Lot-sizing models as a strategic tool for optimizing the supply chain management, Case study: Naftal Company

نماذج Lot–sizing كأداة إستراتيجية للتسيير الأمثل لشبكة الإمداد –دراسة حالة: شركة نفطال–

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Abstract:

Improving the performance of the supply chain management allows the continuity of the organization as well as maximizing its profit while increasing customer satisfaction, and all this is done through the institution's reliance on effective supply chain management through its use of accurate quantitative methods and excluding random methods, which leads to a high level of the institution. So we tried, through this research, to clarify the concepts of supply chain management and assess its performance. We also attempted to illustrate various quantitative methods that help in manage this strategic function in the organization, including Lot-sizing models, and multi-criteria methods. Finally, projecting the most appropriate method on the case of the GPL branch of the NAFTAL Corporation, which is specialized in liquefied petroleum gas, by following the empirical Approach**.** Where very important results were drawn showing the importance of these models in planning this strategic function in the short term.

Keywords: management; supply chain; quantitative methods; lot-sizing models; multi-criteria methods.

JEL Classification Codes: c/c5 : c51; c52; c53 – c/c6 : c61 – c/c2 : c22

ملخص:

إن تحسين أداء إدارة شبكة الإمداد يسمح باستمرارية المؤسسة وكذا تعظيم ربحها مع زيادة رضاء العملاء، ويتم كل هذا من خلال اعتماد المؤسسة على إدارة شبكة الإمداد فعالة وذلك من خلال استعمالها لأساليب وطرق كمية دقيقة باستبعاد الطرق العشوائية، مما يؤدي إلى ارتقاء لمستوى عال للمؤسسة. وقد تم توضيح من خلال هذه الورقة البحثية مفهومي إدارة شبكة الإمداد وتقييم أدائها. وتوضيح مختلف الطرق الكمية المساعدة في تسيير هذه الوظيفة الاستراتيجية في المؤسسة، بما فيها نماذج Lot–sizing والطرق المتعددة المعاير. وأخيرا إسقاط أنسب الطرق على حالة مؤسسة نفطال فرع GPL المتخصصة في غاز البترول المميع بإتباع المنهج التجريبي. حيث تم استخلاص نتائج جد مهمة تبين أهمية هذه النماذج في تخطيط هذه الوظيفة الإستراتيجية في المدى القصير.

كلمات مفتاحية: إدارة، شبكة الإمداد، طرق كمية، نماذج lot–sizing، الطرق متعددة المعايير

تصنيفات JEL: c/c5 : c51;c52; c53 – c/c6 : c61 – c/c2 : c22

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INTRODUCTION:

Today, organizations are forced to search for original and effective solutions to lead the context that results their products and services, from the study office to the retail stores that offer their goods to the final consumer. The requirements of the highly competitive market impose institutions to use all the effective resources of their systems and define the work of supply chain as well, in order to be able to establish a fully effective chain, from the purchase of raw materials from the original supplier until the end of the sale of finished products to the final consumer.

As long as there is rapid change in any field of knowledge, many new terms come into existence soon. In this respect, the term supply and distribution is not an exception. There are many terms that have been used to express the activity of supply and distribution, the most important are Business Logistics, Material Management, Distribution Engineering, Logistics Management and Supply Chain Management.

Supply chain management is of great importance as it is a modern trend management by which the organizations have seen great success, and they have therefore become able to provide goods and services for customers, at the appropriate time and place with desired quality. However, under the widespread developments and the increasing competition, the organizations, industrial especially, after a long time of adopting their decision makers' expertise, experiences, also their personal conditions and the environment of life, the management of these industrial organizations have had to adopt modern scientific techniques and methods. Moreover, in order to solve problems that face these organizations, economics researchers are now no longer confined to intuition and guessing in determining causes, drawing conclusions and making decisions. There is, therefore, an *urgent need* for more modern scientific techniques and mathematical methods for economics in this area.

All of these factors contribute to thinking about using the most modern quantitative methods and techniques for the optimal management of functions and operations of supply chain in industrial organizations, for achieving their economic objectives efficiently.

In this sense, the formulation of this research problem leads us to ask the following question:

How effectively are these Lot-Sizing models used for the optimal management of supply chain in NAFTAL Corporation?

Study hypothesis:

We will try through this study to verify the validity of the following hypothesis:

Lot-sizing models are the most appropriate models for the optimal management of the supply chain in Naftal.

Research objectives:

This research is proposed to:

- Illustrate the importance and the role of supply chain management to the organization performance.
- Identify Lot-Sizing models, and try to apply them from obtained data of the organization under study.

