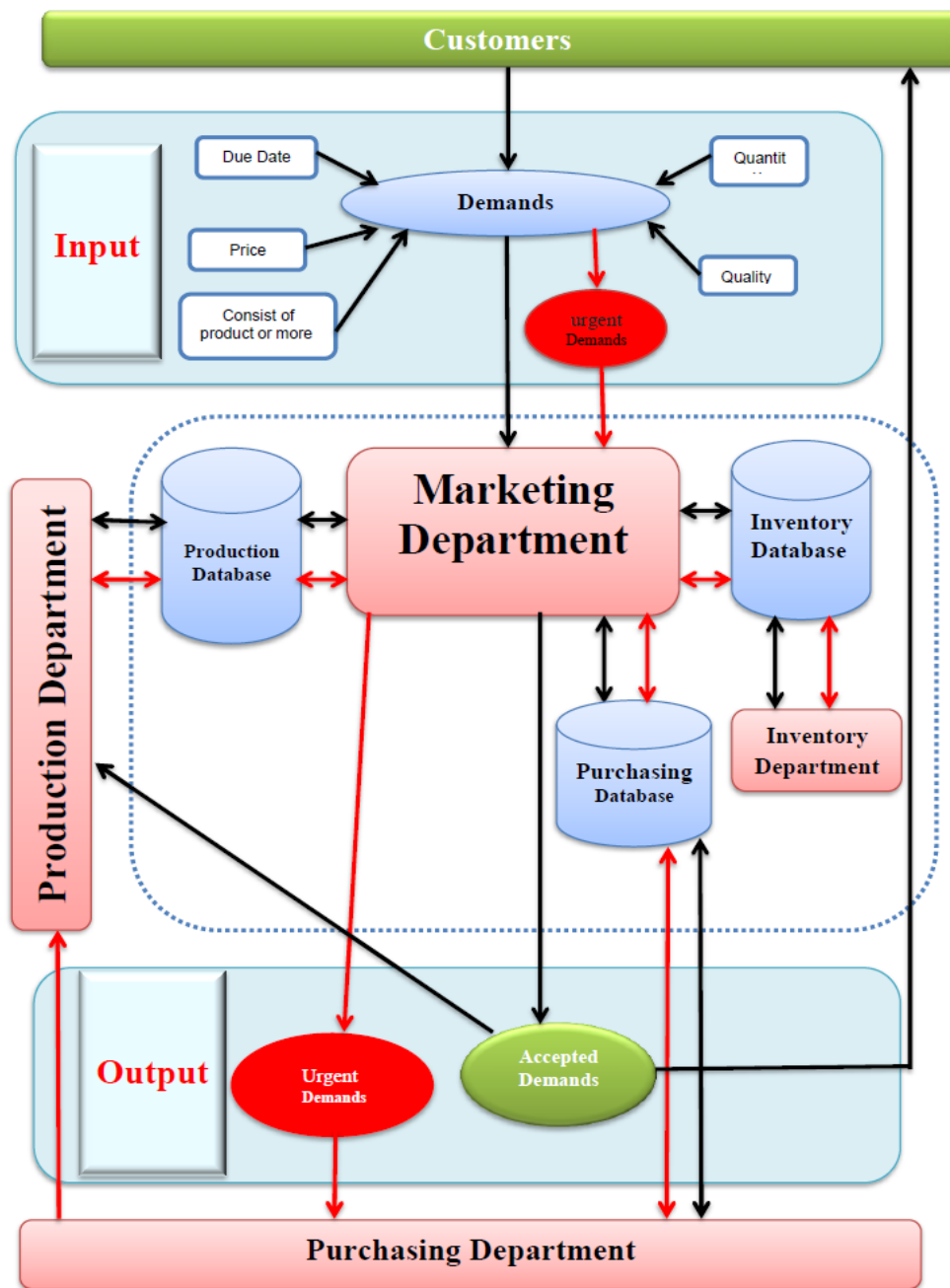Figure (1): Block Diagram for Proposed Methodology

Figure (2): Block diagram for Interaction Between Customer Needs and Marketing Department

2.1 The methodology of Demands, Forecasting in Marketing Department

The marketing department will coordinate its decisions with production, purchasing, and inventory departments to make integrated decisions inside the internal supply chain.