Methodology:

The experimental approach will be relied on in order to study the problem posed by trying to drop and apply one of the Lot-sizing models to the institution under study.

Previous studies:

Despite the importance of this topic, there are few studies in this field, so that we find the most important studies that have attempted to address this topic or part of it as follows:

- Lahcen Blaha « Management de la Supply Chain et Planification Avancée » mémoire pour obtenir le diplôme de Magister en Sciences Economiques Spécialisé en gestion des opérations et de la production sous la direction de Mr Le Professeur M.BELMOKADDEM. Université de Tlemcen Année universitaire 2005-2006.

Which conducted a theoretical study of the various methods of planning supply chain management in the long, medium and short term.

- Abdelkader Hammami « Modélisation Technico-Economique D'Une Chaine Logistique Dans Une Entreprise Réseau ». Thèse présenté pour l'obtention du grade de Docteur de l'Ecole Nationale Supérieure Des Mines De Saint-Etienne, France. Et du grade de Philosophiae Docteur (PH.D.) de la Faculté des Sciences et de Génie, Université Laval, Québec, Canada, Spécialité : Génie Industriel. 26/09/2003.

So that he touched on the various methods and multi-criteria techniques used in the modeling of supply chain management, and he studied the problems of locating the chain, selecting suppliers and determining the arrangement, and he suggested a method of modeling that would allow a cooperative chain of certain institutions to organize in a way that enables them to respond to the offers available in the market while respecting, of course, the needs of customers and the objectives of the partners in this chain of encouragement and talent development.

- François Galasso « Aide à la planification dans les chaines logistiques en présence de demande flexible » Thèse présentée pour obtenir Le Titre De Docteur De L'Institut National Polytechnique De Toulouse, Ecole Doctorale : EDSYS, Spécialité : Systèmes Industriels. 23/04/2007.

Who studied the various approaches used in supply chain planning, the terminology that allows defining the dynamic planning context for a unit of supply, and the methods used to improve relationships with customers and suppliers.

So that we note that all these studies are in French. In addition, it is theoretical and lacks the practical aspect due to its complexity and the difficulty of applying the studied methods due to the difficulty of obtaining data that enables the researcher to apply various scientific methods in supply chain management.

The study that we relied on is:

- Omar BENATEK "ennemdhadja erriadia el ektissadia li chabakete imdade el moassassete essénaia el djazairia [Mathematical economic modeling of Algerian industrial enterprises supply chain" PhD Thesis, Faculty of Economic, Commercial and Management Sciences, University of Abu Bakr Belkaid Tlemcen, December 2014.

The modified model proposed in this thesis was used in the case study of the Naftal Corporation, which was not addressed in this thesis.

1-Supply chain management:

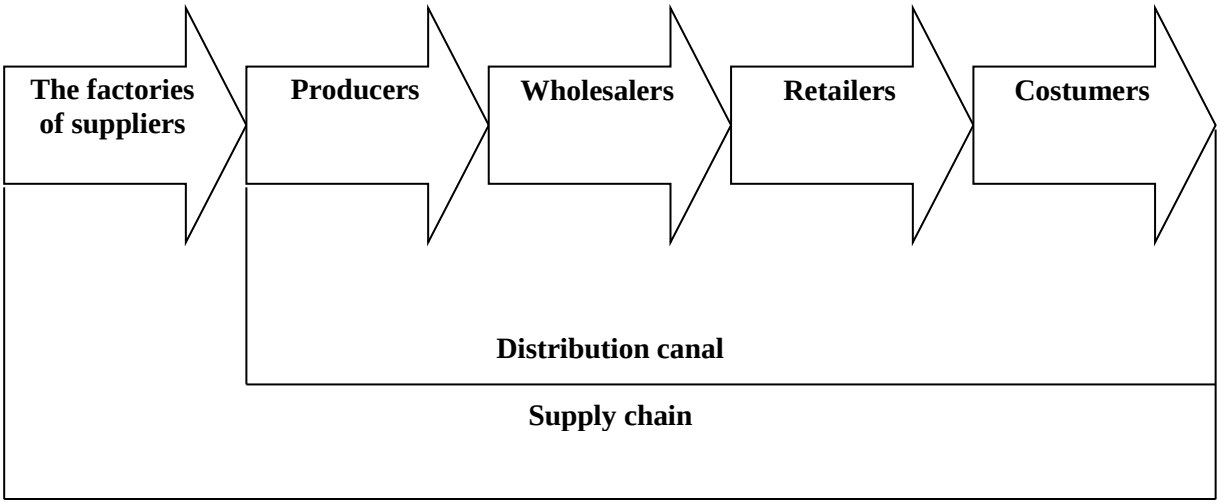
1-1 Supply chain management definition:

Several and different definitions have been provided to supply chain management. In 1986, The Council of Logistics Management (CLM) defined the expression 'supply chain' as: "The process of planning, implementing, and controlling the efficient, cost-effective flow and storage of goods, services, and related information, from point of origin to point of consumption, for the purpose of conforming to customer requirements." (Ismail, 1999, p.6)

Supply chain management is the joint management of the main internal and external operations to a sequence of independent or semi-independent companies (at least two companies) to achieve the agreed goals that are specific to ensure the requirements, production and distribution of the product. (Awad, 2006, p48)

By another definition, supply chain management is the task of integrating organizational units along a supply chain and coordinating the material, information and financial flows, in order to fulfill ultimate customer demands with the aim of improving the competitiveness of a supply chain as a whole. (H.Stadler, 2015)

Figure (1): Supply chain structure.



Source :(G. Nickels, 2002, p. 478)

1-2 Supply chain effectiveness on the organizational performance:

Supply chain is based on respect of customers; they are seen as partners with the organization, and therefore both lead the organization. All organizations have achieved many benefits from this idea such as, reducing the inventory holding cost, optimizing customer satisfaction level, increasing market share…, the more the supply chain is flexible, there is an improvement in the market performance of the organization, in addition to its financial performance, and there is also an increase in the efficiency and confidence. From the above, it may be concluded that:

- The organization that has flexible supply chains achieves higher market share.
- The complementary between organization functions and supply chains increases the performance of the organization.
- In the above circumstances, market share decline does not mean that organizational performance has declined than before. However, there is therefore a new organization in the same field; hence there is a decline in market shares of the other organizations.

Industrial organizations could reduce their activity costs through supply chain management, which would raise the profitability, which result in increasing the performance, and therefore

reinforces the competitive position in the market on one hand, and on the other hand, the decrease in costs for the organization will be reflected in purchasing goods and services by the customers due to the decrease of their prices, in addition to the capacity of the productive organization to provide them with the required quality, at the appropriate time and place.

1-3 Objectives supply chain management:

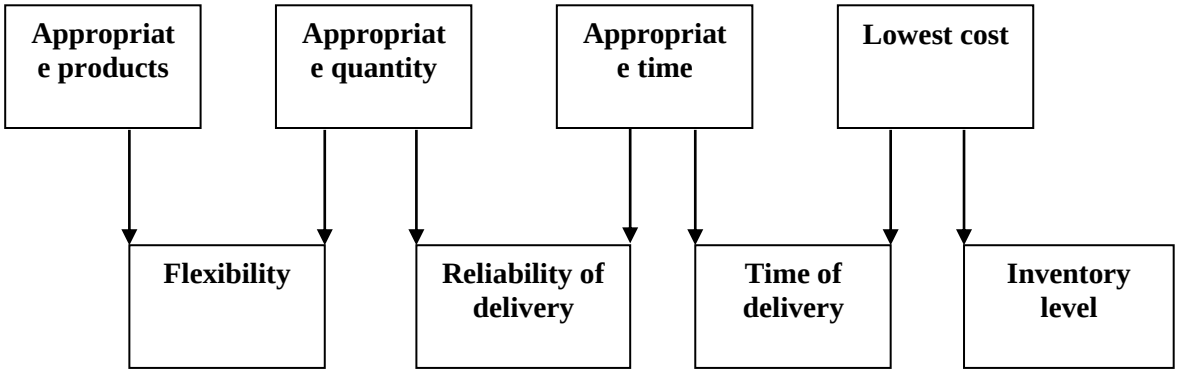
The presence of a set of objectives which are achieved by the participation of functions from both the organization and the other participant organizations in the same supply chain, were required for the process of supply chain management of the organization. These objectives can be summarized as follows: (Shamout, 2008, p. 61-62)

- Improving the competitive position of the organization.
- Ensuring the regular flow of materials, components and services in and out of the organization with at lowest possible cost.
- Keeping safety stock, and supporting the continued improvement of quality.

Making close relationships inside the organization, exploring and developing probable suppliers.

It is also mentioned that the traditional objectives of supply chain management are: providing appropriate products in the appropriate quantity within a time frame, at lowest cost. The following figure represents these objectives, which is known as the diagram of objectives of supply chain management.