The steps of this methodology can be described as follows:

Step 1. The customers' order single or multiple demands, each demand consists of one or more products and it has a due date, price, quantity, and quality. These requirements are considered as an **input** to the marketing department.

Step 2. The marketing department will study customers' demands that are divided to normal demand and urgent demand.

Step 3. The decision maker will accept or reject normal customer demands with cooperating purchasing, production and inventory departments to coordinate its decisions, while the urgent demand sends to purchasing department and inventory departments then production department to study ability to execute this demand.

Step 4. Collect acceptable demand and send to purchasing and production department to execute this demand.

Step 5. The Marketing department will negotiate with customers to change a price, quantity, quality, due date for unaccepted demands.

Step 6. Make the forecast for acceptable demands and calculate accuracy of forecast. If it is unacceptable will repeat forecasting process or change some parameters for Artificial Neural Network (ANN) as number of layers or increase iteration of epochs until the accuracy is acceptable then update collected data for customer's demands.

Step 7. Accepted and urgent demands will the considered as **output** from the marketing department and **input** to the purchasing department.

The details of interaction between customer needs and marketing department are shown in Figure (3).

3. Determination of Ordering Quantity in Purchasing Department

The responsibility of the purchasing department comprises a sort of activities related to the goods and services engaged by or utilized within an organization. Based on the organization structure, the purchasing activities might include materials sourcing and availability, determining the right suppliers and vendor certification.

Purchasing can be described as the acquisition of required materials and services for the operation of the business and is one of the key roles in the management of all types of businesses. The function of purchasing spread across the units of the organization by procurement of the materials required to meet the customer demand and manufacturing schedules.

The objective of decision maker in this department is to reduce the total cost of materials required to make demands of customers. The outline of purchasing department is shown in Figure (4), which will be called best order quantity (BOQ algorithm) where BOQ algorithm is considered as part from the **second** sub-methodology .

The purchasing department determines materials required for accepted demands coordinated with production and inventory departments for each period.