Figure (2): the structure of objectives of supply chain management.



Source: (Jabbouri, 2008, p. 63-64)

2-Lot-Sizing models:

Lot-Sizing models refer to the construction activity of production planning that must take decisions on at the production batches level and time, and that usually involves many products at the same time. Maximizing the organization benefits is the main goal of these models; this was by minimizing the total costs to meet customer demands at the appropriate time. The Lot-sizing model is a pivotal step to improve the supply chain activities; and thus, the organization requires a competitive advantage from reducing costs and improving the customer service.

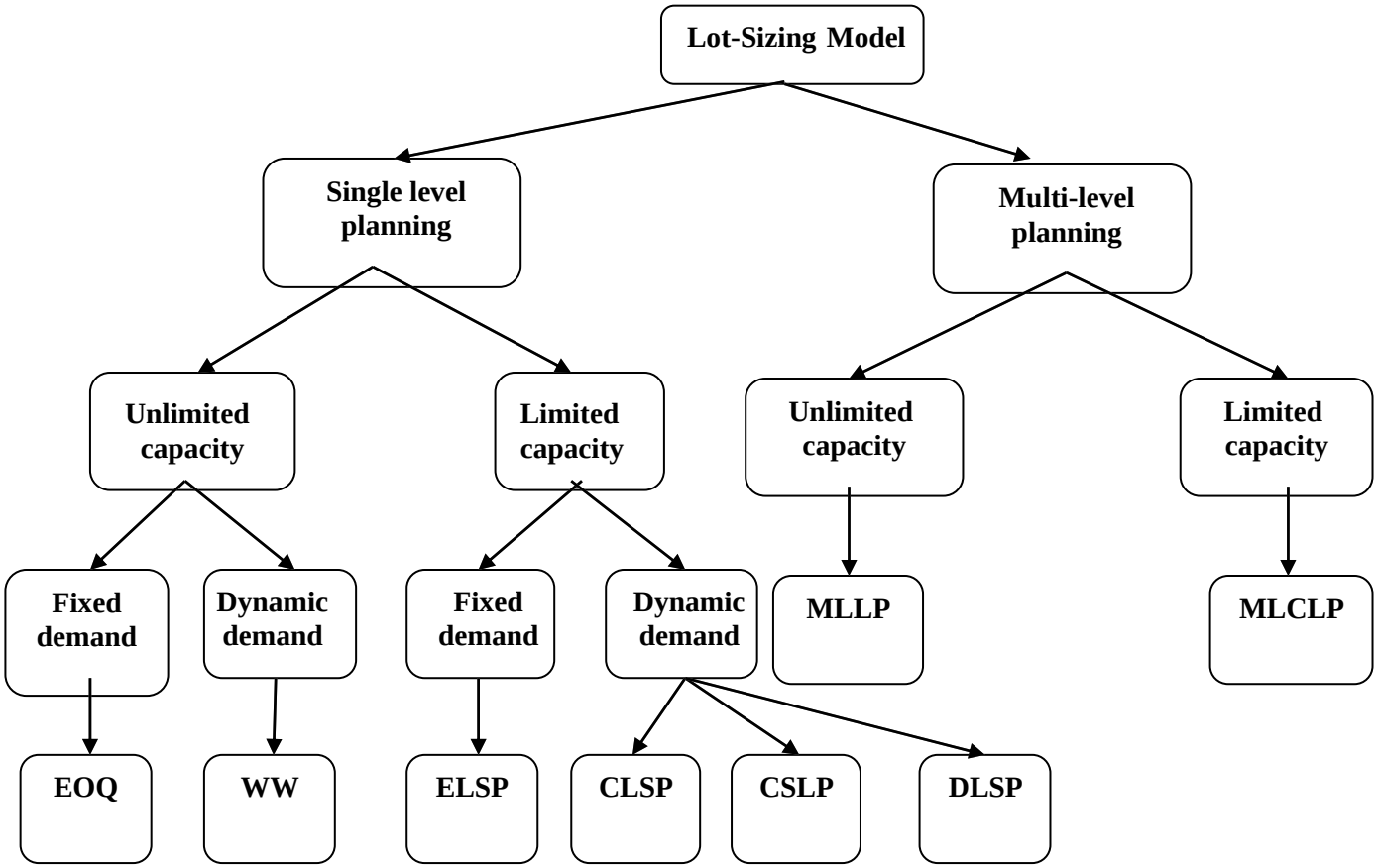
The Lot-Sizing model is mainly used in industrial organizations on the basis of sales forecasting and for meeting the customer demands, in addition to the production planning.