Determination of materials required for demands' products depend on the Bill of Materials (BOM).
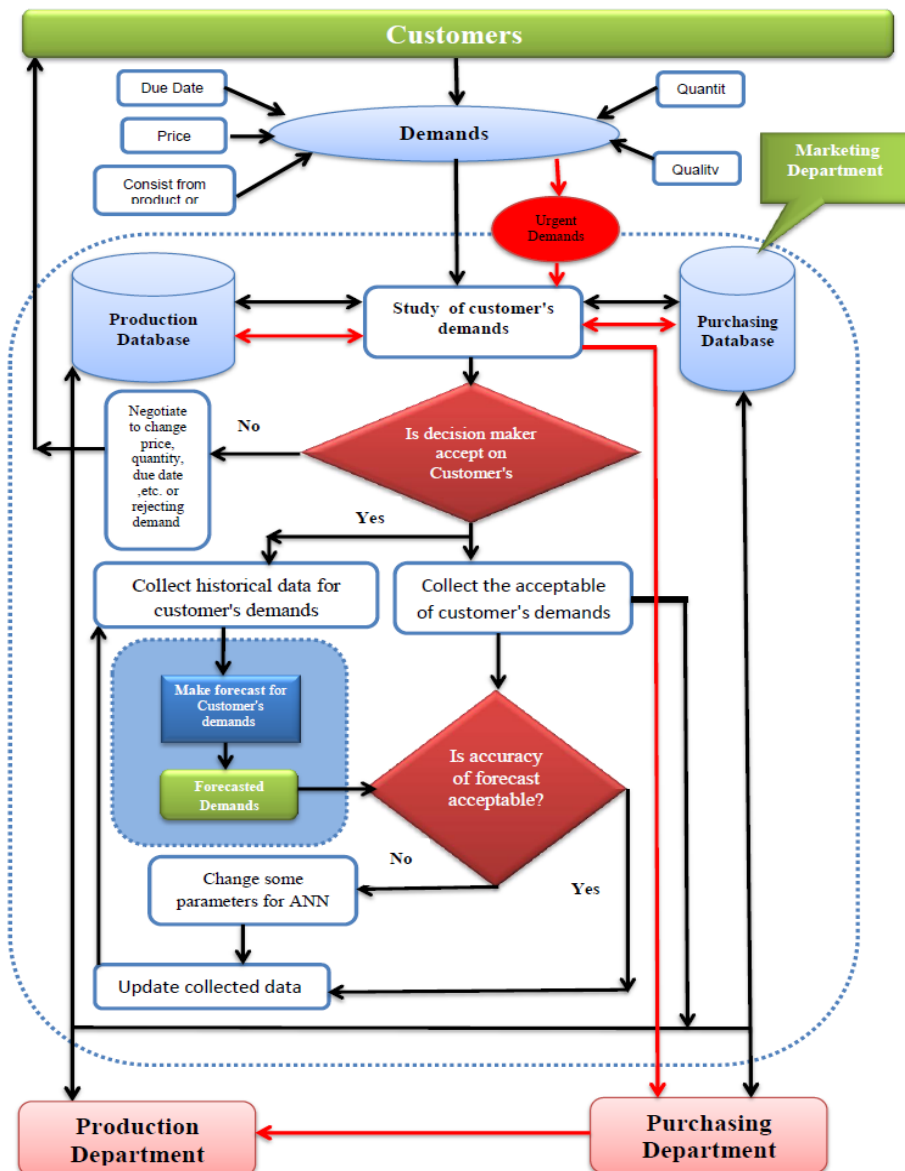
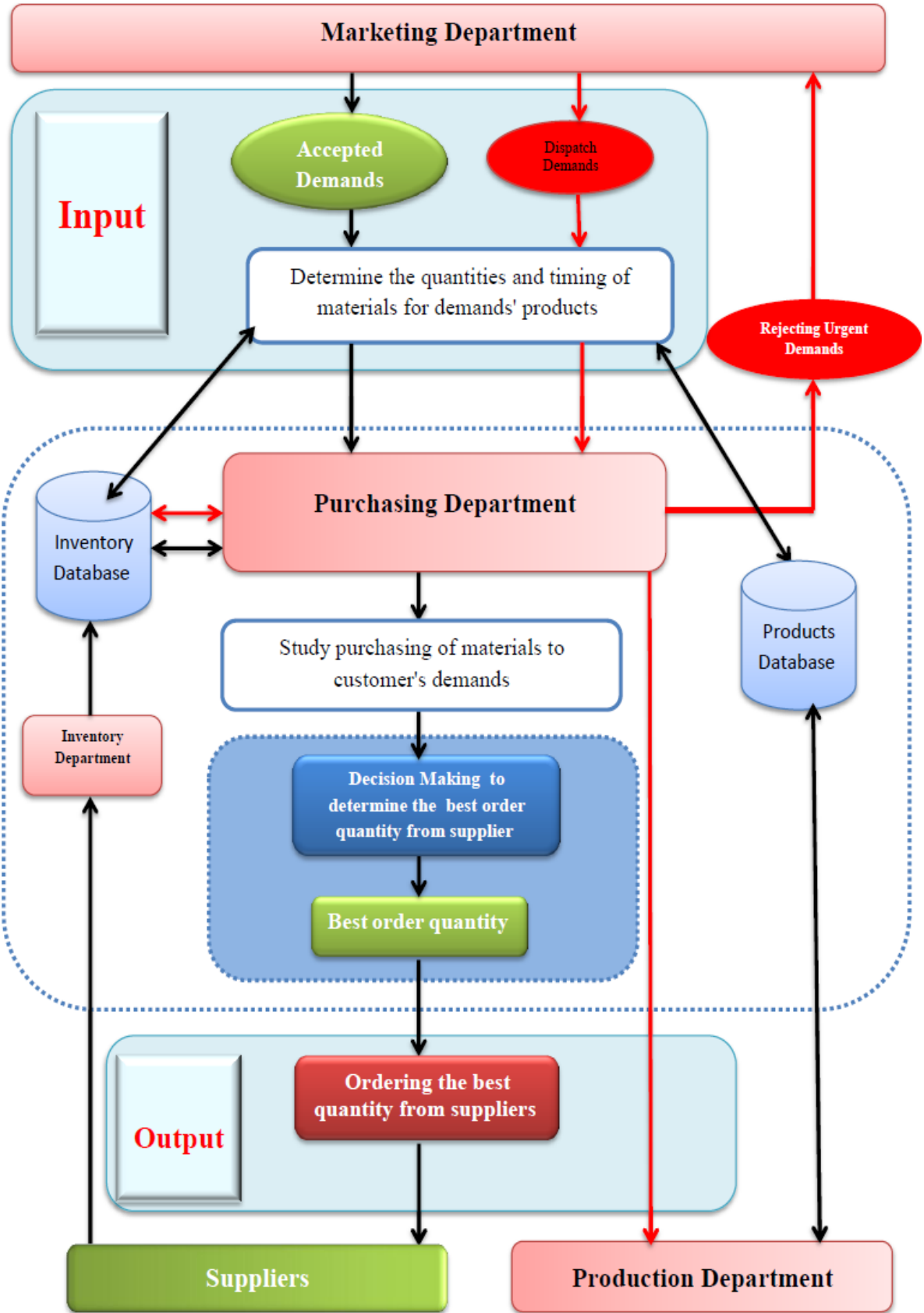Figure (3): Interaction Between Customer Needs and Marketing Department