2-1 The definition of Lot-Sizing models:

Lot-Sizing models emerged as an extension to calculate the Economic Order Quantity (EOQ), the model was introduced by Harvey M. Wagner and Thomas M. Whitin in 1958.It is one of the main models that handle the production planning problems and inventory management where the demand for products varies at the planning level. The purpose of these models is determining the production periods over this horizon (planning level) and the quantities of products which would be manufactured in each period, knowing that each production period would entail additional costs to customize. The overall quantity of production must meet the customer needs in line with minimizing the total costs in this period. (Merzouk, 2007)

2-2 Classification of Lot-Sizing:

Figure (3): Classification of Lot-Sizing models



Source: (Merzouk, 2007, p. 145)

EOQ: Economic Order Quantity.

WW: Wagner-Whitin.

ELSP: Economic Lot-Sizing and Scheduling Problem.

CLSP: Capacitated Lot Sizing Problem.

CSLP: Continuous Set-up Lot sizing Problem.

DLSP: Discrete Lot-sizing and Scheduling Problem.

MLLP: Multi-Level Lot-sizing Problem.

MLCLP: Multi-Level Capacitated Lot-sizing Problem.

2-3 mathematical formulation of Lot Sizing models:

Capacitated Lot Sizing Problem: by using various mathematical modeling techniques based mainly on Lot Sizing models, we analyze new several decision variables, a CLSP formulation is given as follows: (Lang, 2010, p. 35)

Objective function: it is to minimize production and stocking costs.

$$Min\ F(q,x,I) = \sum_{i\epsilon p}\sum_{t=1}^{T}(p_{it}q_{it} + h_i I_{it} + f_{it}x_{it})$$

Subject to the following constraints:

$$I_{it} = I_{i,t-1} + q_{it} - d_{it} \quad / \quad i\epsilon P, t = 1, \dots, T$$

$$I_{i0} = 0 \quad / i\epsilon P$$

$$\sum_{i\epsilon P} k_i^p q_{it} \leq k_t \quad / \quad t = 1, \dots, T$$

$$q_{it} \leq M.x_{it} \quad / \quad i\epsilon P, t = 1, \dots, T$$

$$q_{it}, I_{it} \geq 0 \quad / \quad i\epsilon P, t = 1, \dots, T$$

$$x_{it}\epsilon\{0,1\} \quad / \quad i\epsilon P, t = 1, \dots, T$$

So that:

p : Number of products

T: Number of periods.

d_{it} : Demand for product i in period t

h_i : Cost for storing one unit of product i

p_{it} : Unit production cost of product i in period t

I_{i0} : Initial inventory of product i

f_{it} : Fixed setup or order cost for product i in period t

k_t : Capacity of resource available in period t

k_i^p : Capacity required for manufacturing one unit of product i

For decision Variables

q_{it} : Production quantity of product i in period t

I_{it} : Inventory of product i at the end of period t

x_{it} : Binary variable that indicates whether a setup for product i occurs in period t

Concerning the model proposed by a group of researchers, the formulation is identified as follows: (Chehbi, p. 06)

The objective function attempts to minimize the costs of supply chain management (logistics, production, storage and distribution)

$$Min\left[\sum_{i\epsilon N}\sum_{t\epsilon T}\left[\alpha(i)h_iI_{i,t}+\sum_{k\epsilon K}\beta(i)p_{i,t}X_{i,k,t}+\gamma(i)DAp_{i,t}*CAp_i+\theta(i)D_{i,t}*CD_i\right]\right]$$

So that:

T: Number of periods.

N: the studied manufactured materials of the organization (set of finished products, components, raw materials)

K: set of resources.

h_i : Cost for storing one unit of product i that can be a raw material or a component or a finished product.

p_{it} : Unit production cost of product i in period t

CAp_i : Cost for supplying one unit of product i

CD_i : Cost for distributing one unit of product i

For decision Variables of the modal are:

Production: $X_{i,k,t}$ Production quantity of product i using resource k in period t

Logistics: $DAp_{i,t}$ Quantity of product i for the logistics in period t

Distribution: $D_{i,t}$ Quantity of finished product distributed at period t.

State variable: $I_{i,t}$ stock level of material i at the end of period t.

Subject to the following constraints:

Inventory evolution: $I_{i,t+1}=I_{i,t}+\sum X_{i,t,k}-\sum g_{i,j}X_{i,t,k}+DAp_{i,t}-D_{i,t}$

Limited production capacity: $\sum_{i\epsilon N}b_{i,k}X_{i,k,t}\leq C_{k,t}\ /k\epsilon K,\ t\epsilon T$

Storage capacity: $\sum_{i\epsilon N}I_{i,t}\leq S_t\ \ /\ t\epsilon T$

Transportation capacity: $\sum_{i\epsilon N}D_{i,t}\leq T_t\ \ /\ t\epsilon T$

Nonnegative condition: $X_{i,k,t},DAp_{i,t},D_{i,t},I_{i,t}\geq 0$

Hence, the first constraint allows for calculating the change in inventory between two consecutive periods, the equation takes into consideration the completed production for each type of products in a given period, the quantity of materials that should be for the logistics and the anticipated quantity of materials for distribution.

So that,

$g_{i,j}$: Quantity of product j required for manufacturing one unit of product i

$b_{i,k}$: Quantity of resource k available for manufacturing one unit of product i

$C_{k,t}$: the available quantity of resource k in period t

S_t : Possible storage capacity in period t

T_t : Possible transportation capacity in period t

3-Case study of the Algerian Corporation (Naftal) in Algeria:

We will try to clarify the theoretical concepts by doing a case study of the Algerian Corporation (Naftal) GPL branch, which is considered the leader in the country in the field of transportation and distribution of petroleum products and their derivatives, so it was necessary to search for the optimal management of its supply chain in order to better utilization of its material and human capabilities, raising the country's production capacity and thus increasing profitability and reducing total costs.

3-1 Presenting of NAFTAL Company and introducing its products:

The Naftal Company "National Corporation for the Refining and Distribution of Petroleum Products" was established as a separate unit from the parent company Sonatrach, and it entered the activity in the first of January 1982, with an estimated capital: 6 500 000 000 DA.

The word “Gaz de Pétrole Liquéfié” GPL means liquefied petroleum gas, which is a mixture of butane (c4) and propane (c3).

The company specializes in the production of two types of gases, which are as follows:

- Butane gas bottles of 13 kg, 6 kg and 3 kg.
- Propane gas bottles of 11 kg and 35 kg.

3-2 Characteristics of company products:

studying of the product characteristics is very important in the process of modelling its supply chain, and it is only done by knowing the various objectives to be achieved and conditions or restrictions imposed by the characteristics of the products such as sufficient time for the catering, production and distribution process.

It should also be noted that there are common characteristics between the two products, such as the stages of production, and the process of storing these products. However, they differ in the price and profit resulting from selling each unit of these products...etc. After conducting a detailed study of the costs of purchasing and storing raw materials, the costs of producing and distributing finished products, and the various stages of production involved in that, it was reached to extract the information summarized in the following table:

Table (1): NAFTAL Company' products characteristics

	Butane (B13)	**Propane (P35)**
Selling price per bottle (DZD)	165 ,5	355
unit storage cost (DZD)	56 ,7	71,4
unit distribution cost (DZD)	43	84
Production cost per bottle (DZD)	35	86
unit profit (DZD)	30,8	113,6

Source: Prepared by researchers based on the company's accounting documents**.**

Knowing that the fixed costs of managing the supply networks were estimated at: DA. 3999025,2

3-3 Forecasted sales volume for the second semester of 2021:

Data related to the forecasted sales volume of B13 and P35 for the second semester of 2021 are available at the institution and are summarized in the following table:

Table (2): forecast sales volume for 2021

	June	**July**	**August**	**September**	**October**	**November**
B13	322384	343769	263307	315307	403923	489846
P35	1828	1800	1772	1914	2257	2428

3-4 Mathematical formulation of the supply chain management process for NAFTAL:

- Definition of decision variables:

$x_{1,t}$: Production quantity of B13 in period t.

$x_{2,t}$: Production quantity of P35 in period t.

$DAP_{J,t}$: The quantity of raw material j to be supplied in period t.

$D_{1,t}$: Quantity of B13 distributed at period t.

$D_{2,t}$: Quantity of P35 distributed at period t.

$I_{1,t}$: stock level of butane at the end of period t.

$I_{2,t}$: stock level of Propane at the end of period t.