Figure (4): Block Diagram for Purchasing Department in the Proposed Methodology

3.1 Methodology for Best Order Quantity in Purchasing Department

The purchasing department starts to determine the material for products demands' with corporate production and inventory departments for each period. The steps of this algorithm can be described as follows:

Step 1. Determine the materials that required for execution accepted demands' products, where the quantities and timing of materials are considered as an **input** to the purchasing department.

Step 2. If the available materials are enough in inventory for execution accepted products demands' or urgent demands then update inventory database, and send urgent demands to the production department.

Step 3. If the available materials are insufficient in inventory for execution urgent demands then it rejecting, while if the available materials are insufficient in inventory for execution accepted products demands' then study purchasing of materials.

Step 4. Determine the best order quantity depends on transportation, purchasing and holding costs that consider as output for BOQ algorithm.

Step 5. Order the best quantity from suppliers with minimum total cost.

Step 6. Shipment of quantities that requested and update inventory database.

The output of this sub-methodology is ordering the quantities from suppliers and the urgent demands send to the production department. The detail of this sub-methodology is shown in Figure (5).

4. Determination of the Optimum Products, Sequence in Production Department

A production line structured requires all products to pass through some workstations in the same sequence.

The market requires greater flexibility and variety of products together with the reduction of life cycles.

This guide lead the companies to necessary utilizes from all available requirements, therefore manufacturer within internal supply chain work to interpret this trend and produce multi-products in the same production line to fulfill customer demands in the dynamic environment. The objective of decision maker in this department is reducing the completion time for all demands, the outline of the sub-methodology is shown in Figure (6).

The completion time consists of process time and setup time, assumes that sequence of process is constant, therefore times products processing are constant for each product and setup time assumes to the entire production line. The production department is convert raw material and parts to finish product.

The steps of this algorithm can be described as follows:

Step 1. Accepted demands will be considered as an **input** to the production department.

Step 2. Production department will study the execution of accepted demands.

Step 3. The marketing department will determine the best sequence of demands depending on due date, available material or any other rule.

Step 4. Determine the optimum sequence of products to all demands, that are considered as output for OS algorithm.

Step 5. Re-determine the optimum sequence of products when a change in priority of its execution.

Step 6 . Determine the final optimum sequence of products and all demands then send these products for inventory department or customers.

The output of this sub-methodology is products that will be delivered to inventory department or customers. The detail of this sub-methodology are illustrated in Figure (7).
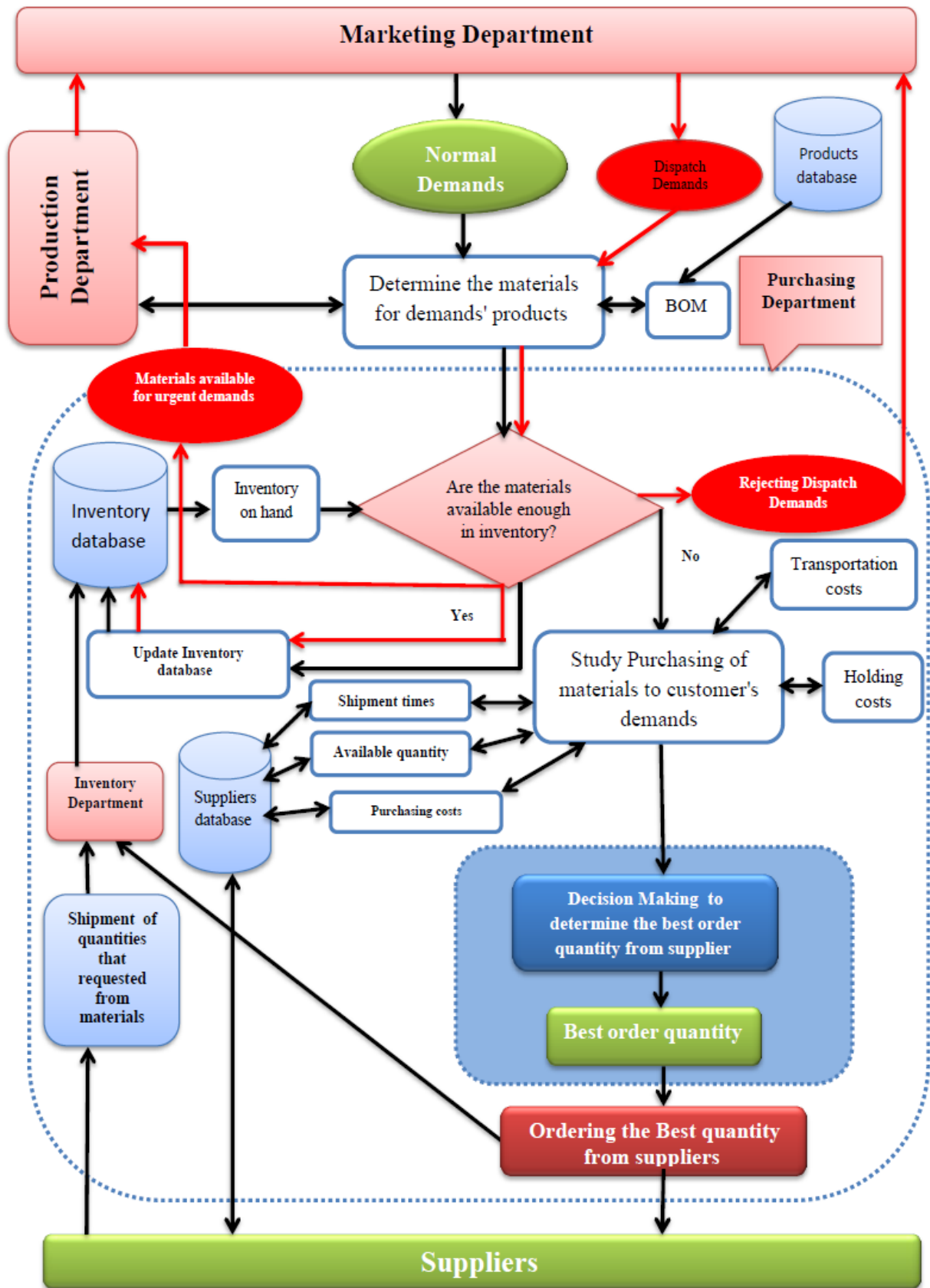