We use the Lot-sizing model that was explained earlier. The objectives of supply chain management for Naftal Corporation are mathematically formulated as follows:

$$Z_1 \text{ Min}=\begin{bmatrix}56{,}7\sum_{t=1}^{6} I_{1t}+71{,}4\sum_{t=1}^{6} I_{2t}+35\sum_{t=1}^{6} x_{1t}+86\sum_{t=1}^{6} x_{2t}\\ +46{,}1\sum_{t=1}^{6} DAP_{1t}+64{,}5\sum_{t=1}^{6} DAP_{2t}+43\sum_{t=1}^{6} D_{1t}+\\ 84\sum_{t=1}^{6} D_{2t}+171\sum_{t=1}^{6} f_{1t}+171\sum_{t=1}^{6} f_{2t}+3999025{,}2\end{bmatrix}.\ldots.\ldots.(1)$$

$$Z_2 \text{ Max} =[30{,}8\sum_{t=1}^{6} D_{1t}+113{,}6\sum_{t=1}^{6} D_{2t}-3999025{,}2].....(2)$$

The first objective is the objective of minimizing costs, and the second objective is the objective of maximizing profits.

There are many constraints that limit the optimal achievement of these goals:

Butane production volume should exceed 307,692 bottles.

The volume of production of Propane should exceed 1714 bottles.

The production of Butane and Propane products must not exceed the forecasted sales volume.

The production capacity of producers must exceed 577,058.

Non-negative condition.

- Production constraints:

$307692<211384+X16\leq 322384$

$307692<I17+X17\leq 343769$

$307692<I18+X18\leq 326307$

$307692<I19+X19\leq 315307$

$307692<I110+X110\leq 403923$

$307692<I111+X111\leq 489846$

$1714<863+X26\leq 1828$

$1714<I27+X27\leq 1800$

$1714<I28+X28\leq 1772$

$1714<I29+I29\leq 1914$

$1714<I210+X210\leq 2257$

$1714<I211+X211\leq 2428$

- Production capacity constraints:

$\sum_{i=1}^{2} x_{it} \leq 577058$ /t=$\{6,7,8,9,10,11\}$.

- Storage constraints:

$I_{1;t+1} = I_{1;t} + x_{1;t+1} - D_{1;t+1} / t=\{6,7,8,9,10,11\}.$

$I_{2;t+1} = I_{2;t} + x_{2;t+1} - D_{2;t+1} / t=\{6,7,8,9,10,11\}.$

$f_{j;t+1} = f_{j;t} + DAP_{j;t+1} - \sum_{i=1}^{2} a_{ij;t+1} x_{i;t+1} / t=\{6,7,8,9,10,11\}.$

- Storage capacity constraints:

$f_{1;t} \leq 2000000 / t=\{6,7,8,9,10,11\}.$

$f_{2;t} \leq 150000 / t=\{6,7,8,9,10,11\}.$

- Distribution constraints:

$D_{1;t} > 307692 / t=\{6,7,8,9,10,11\}.$

$D_{2;t} > 1714 / t=\{6,7,8,9,10,11\}.$

- Non-negative constraint:

$x_{i,t}, I_{i,t}, DAP_{i,t}, D_{i,t}, f_{i,t}, I_{i,t+1} \geq 0 / i=\{1,2\}, t=\{6,7,8,9,10,11\}.$

3-5 Solve the model using the compromise goals programming method:

To solve the previous mathematical model, we use the compromise goals programming with method, by following these stages:

- Determine the Z1 ambition level with the aim of minimizing supply costs under imposed constraints.

- Determining the Z2 ambition level with the aim of maximizing profit under the previously imposed restrictions.

- Searching for the optimal solution that approximately achieves the two goals, after determining the unwanted deviations. The final mathematical formulation of the previous model using this method takes the following form:

$$\text{Min } Z = \delta_1^+ + \delta_2^-$$

subject to

$$\left[\begin{array}{c} 56{,}7\sum_{t=1}^{6} I_{1t} + 71{,}4\sum_{t=1}^{6} I_{2t} + 35\sum_{t=1}^{6} x_{1t} + 86\sum_{t=1}^{6} x_{2t} \\ +46{,}1\sum_{t=1}^{6} DAP_{1t} + 64{,}5\sum_{t=1}^{6} DAP_{2t} + 43\sum_{t=1}^{6} D_{1t} + \\ 84\sum_{t=1}^{6} D_{2t} + 171\sum_{t=1}^{6} f_{1t} + 171\sum_{t=1}^{6} f_{2t} - \delta_1^+ + \delta_1^- + 3999025{,}2 \end{array}\right] = 1067784025$$

$$[30{,}8\textstyle\sum_{t=1}^{6} D_{1t} + 113{,}6\sum_{t=1}^{6} D_{2t} - \delta_2^+ + \delta_2^- - 3999025{,}2] = 101157175$$

and the previous constraints.