Figure (5): Purchasing Department in the Proposed Methodology
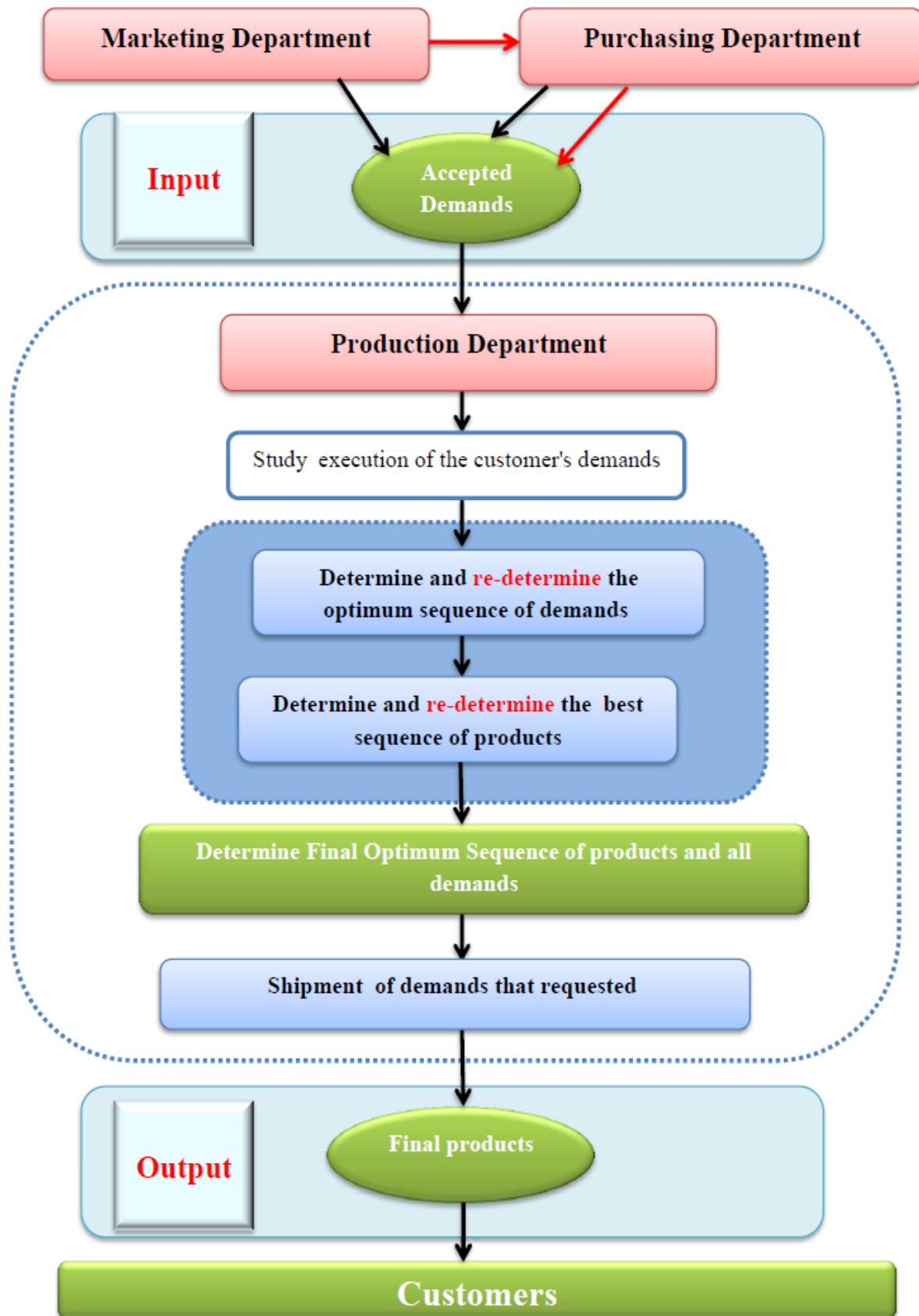
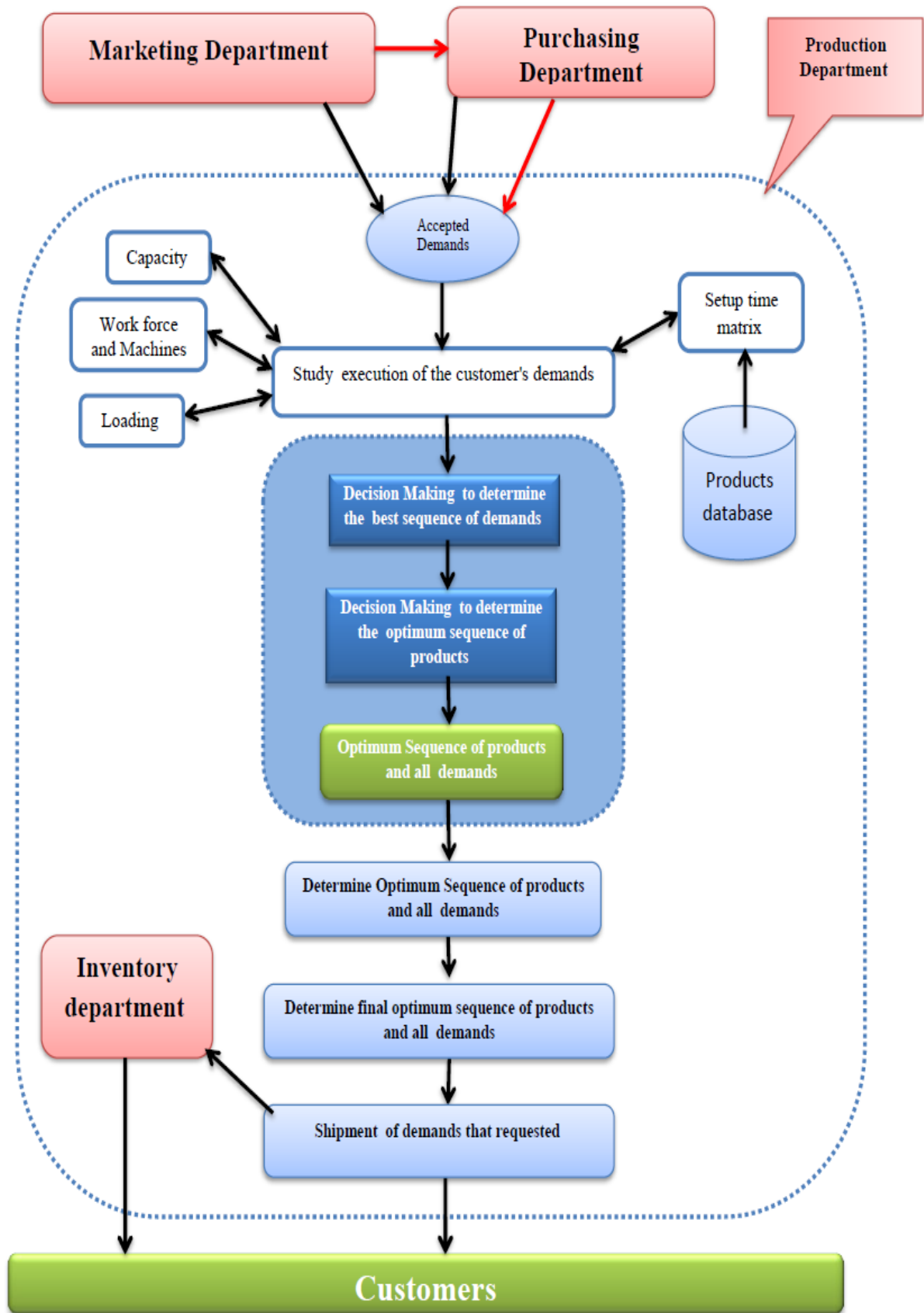Figure (6): Block Diagram for Production Department in the Proposed Methodology

Figure (7): Production Department in the Proposed Methodology

5.Conclusions:

The aim of any industrial organization is to achieve the profit. This aim is achieved by the proposed methodology in this paper to integrate decision making in internal supply chain; Customer satisfaction and understand its wants by using forecasting demand, minimize setup time and also minimize the total operation cost will lead to the good planning and optimization for sequencing products and optimization of inventory level, therefor will lead to minimize of cost and increase the profit.

The main conclusions of this paper are:

1.The implementation of the proposed methodology can be used to help the decision maker in any industrial organization.

2.The proposed methodology divides the company to three departments; marketing, production and purchasing departments.

3.Marketing department use forecasting demand to planning processes within company.

6.References:

[1] Flynn, B. B., Huo, B. and Zhao, X., " The Impact of Supply Chain Integration on Performance: A Contingency and Configuration Approach", Journal of Operations Management, 28 (1), pp. (58–71), 2010.

[2] Anvar M. M., " Supply Chain Integration Model: Practices and Customer Values ", Phd. Thesis, Universidade Nova de Lisboa Faculty of Science and Technology / Mechanical and Industrial Engineering Department, 2013.

[3] Friesland Campina, M. T., " Supply Chain Improvements ", Amersfoort: Friesland Campina , 2010.

[4] Huin, S. F., Luong, L. H. S., & Abhary, K. "Internal Supply Chain Planning Determinants in Small and Medium-Sized Manufacturers", International Journal of Physical Distribution and Logistics Management, 32(9), 2002.

[5] Fawcett, S. E., & Magnan, G. M. (2002). The rhetoric and reality of supply chain integration. International Journal of Physical Distribution& Logistics Management, 32(5).

[6] Edward S.(2011) Supply Chain Integration: Challenges and Solutions, Business Administration, Management, and Operations Commons. http://arrow.dit.ie/nitlbk.