3-6 The results and their discussion:

Using the Lindo61 software, we get the following results:

Z=42928960, P1=0, N2=42928960, P2=0 ,N1=0

I16 =18637 X16 = 121389 DAP16=0

I17= 0 X17= 289054 DAP17=3757709

I18= 0 X18= 307692 DAP18=3999996

I19= 0 X19 = 30769 DAP19=3999996

I110= 0 X110 =307692 DAP110=3999996

I111 = 0 X111=307692 DAP111=3999996

I26= 86 X26= 937 DAP26=0

I27= 0 X27=1628 DAP27=51275

I28= 200 X28 =1914 DAP28 66990

I29= 1514 X29 = 3028 DAP29=105980

I210= 0 X210 = 200 DAP210=7000

I211= 0 X211= 1714 DAP211=59990

From the results obtained, we can conclude:

- The first goal has been achieved 100%, the total cost of production is exactly equal to the level of The ambition that the Naftal Foundation seeks not to exceed.

- As for the second goal, it was achieved by 60%, so that there is a decrease in profit from the level of ambition, and the decrease is estimated at 42928960 DA

- The establishment must produce from the first product (B13) in the second semester of 2021: 121389, 289054, 307692, 307692, 307692 and 307692 bottles per month, respectively. And the second product (P35): 937, 1626, 1914, 3028,020 and 1714 bottles, respectively.

- This production costs the institution an amount of 1067784025 DA as the costs of supply chain management, and it achieves an estimated profit of 58228215 DA.

Hence, the volume of information extracted using Lot-sizing models becomes clear, and this is what makes the method very suitable for supply chain management of this institution, despite the difficulty of applying it due to its large needs for accurate data and its resolution.

Using the Lindo program, which requires great concentration in writing the model in order to avoid errors and misleading results.

Conclusion:

This research paper aims to become familiar with the concept of supply chain management as one of the most important modern administrative concepts and its effective role in the performance of organizations. The importance of this research lies in applying the Lot-Sizing models for the supply chain management in the Algerian organization. We already face several difficulties in determining the appropriate organization and getting data. We could finally contact the Naftal company, we also worked on modeling its product supply chain which lacked using scientific methods on supply chain management level and its activities in general, we therefore surveyed the global situation and the product characteristics in order to determine the appropriate methods for sales forecasting and supply chain management.

We tried to achieve two main goals through this chain modeling process. Firstly, profit maximization; secondly, cost minimization. We have come out with very important results of efficiency and great effectiveness.

Recommendations and results:

This research has investigated the topic of supply chain management of NAFTAL Company, through this case study, there are significant findings:

- The effective management of the supply chain of industrial organizations is the key for the success in achieving their goals efficiently. The success in supporting the competitive position and raising market share of the organization depends primarily on supporting activities that are capable of creating the value and reducing the cost, the main activity is the function of supply chain management that coordinates the various functions of the organization.
- Through Realities on the ground of the supply chain management activity in the company under study, we figured out that there is no importance towards this option despite its effective role in the optimal management of its various functions.
- Lot Sizing models have great effectiveness in function planning of NAFTAL Company's supply chain management, in the framework of the field study, It turned out that it was the appropriate method for modeling NAFTAL Company's supply chain management, it had acceptable results; hence, it positively influenced the planning of all functions of the supply chain management of this company in order to achieve lowest costs and highest profits.
- The nonuse of modern technologies by the company under study especially in the computer programs field, we therefore faced difficulties even in getting the simplest information.
- Taking into consideration the stock levels for avoiding the stock-out, and therefore the organization can confront the customers demand.
- It is better to adopt a short-term period of planning in order to obtain realistic results.
- Modifications can be conducted on a generalized model that we have extracted at the end in order to adapt requirements of any organization.

In light of the above-mentioned results, these are the recommendations:

- At the present time, the industrial organizations are oriented to serving the customer who is considered the cornerstone of the supply chain management objectives. This requires a necessity provided by this modern management method.
- The need to use scientific methods that help Algerian organizations in making decisions.
- Using computer programs that improve the effective use of the information available in the organization.
- Increasing the economic openness and the need to create cooperative relations between the university and Algerian organizations in order to facilitate the process of applying the theoretical aspect in the company management.
- Creating a specialized branch for quantitative technologies in the Algerian organization and recruiting specialized and high level employees.
- The need to provide training courses to human resources about applying quantitative techniques and methods on the ground of Algerian organization.
- The necessity of establishing the department of analytical accounting in the Algerian organization in order to enable researchers to obtain the information needed.

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